goddard news

December 1972—Vol. 20, No. 9

SAS-B in Orbit from Africa

Goddard's Small Astronomy Satellite-B, carrying the most advanced gamma ray telescope ever orbited, was lofted into the starry African sky early on November 16 from the San Marco Equatorial Range in the Indian Ocean off the coast of Kenya.

In describing the launch, the first night lift-off from the range, the Nairobi *Daily Nation* reported, "Jubilant Italian, American and Kenyan personnel manning the Santa Rita off-shore control platform and the Ngomeni base camp watched in wonder as the fiery projectile soared into the night sky. . . ."

For the SAS team headed by Mrs. Marjorie R. Townsend, Project Manager, and Dr. Carl Fichtel, Project Scientist, the success holds the promise of scientific discoveries in the field of gamma-radiation comparable to those pioneered for X-ray astronomy by the first SAS "Uhuru." That satellite was launched December 12, 1970, from San Marco.

The SAS-B launch was a milestone for the Scout rocket team and marked its 26th consecutive successful launch to set a new record for the U.S. space program.

As the *Goddard News* goes to press, SAS-B, officially named Explorer 48, is already sending back scientific data from its orbit high over the earth's equator. The unique 32-level digitized spark chamber gamma ray telescope, designed and built at Goddard, is already undertaking an "all-sky" survey of celestial gamma rays to determine their intensity, energy and direction of arrival.

Dr. Fichtel says, "In the next few weeks we should have the data to resolve the current questions on the nature of the gamma radiation from the galactic center region. From there, we hope to go on to study the dynamics of the galactic plane, point sources including supernovae, and extragalactic gamma radiation."

Gamma ray astronomy, a relatively new field, was given high priority by the Space Science Board of the National Research Council last year. Scientists at Goddard's Laboratory for High Energy Astrophysics are anxious to know more about celestial gamma radiation in order to obtain a better understanding of some of the major energy transfers going on in the universe.

SAS-B should provide many of those insights.

(See Page 2)

HUGE AFRICAN BAOBAB TREE on dirt road to Base Camp. The road, sandy and pitted with chuck holes, proved to be a challenge to SAS project members, most of whom lived in hotels at Malindi, 17 miles south of Base Camp.

RELAXED ATMOSPHERE PREVAILED during the 12-hour, almost trouble-free SAS-B/Scout countdown. In foreground (left), Professor Luigi Broglio, Director of the Italian Aerospace Research Center, talks with Professor Michele Sirinian, San Marco launch director. In background (right) is Dr. Carl Fichtel, SAS-B Project Scientist, along with Mrs. Townsend and John Bosworth.

BEING HOISTED ABOARD the Santa Rita platform in a Billy Pugh net is one of the memorable experiences at the San Marco Equatorial Range. The Italian crane operator says he's never lost a passenger.

Happy Holidays

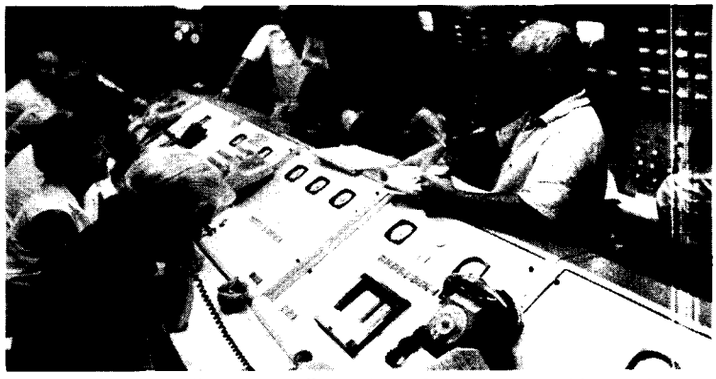
SAS-B . . . From Page 1

In addition to Mrs. Townsend and Dr. Fichtel, Goddard's SAS team includes: John M. Bosworth, Spacecraft Manager; Anthony J. Caporale, SAS-B Experiment Manager; Norman J. Piterski, SAS-B Project Operations Director; Maurice D. Handegard, Project Coordinator; Charles A. Rittler, Business Representative; Thomas Ryan, Tracking and Data Systems Manager; Thomas A. Page, Quality Assurance Manager; James A. Sundermann, Test & Evaluation Manager;

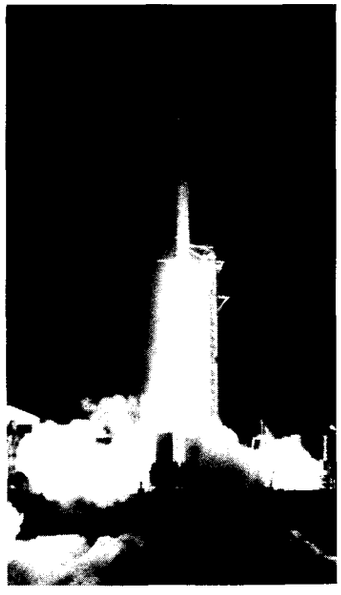
Also, Dr. Donald A. Kniffen, Dr. Robert C. Hartman, and Dr. Hakki B. Ogelman, Co-investigators; Stephen M. Derdeyn, Project Engineer; Robert W. Ross, Detector Engineer; Charles H. Ehrmann, Electronic Engineer; Michael A. Calabrese, Structural Engineer; William J. Cruickshank, Mechanical Engineer; Miss Archie L. Fitzkee, Thermal Engineer; and Mrs. Dorothy B. Matters, Project Secretary.

