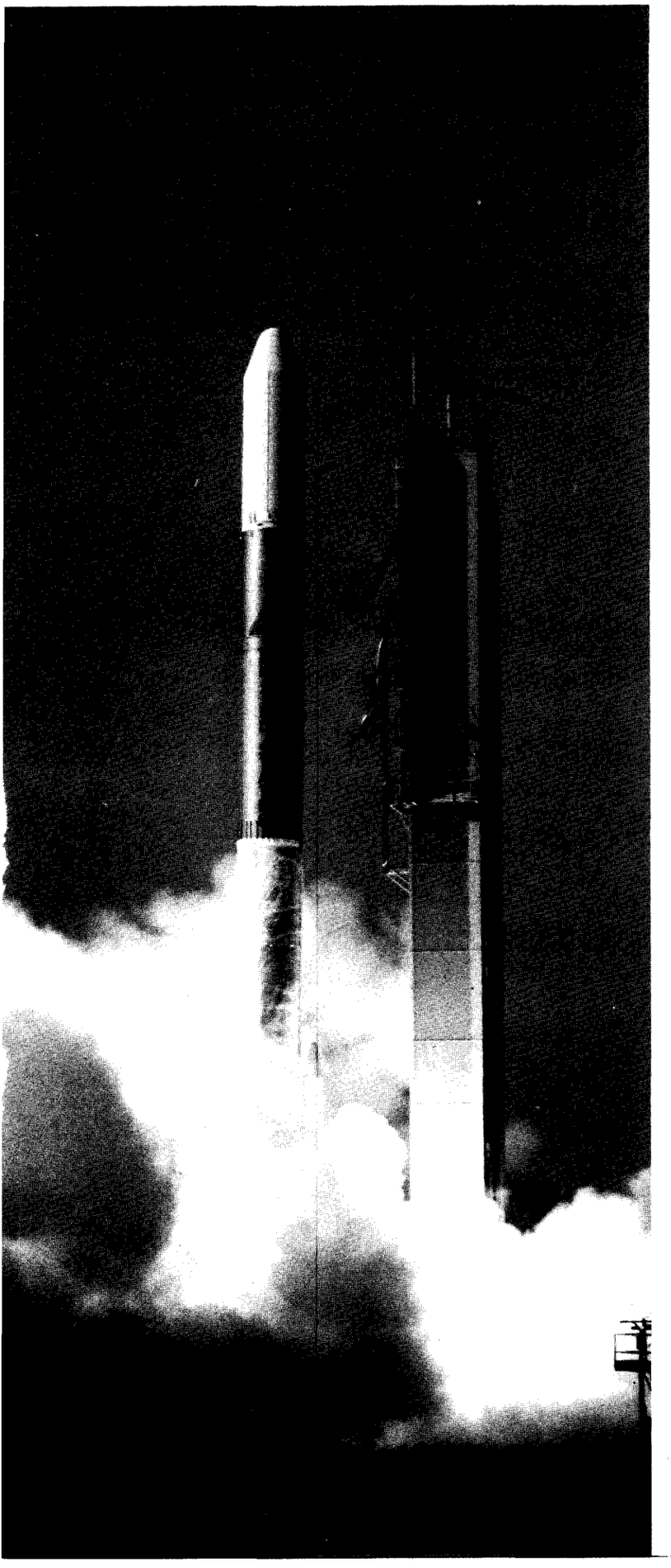
GODDARD NEWS December 1974 Vol. 22, No. 9



Triple Launch A First for Delta

Goddard's "Straight Eight" Delta 104 roared into the California sky at 9:11 PST from Vandenberg Air Force Base on November 15, carrying three satellites—the ITOS-G weather satellite and two piggy-back payloads, Spain's INTASAT and the radio amateur OSCAR-7. The triple launch was a first for Delta, although the versatile rocket has launched several double payloads in the past.

All three satellites are in a 908 by 903 statute mile polar orbit, circling the Earth every 115 minutes.

Operational Weather Satellite

Primary payload for the launch was the ITOS-G, a 339.7 kilogram weather satellite designed and developed by NASA at Goddard for the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). The spacecraft was designated NOAA-4 when it achieved orbit, and was turned over to NOAA on December 4.

