

July 19, 1986

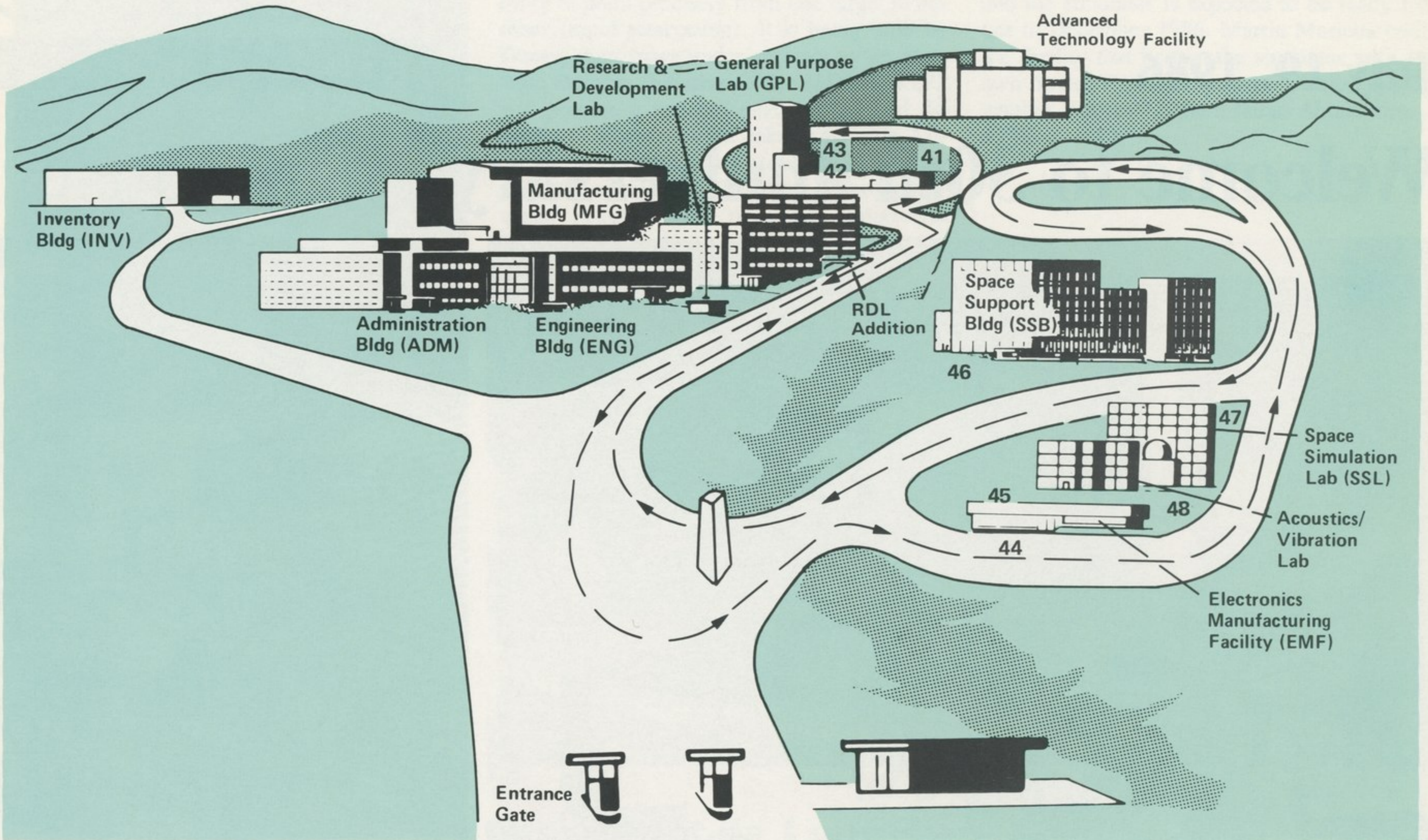
# Welcome to 30th anniversary open house