SAS control section and integration contractor is the Applied Physics Laboratory of The Johns Hopkins University, Silver Spring, Md.

The gamma ray telescope was built by members of the Experimental Engineering and Fabrication Division in conjunction with the Gamma Ray and Nuclear Emulsion Branch of the Laboratory for High Energy Astrophysics.



SANTA RITA "Blockhouse" consists of two trailer vehicles joined together. In foreground on phone is Henry B. Riblet, SAS Project Engineer for the Applied Physics Laboratory, SAS-B prime contractor.



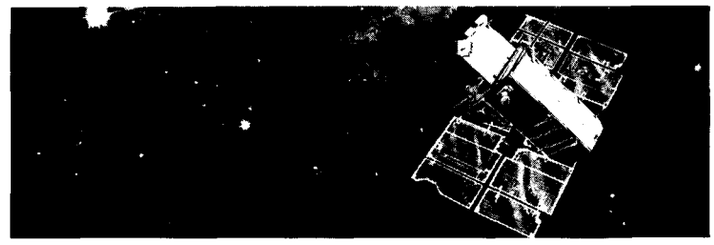
SCOUT LOFTS SAS-B INTO ORBIT. The first night launch from the San Marco platform occurred at 1:14 AM (Kenya time) November 16. It marked the 26th consecutive success for NASA's Scout, setting a new U.S. space record.

MRS. TOWNSEND and Dr. Fichtel discuss SAS-B launch plans under the brilliant African sun at Base Camp.

SAS PROJECT MANAGER, Mrs. Marjorie R. Townsend and SAS-B Spacecraft Manager, John M. Bosworth, in Santa Rita Control Center during countdown.

Peace on Earth

OAO-2 Begins Fifth Year



For members of Goddard's OAO team, the letters "OAO" stand for "on and on" as well as Orbiting Astronomical Observatory. Their first successful spacecraft, OAO-2, passed its fourth birthday on December 7, and should continue operation in the year ahead. Although the spacecraft was initially designed to last a year in orbit, the Wisconsin Experiment Package is still producing good data.

Very briefly, some OAO-2 discoveries over the past four years are: the discovery that the intensity of radiation in extragalactic nebula increases in the far ultraviolet; the discovery of magnesium emission in the spectra of cool giant and supergiant stars; the study of absorption and scattering of starlight in the upper atmosphere of Earth that has provided additional information on the structure and composition of the upper atmosphere; the discovery of a huge hydrogen cloud a million miles in diameter around comet Tago-Sato-Kosaka; and observations that may settle a long standing enigma concerning a group of stars notable for apparently anomalous elemental abuncances and for their enormous magnetic fields, more than 10,000 times stranger than our sun's.

OAO-2 has also made the discovery that the hottest stars are even hotter than suspected, are aging about twice as fast as suspected, and are burning hydrogen at a very rapid rate; and made observations in May of this year of a supernove — the first to be viewed by satellite — in the small galaxy NGC 5253. This was the brightest supernove in the past 35 years, and for a short time its ultraviolet intensity outshown the entire galaxy to which it belongs.

Observations by OAO-2 within the solar system have included the first ultraviolet measurements of the Planet Uranus, and the discovery of ozone in the atmosphere of Mars. The Martian ozone discovery was later confirmed by Mariner observations.

OAO-2 will continue in its present program of observations in 1973 with emphasis on: observations of steller objects such as hot subdwarfs and the nuclei of planetary nebulae which are in advanced phases of evolution; observations of variable stars; the study of certain early-type close binary systems to help discover the effects of tidal distortions caused by one star on its companion or by rotation; the study of extended, expanding atmospheres which surround many hot stars; and the continuing study of solar system objects.

Invitation for Papers AFL Conference

Goddard is sponsoring a three-day conference on APL. Scheduled for March 12, 13, 14, 1973, the conference is intended to provide a forum and a balanced program of papers including adequate time for round table discussions.

Papers are desired on a wide variety of topics including: Science & Technology, Business and Management, Education, APL Implementers Sessions, Enhancements to APL, and General.

All papers will be reviewed by a committee to choose those most appropriate to the conference and should be submitted to: Cyrus J. Creveling, Code 560 extension 6126.

Full papers in triplicate are due by December 31, 1972. Selection will be made by January 31, 1973. (Since proceedings will be printed directly from selected papers, one "camera ready" copy should be provided.) Presentation of papers will be limited to 20 minutes, and papers to be delivered in less time are encouraged.

Happy New Year

GODDARD'S ANNUAL Science and Technology Review, attended by Goddard and NASA Headquarters personnel, was held in the Building 3 Auditorium on November 7 and 8. The first session on November 7 was chaired by Dr. George F. Pieper (left), Director of Space and Earth Sciences, and covered presentations on high energy and solar astronomy; optical and UV astronomy; planetary, lunar and cometary studies; and sensor technology. Robert Bourdeau (right), Director of Space Applications and Technology, was chairman of the second day's session on space and vehicle technology, ground operations, Earth observations, communications and navigation, and Earth physics.