Radiometers on board the spacecraft are providing visible and infrared images of cloud cover, snow and ice, and the sea surface, and gathering information on temperatures and moisture in the atmosphere.

The successful launch helps to maintain the operational satellite system that for more than eight years has provided regular global observations of cloud systems and other environmental features for the weather forecast and warning services of the United States and other nations.

The two piggy-back satellites were placed in nearly the same orbit as ITOS except that all three were spaced away from one another.

Spain's INTASAT

The first Spanish satellite, INTASAT, was designed and developed in Spain to measure the total electron content of the ionosphere, including the annual variations by latitude. It is beaming data to some 30 to 40 experimenters around the world. The program is conducted under the auspices of the Comision Nacional de Investigacion del Espacio (CONIE), Spain's National Commission for Space Research.

The results of the INTASAT experiment will be made available to the scientific community through publication in appropriate journals, and final reports will be provided to the United States National Space Science Data Center at Goddard which has project management responsibility for the U.S.

In addition to launching the satellite for CONIE, NASA will provide tracking and telemetry support for the 20-kilogram (44.1-pound), 12-sided, cylindrical spacecraft. The spacecraft is 44.5 centimeters (17.5 inches) across and 45 centimeters (17.7 inches) high. Attached to it are four VHF telemetry antennas 55 centimeters (21.6 inches) long and two beacon antennas 1.9 meters (74.8 inches) long. Power will be supplied by solar cells mounted on the spacecraft's side panels and by a nickel cadmium battery.

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DELTA 104 lifts off into California skies carrying the project's first triple payload. Launched at one time were the NOAA-4 operational weather satellite, Spain's first INTASAT and the OSCAR-7 amateur radio satellite.

TRIPLE LAUNCH . . . From Page 1

Amateur Radio Satellite

The other piggy-back satellite is AMSAT-Oscar-B (AMSAT-Oscar-7 in orbit), a communications spacecraft designed for non-commercial public service and educational use by the amateur radio community. OSCAR stands for Orbiting Satellite Carrying Amateur Radio. Developed by the Radio Amateur Satellite Corporation (AMSAT), a non-profit scientific corporation headquartered in Washington, D.C., but with a world-wide membership, subsystems for AMSAT-OSCAR-B have been provided by four countries—Australia, Canada, West Germany, and the U.S.

This will be the third OSCAR launched by NASA. The last OSCAR, AMSAT-OSCAR-6, launched in October 1972, (piggy-back on an earlier ITOS launch) is still in operation after two years and has been used by some 2400 radio amateurs in 87 countries and all 50 states. The amateurs transmit through the satellite as it passes within radio range to other amateurs who might be tuned in to the OSCAR frequency. OSCAR satellites are the only type designed for free access internationally.

Purpose of the project is to provide high school and college students with a better understanding of space science by permitting them to participate directly in demonstrations through local amateur radio operators.

Interested teachers may write to the American Radio Relay League (ARRL), 225 Main Street, Newington, Connecticut, to request a 65-page curriculum. Upon receiving the curriculum and being put in touch with a local amateur operator whose equipment would be utilized, the class will have the opportunity to participate in the classroom in telecommunications and telemetry techniques involving OSCAR.

For example, the Doppler effect, the change of frequency similar to the audible change in tone of a train's whistle as it passes a bystander, can be demonstrated with the orbiting spacecraft. Faraday rotation can also be demonstrated by showing how signals fade and return with the rotation of the spacecraft's antenna. Another experiment demonstrates how thermal balance is obtained by rotating the satellite.

The primary AMSAT command stations are located in Washington, D.C.; Los Angeles, California; Newington, Connecticut; Ottawa, Canada, and Melbourne, Australia.

AMSAT-OSCAR-B's onboard systems include two communications transponders (one with a downlink frequency of 29.5 MHz and the other with a downlink frequency of 145.95 MHz) and, two radio beacon experiments (435.1 MHz and 2304.1 MHz), as well as redundant command, telemetry, and power system components. The expected lifetime of the satellite is three years.