*Scenes from 1984 family open house*

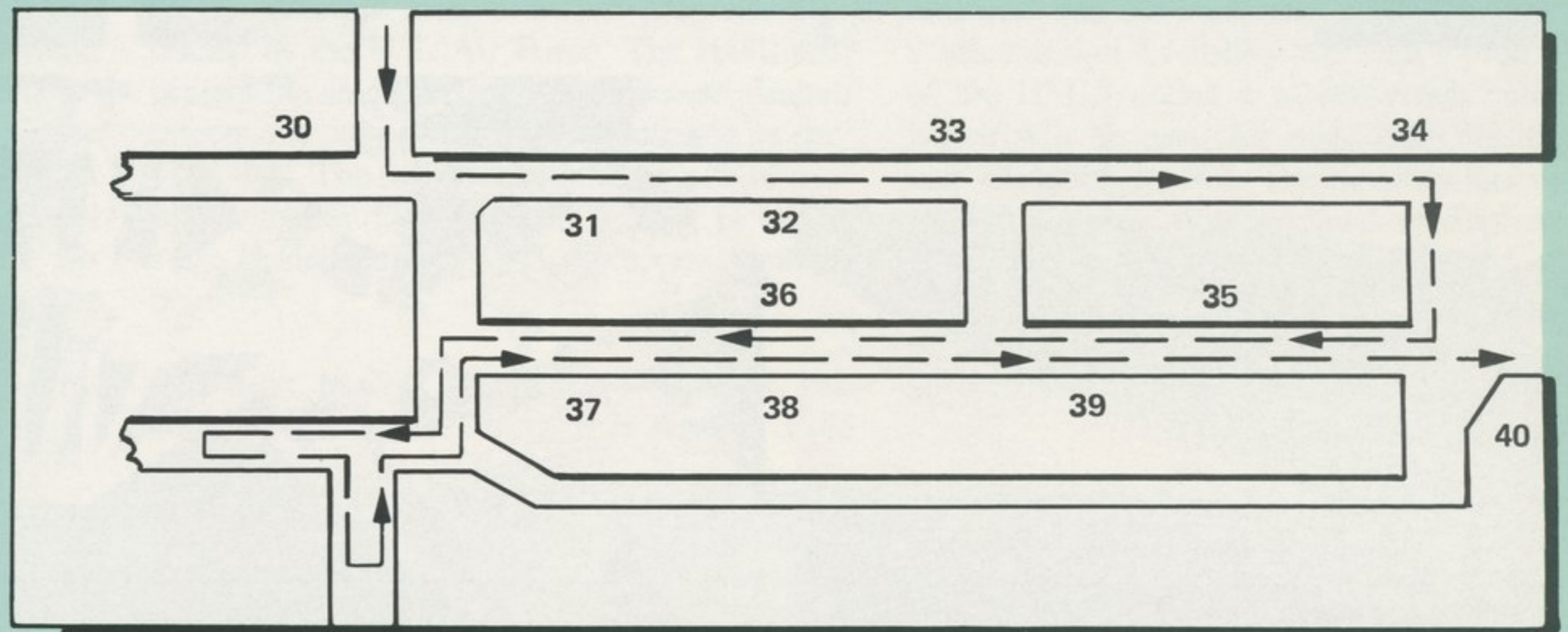


# Sites, facilities along family open house tour route



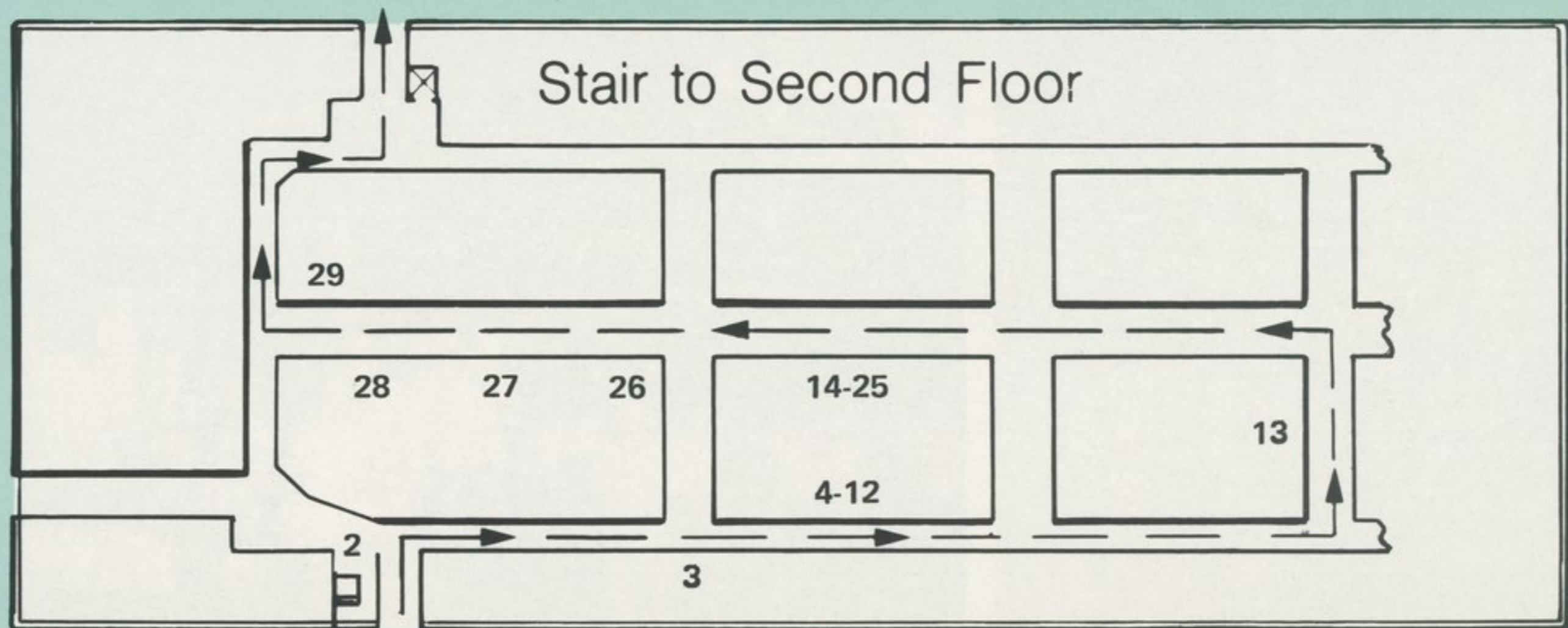
## Manufacturing Building

Second floor



First floor

Enter from Cafeteria Aisle





# Legend, explanations to map and diagrams

## Engineering Building

- 1 Lobby—Greetings
- 2 Second floor—Cafeteria (theater)  
— Films

## Manufacturing Building

First floor:

- 3 Quality control display
- 4-12 Precision manufacturing on milling and drill press machines
- 13 Chem milling display
- 14-25 Precision manufacturing on lathes
- 26 McKay forming press, 24-feet, 200-ton capacity
- 27 Farnharm rolling machine, 1/4-inch-by-24-feet capacity
- 28 Hufford stretch press, 60-ton capacity
- 29 Pacific power brake, 24-feet, 400-ton capacity

Second floor:

- 30 Transtage  
— Propellant Control Module  
— Control Module
- 31 TOS (Transfer Orbit Stage)
- 32 Titan 34D  
— Stage II assembly  
— Stage I assembly
- 33 Electrical harness fabrication
- 34 Honeycomb structure (solar array)
- 35 Pictures—30 years of progress
- 36 Titan II ELV  
— Stage II assembly  
— Stage I assembly

- 37 Vertical weld
- 38 Small ICBM
- 39 Emplacer components
- 40 Safety exhibit

Bus tours start at the north door of the Manufacturing Building and proceed to the Gallery in GPL.

