

# Smog is America's quarry in first of summer flights

The company's 10-meter superpressure balloon, America,



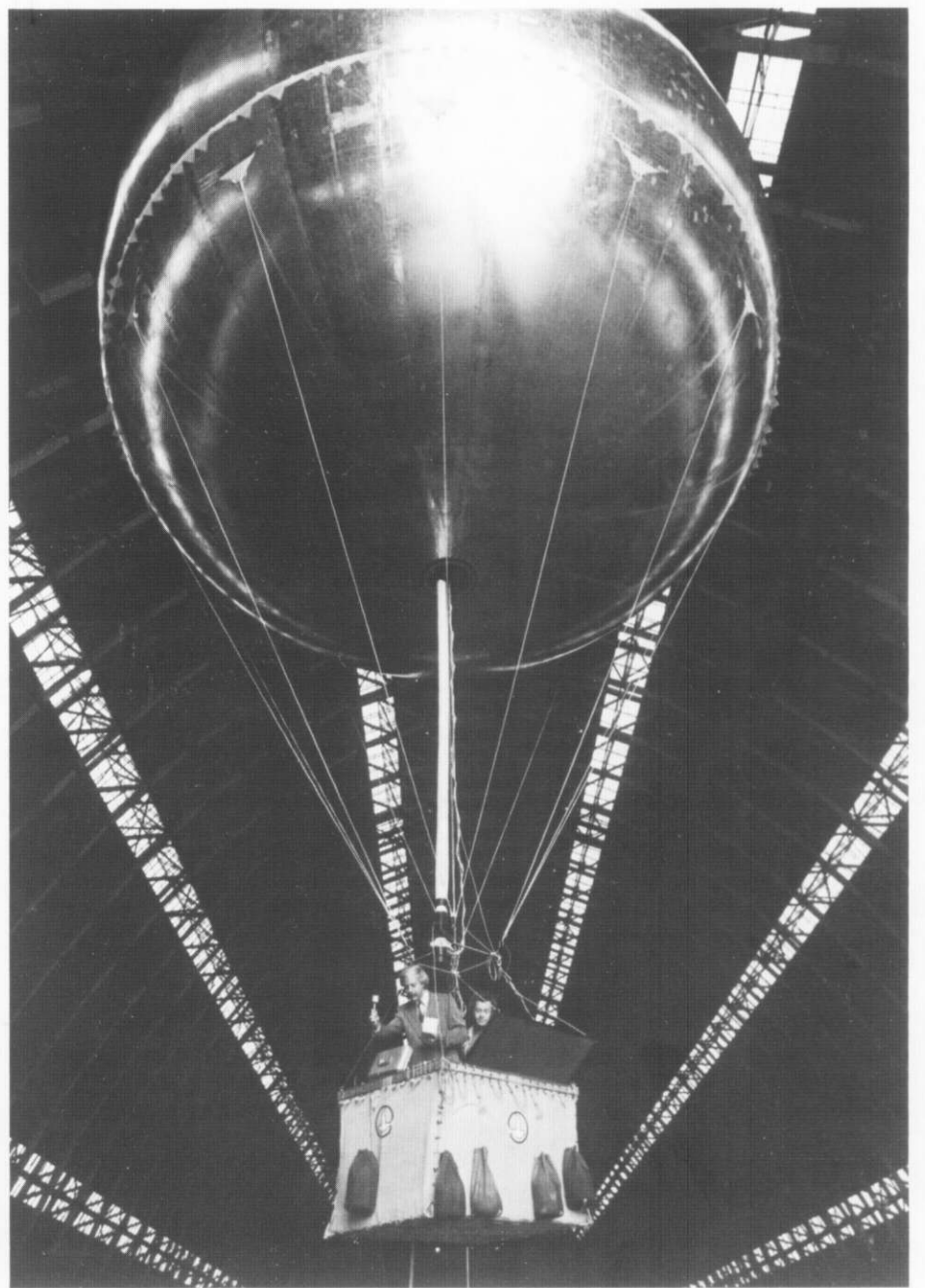
DR. GILBERT KING (right), general manager of the Ivan A. Getting Laboratories, receives Laboratory of the Year Award from Robert Jones, editor of Industrial Research magazine, which chose the labs for the honor. Ceremonies took place June 10.

was scheduled to embark within the next couple weeks on the first of three manned summer flights under contract to the South Coast Air Quality Management District.

With ATMOSAT project director Thomas Heinsheimer as pilot and corporate consultant Peter Neushul as co-pilot, the first flight's objective was to measure pollutant concentrations over a heavily-congested emission source area near the Los Angeles-Orange County coast on a typically moderate-to-heavy smog day in the inland valleys.

America's sophisticated scientific instruments were to monitor the progress of smog buildup in a single parcel of air as it moved over the basin, measuring ozone, nitrogen oxide, hydrocarbons, aldehydes, temperature and relative humidity.

Information gathered from the flight was expected to aid the district in acquiring a better understanding of the source-receptor relationships involved in photochemical smog (ozone).



DR. HEINSHEIMER (right) explains ATMOSAT operations to KNXT television news reporter Steve Lantz during pre-launch preparations at Santa Ana Marine Air Station.

THE AEROSPACE CORPORATION

# ORBITER

Volume 17, No. 12

June 15, 1977

## Board approves 34 corporate research programs

A total of 34 Corporate Programs for Research and Investigation (CPRI) for FY '78, with a budget of \$2.85 million, was approved by the Board of Trustees at its meeting this past weekend.