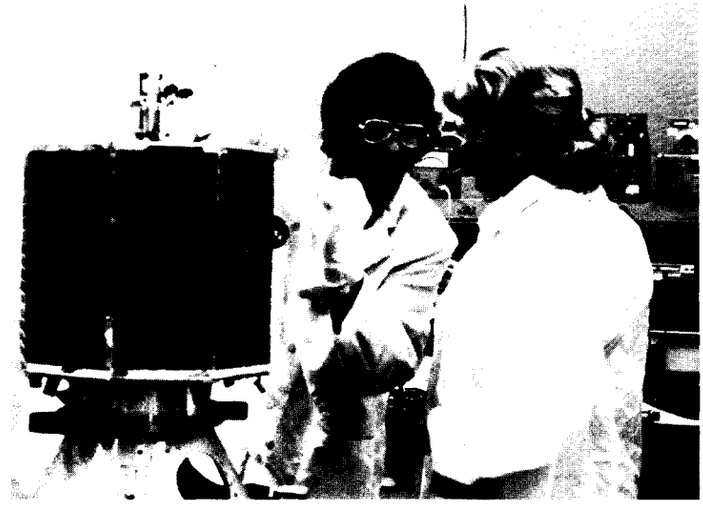
The satellite has an eight-sided, cylindrical configuration with solar cells covering the exterior. It is 42.4 centimeters (16.7 inches) in diameter and 43.4 centimeters (17.1 inches) high and weighs 29.5 kilograms (65 pounds).

Goddard Space Flight Center is responsible for the U.S. project management for INTASAT with William R. Witt, Jr., as INTASAT Project Manager and Larry H. Brace as Project Scientist. For Spain, Jose Dorado is Project Manager and Dr. J. Segredo is Project Scientist.

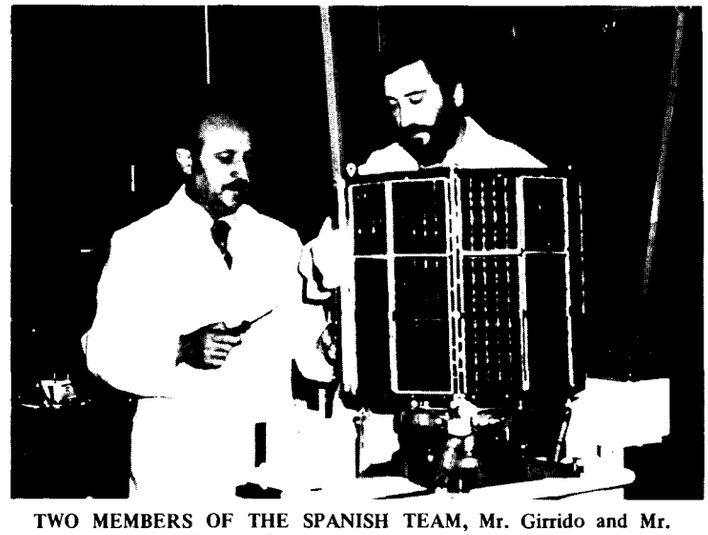
Jan King, Goddard, is AMSAT-OSCAR Project Manager. Mrs. Marie Marr, AMSAT, is responsible for much of the fabrication and testing.

Goddard also manages the ITOS project for NASA and the Delta launch vehicle project. Stanley Weiland is TIROS-N/ITOS Project Manager, and Robert C. Baumann is Associate Director of Projects for Delta. RCA is the ITOS industrial contractor and McDonnell-Douglas the Delta prime contractor.

ITOS PROJECT TEAM members at Goddard discuss the successful launch of their newest satellite, ITOS-G (NOAA-4 in orbit). From left are Charles Thienel, Instruments Manager; Gerald Burdett, Deputy Project Manager/Technical; Stanley Weiland, TIROS-N/ITOS Project Manager; Paul Mowatt, Deputy Project Manager/Resources; and William Peacock, ITOS Spacecraft Manager.



JAN KING, AMSAT-OSCAR-7 Project Manager, and Marie Marr inspect their spacecraft before final closeout and mating of the spacecraft to the Delta vehicle.



TWO MEMBERS OF THE SPANISH TEAM, Mr. Girrido and Mr. Santu, prepare INTASAT for launch.