## General Purpose Laboratory (GPL)

- 41 The Gallery  
— Spacecraft exhibits of past, present and future programs
- 42 Space Operations Simulator (SOS)  
— Simulator  
— Solar Max  
— STS cargo bay
- 43 Autonomous land vehicle

## Electronics Manufacturing Facilities (EMF)

- 44 First floor: EMF Cafeteria  
— Data Systems microcomputer display  
— Computer purchasing information
- 45 Second floor:  
— Assembly work areas  
— Electronics manufacturing

## Space Support Building (SSB) South

- 46 SSB Cafeteria  
— Space art display  
— Theater—Astronaut Bruce McCandless  
— Manned maneuvering units  
— Young astronaut display  
— Propellant management devices
- 47 Reverberant Acoustic Laboratory  
— International exhibits  
— AFA—Air Force programs  
— AIAA—NASA programs
- 48 Space Simulation Laboratory  
— Vacuum chamber (first floor only)  
— International exhibit  
— AFCEA—I&CS  
— Research and Development Lab (RDL) north parking lot  
— Food area  
— Entertainment area  
— Gifts area  
— Administration parking lot  
— Food and entertainment  
— EMF parking lot  
— Food and entertainment  
— SSB North parking lot  
— Food and entertainment



Denver Aerospace has experienced tremendous growth during the past 30 years. More than 6,000 people now work at the company's main facility, pictured here in a 1984 aerial photo. Another 5,000 work at other facilities in the southern Denver metropolitan area.

## In case of emergency

Plant protection, telephone Ext. 7-4646, is the contact for assistance in an injury or illness during the family open house. That same extension should be used for vehicle trouble or to locate missing children.



## Teets welcomes open house visitors



Peter B. Teets

It gives me great pleasure to welcome Martin Marietta employees and their families to our open house—in a year that marks our 30th anniversary in Denver.

We have grown a great deal during the past years and added many new people to our company. This day offers a chance to glimpse many of the programs with which we're involved.

Our past and continued success depends, of course, on the fine performance of our employees. You have made possible our splendid results and the excellent reputa-

tion that Martin Marietta has achieved in the past 30 years.

Our focus has been and continues to be on Mission Success. Today, you will see many of the facilities that have been used to build and test our quality products, but, in the final analysis, it is our people that we count on to assure Mission Success.

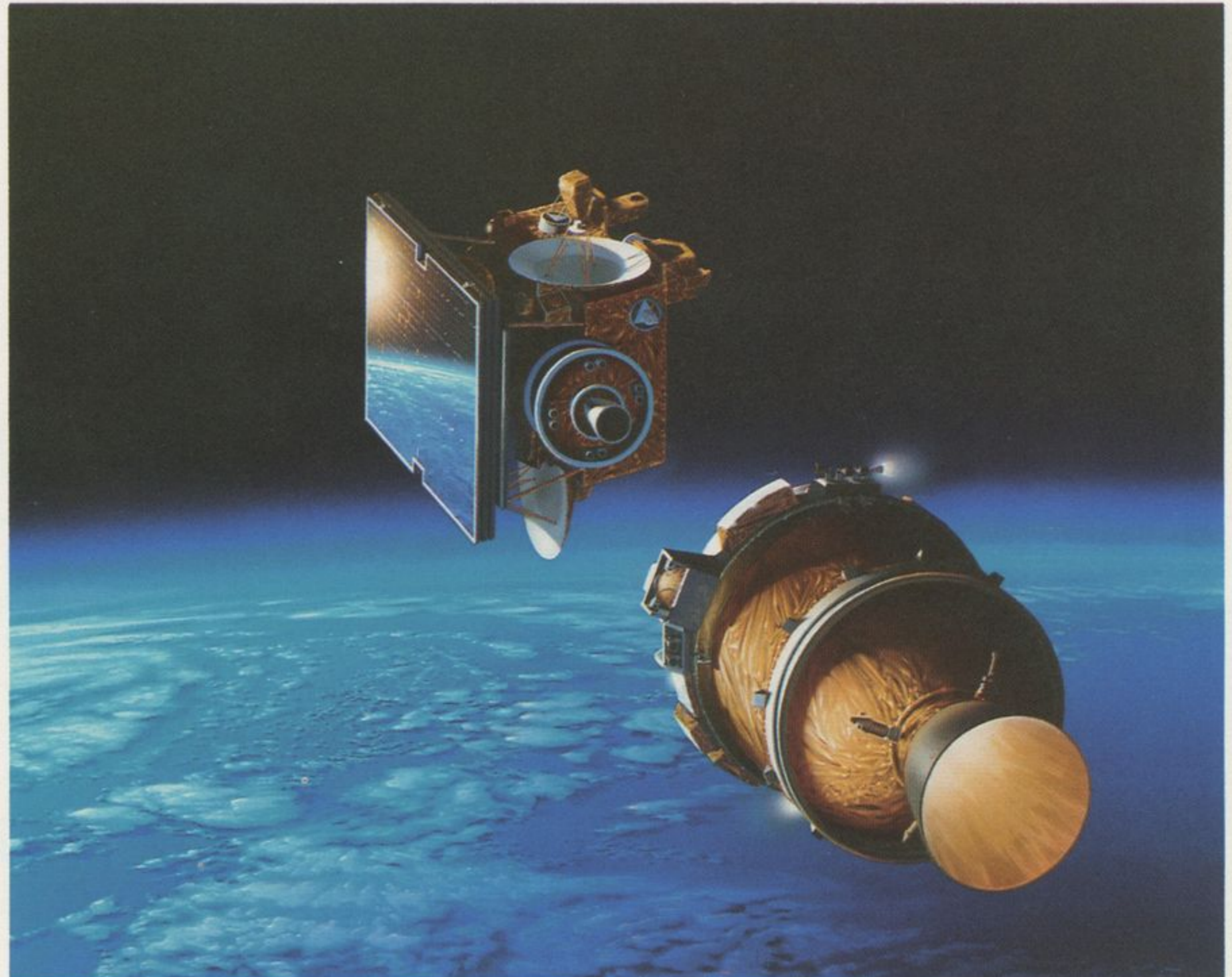
Thank you for your continued fine support, and I hope you enjoy your visit here.