Funds for the CPRI include \$2.2 million authorized by the board from corporate resources. An additional \$650,000 will come from research support, which is negotiated as an overhead charge on contracts with agencies other than DOD. Approximately \$188,000 is being withheld for additional funding on approved programs or for possible project proposals received later in the year.

Primary emphasis continues to be on scientific research. Significant effort, however, will be placed on programs for improving technical skills and the capabilities of the company in new areas. Emphasis on economic implications of civil systems continues, particularly in the areas of energy generation and conservation. Work also is continuing on atmospheric problems and their relationship to space phenomena. Several projects are related to laser development and applications, and other projects that use lasers as elements in their experiments.

Among the many projects that have shown important results during the past year are the

bistatic radar experiment that detected aircraft illuminated by signals from a satellite, and the chaoite film coating of metals and plastics, giving a scratch-resistant transparent surface. Both are continuing, the first for defining operational military potentials and the second for possible commercial applications.

Among new programs to be carried on during FY '78 are: Water Related Constraints on Energy Production, Advanced Computational Fluid Dynamics, Crystal Growth by High Temperature Lasers, and Hydrodesulfurization Process under Commercial Operation Conditions.

(Continued on page 4)

## Gallium arsenide laser source earns Inventors' Award

Design of a unique high-spectral-radiance gallium arsenide laser source has earned Drs. Harold Stoll and Elsa Garmire Inventors' Awards.

Currently under development, the laser source is designed to emit up to one watt of power in the 0.835 to 0.855  $\mu\text{m}$  spectral range in a continuous-wave, room-temperature operating mode.

No larger than a man's fist and weighing only a few pounds, the device is expected to have an electrical "wallplug" efficiency of between 25 and 30 per cent.

The unit's operating characteristics are obtained "by exploiting the techniques of integrated optics in order to combine coherently the outputs of a large number (20 to 30) of gallium arsenide lasers," explained Drs. Stoll

and Garmire.

The laser source's unique design features include guided wave beam expansion elements that reduce the output beam divergence of the array to the milliradian range, and distributed Bragg reflector laser cavities that allow the precise selection of the lasing wavelength.

"The reduced beam divergence (three orders of magnitude less than state-of-the-art gallium arsenide lasers) permits efficient output beam collimation and collection," said the inventors.

"The wavelength selectivity enables frequency multiplexing — for communications purposes — over as

(Continued on page 4)



Drs. Stoll and Garmire

## ... As does orbital gravity-gradient solar power station

Dr. Vladimir Chobotov of Guidance and Control Division's mission analysis department has received an Inventors' Award for conceiving an orbital gravity-gradient stabilized solar power station.

In explaining his conception, Dr. Chobotov noted that "the possibility of collecting large amounts of solar energy in space has been considered for many years, mainly because such a scheme would enable energy to be generated on a continuous basis, with no day-night cycles or weather restrictions."

However, he said, "the solution of many problems such as the deployment, assembly and control of very large, flexible structures in orbit is required if such systems are to become technically and economically

viable by the turn of the century."

Currently-favored photovoltaic designs require 40 to 80  $\text{km}^2$  of solar cell area for the microwave delivery of 5,000 to 10,000 megawatts of power to earth.

During a NASA-funded study, Dr. Chobotov identified an innovative approach in which "the large solar array area is segmented into much smaller units that can be joined together in a linear manner and oriented along the local vertical."

The concept's principal advantages, said Dr. Chobotov, are that it enables natural forces (gravity-gradient) to maintain earth-pointing of the array; allows simplified active attitude control of the sun-

(Continued on page 4)



Dr. Chobotov

# Hernandez plays a hand in workshop

Equal Opportunity Programs Representative Richard Hernandez participated in the third annual Career Awareness Workshop conducted at Whittier College June 3.

Co-sponsors of the event were the college's Center of Mexican American Affairs, the Whittier Union High School District and the Personnel Management Association of Aztlan, of which Hernandez is

## H-P to display wares

Aerospace employees are invited to visit a display of Hewlett-Packard Company table-top calculators and peripheral equipment and the firm's complete line of pocket calculators.

The display will be in a mobile trailer in the parking lot between Bldg. A6 and the employees' entrance to the main complex, on Friday, June 17. The hours will be 9 a.m. to noon.

## Yoga series to begin

Aerospace and SAMSO employees may sign up for a six-week series of yoga classes to be conducted from 5 to 6 p.m. on Wednesdays in Bldg. A1/1062 beginning June 22.

Cost of the series will be determined by the number of persons taking it. For further information, call Helen Renaldi, ext. 86247.

president. Some 225 students from seven schools in the mostly-Hispanic district attended the all-day affair, whose theme was "Career Awareness Through Motivation."

Representatives from business, industry and government participated, with Hernandez conducting a workshop on career opportunities in engineering.

The company provided packets of educational material on engineering careers and defrayed the cost of "brown bag" lunches.

"Each year we have a seminar for Hispanic students interested in engineering sciences, usually held at Aerospace," said Hernandez. "This year I tried to do something different and take Aerospace out into the community."

