

MARTIN MARIETTA

news

DENVER AEROSPACE

Number 9/1984



Infrablack inventors' demonstration

Company committed to upper stage development



Artist's concept of the transfer orbit stage (TOS)

Denver Aerospace has been involved in upper stage development and production continuously since the first transtage contract award during 1963.

During December of last year, the company began full-scale development for the Transfer Orbit Stage (TOS) for the space shuttle under a contract with Orbital Sciences Corporation (OSC). Currently, Martin Marietta is also studying an apogee and maneuvering stage (AMS) for OSC that could be used in conjunction with TOS—or as an independent upper stage.

The space shuttle era has brought about additional interest in two additional highly sophisticated upper stages: the orbital maneuvering vehicle (OMV), for operations within 1380 statute miles of the shuttle orbiter, or a space station; and the orbital transfer vehicle (OTV), for operations up to geosynchronous orbit—22,300 miles. Denver Aerospace currently has proposals outstanding for both those systems.

Transtage is used with the Titan III and Titan 34D launchers. It has the capability to boost 4,200 lb into geosynchronous orbit when mated with a 34D. Transtage also could be made compatible with the shuttle orbiter.

"The first contract to build Titan III Transtages was awarded in 1963, and the company currently is under a contract awarded in 1979 by the U.S. Air Force's Space Division to build and launch four Titan 34D Transtage systems," said Robert F. Johns, Titan program director. "The Air Force has successfully launched two Titan 34D Transtages already this year."

Johns added there have been a total of 30 Titan IIIC/Transtage launches in addition to the two 34Ds.

He said performance improvements in the 34D/Transtage program have included the development and qualification of a lightweight helium sphere, made of a thin

Titanium liner with a Kelvar/epoxy overwrap, which yields a payload gain in excess of 100 lb. Delivery of the first production spheres is set for June.

TOS, being developed commercially under a \$35.5 million contract to Orbital Sciences Corporation, Inc (OSC), is a medium-capacity space shuttle upper stage.

TOS is designed to place 6,000- to 13,000-lb payloads into geosynchronous transfer orbit.

Development of the TOS is well underway at Denver Aerospace where the upper stage will be designed, assembled, and tested. The first TOS spacecraft is scheduled to be ready for flight during 1986.

"We're planning to go to our preliminary design review on May 22 to 24," said Richard J. Farrell, TOS program director. "This is a major milestone in the program."

Farrell said the company is looking into the application of ring laser gyros, an advanced concept that uses laser beams to generate vehicle attitude rates for improved guidance accuracy.

The company also is developing the AMS, an upper stage that can be used with TOS or independently.

Used alone, the AMS can place communications satellites weighing up to 4,350 lb



into geosynchronous transfer orbit after their deployment in the standard shuttle parking orbit. Other missions include low-orbit maneuvering between the shuttle and NASA's planned space station, delivery of payloads to sun-synchronous and polar orbits, and military on-demand maneuvering capability.

The TOS configured with the AMS can deliver up to 6,500 lb into geosynchronous orbit.

Denver Aerospace currently is submitting proposals to OSC that would allow NASA to use the TOS and TOS/AMS combination for missions.



The manned maneuvering unit (MMU) that astronaut George D. "Pinky" Nelson used last month during the historic Solar Maximum Observatory Satellite repair mission is back in the space support building (SSB) high bay at the main plant. That unit and the other MMU flight article as well as the two flight support stations (FSS) are undergoing preliminary visual inspections before detailed testing begins. MMU project personnel shown here during those preliminary checks are: Ken S. Ives (kneeling), technician; (standing left to right) Steven R. Sebastian, technician; Joseph A. Lenda, systems engineering manager; and Louis L. Aldridge, engineering manager.

JA Bowl-a-thon \$\$\$ prizes

The Junior Achievement (JA) program of metro Denver is sponsoring a fund-raising bowl-a-thon—dubbed "Strike Out for Free Enterprise"—at the Celebrity Sports Center, Inc., 888 South Colorado Blvd.

Top prizes among the dozens to be awarded are three checks for \$700 for "vacation escapes."

Lori Sharp, Martin Marietta's JA coordinator, ext 6605, is seeking employees, their spouses and dependents to form five-member teams to bowl three games between 11:30 a.m. and 2:30 p.m., or 2:30 to 5:30 p.m., June 9.

Denver Aerospace will pay entry fees for its employees as well as those individual's spouses and dependents. Those bowlers will be asked to get JA pledge donations.

'Family event' date set

The Denver Aerospace-sponsored family event pops concert by the Denver Symphony at McNichols Arena has been set for 8 p.m., Friday, September 21.

Guest conductor for the space-aged theme program will be Lionel Newman, vice president of 20th Century-Fox Film Corporation.

Tickets for employees who signed up earlier for the concert as a family event will be distributed to department administrators in August.

Companion contracts look at defense against lasers

Denver Aerospace is in the midst of two contracts in support of space-based lasers, and both are considered key elements affecting the government's eventual deployment of such systems.

One contract—for \$1.8 million over 4 1/2 years—is with McDonnell Douglas Astronautics Company, and deals with laser-hardened liquid propellant ballistic missiles program. The other—for \$700,000 and for a similar time frame—is with Lockheed Missiles and Space Company, and centers on solid propellants for strategic missiles. The companion contracts

are for the Air Force Materials Laboratory at Wright-Patterson Air Force Base, OH.