CHINESE SCIENTISTS. An eleven member delegation of scientists from the People's Republic of China began a three week tour of the United States on November 20. On November 21, they were at Goddard as part of their program to visit American research institutions. The day at Goddard included a briefing on the over all Center mission by Dr. Leslie H. Meredith, Goddard Assistant Director; a discussion of the ERTS Project by Dr. William Nordberg, ERTS Project Scientist; and tours of the T&E complex, OPSCON and the OAO Control Center.

INDIAN BOY SCOUTS. The Washington, D.C., area American Indian Intertribal Troop 110 of the Boy Scouts of America visited Goddard on November 24. John Kaskaske of the Computation Division took the boys on a tour of the Center which included the Satellite Room of Building 1, the Building 3/14 control areas, T&E, and a presentation by Shiela Duck in the Goddard Planetarium. Young boys in the front row (from left) are Eric Parker, Hokkayh Hyzan, and Aaron Jolie. In the back row are Scout Master John Parker, Andre Jolie, Edward Collins, Marty Lonewolf, Michael Collins, Merrill Lonewolf and John Kaskaske.

New EEO Counselor

Johnnie Noel

ANN MERWARTH has been appointed Equal Employment Opportunity Counselor, replacing Ernest Neil. Mrs. Merwarth is well known at Goddard as president of the club which is presently organizing a day care center for the children of Goddard employees. She is a mathematician in the OAO Project responsible for programming and analysis of the Copernicus (OAO-C) onboard computer. A graduate of Emory University in Atlanta, Georgia, she came to Goddard in July of 1963. She has done scientific programming and telemetry data processing on the IBM 7094 computer and was head of the OSO Control Center Software from 1965 to 1968. Her husband, Phillip D. Merwarth, is also a mathematician here at Goddard. They have one son, Stephen, 4. Mrs. Merwarth is located in Building 5, room 270, and can be reached on extension 5933.

GODDARD SCIENTIFIC COLLOQUIA

December 22 – No Colloquium

December 29 – No Colloquium

January 5 – Kenneth R. Hardy
Chief, Weather Radar Branch
Air Force Cambridge Laboratories
Sudbury, Massachusetts
CLEAR AIR TURBULENCE (CAT)

January 12 – John F. Dewey
Department of Geological Sciences
State University of New York at Albany
Albany, New York
PLATE TECTONICS

January 19 – Norman F. Ramsey
Department of Physics
Harvard University
Cambridge, Massachusetts
SPIN TEMPERATURES AND NEGATIVE ABSOLUTE TEMPERATURES

January 26 – Harold Masursky
Center of Astrogeology
U.S. Geological Survey
Flagstaff, Arizona
MARINER 9 EXPLORATION OF MARS

February 2 – John C. Brandt
Chief, Laboratory for Solar Physics
Goddard Space Flight Center
ROCK ART ASTRONOMY

Timing Conference

The fourth Precise Time and Time Interval (PTTI) Conference, sponsored by Goddard and the Department of Defense, was held here on November 14, 15, and 16. Over 300 people attended, including members of the Australian and Canadian Embassies.

The purpose of the conference was to disseminate and coordinate information at the user level associated with precise time and frequency; to review present and future PTTI requirements; to acquaint systems engineers, technicians and management with precise time and frequency technology and its problems. Papers presented covered navigation, communication, geodesy, satellite tracking, collision avoidance, search and rescue, meteorology, precision frequency and time generation and synchronization, and very long base line interferometry.

CONFERENCE COORDINATOR, Clark Wardrip of Code 814.2 welcomes the conference attendees.

L. R. STELTER, Associate Director for Engineering in the Networks Directorate, gives the opening address to the PTTI Conference participants.

SOME PTTI CONFERENCE PARTICIPANTS are (from left, front row) James Murray, Jr., of the Naval Research Laboratory (NRL); Andrew Chi and John Lavery, both of Goddard; John Wilson of the Naval Electronic Laboratory (NELC); Robert Stone of NRL; and Dr. Arthur McCoubrey of Frequency and Time Systems, Inc. On stage and the steps are (from top) Dr. Gernot Winkler of the U.S. Naval Observatory; Dr. Frederic H. Reder of the U.S. Army Electronics Command; Clark Wardrip of Goddard; Eric Swanson of NELC; and Dr. William Hurd of the Jet Propulsion Laboratory.

Calendar Photo Contests

Felices Fiestas

PAST WINNERS of the Goddard Photo Club's contests are Marvin Maxwell's "The Sea and Thee" (left) and Richard Buehler's "Water Lilies." Pictures from the contests appear in the 1973 calendar now available in the Credit Union Office. The club is again sponsoring a series of black and white photo contests. The contests are for summer and fall season photographs ending January 2, 1973, for winter photographs ending March 31, for spring photographs ending June 15, and for fall photographs ending August 21. Best of show winner of each contest will receive a $10 prize, and there will be 12 honorable mention awards of $5. A color print and color slide contest will be announced at a later date. For further information of the contests call any of the following club officers: Richard Buehler, ext. 2486; Fran Stetina, ext. 2357; Dan Wittgartner, ext. 5640; or Fred Berko, ext. 5876.