Peter B. Teets  
President  
Denver Aerospace

## Transfer Orbit Stage/Apogee and Maneuvering Stage (TOS/AMS)

**Description:** Martin Marietta and Orbital Sciences Corporation (OSC) are developing a series of upper-stage systems for commercial or government use to boost satellites from low-Earth orbits to higher orbits and planetary escape trajectories. OSC has contracted with Martin Marietta for commercial development of TOS and study of AMS. TOS will be a medium-capacity upper stage designed to place 6,000- to 13,000-pound payloads into geosynchronous orbit or to deliver spacecraft into planetary trajectories. The AMS will be a liquid bipropellant propulsion module that can operate with or without TOS. As a standalone stage, the AMS would be capable of placing satellites weighing up to 5,600 pounds into geosynchronous transfer orbit. Combined with the TOS, it could deliver a 6,600-pound payload into geosynchronous orbit.

**Status:** In March 1986, NASA selected OSC to provide the upper stage for use with the space shuttle to launch the Mars Observer mission in 1990. NASA plans to enter into contract negotiations with OSC to use the TOS, and for options for additional upper stages to launch three follow-on planetary missions.



## Manned Maneuvering Unit (MMU)

**Description:** Martin Marietta developed the MMU at Denver Aerospace under contract with NASA's Johnson Space Center. The MMU gives astronauts the capability to operate untethered during extravehicular activities (EVA), and is an essential tool to assemble, service and repair spacecraft, including a permanently manned space station.

**Status:** In 1984, astronauts using two MMUs flew nine missions on three space shuttle flights for a total of 10 hours, 22 min-

utes. Both flight units were flown in February 1984 on STS 11/41B for more than 5 hours of operations. In April 1984, the MMUs were used in a successful mission (STS 13/41C) to repair the Solar Maximum Observatory satellite. In November 1984, MMUs were used in a mission (STS 51A) to retrieve two errant communications satellites—the Palapa B-2 and Westar 6—which were brought back to Earth for repair.

The MMU and its development team received the prestigious Collier Trophy in 1985

for significant contributions to aeronautics and astronautics.

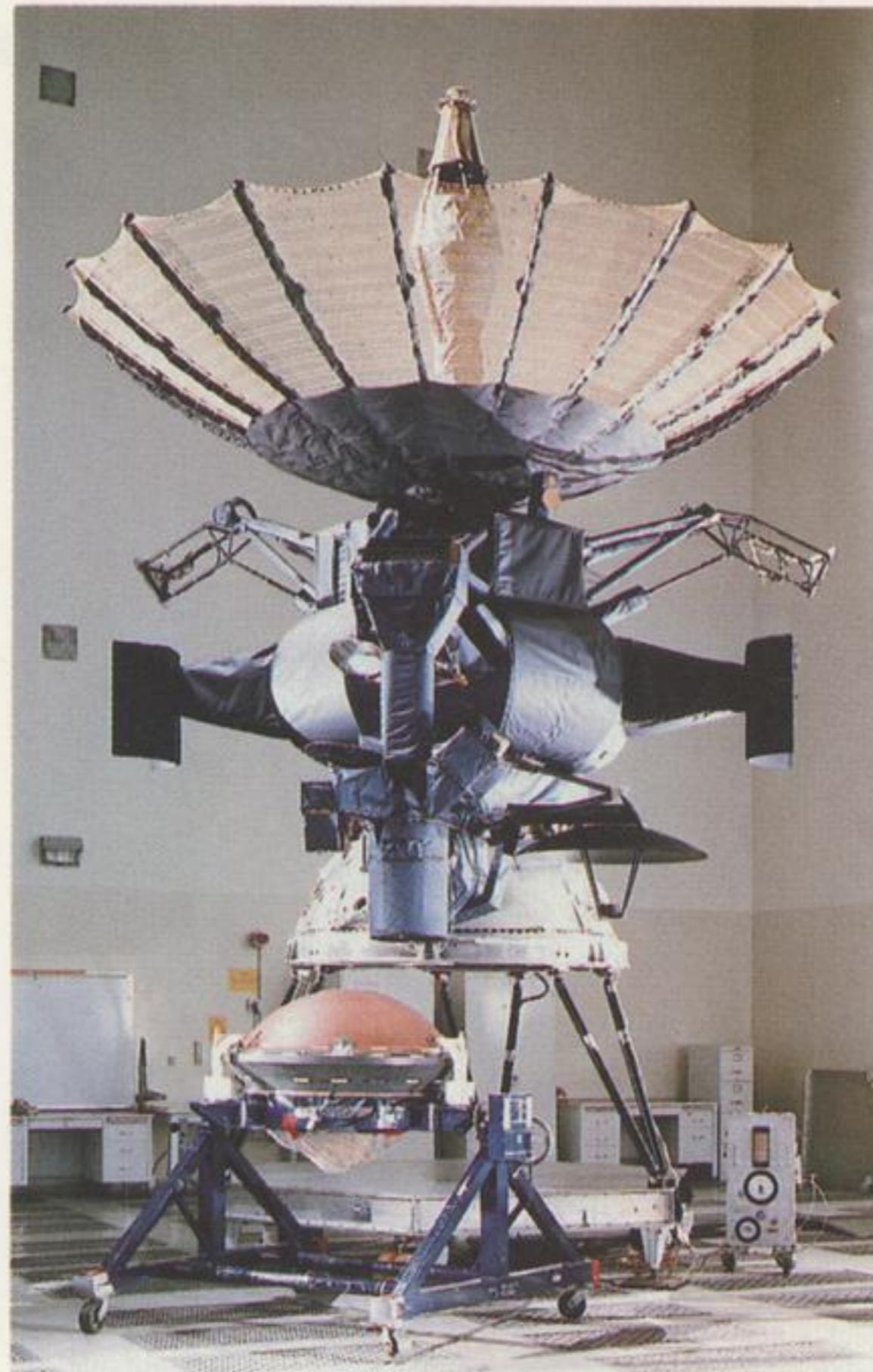
In December 1985, officials at NASA's Johnson Space Center informed Denver Aerospace to prepare for another mission. They specified including a new, much simpler separation nut system on both MMU flight units, and one strap-on propulsion tank unit, which gives the MMU twice as much maneuvering capability.