### IN APPRECIATION

A letter expressing appreciation to fellow employees and to Aerospace has been received from:

**PEGGY BERGMAN** and family, on the death of her brother.

**ALLAN H. GOTT**, on the death of his father.

**EARNEST E. RICHARDSON** and family, on the death of his grandfather.

### IN MEMORIAM

Sincere sympathy is extended to the family of the following employee:

**RICHARD J. ROONEY**, 50, graphics services manager, died June 4. Hired, Oct. 3, 1960.



**HERB SANCHEZ**, chairman of the Los Angeles-area Youth Motivation Task Force (YMTF), addresses 38 Aerospace employees who participated in the organization's 1976-77 program by visiting high schools in minority neighborhoods and stressing the importance of a continuing education. For their efforts they were presented YMTF certificates by Administration Operations Associate General Manager M.C. (Bud) Hendrickson (seated far left). Equal Opportunity Programs Representative Richard Hernandez (seated next to Hendrickson) is the company's YMTF coordinator.

## in brief: APPOINTMENTS & PERSONAL NOTES

### APPOINTMENTS

#### ENGINEERING SCIENCE OPERATIONS

**Vehicle Engineering Division:** Vehicle design subdivision has been organized as follows: **E. Robert Ryder** is design integration department head, **John Cardoso** is reentry systems design manager and **William Smith** is space systems design manager; **George Kelsey** is design analysis department head and acting mechanical components manager, **Charles Pullen** is mass properties manager and **Larry Selzer** is design evaluation manager. Continuing as operations and thermal control department head and acting test operations manager is **John Emerson**, while **Andrew Bavetta** is satellite heat transfer manager and **Richard Farran** cryogenics and thermal subsystems manager. Reporting directly to the subdivision directorate are senior staff engineers **Bertrand Bertrando**, **Dr. Alfred Johnson** and **Kaye Swan**.

**Electronics and Optics Division:** **Dr. Lester Goldstein** has been appointed manager of optical systems department's newly-formed electro-optics section.

**Information Processing Division:** **Sadako Ishii** has been promoted to administrative applications department's administrative production control section manager.

#### SYSTEMS ENGINEERING OPERATIONS

**Satellite Systems Division:** **Dr. Carl Verhey** has been promoted to A-45 office's software systems manager, **Harold Jensen** has been appointed manager of the newly-established management systems and administration office and **Charles Lodwick** has been named administration director for division operations at Sunnyvale.

### PERSONAL NOTES

**Andrew Tescher** of Electronics and Optics Division's optical systems department has been named a Fellow by the Society of Photo-Optical Instrumentation Engineers. The advancement will become effective with the awarding of diplomas at the organization's 21st annual meeting Aug. 22 to 26 in San Diego.

Mmm  
—mm



**A STEAK BARBECUE** made the 21st a beautiful May day for about 75 Aerospace employees and their families at Vandenberg AFB. Secretaries and wives provided salads to go with the main course during the facility's third annual picnic, held at Los Alamos Park. The event was organized by Patrick Dunn, with the assistance of co-chairman Claude Duvivier and secretary-treasurer Dorothy Foster. Cooking up the goodies were (left to right) Otto Bender, John Fox, John Gray and Jack Goodman.

## Professional Papers

The following professional papers have been cleared for possible presentation and/or publication.

- W. H. Allor**, "Space Shuttle Reentry Simulation at the Aerospace Corporation," Simulation & Space Shuttle Conference, Downey, Calif., May 5, 1977.
- C. C. Badcock, W. C. Hwang and J. F. Kalsch**, "Enrichment of a Bromine Isotope by Vibrational Photochemistry," American Chemical Society Meeting, Montreal, Quebec, Canada, May 29-June 2, 1977.
- N. K. Baker**, "Variable Domain Operators and Adaptive Coding," 1977 IEEE Workshop on Picture Data Description, Chicago, Ill., April 22, 1977.
- S. B. Belknap**, "A Simple Tangent Steering Model for Space Shuttle Ascent and Abort Simulation," Simulation & Space Shuttle Conference, Downey, Calif., May 5, 1977.
- M. Birnbaum, A. W. Tucker and C. L. Fincher**, "CW Ruby Laser Pumped by an Argon Ion Laser," Conference on Laser Engineering & Applications, Washington, D.C., June 1977, and Journal of Quantum Electronics.
- M. Birnbaum, A. W. Tucker and C. L. Fincher**, "CW Room Temperature Laser Operation of Nd:CAMGAR at 0.94 μ and 1.059 μ," Conference on Laser Engineering & Applications, Washington, D.C., June 1977, and Journal of Quantum Electronics.
- J. B. Blake and L. M. Friesen**, "A Technique to Determine the Charge State of the Anomalous Low-Energy Cosmic Rays," 15th International Cosmic Ray Conference, Plovdiv, Bulgaria, Aug. 16-20, 1977.
- J. B. Blake, J. P. Wefel and D. N. Schramm**, "UH Cosmic Rays: Possible Origin in Massive Stars," 15th International Cosmic Ray Conference, Plovdiv, Bulgaria, Aug. 16-20, 1977.
- E. T. Bobak, R. G. Clabaugh and O. E. Behunin**, "The NATO Phase III Communication Satellite Program," NATO Defense Research Group Seminar on New Trends in Communications, Bruz, France.
- F. E. Bond**, "Next Generation SATCOM Systems — Architecture, Issues, Schedules," Methods for Enhancing Satellite Communication Link Survivability, Washington, D.C., May 18-19, 1977.
- J. F. Bott and R. F. Heidner, III**, "Kinetic Study of H + HF(v=3): Kinetic Isotope Effect and Temperature Dependence," American Chemical Society Meeting, Chicago, Ill., Aug. 28, 1977, and Journal of Chemical Physics.
- S. L. Channon**, "Confidence in Beryllium," Fourth Inter-