Annual Battery Workshop

The 1972 Goddard Battery Workshop was held in Building 7 on November 14 and 15. Representatives from government and industry joined with battery manufacturers to discuss problems and improvements made on aerospace nickel cadmium batteries.

Subjects covered by the two-day workshop included separator developments, materials improvement, storage and test experience, and the new nickel-hydrogen battery.

Copies of the workshop proceedings are available through Chairman Jerry Halpert on extension 5751.

Wesołych Świąt

SCIENCE AND ENGINEERING REPORTS

RAE Satellite Inverted In Orbit

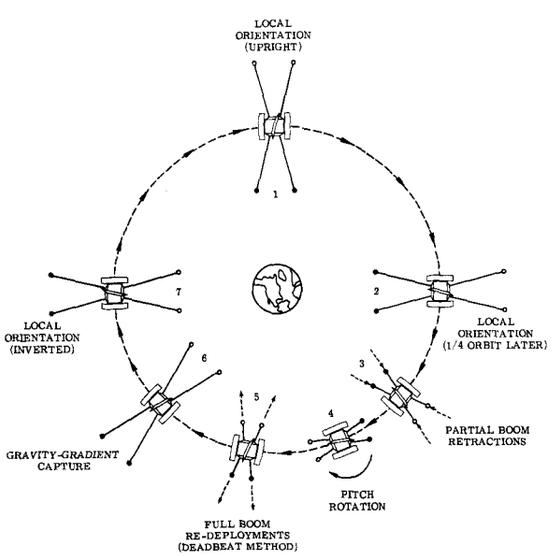
By
Harvey Walden & David L. Blanchard

Employing a natural law of physics which is commonly relied upon by skilled ice skaters, the largest artificial satellite of the earth was recently overturned in deliberate, precise and well-calculated fashion. The satellite is the 4½-year-old Radio Astronomy Explorer (RAE-I) which possesses four highly flexible tubular antenna booms extending radially outward from a central spacecraft hub in a double-Vee configuration measuring 460 meters (1500 feet) from tip to tip. On the appropriate date of October 31, 1972, the spacecraft was "tricked" into turning itself over, or interchanging its upper and lower Vee-antennas, by carefully phased partial retractions, followed by later re-deployments, of its four lengthy antenna booms. The inversion maneuver was performed for both scientific and technological reasons. From a scientific viewpoint, the RAE-I mission of astronomical data gathering in the long-wavelength radio spectrum was enhanced by the ability to utilize the original downward or earth-pointing antenna for viewing emissions from celestial sources. On a dynamical basis, it was felt that a successful maneuver of this type would be of general value in increasing the limited understanding of passive three-axis gravity-stabilized satellites and of specific value in contingency planning for the mission of RAE-B, which is to be launched next spring into a lunar orbit.

The inversion of the RAE-I spacecraft was a natural sequel to a series of six gravity-gradient dynamics experiments which were sucessfully performed in 1970-71 utilizing the same RAE-1 satellite. These experiments were described in an article published in these pages in February 1972 by the first of the present authors, both of whom served as dynamics experimenters. Several of the original dynamics experiments involved partial single or double boom retractions and re-deployments, but the objective at that time was only to disturb the quiescent dynamical state and generate large angular attitude motions temporarily and ultimately to re-stabilize about the original local orientation. Based upon the success achieved during these dynamics experiments in predicting the satellite's dynamical behavior in orbit with the use of computer simulations, in generating desired angular disturbances through boom operations, and in controlling the resultant motions for three different spacecraft configurations through use of a passive on-board libration damper mechanism, the concept of flipping the RAE-1 over in space was proposed by the dynamics experimenters. After careful consideration and study, the idea was approved by the RAE project manager, John T. Shea, project scientist, Robert G. Stone, and by John E. Naugle, the associate administrator for space science at NASA Headquarters.

The RAE-I spacecraft is in a gravity-stabilized 225-minute orbit about the earth such that its pitch rotational rate matches its orbital rate, and the result is that the same Vee-antenna remains directed toward the earth. That is, the spacecraft array rotates once around its central hub each orbit as viewed by a stationary observer outside the earth-orbit system. In exactly the same manner, the earth's natural satellite, the moon, has a rotational period equal to its monthly orbital cycle and thus keeps one face forever fixed toward earth. The method used for inversion is dependent upon the physical principle of conservation of angular momentum. By retracting all four Vee-antenna booms simultaneously to a sufficiently short length (160 meters, or 525 feet, was chosen), the in-orbit rotational rate of the spacecraft was increased from its usual orbital rate to a rate at which the spacecraft completely rotated in pitch in a little over 90 minutes (see diagram). In an analogous maneuver, a figure skater, performing an upright spin on the ice with arms extended, increases his spinning rate by the simple device of pulling his arms to his side, and, conversely, slows his spin by extending his arms at full reach. In order to reduce the satellite rotation to match the orbital rate so that the spacecraft would remain in an inverted position, the four booms were then re-deployed to full lengths just before the full inversion was completed. This method of timing boom deployments such that spacecraft motions are reduced to virtually zero is known as a "deadbeat" technique. The mechanical and electrical systems on board the spacecraft performed quite satisfactorily, particularly considering the fact that some of these systems had not been exercised in more than four years of exposure to the hostile environment of space. The timing of these operations which changed the moments of inertia of the large spacecraft array was so precise that gravity-gradient capture and stabilization about local orientation in the inverted position was achieved with very small residual oscillations about the new equilibrium position. Steady-state conditions were attained within a matter of only several hours. The observed dynamical behavior agreed with the pre-inversion computer simulations to a remarkable degree (especially considering that the boom positions and motions prior to the inversion were not known). This further confirms the validity and adequacy of the analytical techniques and computer simulations of the RAE dynamics which were developed prior to launch in 1968 and have been refined and improved since. The radio astronomy experiments aboard the RAE-I spacecraft are now gathering data from the cosmos with an antenna receiver which was originally relegated to monitoring the earth's background noise. More significantly perhaps, the difficult and complex maneuver of having a satellite with spidery appendages capable of spanning the Empire State Building perform a "half-cartwheel" in space and then regain its "balance" is indeed an unprecedented feat.