## Galileo Spacecraft ▶ Instruments

**Description:** NASA has scheduled Galileo, a major, new deep-space probe, for a future space shuttle flight. The Galileo spacecraft will be carried into orbit by the shuttle and then launched by a rocket toward Jupiter, where it will release a probe into the planet's atmosphere. Martin Marietta has built three instruments to be carried by the Galileo Jupiter entry probe and is providing the attitude and articulation control flight electronics on the spacecraft.

**Status:** Denver Aerospace delivered two instruments—a nephelometer and an atmosphere structure instrument—to NASA in February 1983. The third instrument, a net flux radiometer, was delivered to NASA in June 1985. The contract with the Jet Propulsion Laboratory for the attitude and articulation control system is complete, with hardware delivered in June 1983. System testing of the entire spacecraft is complete.



## Faint Object Spectrograph (FOS)

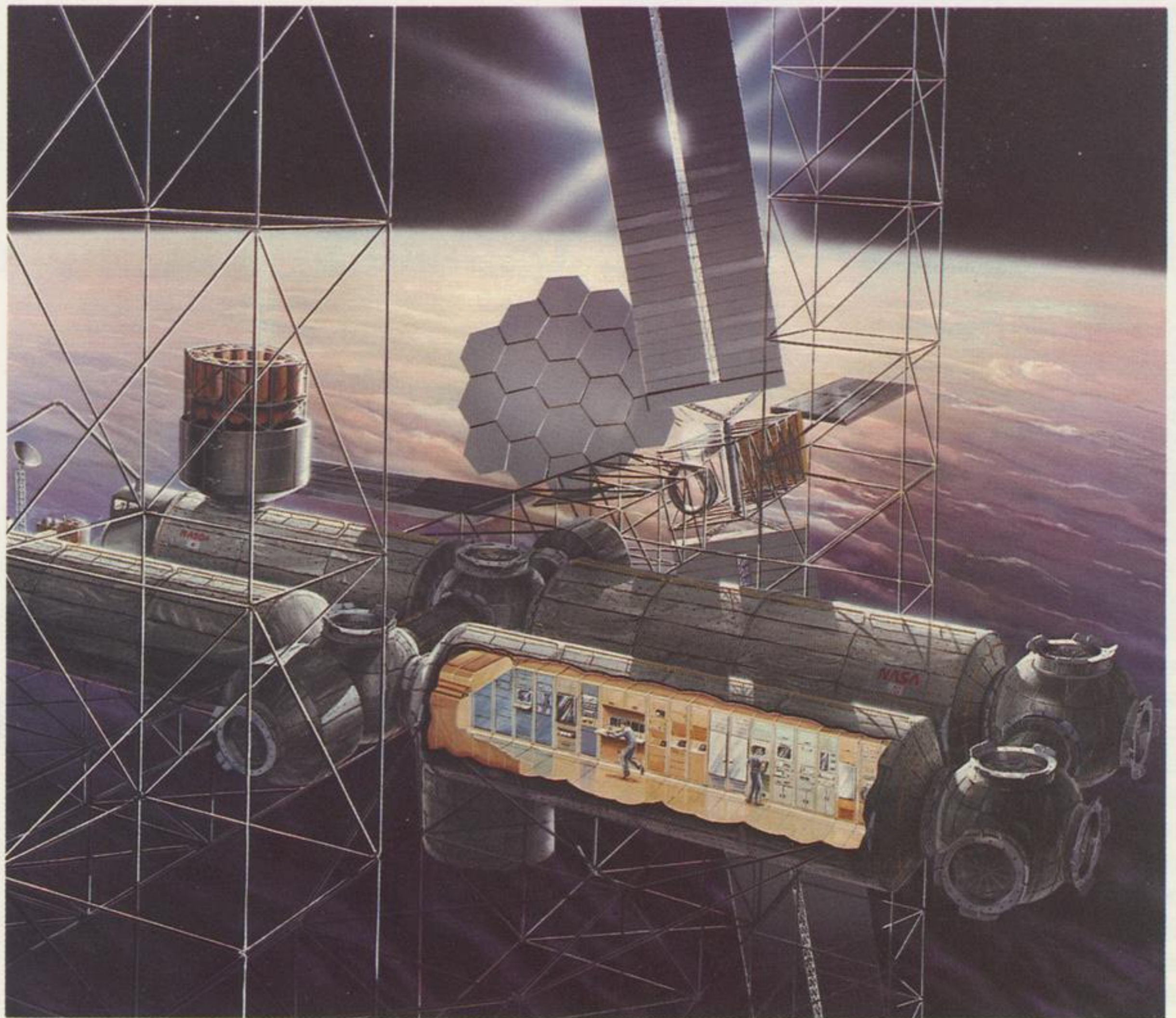
**Description:** The FOS program, under a contract to NASA's Goddard Space Flight Center, began in February 1978. Martin Marietta teamed with the University of California at San Diego to design, build and test a high-sensitivity astronomical spectrograph for use on the Hubble Space Telescope. The FOS and other space telescopes will enable man, uninhibited by the Earth's atmosphere, to explore the outer reaches of space. It promises to expand man's knowledge of space.