- national Conference on Beryllium, London, England, Oct. 4-7, 1977.
- G. A. Chapman, J. N. Heasley and F. Kneer**, "The Effects of Partial Redistribution on Facular K Line Profiles," Solar Physics.
- C. C. DeBilzan**, "An Overview: The GTS Software System as Applied to Space Shuttle and Interim Upper Stage Studies," Simulation & Space Shuttle Conference, Downey, Calif., May 5, 1977.
- R. L. Dickman**, "Bok Globules," Scientific American.
- R. B. Dybdal**, "Horn Antenna Sidelobe Reduction Using Absorber Tunnels," IEEE International Symposium on Antennas and Propagation, Stanford, Calif., June 20-24, 1977.
- R. B. Dybdal and H. E. King**, "93-GHz Radar Cross Section Measurements of Satellite Elemental Scatterers," IEEE Transactions on Antennas and Propagation.
- B. C. Edgar, H. C. Koons and A. L. Vampola**, "Induced Precipitation of Inner Zone Electrons: 2. Resonance Calculations," American Geophysical Union Meeting, Washington, D.C., May 30-June 3, 1977.
- J. S. Evangelides**, "Influence of Pyrolysis Pressure on Microstructure of Carbon-Carbon Composites," 13th Biennial Conference on Carbon, Irvine, Calif., July 18-22, 1977.
- D. R. Ferguson**, "Applications of Variable Knot Spline Analysis to Problems of Event Detection," Summer Computer Simulation Conference, Chicago, Ill., July 18, 1977.
- A. A. Fote, A. H. Wildvank and R. A. Slade**, "Coefficient of Friction of PTFE Impregnated Porous Bronze vs Temperature," Wear.
- F. B. Fote and D. T. Hodges**, "CW Performance of Optically-Pumped Lasers in the Millimeter-Wave Spectral Region," Microwave Theory and Techniques, Microwave Symposium, San Diego, Calif., June 21, 1977.
- J. A. Gelbwachs**, "Laser Photoacoustic Detection of Explosive Vapors," The Society of Photo-Instrumentation Engineers, Reston, Va., April 20, 1977.
- J. A. Gelbwachs, C. F. Klein and J. E. Wessel**, "Single Atom Detection by SONRES," Conference on Laser Engineering and Applications, Washington, D.C., May 31, 1977, and Journal of Quantum Electronics.
- P. T. Gray**, "Computer Simulation for Space Surveillance Network Evaluation," Summer Computer Simulation Conference, Chicago, Ill., July 18-20, 1977.
- K. L. Hainebach, J. B. Blake and D. N. Schramm**, "The r-Process Path in the Superheavy Region," 15th International Cosmic Ray Conference, Plovdiv, Bulgaria, Aug. 13-26, 1977.
- K. C. Herr, D. P. Grimmer, K. Zinn and B. E. Wood**, "Augmented Solar Energy Collection Using Different Types of Planar Reflective Surfaces: Theoretical Calculations and Experimental Results," Annual Meeting of the American Section of the International Solar Energy Society, Orlando, Fla., June 6-10, 1977.
- D. T. Hodges**, "CW Optically Pumped FIR Lasers," Society of Photo-Optical Instrumentation Engineers Journal.
- W. C. Hwang, C. C. Badcock and J. F. Kalsch**, "Vibrational Photochemistry of Hydrogen Bromide with Iodine Atoms," International Conference on Lasers in Chemistry, London, England, May 31-June 2, 1977.
- W. Jerkovsky**, "The Structure of Multi-Body Dynamics Equations," AIAA Symposium on Dynamics and Control of Large Flexible Spacecraft, Blacksburg, Va., June 15, 1977.
- D. A. Lilly, D. E. Joslin and H. K. A. Kan**, "Metal-Insulator-Semiconductor Studies of Lead Telluride," Infrared Physics.
- J. G. Luhmann and J. B. Blake**, "K-Shell X-Ray Fluxes at Satellite Altitude from Proton Precipitation," Journal of Atmospheric and Terrestrial Physics.
- J. G. Luhmann and J. B. Blake**, "Rocket Altitude Atmospheric X-rays from Magnetospheric Electrons at Subauroral Latitudes," 15th International Cosmic Ray Conference, Plovdiv, Bulgaria, Aug. 16-29, 1977.
- J. G. Luhmann**, "High Latitude Windshield Wiper Effect," American Geophysical Union Meeting, Washington, D.C., May 30-June 3, 1977.
- D. G. McCaughey and H. C. Andrews**, "Degrees of Freedom of Images and Imaging Systems," SPSE 30th Annual Meeting, Hollywood, Calif., May 1-6, 1977.
- M. McColl**, "Review of Submillimeter Wave Mixers," SPIE/SPSE Technical Symposium East, Reston, Va., April 18-21, 1977.
- P. F. Mizera, J. F. Fennell and A. L. Vampola**, "Charged Particle Distributions in the Presence of Large DC Electric Fields," American Geophysical Union Meeting, Washington, D.C., May 30-June 3, 1977.
- J. W. Murdock and T. D. Taylor**, "Numerical Investigation of Nonlinear Wave Interaction in Two-Dimensional Boundary Layer," AGARD Meeting on Laminar Turbulent Transitions, Copenhagen, Denmark, May 2-4, 1977.
- S. Schlesinger, R. Sylvester and G. Innis**, "Model Certification — Varying Views from Different Specialties," 1977 Summer Computer Simulation Conference, Chicago, Ill., July 18-20, 1977.
- D. J. Spencer**, "Sensitive F<sub>2</sub> Absorption Diagnostic," 5th Conference on Chemical and Molecular Lasers, St. Louis, Mo., and Journal of Applied Physics.
- D. J. Spencer and C. Clendening**, "F<sub>2</sub> Absorption Measurement in CL XI Chemical Laser Nozzle," Journal of Applied Physics.
- I. J. Spiro**, "Radiometry and Photometry," Optical Engineering.
- J. M. Straus, A. Del Genio and G. Schubert**, "Atmospheric Gravity Waves at a Temperature Gradient Discontinuity," Journal of the Atmospheric Sciences.
- A. L. Vampola and G. A. Kuck**, "Induced Precipitation of Inner Zone Electrons: 1. Observations," American