Goddard's support team for the inversion includes, besides the dynamics experimenters, John T. Shea, RAE project manager, and his deputy, Carl L. Wagner, Jr.; radio astronomy investigator Joseph K. Alexander, Jr.; electronic systems engineer McLean M. Grant; mechanical systems engineer Earl D. Angulo; attitude determination engineer Robert W. Frye; and William R. Moore, spacecraft controller at the Multi-Satellite Operations Control Center. In addition, Joseph V. Fedor served as a dynamics consultant, and Marjorie L. Johns and Frederick W. Hager assisted with computer simulations of the dynamics.



RAE SPACECRAFT INVERSION TECHNIQUE

Many Receive Award

NASA ADMINISTRATOR Dr. James C. Fletcher (right) presents a NASA Group Achievement Award to Joseph Purcell on behalf of the OAO-III Team. Wilfred Scull also received a group award for the ERTS Project team at the NASA ceremony on November 9. Below are some of the Goddard employees who received individual awards.

James P. Heppner

Moe I. Schneebaum

Gerald W. Longanecker

Wilfred E. Scull

J. O'Neil Mackey, Jr.

John Y. Sos

Helen M. Neumann

Raymond J. Sumser

Henry W. Price, Jr.

Stanley Weiland

William A. Russell, Jr.

Robert R. Zeimer

Two awards ceremonies were held in November to honor individuals and groups for their contributions to the nations space program. Agency-wide honors were presented by Dr. James C. Fletcher, NASA Administrator, during the NASA ceremony at the L'Enfant Theater in Washington, D.C., on November 9. Goddard awards were presented on November 30 by Dr. John F. Clark, Goddard Director, during the Center's ceremony in the Building 8 Auditorium.

NASA Awards for Goddard People

NASA Group Achievement Awards went to two Goddard project teams: The Earth Resources Technology Satellite Team for "development and operation of the world's first satellite devoted to the acquisition of data related to observation, inventory and management of earth resources," and the Orbiting Astronomical Observatory-III team for "development and operation of the world's largest and most precise astronomical observatory."

Twelve Goddard men and women received NASA Exceptional Service Medals. They were: **Charles R. Gunn** for "leadership and technical management of the Delta Vehicle improvement program," **Gerald W. Longanecker** for "technical and managerial leadership of the Small Scientific Satellite Program," **J. O'Neil Mackey, Jr.**, for the "management and direction of the Center's procurement activities," **Helen M. Neumann** for "technical direction in the development and successful execution of both the Nimbus and Earth Resources Technology Satellite Controls System," **Henry W. Price, Jr.**, for "leadership in systems engineering which have proven invaluable in the success of the Earth Resources Technology Satellite," **William A. Russell, Jr.**, for "contributions which have advanced the state-of-the-art in Sounding Rocket Control Systems," **Moe I. Schneebaum** for "effort leading to the successful development and space flight of advanced sensors for both the meteorological and earth resources disciplines," **Wilfred E. Scull** for "management of the

JAMES R. MUNDY (left) receives a NASA Equal Employment Opportunity Award from Dr. Fletcher.

Prettige Kerstdagen

in 1972 Ceremonies

DR. CLARK presents Career Service Awards at the Goddard ceremony on November 30.

development and operation of the first Earth Resources Technology Satellite Program," **John Y. Sos** for "contributions to the development of the electron beam recorder and the image processing subsystem of the ERTS GDHS," **Raymond J. Sumser** for "accomplishments in the field of personnel management," **Stanley Weiland** for "technical management in the design, development, integration and test launch of the observatory for the first Earth Resources Technology Satellite," and **Robert R. Zeimer** for "leadership in the technical management of a highly skilled space engineering organization."

Goddard scientists receiving the NASA Exceptional Scientific Achievement Medal were: **Dr. James P. Heppner** for "contributions in the observation and interpretation of the magnetic and electric fields in the magnetosphere," and **William F. Hoffman** for "contributions in far infrared astronomy and his detailed exploration of the sources in the galactic plane and galactic center."