1974 NASA Awards Presented

On October 29, NASA held its 16th Annual Awards Ceremony to honor individuals and teams that have made outstanding contributions to the United States space exploration program in 1974. Dr. James C. Fletcher, NASA Administrator, presented the awards at the ceremony held in the Department of Health, Education and Welfare Auditorium in Washington, D.C.

John M. Thole, NASA Deputy Associate Administrator for Space Science, was one of five NASA officials to receive the NASA Distinguished Service Medal, the agency's highest award. His award was presented for "distinguished leadership and outstanding technical contributions" while he was Project Manager of the Applications Technology Satellite Project here at Goddard.

Nine Goodard employees received the Exceptional Service Medal. They are:

Gilbert W. Branchflower "For . . . leadership in managing the design, development, and system testing which has directly contributed to the superb performance of the first Earth Resources Technology Satellite."

S. Chris Dunker for ". . . exceptional performance in planning and carrying out the attitude control of the Orbiting Solar Observatory Spacecraft . . ."

Don V. Fordyce "For . . . leadership as Project Manager of the first and highly successful Synchronous Meteorological Satellite . . . ."

David W. Grimes "For . . . leadership in the planning, technical development and cost management of the Atmosphere Explorer Project, and expecially for his contributions to the success of the Atmosphere Explorer-C spacecraft . . ."

Henry C. Hoffman "For . . . leadership and significant technical contributions in the areas of spacecraft dynamic stabilization and automatic attitude control . . ."

Rhoda S. Hornstein "For . . . contributions . . . in providing accurate and responsive real-time computational support . . . during the critical launch and early orbit phases of NASA spacecraft missions."

Walter La Fleur "For contributions to the successful management of the Spaceflight Tracking and Data Network . . ."

Albert Rango "For . . . developing the practical application of remotely sensed data to water resources management . . ."

Albert A. Whalen "For . . . contributions in developing the close cooperative relationships between NASA, state organizations, Federal agencies, and a host of medical and educational experts, which has made possible the success of the health, educational and telecommunications experiments of the Applications Technology Satellite-6."

The three Goddard scientists who received the NASA Exceptional Scientific Achievement Medal are:

Siegfried J. Bauer "For . . . contributions in space science, particularly in regard to the physics of the ionospheres of Earth, Mars, and Venus . . ."

David E. Smith "For . . . contributions to the development of special techniques for the analysis of precision laser satellite range measurements and their practical applications to problems in geodynamics."

Thomas T. Wilheit, Jr. "For . . . contributions to the development of a radio-metric sensor which has made it possible for satellites to observe atmospheric moisture over the oceans, map sea ice, and detect soil moisture over the continents."

Four of the twelve NASA Group Achievement Awards presented by Dr. Fletcher went to Goddard Projects. These are the Atmosphere Explorer-C Project Team, the ATS-6 Project Team, the Operation Kohoutek Team, and the SMS-1 Project Team.

In addition, **Valerie L. Thomas** of Goddard's Information Processing Division was one of four NASA employees to receive the NASA Equal Employment Opportunity Award.

GILBERT W. BRANCHFLOWER is congratulated by Dr. James C. Fletcher as he becomes the first Goddard employee to receive an Exceptional Service medal at the NASA Awards Ceremony on October 29. At left, George M. Low, NASA Deputy Administrator, holds the award plaque.

Siegfried J. Bauer

Rhoda S. Hornstein

S. Chris Dunker

Walter La Fleur

Don V. Fordyce

Albert Rango

David W. Grimes

David E. Smith

Henry C. Hoffman

Thomas T. Wilheit, Jr.

(Not shown is Albert A. Whalen.)

Iran to Build Earth Resources Ground Station

Iran will build a ground station designed to receive data directly from NASA's experimental earth resources satellites under an agreement signed in Tehran Oct. 29.

According to the Memorandum of Understanding announced on October 30 in Washington, Iran's Plan and Budget Organization will build the ground station in the Tehran area.

The new installation will complement existing U.S. ground stations at Fairbanks, Alaska; Goldstone, California; and here at Goddard. Foreign stations are already in operation at Prince Albert, Canada and Cuiaba, Brazil. A third foreign station is now under construction at Fucino, Italy, with full operation expected in mid-1975.

In exchange for rapid access to satellite-gathered information about conditions on the Earth's surface, Iran will make copies of the imagery and computer-compatible tapes they produce available to NASA.