Geophysical Union Meeting, Washington, D.C., May 30-June 3, 1977, and Journal of Geophysical Research.

- A. L. Vampola, J. B. Blake and G. A. Paullikas**, "A New Study of the Outer Zone Electron Environment: A Hazard to CMOS," AIAA Journal.
- R. L. Varwig, J. M. Lyons and A. Ching**, "Shock Tube Simulation of Silo-Launch Flows," Proceedings of 47th Semiannual Supersonic Tunnel Association Meeting.
- H. E. Frank Wang**, "Introduction to the Space Test Program S3-3 Satellite," American Geophysics Union Meeting, Washington, D.C., May 30-June 3, 1977.
- J. L. White and J. E. Zimmer**, "Disclination Structures in Coke and Graphite," 13th Conference on Carbon, Irvine, Calif., July 18-22, 1977.
- A. G. Whittaker and J. S. Evangelides**, "Influence of Carbon Polymorphs on Ablation of Graphitic Materials," American Carbon Society, Irvine, Calif., July 18-22, 1977.
- J. E. Zimmer and J. L. White**, "Thermal Expansion of Microconstituents of Coke," 13th Conference on Carbon, Irvine, Calif., July 18-22, 1977.
- J. E. Zimmer and J. G. Baetz**, "Microstructure and Chemical Erosion of Carbon-Carbon Nozzle Materials," 13th AIAA/SAE Propulsion Meeting, Orlando, Fla., July 11-13, 1977.

For information, contact Fran Brady, ext. 85058. For copies of papers, contact authors.

Volume 17, No. 12 June 15, 1977

## THE AEROSPACE CORPORATION ORBITER

Published bi-weekly by the Office of Information El Segundo, California  
Peg G. Coale, Editor and Manager  
Employee News Publications

Bernie Chernis-Silver  
Associate Editor

Editorial Office: Bldg. A1, Room 1012  
Ph. 618-5444

Member of Southern California Business Communicators and the International Association of Business Communicators.



Jeff Holly . . .



. . . shows the form . . .



. . . that got him . . .



. . . into the . . .



. . . major leagues.

## Holly's kid: a big man makes it into the big leagues

None of Don Holly's offspring is receiving a degree this summer, but one of them is a new graduate nonetheless.

His son Jeff, 24, recently moved from Tacoma of the Pacific Coast League into baseball's big time: the Minnesota Twins of the American League's West Division.

Don is a former Aerospace employee who worked as an air-conditioner mechanic in facilities until a back injury sustained on the job forced him into long-term disability in 1971.

Jeff was employed as a security officer with the company in 1970-1971, and sister Diane Eldridge is currently a secretary in the Materials Sciences Laboratory.

You might say both father and daughter are rather proud of Jeff, a strapping 6-foot-6, 210-pound southpaw.

"Ever since he was six or seven, he's wanted to be a big-league ballplayer," said Don, who helped him reach that goal by tutoring him and rooting him on in Little League competition and boosting his morale during a tough haul in the minors.

Jeff attended Aviation High School in Redondo Beach, where he set a batch of records in both basketball and baseball.

Scholarship offers flooded in from colleges throughout the country, but when the Chicago White Sox drafted him Jeff saw a dream coming true and accepted.

He spent several years in the Chisox farm system, then was optioned to the Mexican League in 1975. He eventually walked out along with five other players in a contract dispute and, after being released by the Sox, returned to Los Angeles.

He was not on cloud nine.

Don didn't exactly boost him that high, but he did encourage him to hang in there, and in May of '76 Jeff was signed by the Twins.

He pitched well for Orlando in the Class A Southern League, again in Mexico last winter and in the Twins' minor league camp in Melbourne, Fla.

The determined hurler was toiling for Tacoma in the Triple-A Pacific Coast League when Twins pitchers Mike Pazik and Don Carrithers were seriously injured in an automobile accident.

Up came Jeff and Davis May to replace them.

Early last month young Holly made his major league bow, and the dramatic way he did so befitted a Bunyanesque pitcher who throws a  
*(Continued on page 4)*

### AEA WINTER BASKETBALL (Final standings)

TEAM	W	L
Jerry Searcy	9	2
Dick McGrath	8	3
Russ Gowin	5	5
Jack Sprouse	5	5
Tom Ward	2	8
Paul Gelan	2	8

### AEA SOFTBALL STANDINGS (As of June 2, 1977)

TEAM	W	L
Wild Turkeys	3	0
Data Reducers	2	1
Has Beens	2	1
49er's	1	2
Aardvarks	0	4



MEMBERS of winning squad in recently-completed AEA winter basketball competition are (left to right) Dave Conrad, Jesse Parker, Dick Meis, Dick Rountree, Gary Schelin and captain Jerry Searcy. Not pictured is Tim Paulsen.