A special NASA Equal Employment Opportunity Award went to Goddard's **James R. Mundy.**

Goddard Awards

Sixteen GSFC Exceptional Performance Awards were presented to: **James L. Baker** for "initiative in shaping the Communications and Navigation Program to meet the requirements of the user community," **Larry H. Brace** for "contributions to the scientific study of the earth's ionosphere and associated solar terrestrial relationships," **Walter C. Bradley** for "contributions to the success of the first Earth Resources Technology Satellite as Network Support Manager, **Gerald L. Burdett**, for "contributions to the successful completion of the ITOS-D mission," **Jon R. Busse** for "contributions to Sounding Rocket Research during the past decade," **Robert A. Hoffman** for his work as "Project Scientist for the Small Scientific Satellite," **Louis J. Ippolito** for "scientific excellence in the investigation and reporting of Millimeter Wave Propagation experiments," **Patrick M. Kelley** for "contributions to the Center's many programs through the medium of the visual arts," **Robert F. Kempf** for "professional standards maintained by himself and his staff in the Patent Counsel's office," **Anthony A. Longo** for "technical contributions during the vital phase of development, testing and production of the first Delta Inertial Guidance System," **B. Harry McKeehan** for "contributions in efforts to establish and maintain good relations with the government and people of the foreign countries where NASA Tracking Stations are located," **Melba L. Mouton** for "contributions to the formulation and implementation of the Center's Equal Employment Opportunity Program," **Edward A. Rothenberg** for "technical excellence in the fields of primary and auxiliary propulsion," **Joseph W. Siry** for "contributions in the formulation and development of basic orbit determination techniques and concepts," **Donald E. Stilwell** for "contributions in the electronic and technical engineering advances in space flight instrumentation for high energy astrophysics," and **Joseph L. Tinsley** for "contributions to the construction of the ERTS facilities which led to the successful and timely operation of the ERTS Ground Data Handling System."

GSFC Group Achievement Awards went to the Laser Tracking and Geodynamics Team and the Mariner (IRIS) Project Team.

Topping the list of Goddard employees receiving Career Service Awards were Lyle D. Bonney, C. Snowden Conkey, Arthur L. Essex, and Benjamin Schlachman who received pins for 35 years of government service. In addition 68 people received 30 year awards and 81 people received 25 year awards.

MELBA MOUTON was one of 16 employees to receive the GSFC Exceptional Performance Award.

LASER TRACKING AND GEODYNAMICS TEAM members receive their GSFC Group Achievement Award.

MARINER (IRIS) PROJECT TEAM members receive their GSFC Group Achievement Award.

News from the Sea Ventures

SEA VENTURES OFFICERS (from left) Larry Line, Vice President; Janet Burke, Secretary Treasurer; and Ron Miller, President; display the Certificate of Appreciation the club received for participating in the last "Inward to the Sea" film presentation.

The Goddard Sea Ventures Scuba Club presents its new slate of officers. Elected at the November meeting were President Ron Miller, Vice President Larry Line, and Secretary/Treasurer Janet Burke.

The club is conducting its annual membership drive, and at the last meeting five applications were accepted. The only requirements are an interest in diving/snorkeling and the desire for excitement and fun.

Annual dues will be collected at the January meeting, $5.00 for existing members, $6.00 for new members. The additional $1.50 covers the cost of the club patch. Everyone is welcome, so plan to attend. The time and place will be announced.

The Cascade Air Station in the Building 22 parking lot by the loading dock is in full operation and available to club members. A charge of $.50 per tank was voted in, the money being set aside for future maintenance of the system. A special note of thanks goes to GEWA and to all those who volunteered their time and talent to make the station possible.

The club's elementary school lecture series is still going strong. A slide show will now accompany the usual lectures and equipment/artifact presentations. Anyone desiring this service may contact any officer or member for details.

A N.A.U.I. Award was recently presented to the club for its participation in the last "Inward to the Sea," two-day lecture and film show. The award will be displayed at the air station.

LARRY LINE (from left), Sea Ventures Vice President; Max Aleksandrov and Ralph Ryder display several artifacts recovered from the Atlantic and Chesapeake Bay. The artifacts include: a plaque from a converted subchaser which ramed a U-Boat 20 miles off the New Jersey Coast and sank in 150 feet of water, a copper pin made by the Paul Revere Foundry for the USS New Hampshire which was fitted in 1819, Civil War bullets found in the Bay at Point Lookout in seven feet of water, and a porthole recovered from the "John De Gill" a tanker which lies 23 miles off the Coast of North Carolina in 100 feet of water.

Bonne Annee

FED Holds Christmas Charity Sale

THE WOMEN OF FED who planned and organized the Christmas charity sale are (from left) Virginia Sweeney, Silvia Green, Doris Yates, Marge Landstreet, Ginny Villa, Ellen Boye, Eileen Lingeback, Mona Hobar and Betty Pena.

From a few casual remarks such as "count your blessings" and "don't know how lucky we really are", started whirlwind plans of a White Elephant Sale and Raffle by the WOMEN BEHIND THE MEN of the Facilities Engineering Division. The sale was a one day event on December 5 in Building 5. The charities chosen to benefit from the sale are the Appalacian Foundation, working with the destitute children in Appalacia, and the local Salvation Army, which needs as much help as it can get to take care of both children and older citizens in this area.