**Status:** The FOS is complete, and the instrument has been integrated into the Space Telescope at Lockheed Missiles & Space Co. in Sunnyvale, Calif. Systems-level environmental testing is scheduled this summer to assure everything works properly in preparation for the Space Telescope's launch and deployment from a future space shuttle mission.

## Space Station

**Description:** The space station, being developed by NASA, will be a multipurpose system of permanent, manned and unmanned elements in orbit with the capability to communicate with ground support facilities. It will consist of a manned base and two or more free-flying unmanned platforms. NASA is considering space station design concept alternatives, and has assigned work packages covering all aspects of space station development to four of its centers. The agency awarded competing contracts for each of the work packages in March 1985.

**Status:** Martin Marietta was one of two companies selected on March 14, 1985, by NASA's Marshall Space Flight Center to proceed with Phase B of space station development, which includes definition and preliminary design. Under contract, the company is designing the space station's common modules, its environmental control and life support systems, and an auxiliary propulsion reboost system. In addition, the company is developing recommendations for docking and handling orbital maneuvering and orbital transfer vehicles, and for systems design of laboratory and logistics modules. After completing the 21-month contracts, NASA plans to move into final design and development of the space station.



## Tethered Satellite System (TSS)

**Description:** The tethered satellite is a reusable satellite designed to be deployed from and retrieved by the space shuttle orbiter using a tether up to 62-miles long. Being developed by NASA and the Italian Council for National Research, the satellite system will study areas of the upper atmosphere previously accessible only to sounding rockets on

brief flights. The system also will study electro-dynamics and power generation.

**Status:** Martin Marietta has been on contract with NASA's Marshall Space Flight Center since December 1982 for the design, development, manufacture, test and delivery of the tether and deployer portion of TSS. The com-

pany also is responsible for integrating the deployer with the NASA-furnished satellite payload. The initial satellite is being developed by the Italian firm Aeritalia under the auspices of a United States/Italian government memorandum of agreement.



## Titan II

**Description:** Titan II is being deactivated as an intercontinental ballistic missile, and the U.S. Air Force has studied converting the Titan IIs to expendable launch vehicles (ELV). This includes modifying the basic missiles and ground equipment needed to launch them from Vandenberg Air Force Base, Calif. The Titans will be converted from ICBMs to space launch vehicles to launch various Department of Defense satellites, such as the defense meteorological satellite program.

**Status:** In January 1986, Martin Marietta and the U.S. Air Force signed a letter contract authorizing the company to proceed with the final system design review for conversion of Titan II missiles to ELVs. Work began on the first deactivated Titan II at Denver Aerospace in March 1986.

## Magellan

**Description:** Magellan, formerly called the Venus Radar Mapper, is an unmanned planetary spacecraft designed to provide detailed information about Venus' origin, evolution and condition. Scheduled to be launched by NASA from a space shuttle mission, the Magellan spacecraft will orbit the planet and send back images of its surface. The similar-to-photograph images will be taken using synthetic aperture radar to pierce clouds of carbon

dioxide and sulfuric acid that conceal the planet. The probe also will measure Venus' gravity field to study the planet's density and distribution of elements.

**Status:** Martin Marietta was awarded a contract in December 1983 by NASA and the California Institute of Technology's Jet Propulsion Laboratory. The contract covers design, development, manufacture, test, delivery

**Description:** The ALV is an autonomous, land-roving robot vehicle that is used as a national test bed for industry and university developments in artificial intelligence and advanced computer architectures. The ALV is a self-contained vehicle that uses artificial intelligence and advanced sensory perception technologies to operate without human intervention. The ALV is being developed by the U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Va., with joint funding by the Defense Advanced Research Projects Agency.

**Status:** Martin Marietta was awarded a contract in September 1984 to develop and integrate systems for the ALV. The 5-year contract calls for yearly demonstrations of technology advancements.



## Peacekeeper Assembly, Test and System Support (AT&SS)

**Description:** The Peacekeeper is a four-stage intercontinental ballistic missile that carries 10 independently targetable warheads. It is being developed by the U.S. Air Force. The AT&SS is a critical element of the Peacekeeper missile program. The AT&SS provides for multiple development tasks and basing studies. It provides instrumentation and flight system safety (IFSS) hardware for airborne and ground support equipment, transportation and handling (T&H) equipment, systems engineering and analysis, missile emplacer equipment, assembly and checkout planning, logistics, and testing at Vandenberg Air Force Base, Calif.

**Status:** Systems design, analysis, development and fabrication of IFSS and T&H equipment to support the Flight Test Program are complete. Test facilities at Vandenberg are fully operational and the flight test program is well under way. As of June 1986, the first 12 test flights (including four launches from an underground silo) were successful. In early 1984, Martin Marietta won a follow-on contract to continue the AT&SS work into the development test and evaluation (DT&E) and operational test and evaluation (OT&E) phases. The contract is from June 1984 through July 1987. In addition, in August 1985, Martin Marietta was awarded a production contract for transportation and handling support equipment.