## Sharon takes the prize



Sharon Dódd was a little hoarse the morning of Tuesday, June 7. She had done a bit of screaming the night before.

Fortunately, the shouts had been for joy, as the lab support clerk-typist cleaned up on the popular television game show, "The Price is Right."

Sharon's guesses were certainly right, on a set of cookware, a hand-sweeper, a hamburger cooker and some leather accessories whose cost she correctly assessed, enabling her to win them and a number of other prizes totaling \$3,000.

Additional bounty to be delivered to her Redondo Beach apartment are a healthy supply of salad dressing, a pinball machine, a pool table and a stereo set.

Was she nervous? Indeed. Is she happy? Deliriously. As is husband Johnny, a pinball aficionado. Sharon herself favors the pool table.

The newly-won merchandise will be delivered within the next few months, by which time she and Johnny will have rearranged their living room to accommodate the bulkier of the prizes.

Sharon can be seen pricing it right at 9 a.m., Monday, June 27 on KNXT-channel 2. The show is hosted by Bob Barker.

## Daughter gets NSF grant for graduate work

Paula Shadle, daughter of Paul Shadle of Advanced Orbital Systems Division, has received a three-year National Science Foundation grant for graduate work in neurobiology.

The award includes full tuition and a stipend at the graduate school of the recipient's choice. Of nearly 5,000 applicants throughout the country, 550 were presented grants in all categories.

Paula will receive a bachelor's degree from the University of California at Davis on June 17. She

will begin graduate studies at UC-San Diego this fall.

As a sophomore, Paula attended an NSF-sponsored chemistry summer session at San Diego State University. She received a scholarship from the U.S. Office of Gifted and Talented to attend a marine biology research project sponsored by Educational Expeditions International.

She has studied at the Marine Biology Laboratory, Woods Hole, Mass. and at the University of Washington's Friday Harbor Laboratory.

## Trustees OK company research projects

(Continued from page 1)

Until recently, supplies of water seemed to be endless and new energy resources could be created where there was water. With the current shortage it is realized there are constraints. This study, within the Environment and Energy Conservation Division, is directed toward defining such water-related constraints.

The use of some of the new computer techniques, particularly with the advancement of integrated circuits and availability of microcomputers, will be applied to computational fluid dynamics with techniques that will be faster and more economical than at present.

## Solar power station earns Inventors' Award

(Continued from page 1)

oriented panels, and alleviates problems in system deployment and assembly.

Thus, said Dr. Chobotov, the concept offers a potentially longer life, increased reliability and lower

### Circus tickets on sale

AEA discount tickets to the venerable Ringling Bros. and Barnum and Bailey Circus are currently available in personnel services, Bldg. A1/1069.

Tickets at \$5.50 apiece — \$2 off the regular price — are being sold for the 6 p.m., Sunday, July 24 Forum performance.

Purchase deadline is Monday, July 11.

### Play date moved back

The date for which AEA is offering reduced tickets to "Annie Get Your Gun" has been moved back from Thursday, July 14 to Thursday, July 28.

The Irving Berlin musical starring Debbie Reynolds will be performed at the Dorothy Chandler Pavilion.

Deadline to purchase the \$12.25 discount tickets, available in personnel services, is Friday, June 24.

This program will be carried on within Engineering Science Operations.

Within the Electronics Research Laboratory, high temperature lasers will be used to develop a technique for growing crystals, which will drastically reduce the possibility of contaminants.

The use of low-grade coal and fuel oil in commercial operations can produce damaging amounts of sulfuric acid. This program in the Chemistry and Physics Laboratory is directed toward finding catalysts that will remove the sulfur before the burning process and be applicable to large-scale operational power plants.

### Inventors' Award

costs than systems using monolithic structures.

Another advantage is that a natural roll oscillation may be employed to minimize or eliminate shadowing of the array near local noon at the equinoxes. In addition, the concept improves as the power station's mass and size increase.

Several papers describing the system in detail have been written recently by Dr. Chobotov and Leo Cantafio of Electronics and Optics Division and Dr. Malcolm Wolfe of Advanced Orbital Systems Division.

"Additional effort is required, however, to further optimize the design and compare its cost effectiveness with other competing configurations," said Dr. Chobotov.

### Laser source

(Continued from page 1)

many as 100 different optical channels.

"The latter advantage, when combined with the demonstrated ability to modulate directly a single laser over a one-gigahertz bandwidth, implies a communications channel with a 100-gigahertz bandwidth."

## Holly's son makes the major leagues

(Continued from page 3)

sinker, slider, screwball and curve from three different angles.

Manager Gene Mauch called him in against the Detroit Tigers in the top half of the third with the Twins trailing 5-0.

Now definitely on cloud nine, Jeff caged the Bengals for seven innings on two hits and a walk while his teammates got two runs back in the sixth and seventh and scored four more with two out in the bottom of the ninth to save the day — and debut — 6-5.

The victory was celebrated all the way from the Midwest to the West Coast.

Don, Diane and other relatives were in special box seats when the Twins played the Angels in Anaheim Stadium last month, but did not get to see Jeff pitch.

The elder Holly and wife Dee will travel to Minnesota this month and be back in their Anaheim box on July 11, 12 and 13 when the Twins return.

Since Jeff is now part of a five-man starting rotation, it's very likely that Don will soon view his son the "graduate" in action.