The girls of the Facilities Engineering Division, better known right now as the WOMEN BEHIND THE MEN OF FED, had been complaining about the difficulties of Christmas shopping, the crowded stores, and the hair pulling job of what to buy someone who has everything, when someone remarked what about the less fortunate children and old folks that are forgotten not only at the holiday season but all year 'round. So the nine WOMEN BEHIND THE MEN OF FED decided to start the ball rolling and help out in some way to brighten the holidays for someone else. Full cooperation of James F. Mills, Chief, and Larry E. Brown, Assistant Chief, helped to put the show on the road.

After the first planning meeting, every male employee went home with a note pinned to his lapel to remind some member of his family to send in a few articles for the sale. The wives, the men, and everyone in Building 5 have been most generous in their giving when told all proceeds will go to charity. Mrs. Ellen Boyce, Division Secretary, donated a hand crocheted cranberry colored afghan as first prize for the raffle. There were other prizes awarded also. Other committee members are Doris Yates, Silvia Green, Marge Landstreet, Betty Pena, Virginia Villa, Romona Hobar, Virginia Sweeney and Eileen Lingebach.

SANTA IS COMING

Don't forget

Children's

Christmas Parties

December 17.

Merry Christmas

Model Rocketry: An Educational Hobby

HOWARD GALLOWAY and his wife, Dottie, work with young model rocketeers in their Severna Park home.

By Robert C. Service

Model rocketry teaches children math and science as well as valuable skills – and it's fun. To get started, kids build model rockets from kits that are designed for ease of construction and to assure that even a beginner's rocket will fly.

Besides being fun, putting kits together teaches children such things as how to use a knife, how to glue, how to sand and how to paint. As they advance in the hobby, young rocketeers, some only eight years old, are introduced to other skills and techniques.

The importance of good craftsmanship becomes evident when the kids observe the performance of their models and begin to wonder why one rocket flies straight while another rocket's performance is erratic.

"When they come and ask why, then you've got 'em. Then they begin to learn," says Howard Galloway, a Goddard employee who at home is advisor to the Star Spangled Banner Section of the National Association of Rocetry. "If one fin on a kid's first model isn't straight, the rocket wobbles all over in flight. The kid knows something is wrong and he wants to know why. From that point, he begins to learn all about model rockets, and science too."

It is this first reaction to model rocketry that creates interest and the youngster soon masters the art of getting the fins straight. He has now mastered some skills – simple skills, true, but he is now on his way. Step by step he learns to check his rocket, to set it up for launch and to launch it. He learns the safety rules, to check electrical igniters, to use a safety switch, and to stay at least 20 feet from any rocket being launched.

Model rockets are constructed of strong, but extremely lightweight materials with self-contained engine. Each rocket is recoverable by parachute. The beginning model rocketeer quickly learns the basic principles of real rocket flight by following his model through its stages of flight which include ignition, lift-off and the burnout of the engine. The momentum of the rocket carries it on after burnout through the coasting period to apogee where the rocket is at its peak and starts downward. At this point, the parachute is ejected and the rocket floats down to a soft landing where it is recovered and usually flown again.

With experience, as their rockets become more sophisticated, model rocketeers learn advanced techniques such as launching an egg in a rocket's nose cone and bringing it back unharmed or sending a movie camera aloft to film the entire flight from the "rocket's point of view." While doing all of this, the kids learn mathematics, physics, aerodynamics, meteorology, and some advanced space concepts. Older rocketeers have even used their knowledge to construct computer programs to predict how a rocket will behave under given conditions, and enjoy the thrill of seeing their models fly as predicted.

Some members of the Star Spangled Banner club started out as young rocketeers and have gone on to take real jobs with the space program. Sheila Duck, Karen Lee, John Nowakowski and Carl Guernsey are now working here at Goddard because they were inspired by model rocketry and Howard Galloway or "Howie" as he is affectionately known by his "kids." Howard is on the staff of the ATS Project her at Goddard. He founded the NAR Star Spangled Banner Section and regularly holds club meetings in his home in Severna Park, Maryland. He and his wife, Dottie, have unselfishly devoted their time to helping young people get started in model rocketry. Because of this, several youngsters have gone on to college and majored in aerospace engineering. The University of Maryland has a model rocket project that has become a high point in their final preparation for graduation.

If you know anyone that wants to get started in model rocketry, contact Mr. Galloway on extension 4094 or NAR President Jim Barrowman of the Flight Performance Branch on extension 4865.

Snow-Time is Ski-Time

CLINT CARLE, Ski Club Vice President and instructor for the club's free ski class on December 5, demonstrates the snowplow, a method for slowing down or stopping when skiing down hill. Watching are students (from left) Cheryl LaDow, Laurrie Weimar and Jim Christo. Ski Club members are looking forward to winter activities which include planned trips to Killington in Vermont for New Years and a trip to Canada for a week beginning January 21. For further information on the trips, attend the club meetings on December 13 and 27 in Building 7, Room 231 at 11:30 a.m. or call Jay Oberfield on X-4323 or Clint Carle on X-5683.