According to Engineering Mechanics' Richard C. Rozycki, program manager, the overall objective is for Martin Marietta to develop protective materials and flight maneuvers to protect land- and sea-based strategic missiles from high-energy laser beams. The company's responsibilities include designing and building a large-scale test article for demonstration under actual laser beam testing, and design integration of protective schemes into representative missile configurations.

Easy, no-risk way to make money

The new U.S. Series EE market-based savings bond makes an especially attractive moderate- to long-term investment, particularly for the small investor.

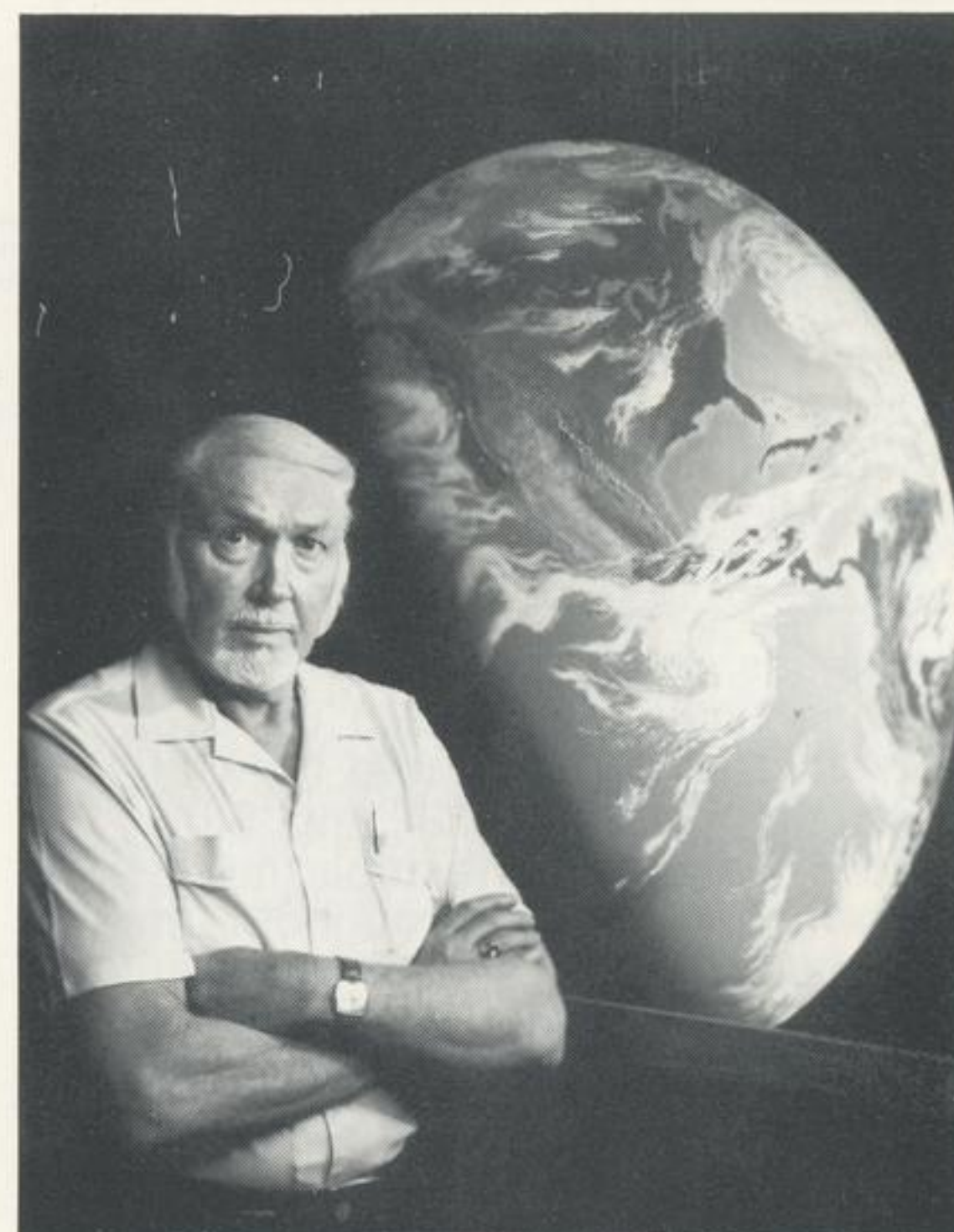
The investor now receives a market rate of interest based on 85 percent of the average yield on five-year Treasury securities. That means if yields on securities go up, the bond holder gets a higher rate of interest on those bonds. Conversely, if yields go down, the bond investor is guaranteed a minimum 7.5 percent return.

Savings bonds aren't big gainers—like some stocks and mutual funds—but they don't lose money either. There's also the convenience of buying them through pay-

roll deduction and not tying up money in riskier ventures.

A person who invests \$50 a month in savings bonds would accumulate \$9,726.68 in 10 years with a 10 percent average interest rate. If the bond earned only the 7.5 percent guaranteed minimum, the investor would still have accumulated \$8,696.92 in 10 years. Series EE bonds must be held at least five years to earn the market-based rate. Otherwise the investor would receive a lower rate of interest.