Iran will bear the full cost of constructing and operating the new facility, will relieve NASA of the responsibility for providing satellite data to selected scientific investigators in the region and will also supply data to the general public in the area surrounding the new station.

Under the agreement, NASA guarantees free access to the first experimental Earth Resources Technology Satellite, ERTS-1, for as long as it continues to operate, and to the second ERTS satellite, ERTS-B, at least during its design life of one year. Following that period, NASA has the option to establish some cost-sharing arrangement for participating ground stations.

The Iranian station will be available to offer emergency support in the event of a satellite malfunction. If, for example, tape recorders aboard an earth resources satellite should fail, all the cooperating earth resources ground stations—including the new facility at Tehran—might be asked to grant special assistance and to provide additional copies of transmitted data.

Data relayed from ERTS-1 has already been distributed to some 300 investigators in the United States and 37 foreign countries. Their investigations include such diverse areas as agriculture, forestry, urban and regional development, pollution monitoring, oceanography and geology.

Under the operational control of the Goddard Space Flight Center, ERTS-1 has been returning data from orbit since its launch in July 1972, viewing the same points on the Earth's surface every 18 days.

ERTS-B, an identical satellite currently scheduled for launch January, 1975, is expected to continue providing valuable research data through the growing network of ground stations.

Large Area Crop Inventory Experiment

The launch of the second Earth Resources Technology Satellite (ERTS-B), presently scheduled for January 1975, will make possible the next steps of experimentation in the various earth resources disciplines.

Several experimental demonstrations designed to show the practical benefits to resource management of multispectral remote sensing from space have been selected, including experiments in water management, agriculture, land use planning, and monitoring ice conditions in navigable lakes.

One of these is a Large Area Crop Inventory Experiment (LACIE), a joint investigation by the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce, and the National Aeronautics and Space Administration (NASA) to test whether the use of data gathered by spacecraft and analyzed with the aid of computers can improve the timeliness and accuracy of major crop forecasts.

At the outset LACIE will concentrate on wheat grown in the North American area. The experiment will combine crop acreage measurements obtained from ERTS-B data and meteorological information from NOAA satellites and from ground stations designed to relate weather conditions to yield assessment and ultimately to production forecasts. A particular state or several states initially will be chosen for detailed evaluation, particularly as to the adequacy of the yield modeling. At the same time area estimates will be made by a sampling technique covering the entire region. If during the first year this activity proves successful and useful, it will be extended in the second year to other regions and ultimately to other crops.

The Department of Agriculture will study the utilization of the experimentally derived production estimates in its crop reports. These reports are made public as a routine service to the domestic and international agricultural community.

Like ERTS-1, which was launched in July 1972, ERTS-B will circle the globe 14 times a day, scanning a swath of the Earth's surface 185 kilometers (115 miles) wide from a 912-kilometer (567-mile) circular, near-polar, Sun-synchronous orbit. The satellite passes over each local area with the same Sun angle every 18 days. ERTS-1, in its 27 months, has returned some 100,000 images covering all the United States and three-fourths of the world's land masses. The imagery is provided to investigators throughout the world and to several government agencies, and is put on public sale through Federal data centers.

As is currently the case with ERTS-1, the data received from ERTS-B will be processed into basic forms at the Goddard Space Flight Center. For LACIE, Goddard will process automatically the raw data from the sample areas into computer compatible magnetic tapes. The tape reels will be shipped to the Johnson Space Center in Houston, Texas. There a computer-assisted analysis of the North American data will take place for purposes of crop identification and for the integration of the sample areas into an overall acreage estimate.