Meilleurs Voeux

JAY OBERFIELD (left), Ski Club President, and Frank Ottens show Cheryl LaDow the proper and safe way to strap on her skis.

One Engine Over the Atlantic

CHRIS STEPHANIDES

Where would you fly for a vacation if you were a private pilot with an instrument rating, owned your own single-engine airplane, loved challenges and wanted to get a real sense of self-satisfaction? Well, you might fly across the Atlantic.

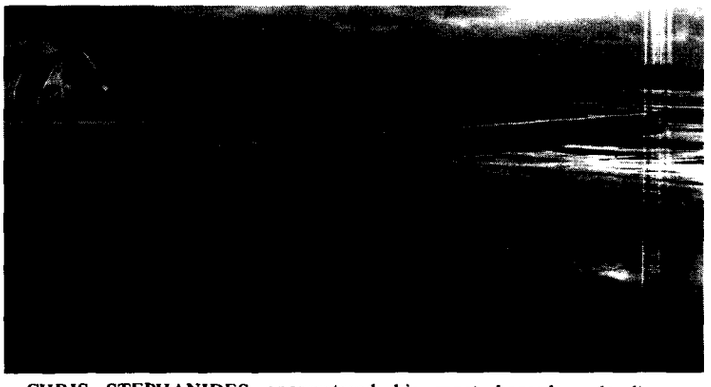
That is exactly what Chris C. Stephanides, of Goddard's Laboratory for Meteorology and Earth Sciences, did in his single engine Mooney Super-21. He replaced the back seat of the Mooney with a 55 gallon drum for added fuel, assembled survival equipment which included a wet suit and crash helmet, carefully planned the trip and took off early in September from Freeway Airport on a solo journey that took him three weeks and 120 flying hours to complete.

Piloting what was virtually a flying molotov cocktail, Chris Stephanides flew his airplane around the world to Teheran, Iran and back. The flight route passed through Canada, Greenland, Iceland, Scotland, Germany, Belgium, Switzerland, Greece, Turkey and Iran. The longest over-water leg was 740 nautical miles between Iceland and Scotland which took approximately 6.5 hours. Flight over the Alps and the even more hostile mountains between Turkey and Iran was conducted at 15,000 and 16,000 feet.

Mr. Stephanides reports that icing conditions were rough throughout the northern portion of the flight, and that he had some anxious moments when a piece of ice came off one of the propellers, causing the engine to shake violently on the way in to Scotland from Iceland. The engine stopped for a few minutes 75 miles off the east coast of Greenland on the way back. In spite of flying hazards, however, he felt the most dangerous parts of his journey were taxi rides into and out of Ankara.

Mr. Stephanides got his private license on Christmas Eve, 1969. In 1970 he bought the Mooney flown on this trip and also obtained his instrument rating. That Christmas, he flew to the Bahamas, Dominican Republic and Haiti. 1971 found him winging the Mooney to the West Coast, Cozumel, Mexico and the Yucatan Peninsula.

He works in the Experiment Management Office of the Laboratory for Meterology and Earth Sciences as a technical officer for the ATS F&G Very High Resolution Radiometer. In the past, he has worked at Goddard as integration engineer and assistant project manager on the Atmosphere Explorer satellite program. He was Station Director at the Kano, Nigeria, tracking station during its closing, and a team member of the Venus Multiple Energy Probe Study. He graduated from Virginia Technical Institute with a BSEE in 1959.



CHRIS STEPHANIDES encountered his most hazardous landing conditions on his return flight at this airport in Reykjavik, Iceland. His Mooney is left.

New Goddard Chess Champion

AL GEEHAAR (left) Goddard Chess Champion for 1972 and Larry Hull, Tournament Director and 1971 Goddard Chess Champion.

The Goddard Chess Club recently completed its 1972 Fall Tournament in which fifteen chess players competed for a first prize of a chess clock. Winner of the six-round, three week Tournament was Al Geehaar. Al managed to end up with a score of 5-1, (Win, 1; draw, 1/2). Runner-up was Thomas Vallee with a score of 4 1/2 – 1 1/2. A special trophy went to a new member Mark Sokol for best performance from a previously unrated player.

The Goddard Chess Club conducts two major tournaments annually, Fall and Spring. Membership is open to all on-site Goddard employees, both contractor and Civil Service, and members of their families. Annual dues are $2.00, but a special rate covering newcomers through March 1973 can be obtained for $1.00. The Club meets weekly, every Tuesday evening between 7:00 PM and midnight, at the building 1 Cafeteria unless a special event is scheduled.

Anyone wishing more information may contact Club President, Daniel Dembrow, Code 470, Extension 5710, or any of the Club officials: Vice President Floyd Stecker, Treasurer Thomas Vallee, Secretary Anthony Miller. The club owns seven sets of boards, chess pieces, clocks, and can therefore accommodate 14 players simultaneously.

Most popular of the programs scheduled recently was a "Human vs. Computer" night held November 14 when members played against three Varian 620/i computers with Chris Daly's program which had taken a second place at the Automatic Computing Machinery Chess Playing Contest in New York in 1970. Humans beat the computers by a score of 9-4, but the computers are eager for a rematch.

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Frohe Weihnachten und ein Gutes Neues Jahr