There's still time to get more information and invest in Series EE bonds by contacting the bond coordinator in individual departments by May 31.



Twenty-eight-year veteran of Denver Aerospace's graphics department Charles O. Bennett stands beside the color acrylic mural he recently completed for "The Gallery," the company's showcase museum of its various aerospace and defense projects. Bennett took 10 days to complete the 50-by-8 ft mural of Earth which will be part of an eventual larger display showing various planets in our solar system and depicting Martin Marietta's spacecraft, experiments, and instruments related to those bodies.

The outgoing president of the American Institute of Aeronautics and Astronautics (AIAA), Norman R. Augustine, president of Denver Aerospace, moderated a seminar on young professional development during last week's annual event for the 30,000-member organization. The theme was "The Elements of Professionalism." Augustine, who was succeeded as AIAA president by Dr. John L. Lucas of Washington, D.C., remains active in technical advisory capacities. Also featured in one panel discussion was W.W. Bollendonk, manned maneuvering unit (MMU) program manager, who summarized the company's product on the February and April space shuttle missions that saw astronauts fly in space for the first time without benefit of a lifeline or tether. Martin Marietta had an extensive display at the 53rd international annual AIAA exhibit in the nation's capitol May 1-5 which was an industry, engineer, scientist, and government meeting to promote better understanding of space, civil, and military aerospace projects and technology. The company's technical display centered around a 1000-sq ft exhibit that featured the MMU, space station, Venus radar mapper, orbital maneuvering vehicle, transfer orbit stage, tethered satellite, external tank, and Titan, complete with scale models.