## Small ICBM

**Description:** The small intercontinental ballistic missile (Small ICBM) is a new small, single-warhead missile with intercontinental range that is being developed by the U.S. Air Force. As envisioned, it will be 42-feet long, 46-inches wide and weigh less than 30,000 pounds. It will consist of three solid-fuel stages and a postboost vehicle. The missile's comparatively small size and weight will permit mobile basing. The President's Commission on Strategic Forces has recommended developing the Small ICBM for deployment in the early 1990s as a major element in the long-term solution to the need for a survivable ICBM force.

**Status:** The U.S. Air Force selected Martin Marietta Denver Aerospace to perform assembly, test and system support for the Small ICBM, and to build its postboost vehicle. Two contracts were awarded to the company by the U.S. Air Force Ballistic Missile Office on July 1, 1985. They cover an initial 5-year period, with options for succeeding years. Denver Aerospace will be the assembly and test contractor for the Small ICBM flight test program at Vandenberg Air Force Base, Calif. Present plans call for 22 test flights beginning in early 1989.

## Shuttle Orbiter Subsystems

**Description:** The spacecraft systems product area of the Space Systems Division in Denver supplies several subsystems for the space shuttle system. This hardware includes: the solid rocket booster/decelerator subsystem (SRB/DSS); pyrotechnic initiator controllers (PIC); caution and warning (C&W) system; and the reaction control system (RCS) propellant tanks.

**Status:** All of this hardware flew on the first 24 space shuttle missions and performed with a 100-percent mission success record.

## Strategic Defense Initiative (SDI)

**Description:** The SDI is a research program to investigate ways that the United States and its allies can defend themselves against a ballistic missile attack. It involves a number of space-based and ground-based weapon concepts; a large architecture project; command, control and communications (C<sup>3</sup>) and battle management; and new technology. These weapon concepts include kinetic energy weapons, high-energy lasers and neutral particle beam weapons. The SDI also involves an overlay of the logistical and launch support servicing concepts to support any architecture.

**Status:** Martin Marietta is helping the SDI organization define and evaluate system architectures. The company is one of five awarded study contracts in September 1985 for Phase II of the SDI architecture study. Martin Marietta



## Titan 34D

**Description:** The Titan 34D is a member of the Titan III series of expendable space launch vehicles. Titan III has been the U.S. Air Force's principal launch vehicle for critical national security payloads since 1966. Designed and built by Denver Aerospace for the U.S. Air Force, the Titan III/34D series of launchers had successfully completed 129 of 134 operational launches as of May 1986.

**Status:** Denver Aerospace has built and delivered 14 Titan 34Ds to the U.S. Air Force. Delivery of a 15th, the last for which the company is under contract, is scheduled for Sept. 30, 1986. Nine vehicles had been launched by the U.S. Air Force as of May 1986.

was awarded a contract in September 1985 to study concepts for an acquisition, tracking and pointing platform to be used in a directed energy weapon ballistic missile system. In July 1985, Denver Aerospace won a contract to conduct a concept definition study and experimental design of a kinetic energy weapon.

In addition, Denver Aerospace and Information & Communications Systems (I&CS) have contracts and are bidding on many of the new weapon systems and C<sup>3</sup> and battle management jobs associated with SDI. I&CS was one of four companies awarded parallel study contracts in March 1986 for concept definition of a national test bed that would simulate, evaluate and test SDI concepts.

Denver Aerospace is involved in the space-based laser program. Denver Aerospace also has technology contracts that support the

## Complementary Expendable Launch Vehicle (CELV)

**Description:** In February 1985, Martin Marietta was chosen by the U.S. Air Force to build and launch 10 CELVs capable of placing 10,000-pound payloads into geosynchronous orbit. Martin Marietta will build an improved version of the highly successful Titan space launch vehicle, called the Titan CELV, with stretched first and second stages, seven-segment solid-propellant rocket motors, a 16.7-foot diameter payload fairing and a Centaur G-prime upper stage.

**Status:** Denver Aerospace has begun production of the Titan CELV. The period of performance for the full contract is Feb. 28, 1985, through Sept. 30, 1993.



space-based laser program, including R2P2, a ground simulator that evaluates performance; passive and active control of space structures (PACOSS); and a development program to investigate and test the effects of modern composite materials, passive damping techniques and active control techniques on the behavior of large space structures. Other Denver Aerospace technology contracts include space-based laser fire control and megawatt burst thermal control.

Denver Aerospace is bidding on a contract to design and build SDI tracking and pointing experiments to be flown on the space shuttle. Denver Aerospace also is bidding on a defensive shield demonstration, focusing on space asset survivability.





## Ground Support Systems Installation and Checkout (GSSI&C)

**Description:** The GSSI&C project is a key to developing the capability for the U.S. Air Force to support space shuttle operations at Vandenberg Air Force Base, Calif. The project provides for design, procurement, installation and testing of the various facilities and support systems required to launch and recover the space shuttle.

**Status:** By Nov. 15, 1985, Martin Marietta had successfully installed all major project support equipment and company-performed ground systems tests at Vandenberg. The company continues to support the U.S. Air Force in the checkout phase, and will continue that support through the first launch. In April 1986, the U.S. Air Force approved an 18-month extension of the GSSI&C contract. The initial contract modification will bring the Vandenberg shuttle launch site to full operational capability.