## MEETINGS CALENDAR

**CAMERA CLUB** will meet on Thursday, June 16 in Bldg. A1/1082 at noon. Slide contest will be held. Contact: C. Grow, ext. 85665.

**CAR CLUB** will meet on Monday, July 11 in Bldg. A4/1404 at noon. Contact: J. Pranke, ext. 87419.

**CHESS CLUB** meets every Monday & Thursday in Bldg. A1/1052C at noon. Contact: M. Tavis, ext. 85440.

**CHORAL CLUB** meets on Tuesdays in Bldg. A7 at noon. Copies of club music have been distributed over the years. Former members, please check and return any you may have. Contact: J. Masek, ext. 85630.

**COIN & STAMP CLUB** will meet on Monday, June 20 in Bldg. 100/1538 at noon. Contact: P. Leo, ext. 85372.

**COMPUTER & ELECTRONICS CLUB** meets on the first & third Mondays of each month in Bldg. A1/1082 at noon. Tutorials, discussions & demonstrations on home & hobby computers, microcomputers & minis. Contact: G. Comisar, ext. 86930.

**DIXIELAND JAZZ CLUB** meets every Monday in Bldg. A7 at noon. Musicians & listeners welcome. Contact: J. Hook, ext. 85288.

**GEM & MINERAL CLUB** meets on first Tuesday of the month in Bldg. A3/Din. rm. A at noon. Contact: C. Hills, ext. 86936/G. Nichols, ext. 87323.

**GUN CLUB** will meet on Friday, June 24 in

Bldg. A3/Din. rm. B at noon. Contact: W. Fenner, ext. 87604.

**MODERN JAZZ CLUB** will meet on Friday, June 17 & 24 in Bldg. A7 at noon. Come and hear Aerosax! Contact: C. Crummer, ext. 85145.

**SCUBA CLUB** will meet on Friday, June 17 in Bldg. A6/1404 at noon. Continental Airlines color film "Silent Warrior" will show diving to Japanese wrecks at Truk. Upcoming trips: Catalina Island — June 18-19 & June 25, local beach dive — July 9. Contact: P. Landecker, ext. 87019.

**STOCK MARKET CLUB** will meet on Tuesday, June 21 in Bldg. A1/1062 at noon. Robert Sweet will discuss Inflation Survival Letter & The Forecaster, Carl Erickson will discuss The Professional Tape Reader. June 28, Russ Swallow, G. H. Jamison Co., will discuss Tax Deductible Life Insurance as an Investment. Important: No Stock Club meetings in July & August. Contact: G. Adams, ext. 86002.

**TOASTMASTERS CLUB** meets every Wednesday in Bldg. A6/1404 at noon. Contact: D. B. Ward, ext. 85677.

**TRAVEL CLUB** will meet on Thursday, June 23 in Bldg. A1/1062 at noon. Ernie Pritchard will show his slides on "Scandinavia by Plane, Hydrofoil, Coastal Steamer, Railroad, Auto & Weather Map." Contact: J. Campbell, ext. 85344.

**BASSINET**, wht. wicker, \$10. J. Kohn, 926-8438.

### FOR SALE — REAL ESTATE

**3-BDRM**, 1 1/4 bath, dbl. garage, Carport, \$63,900. Capt. J. Moonan, 835-4097.

**4-BDRM**, 2 bath, fam. rm., firepl., din., patio, built-ins, cul-de-sac, Fountain Valley, \$84,950. Capt. J. Ray, ext. 30183.

### FOR RENT — REAL ESTATE

**4-BDRM**, 2 1/2 bath, fam. rm., swim pool, 30/35 min. fm. SAMS0, \$625 mo./owner transferred. A. Starnes, 547-2325.

### FREE

**SOIL**, loose & clean; immediate disposal imperative. C. Klein, 376-7736.

### COMMUTER SERVICE/CAR POOL

**MEMBER** for car pool needed, west Long Beach/Navy housing area. J. Hernandez, ext. 30773.

**MEMBERS** wanted for car fm. Carousel tract in Carson. D. Wilhelm, ext. 30131.

### GOT A QUESTION?

Call ext. 85555 and ask Jim Benning. You'll get a straight answer - confidence assured.

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Deadline date for the next issue is:

Monday Noon  
June 20

### FOR SALE — AUTOMOBILES

- '76 CHEV. LUV pickup, AM/FM stereo, only 13,000 mi., perf., \$2,660. S. Mayer, 475-3793.
- '76 CHRYSLER Cordoba, full eqpd., xlnt. cond., \$5,900. T. Nevin, ext. 85392/322-3631.
- '76 FORD Granada, a/c, auto., ps/pb, stereo, 2-dr. coupe, factory war., \$4,200. G. Epstein, 394-5268.
- '75 BLAZER, auto., \$5,500 firm; 4 mount. Firestone radials, \$100. C. Crummer, 393-6318.
- '75 DATSUN B-210, 4-sp., 8-trk., new tires, xlnt. cond., \$2,350. Maj. J. Shoutta, 633-7867.
- '74 MERCEDES BENZ 230, blu, 44,694 mi., one owner, \$8,875. S. Ferryman dePlaza, 322-6572.
- '74 VW Super Beetle, bright yellow, 21,000 mi., xlnt. cond. R. Mackey, 830-3016.
- '73 BUICK Electra 4-dr., a/c, legal/no CA smog eqpt., \$2,200. D. Swanson, ext. 85728.
- '73 DATSUN 610, auto., a/c, 42,000 mi., good cond., \$2,200. S. Cheung, 926-5322.
- '73 FIAT 128SL, AM/FM stereo, 48,000 mi., xlnt. cond., \$1,650. H. Yura, 274-1361.
- '72 VEGA 3-sp., stick, 22 mpg, xtras, xlnt. cond., \$1,195/offer. D. Nunberg, 670-4073.
- '71 PONTIAC wagon 8-pas., a/c, full power, xtras. D. Hall, ext. 85896/377-7334.
- '70 VOLVO 4-dr., 4-sp., a/c, radials, good cond., \$1,250. R. Colander, 322-0308.
- '69 CHEV. Impala coupe, auto., ps/pb, good cond., \$975. J. Dyckman, 294-0276.
- '69 CORVETTE, 2 tops, 350, auto., 43,000 mi., cherry, \$5,500/best offer. J. Hill, 541-4475.
- '69 FORD van with Sundial camper, \$2,250. Nancy, 323-0568.
- '68 MUSTANG fastback V8, 4-sp., good cond., \$950. J. Higan, 641-2012.
- '68 VW Bug, mag wheels, 8-trk. tape, xlnt. cond., \$1,200. P. Mossembekker, 644-1500.
- '67 CHRYSLER NY, auto., power, a/c, radio,