Tips on writing elected reps

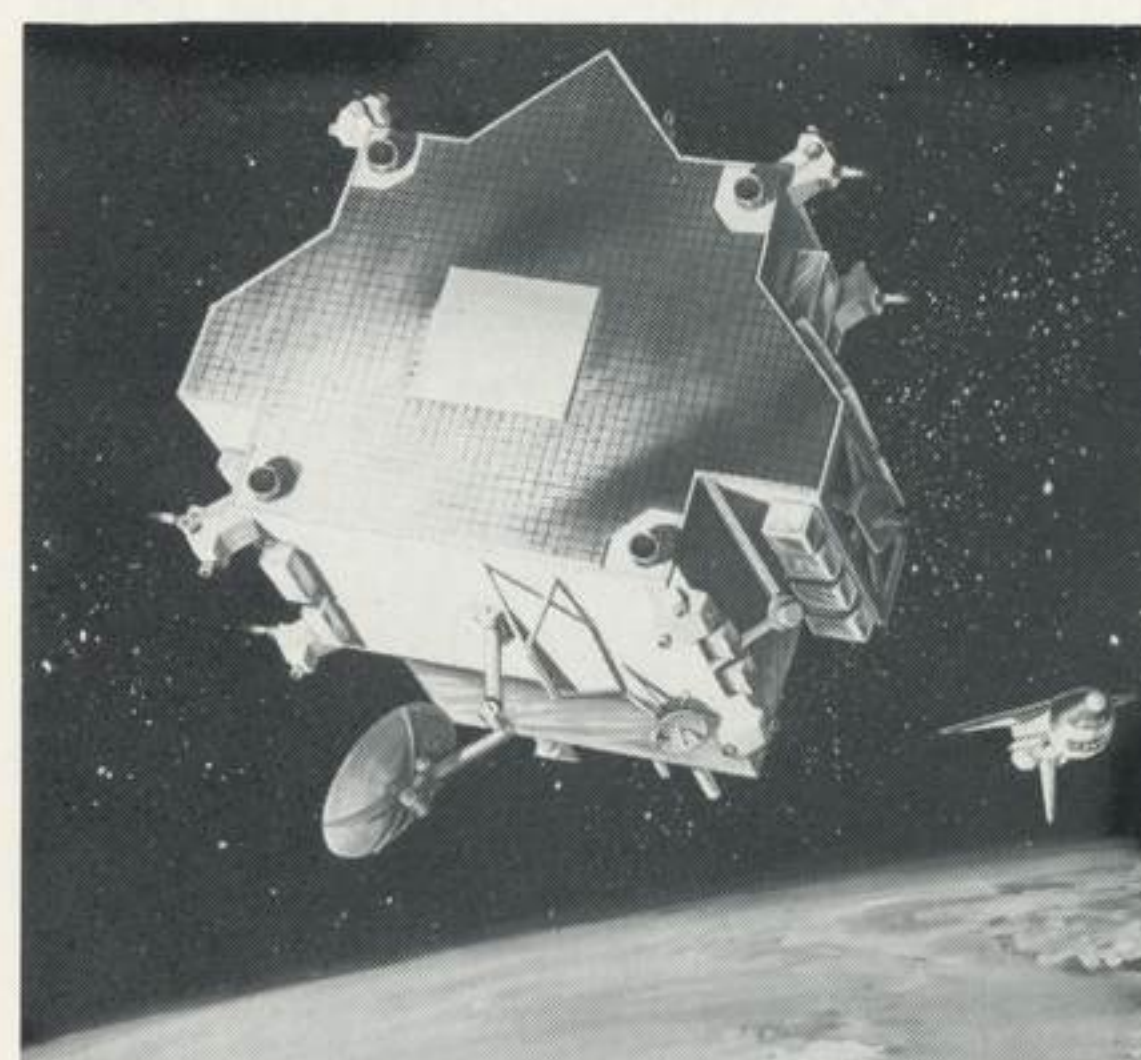
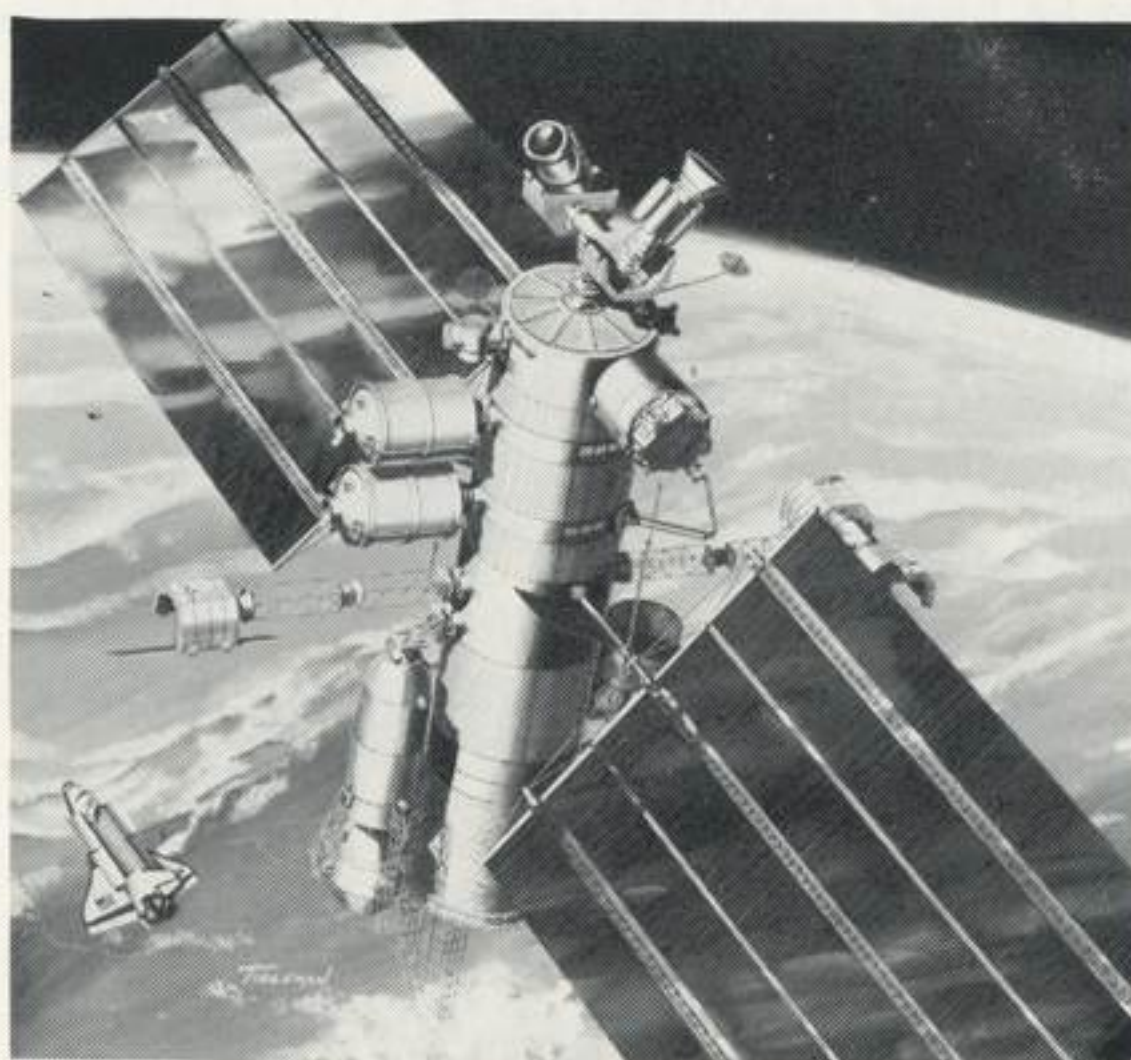
(Editor's note—Addresses of Washington, D.C., legislators are in local telephone directories under U.S. Government listings for "Congress," "Senate," and "House of Representatives.")

It is always appropriate for voters to write, telephone, or wire elected representatives with opinions—pro or con—on issues coming up during sessions. Legislators often bemoan they do not hear from constituents as to how they want their U.S. and state senators and representatives to act on particular issues. It is equally appropriate—even appreciated—to express one's support or admiration for a legislator's efforts that merit approval.

The following tips on writing a correct and effective letter to a member of Congress apply as well for state legislators and other government officials at various levels.

- 1) Use personal stationary, not a company or organization letterhead—unless the writer does, indeed, represent that group's official position. Avoid postcards or telegrams unless absolutely necessary because, perhaps, of an imminent vote.
- 2) The writer's signature and address are important to show the letter comes from a bona fide constituent of the legislator's district.
- 3) Never use form letters.
- 4) Focus on only one issue in each communication, and identifying the bill by its popular name and official bill number whenever possible.
- 5) State specific reasons for opposing or supporting a measure. Offer alternative solutions if opposed to the issue. Be brief and constructive rather than argumentative or hostile.
- 6) Suggest or recommend; do not demand action. Be courteous—rudeness will diminish the letter writer's case.
- 7) Time the letter for the greatest impact, such as having it arrive a day before a crucial vote in committee, for example. Too early or too late are equally ineffective.
- 8) Keep up with committee activities in which the legislator is involved. Committee and subcommittee hearings precede measures to the full Senate or House floors for action. Any information a legislator has beforehand in considering a given question can help assure the most effective bill will be proposed.
- 9) One or two letters from the same individual on the same subject will suffice. That does not preclude motivating others to add their views through other letters on that same issue.