## Transtage

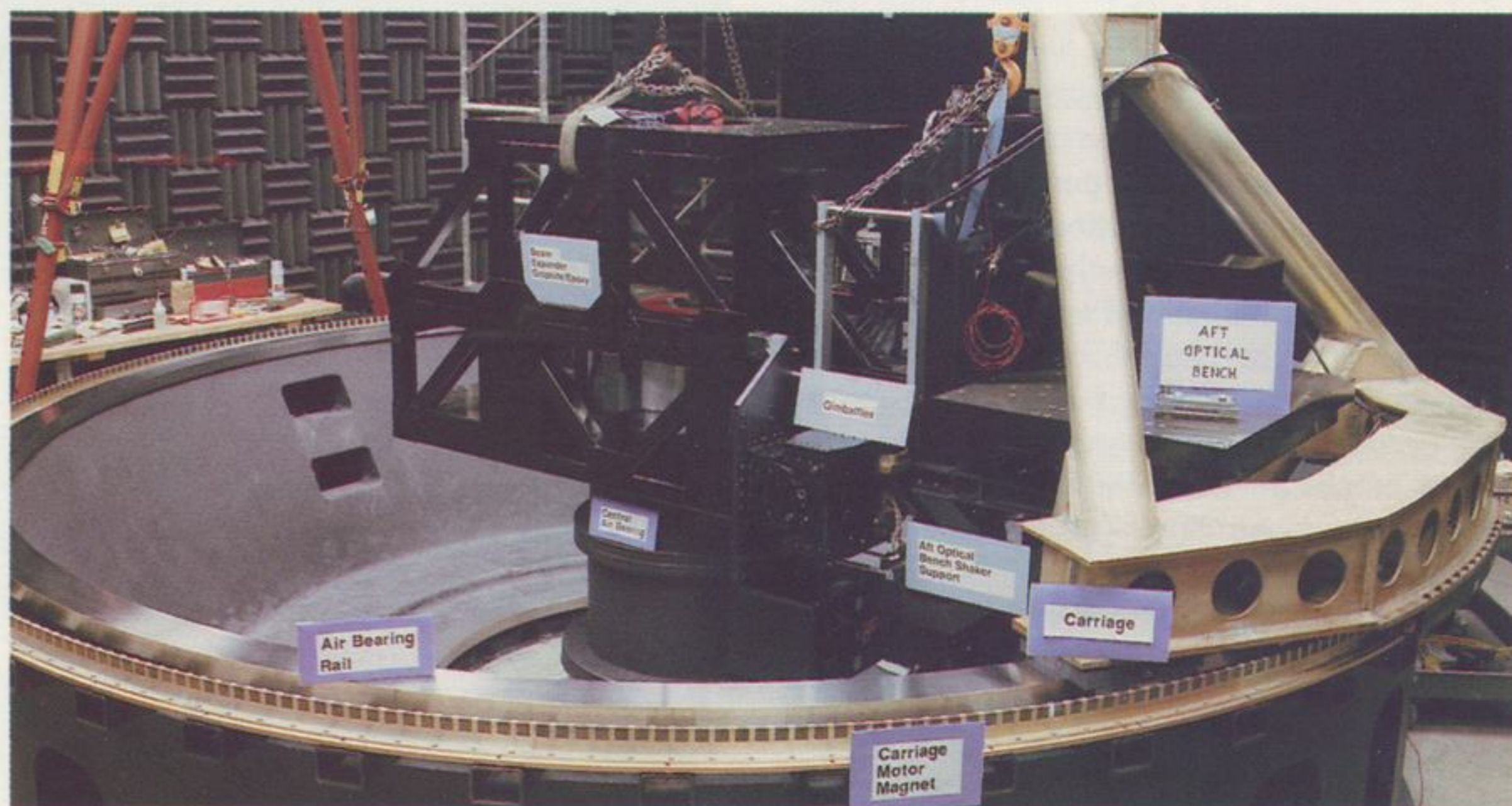
**Description:** Transtage is a storable liquid bipropellant upper stage used with Titan launch systems. It is used as the fourth stage of the Titan to boost single or multiple payloads weighing up to 4,000 pounds into geosynchronous orbit. With its ability for multiple starts, Transtage has deployed as many as eight satellites during a single mission. Martin Marietta has built and delivered 40 Transtages for the U.S. Air Force, and 39 of those have been flown.

**Status:** Denver Aerospace has a contract through Sept. 30, 1986, to build three Titan 34D/Transtage systems. One of these Transtages is complete; two remain to be built. When the contract is complete, the company will have built 47 Transtages.

## Rapid Retargeting/Precision Pointing (R2P2)

**Description:** R2P2 is an on-ground simulator that will test the performance of extremely sensitive space systems that require the capability to point precisely from one target to another (rapid retargeting). It is being built by Denver Aerospace under contract to the Strategic Defense Initiative Office (SDIO). R2P2 will provide a national research test bed for elements of space-based defense systems. Located in a facility set on seismically stable bedrock, the simulator will evaluate space experiment results and provide additional experiments.

**Status:** Denver Aerospace has a contract with the SDIO to build and evaluate the R2P2 simulator. Construction began in April 1985, and the simulator is expected to be ready for use in December 1986. Martin Marietta built the facility that houses the simulator with its own funds. That facility was dedicated in November 1985 by Lt. Gen. James Abrahamson, SDIO director.



## Hard Mobile Launcher (HML)

**Description:** The HML will protect, transport and launch the Small ICBM, and is part of the strategic modernization program conducted by the U.S. Air Force. The HML will protect the small missile from nuclear weapon effects and provide mobility to enhance its survivability. The program to develop a hard mobile launcher for the Small ICBM is in the stage before the full-scale development phase begins.

**Status:** Martin Marietta was one of two companies awarded contracts in January 1985

for parallel 21-month, early full-scale development projects. Under the contract, Martin Marietta and its teammate, Caterpillar Inc., studied design feasibility and built a prototype of the HML, called a mobility test vehicle, which will be used for additional feasibility and validation studies. The mobility test vehicle initially was demonstrated in September 1985, and was turned over to the U.S. Air Force in January 1986. One of the two competing prototypes is expected to be selected for development in October 1986.



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