buckets, recliner, discs, \$900. D. Katsuda, ext. 86954.

'66 CHEVY Caprice 396, 4-dr., all power, one owner, xlnt. cond., \$600/best offer. M. Thieme, 374-0382.

'66 OLDS Delta 88, 4-dr., a/c, all power, xtras, runs great, \$650. R. Orth, 377-7187.

'65 CHRYSLER wagon, auto., ps, a/c, xlnt. mech. cond., \$500. L. Cantafio, 541-4998.

'65 RAMBLER Classic, good body, needs work, as is, \$150. C. King, ext. 87101.

'65 VW Bug, new paint, upholstery, AM/FM radio, \$1,150. C. Peart, ext. 85905.

'40 FORD delux coupe, a real classic, restored, orig., \$5,500/offer. F. Wisely, 545-6293.

### FOR SALE — MISCELLANEOUS

**MINIBIKE**, Bonanza, a good, street/trail, \$185. R. Risley, 541-2765.

**VACUUM**, Kirby upright w/attach., little used, \$150. A. Rusich, 641-8911.

**'70 SUZUKI** 90 dirt bike, needs work, good tires, \$35. J. Humphreys, ext. 86777.

**KITTENS**, seal-point Siamese, avail. July 1, \$50. M. Eckman, ext. 31666/831-6172.

**VOYAGER GT** shell/'69-'71 El Camino, fiberglass, sunrf., 3 mo., \$425/offer. R. Dennis, ext. 86520 after 3.

**HELMETS**, motorcycle, w/visors, ext. XL, 1-\$5, 1-\$15. E. Huckins, ext. 85905.

### FOR SALE — FURNITURE & APPLIANCES

**TABLE**, 6 chairs w/match, china cab., colonial, good cond., \$400. G. Madrid, 645-2975.

**STEREO**, AM/FM Zenith, beaut. wood, 6 spkr; dinette set; oak hall bench. R. Norris, 292-5156.

**BEDSPREAD**, multic. patchwk. king, new, \$110; twin mattress w/rollaway frame, \$35. S. Manire, 823-5803.

**PIANO**, Wurlitzer elec., walnut, 66 key, like new, \$500. D. Briner, 823-2914.

**DISHWASHER**, Whirlpool elec. white, Cairns, 542-9355.

**COUCH**, 3-pc. sect., pole lamp, birdcage, bookcase, chest, desk. P. Matherly, 671-2685.

**DINING** set, \$150; antique china cab., \$300; photos at office. H. Bernstein, ext. 87028.

**CREDENZA**, 30" wide, walnut, xlnt. cond., \$15. R. Leatherman, ext. 87676.

**RIFLE**, 1868 Sharps, cal. 50-90, antique, xlnt. cond., \$700. D. Robinson, 821-9891.

'71 BMW motorcycle R75/5, 9,000 mi., bag, rack, xlnt, always garaged, \$1,600. N. DeLong, 645-6207.

**SCHNAUZER**, 2-yr., miniature, AKC, fixed, great w/children, \$25. G. Thompson, 542-7593.

**CAMERA**, 35mm SLR, xtra lenses, tele-extend., will separate. H. Mayer, 377-6122.

**WOVEN** wood shade, walnut, grn/gold, 4'x6', \$50. Capt. J. Gould, 542-9378.

'71 HONDA SL350, street/dirt, xtra tires, turn sigs., \$450/best offer. M. Bunn, 377-6515.

**TRAVEL** trailer, 16', sleeps 6, xlnt. cond. J. Atwood, ext. 30560/926-5054 after 6.

**KETTLE**, Weber, largest size, used twice, \$50. M. McClintock, 370-5152.

**FIREWOOD**, approx. 1 1/2 cord, seasoned pine, \$115. W. Burkhalter, 374-5706.

**CAR SEAT**, Peterson safety shell w/infant insert, tan pad, \$18. W. Mullee, ext. 85486.

'75 SPECTRA 20 day cruiser, mint, all access., \$9,000 firm. J. Deboe, 379-2111.

**QUARTERHORSE**, 1/2 Arabian, 16+ hand, 12 yrs., \$500. J. Citrowski, 339-7178.

**U.S. STAMPS**, plateblocks, airmail, commems, definitives, 50% catalog, list avail. H. Katz, ext. 86652.