And . . . , the winners are . . .



These three pieces of artwork earned honors in their respective categories for three artists in Denver Aerospace's graphics department during the Society for Technical Communication's recent annual international awards ceremonies at Seattle. John Tieleman received an award of excellence for his concept of a space station, shown at left, in the presentation graphics category. William Mitchell received an award of achievement in that same category for his concept of a teleoperated maneuvering system, at right, and Robert Murray's brochure for the transfer orbit stage (TOS), earned him an award of excellence in the single sheet brochure category. All three artists had previously earned regional honors from the Washington, D.C.-headquartered professional group.

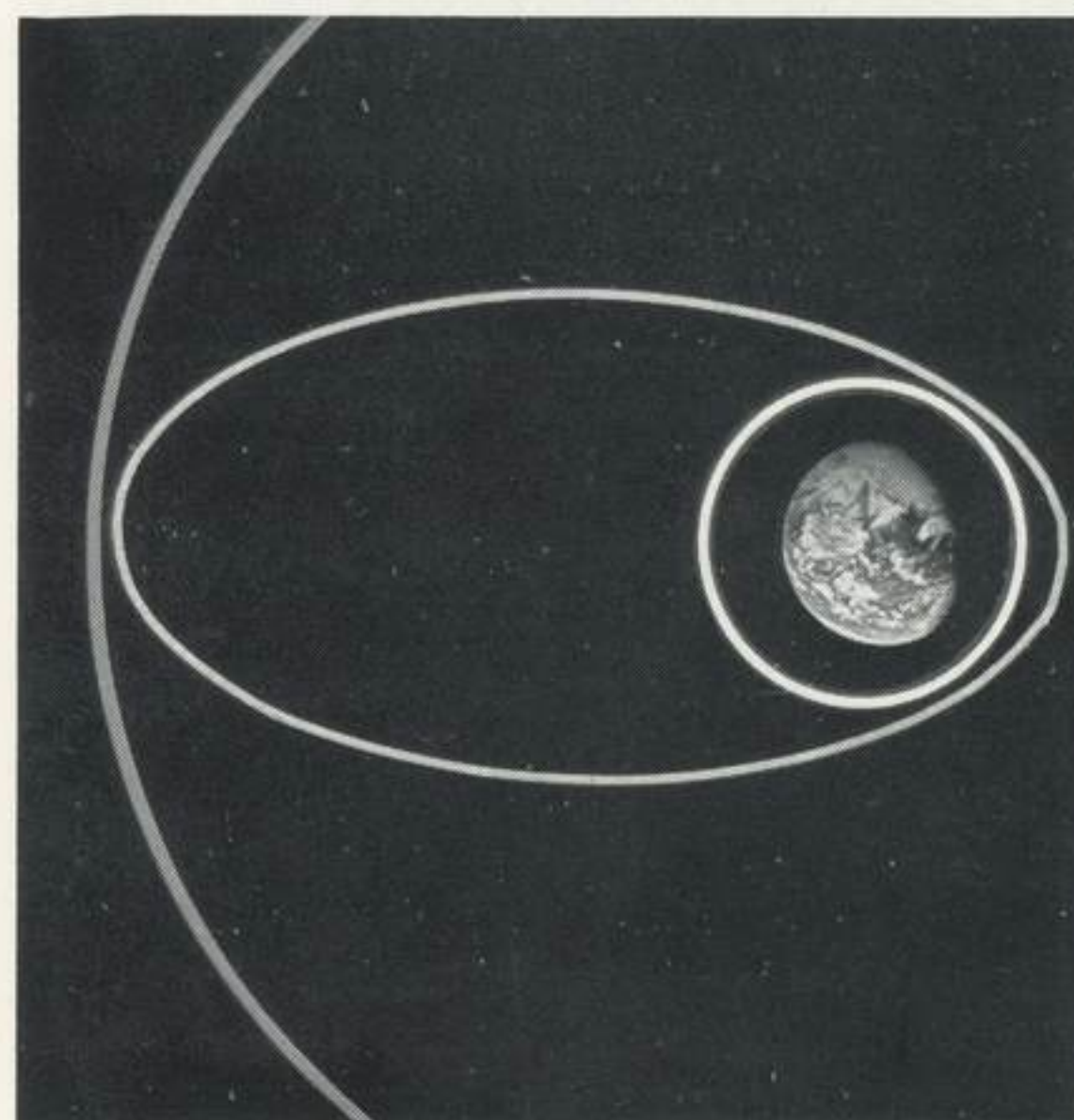
- 10) Finally, the correct letter salutation is "Dear Senator (last name)," or "Dear Mr./Mrs./Ms. (last name)" for a member of the House of Representatives. (A letter to the President should bear the salutation: "Dear Mr./Madame President.") Envelopes should be addressed to: "The Honorable (full name)."

Games' coordinators named; tryouts continue

Most of the Denver Aerospace volunteer coordinators for the fourth annual Denver Corporate Games, scheduled for June 2, have been selected. They are:

Ray Salem, racquetball; Joe Mensch, coed volleyball; Terry Heggy, swimming; Ken Rillings, bicycling; Jeff Findle, 5-kilometer and 1500-meter races; Tony Jones, track; and Brian Gallagher, tennis. Volunteer coordinators for golf and bowling have to be named yet.

Meanwhile, volleyball and racquetball tryouts are scheduled for Saturday, May 12, at Arapahoe Community College (S. Santa Fe Dr.), and Saturday, May 19, at the Centennial Athletic Club (S. Federal Blvd. and Bellevue Ave.), respectively.



NES dinner slated May 22

Guest speaker at the National Estimating Society's (NES) new membership dinner will be Nick Compensano, national board admissions director of St. Louis. His presentation will review the Washington, D.C.-based organization's new role today.

The evening will begin at 5:30 p.m., May 22, at the Sheraton Inn-Lakewood, 360 Union Blvd. Contact Diana Miller, ext 2517 for reservations and further information.

Credit union meeting Monday: elections, door prizes

The Red Rocks Federal Credit Union's annual election of officers will begin at 5 p.m., Monday, May 14, in the SSB (space support building) presentation room.

Other items on the agenda include the group's annual committees' and officers' reports, and a general business discussion.

Refreshments will be served and door prizes awarded—including a microwave oven and cooking lessons, portable AM/FM cassette recorder, calculator, shower massage, security light, and a smoke alarm. Winners must be present to win.

Seating is limited, so contact the credit union at ext 6000.

On the cover

Left to right, Dr. Donald F. Shepard, Derek W. Bergener, Stephen M. Pompea, and a demonstration of their ultrablack coating invention, Infrablack.



The space shuttle orbiter *Enterprise*, piggyback atop a 747, recently circled over New Orleans at a mere 2,000 ft over the Mississippi River Bridge downtown while en route to Mobile, AL. There, it was loaded on a barge and shipped along the Gulf Coast to the site of the 1984 World's Fair at New Orleans where it will be on display through November 11.

Data Systems wins \$225M Navy contract

The U.S. Navy has awarded Martin Marietta Data Systems a comprehensive 10-year contract valued at an estimated \$225 million for an automated personnel/payroll data system. It will replace a manual system that covers more than 400,000 enlisted personnel and reservists.

The systems integration contract calls for the installation of hardware, software, and data communications equipment; management of preventive and remedial equipment maintenance; and technical training of operations and management personnel.

Martin Marietta will install more than 60 Hewlett-Packard Series-3000 central processors at 36 processing centers, 12 of which are overseas, and almost 2,000 pieces of data communications equipment. More than 3,600 terminals will operate from more than 400 sites, including every state in the U.S. and 18 foreign countries.

Robert V. Windley, Data Systems vice president for U.S. operations, said the contract "represents a transition in data management industry procurement from suppliers of hardware and software to systems integration. Martin Marietta designs, produces, integrates, and operates complex systems, whether they be in aerospace, communications, or information management."

On the cover

Infrablack invention at Denver Aerospace ideal for space telescopes

A trio of Denver Aerospace engineers has created an optical surface that is blacker than any known to man today—Infrablack—to absorb and trap nearly all visible and infrared radiation that strikes it. Those properties make it an ideal coating for the inside of space telescopes and all instruments requiring an absolute minimum of stray radiation.

Stephen M. Pompea and Derek W. Bergener, both of payload sensors and instruments in electronics, and Dr. Donald F. Shepard, a propulsion engineer in engineering mechanics, recently were granted cash awards by the Denver Product Development Review Board for their inventions: "A Superior Black Surface for Infrared Use" and "Atomic Oxygen Resistant Anodized Black Surfaces for Space Shuttle Applications."

They were among a group of 16 other inventors also recognized by the review board.

Their ultrablack coating is created by an anodizing process (subjecting a metal to electrolytic action to coat it with a protec-

and Shepard, both Martin Marietta's optical black surfaces—Martin Optical Black (more commonly referred to as Martin Black) and Infrablack—now have been modified to increase significantly their resistance to chemical attack and to increase their mid- and far-spectrum infrared absorbance.

Test results from the Space Shuttle mission of August 30 to September 5, 1983 showed "the highly energetic atomic oxygen does not affect those improved black surfaces, but does cause weight losses and changes in the reflectance properties of surfaces that are merely painted black," said Shepard.

"These modified coatings offer significantly improved long-term stability and optical performance."

Martin Black has been an industry standard for black surfaces almost from its inception about 10 years ago. It is used on two of the Galileo probe atmospheric instruments—the nephelometer and the net flux radiometer, and has been used extensively on sunshades, baffles, and

Sixteen other inventors receive awards from review board

Sixteen other Denver Aerospace employees also have been granted cash awards by the Denver Product Development Review Board for their inventions. They are:

Phineas S. Woods, engineering mechanics: "Ride/Roll Control System for Use in a High-Speed Highway Transporter;" James R. Tegart, engineering mechanics: "Screen Window Protector;" James C. Fleming, electronics: "Photon Counting Hybrid CCD;" Dean S. Monitor, engineering/Michoud: "Variable Spring Rate Hydraulic Spring;" William R. Llewellyn, Fred A. Morris, and William J. Gardner, engineering mechanics: "Laser Assisted, Nitinol Powered, Refoldable Hinge Joint;" Thomas A. Milligan, electronics: "Printed Circuit Dipole Array with Coupled Microstrip Feed Network;" Raymond G. Ziehm, systems engineering, S&ES: "Technique to Maintain a Flat Antenna Array Surface in Space;" John R. Lager, Donald A. Thomas, and Walter F. Thiemet, engineering mechanics: "FILAS—Fiberglass Launch Seal;" William C. Brown, electronics: "Gigantic Aperture Space Assembled Reflector (GASAR);" David D. Wilson and William E. Echols, electronics: "ESD Simulation Test System;" and Lyle E. Bergquist, electronics: "Leak Detector for Microelectronic Packages."

tive or decorative film), and was developed with extensive support from the model shop and the micro-electronics laboratory.

It was developed specifically for stray light suppression in optical instruments because, as Pompea explained, "telescopes are limited by the amount of stray light that gets into detectors. Using Infrablack, we can keep that stray light from bouncing around inside and getting into the detector or camera. That, in turn, gives us a better telescope that enables us to see even fainter objects with greater contrast."

Through the efforts of Pompea, Bergener,

interior surfaces of photon counting ultraviolet photometers and spectrometers.

Martin Black also was used as the principal baffle coating in the infrared astronomy satellite (IRAS) launched during 1983, and the spacelab infrared telescope scheduled to fly on the space shuttle next year.

The coating also is on the four internal baffles, also manufactured at Denver Aerospace, of the particle impact analyzer (PIA) which will be aboard the European Space Agency's Giotto spacecraft during March 1986, when it explores Halley's Comet. The spacecraft will photograph the comet's nucleus and analyze the dust and gas surrounding it.

Recreation

Alpine—The Rocky Mountain Alpine Club (RMAC) has scheduled two special training events for May. A beginning rock climbing seminar and field sessions is planned for Thursday, May 17, which will include sessions on ropes, knots, equipment, and climbing techniques. Sunday, May 20's field session will cover bouldering and top rope-assisted climbs. Contact Duane Cichy, ext 2398 or 697-6570. Flyers also are available from the Recreation, module 124, Eng. Bldg., ext 6570 and from the department's information racks throughout the company.

Chess—The Martin Marietta Chess Club, open to all employees and their dependents (16 years or older), meets twice each month at the Denver Systems Center (DSC) snack-ateria. Contact Dick Pickerell, ext 5891. Flyers are available from Recreation and information racks.

Photography—The Platte Canyon Photo Club has scheduled a 7:30 a.m. guided field trip through Roxborough State Park for Sunday, May 20. Contacts are:

Bill Privatsky, president, ext 5920; John Smith, vice president, 5400; Polly Speranza, treasurer, 4790; John Bordenkirchner, 4478; and Robert Fischbach, recording secretary, 3030 or 3359. The photo club also has planned a seminar on photo composition for 7 p.m., Thursday, May 31, in room 200K at DSC. Flyers are available from Recreation and the racks.

Soccer—The Martin Mariners' Soccer Team still needs players for the balance of this season and for the upcoming fall season which begins in August. Current practices are held at 5 p.m., Thursday, at the east side of Foothills Park, West Hampden Ave. and Kipling Street. Contact Robert Avjian, ext 3085. Flyers available from Recreation and racks.

Softball—Teams are still needed for the 1st Annual Martin Marietta Open Softball Tournament scheduled for May 18, 19, and 20. All employees, their spouses, and dependents are eligible. Contact Recreation, ext 6605 by 4 p.m., May 15.

UCD honors Thomas

The University of Colorado at Denver (UCD) recently presented its 1984 Outstanding Part-time Mechanical Engineering Faculty Member Award to Dr. Robert A. Thomas.

Thomas, program manager in space and electronics division's advanced programs group, has been teaching mechanical engineering at the school since 1983. He was awarded his doctoral degree from UCD during 1982, and has been with Denver Aerospace since October 1980.

Safety eyeglasses do the job!

Wearing safety eyeglasses on the job recently averted a potentially serious injury for a Denver Aerospace employee.

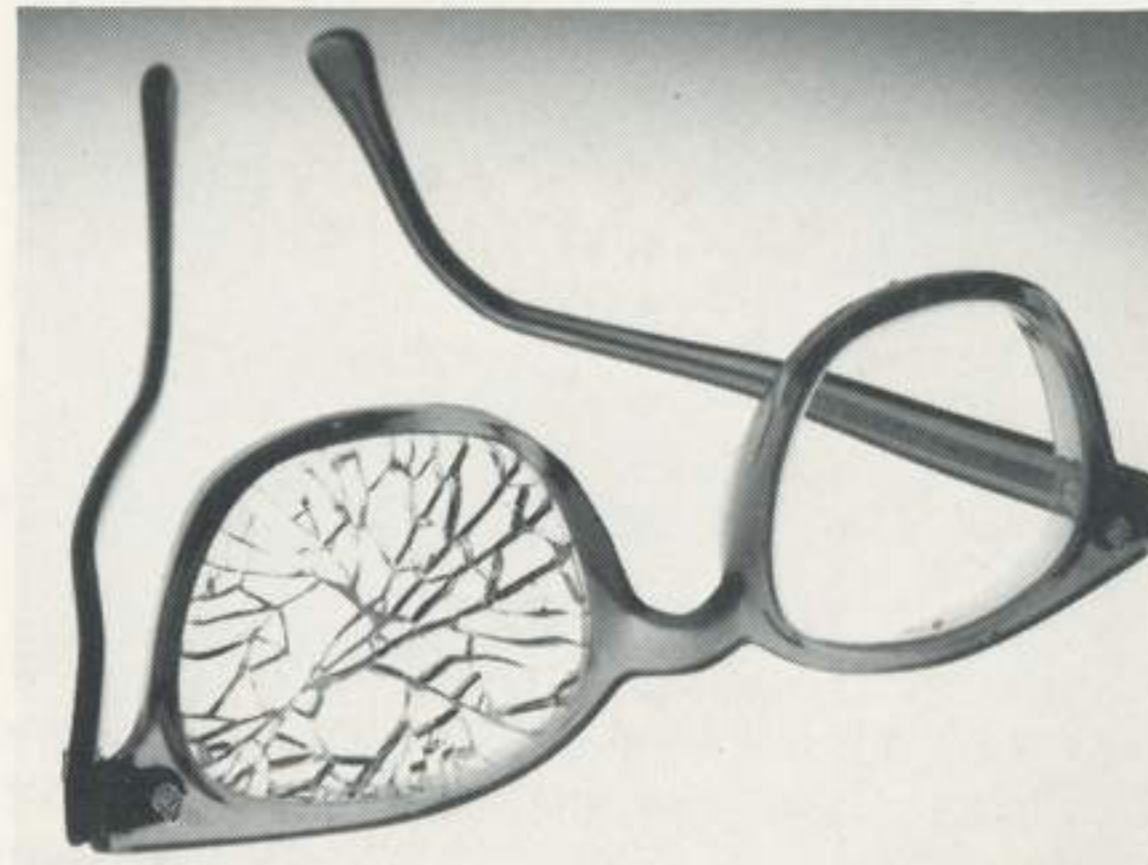
The employee was operating a milling machine in the general purpose laboratory (GPL) when a piece of the cutter broke off, flew up, and shattered the left lens of his safety glasses. Instead of being blinded, he suffered only slight soreness.

Personnel Safety, ext 4444, reminds all employees that only approved industrial strength safety glasses, meeting American National Standard provisions, are to be worn on operations requiring eye protection.

Approved industrial-strength, nonprescription safety eyeglasses are available in tool cribs throughout company facilities. Prescription industrial safety eyeglasses may now be purchased through a contract Denver Aerospace has nego-

tiated with Spectacles by Leon, 10151 West Bowles Avenue, Littleton, 978-1170.

Also included in the contract with that optometrist is a 10 percent discount on street-wear glasses for employees and family members.



These safety eyeglasses saved one Denver Aerospace employee from blindness.

21 retirees notch 336-plus years with Denver Aerospace

Twenty-one recently retired Denver Aerospace employees have accumulated more than 336 years of service with the company. They are:

From Denver—Mary Watson, 22 years/3 months; Ronald Atkinson, 25/6; Ivory Bryant, 22/1; Howard Severson, 12; Casimiro Romero, 13/2; Emery L. Boykin 26/5; Paul E. Antrillo, 27/4; Burt Bittner, 7; and Robert Winslow, 13/10;

From Michoud—Gregory Kaminski, 37 years/6 months; George McCurry, 5/1; Milton Johnson, 10/2; Jack Terrand, 7; T.J. Mumme, 10/3; Curtis Brooks, 5/2; and Orban Dobbs, 7/9;

From Kennedy Space Center—Donald Suarez, 7 years/3 months; Johnnie Thompson, 7; Raymond Schwartz, 6/8; Sam Gentile, 11/8; and Betty McCormick, 6/10.

Student exchange hosts sought

The Washington, D.C. based Youth for Understanding International Student Exchange is recruiting host families for foreign scholars due to arrive during August.

Denver Aerospace employees who currently have exchange students living in their homes include Charles H. Green, Masami S. Morikawa, Arthur E. Koski, and David K. Myers.

Those interested should contact Ann Shaw Kusic, regional director of the program, 2140 South Ivanhoe Street, Suite G-12, Denver 80222, 758-8085.

PSP re-enrollment clarified

Performance Sharing Plan (PSP) participants cut back to 12 percent from original elections under the salary deferral option January 1, 1984, do not have to reenroll for the original election during May's open enrollment period.

Adjustments—up or down—from 12 percent will be made from the original election unless a change was made on the salary contribution percentage. The adjustment will be made when the discrimination test is run.

Employees are reminded PSP open enrollment, as well as changes in contributions or tax mixes, must be received by May 31, for the election to be effective July 1, 1984. Forms received after that date will be returned for resubmittal during November and be effective January 1.

The benefits office is located in module 125, Eng. Bldg., and can be contacted anytime through ext 5609 or 4928. Office visits are between 10:30 a.m., to 12:30 p.m., and 2 to 3 p.m., Monday, Wednesday, and Friday.

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Call Ext. 5364 with information or suggestions for articles, or call one of the following coordinators:

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