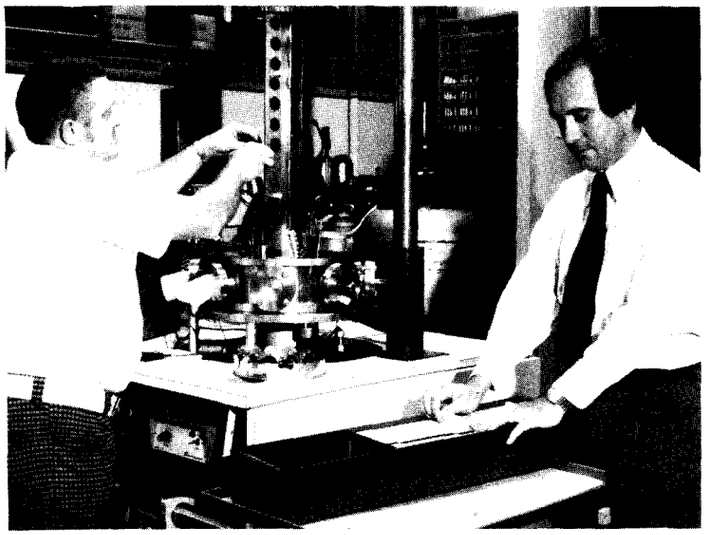
It is hoped that such information could be assembled a number of times during the growing season. The yield data will also be integrated with the acreage information at Houston, although early experimental work on yield modeling will be done at other places, such as NOAA's Center for Climate and Environmental Assessment at the University of Missouri at Columbia.

Work in the first year of LACIE will be mainly of a research nature to develop and validate methods. Computer techniques for classifying growing crops and estimating acreage will be refined and the results checked by visual image-interpretation and field reporting.

During the same time, agricultural-meteorological computer models relating weather and climate information to crop yield will be designed and tested. Data processing and analysis procedures will also be developed for routine handling of the quantities of data required for large-area inventories.

Each of the three agencies will have its own Project Manager responsible for the resources provided by his agency and for guidance of its part of the LACIE implementation; however, to aid in integration, an interagency Executive Steering Group has been estab-

(See Page 8)



BILL CAMPBELL loads a collector plate into the cooling bar as he prepares to test another material for its outgassing properties while Dick Marriott makes corrections to past data cards preparatory to a computer run of the complete data.

Materials Engineering Services

This Article by Dr. John J. Park, Head of the Chemistry and Physics Section, is the fifth in a series of articles about the services and people of the Materials Engineering Branch.

Polymer Processing and Testing

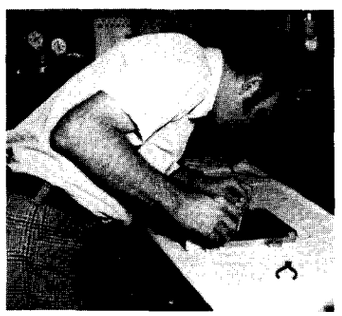
The members of the Chemistry and Physics Section are continually involved in polymer processing, testing, and evaluation. A wide variety of requests concerning paints, potting compounds, conformal coatings, and other polymeric materials have been processed, some requests requiring us to develop new materials or techniques.

Lately, however, requests have been coming in for tests at temperatures outside the usual temperatures, both hot and cold, and for materials with unusual properties. For example, the Helios spacecraft is expected to have some areas at temperatures near 200°C as it gets close to the sun. This has required us to conduct high temperature outgassing tests, well outside the 125°C used as the normal testing temperature. Also, the lower cone of the IUE will see temperatures down to near liquid nitrogen temperature and thus tests of adhesives have been conducted at this temperature.

Polymers are used a great deal in our satellites and components, though they may not be as visible as the outer metal surfaces. Polymers may be present as a thin layer of adhesive, or perhaps in a thick potting material used to protect or to shield electronic components from vibratory shock. The selection of a particular polymer should be based upon certain desirable properties, but by proper selection of the polymer a relatively hard or very soft, a relatively stiff or very flexible, a clear or an opaque polymer may be chosen. But, one added criteria for spacecraft use is the outgassing of the polymer when in vacuum and being heated.

Early space experimenters have learned that many polymers are affected by vacuum and doubly so if temperature must be considered also. A principal effect is the outgassing or loss of volatile constituents from the polymer's potting material or paint. Consequently, outgassing tests are being conducted each week on various materials that a contractor may want to use. These outgassing tests are run by Bill Campbell in a special apparatus which can take 24 separate samples, usually as eight materials in triplicate. Each sample is weighed and loaded into its separate small chamber; the small sample chamber is closed at the back so that the only exit port is a small opening facing a polished chromium-plated collector plate. The sample is heated to 125°C in the vacuum chamber which causes the volatile components to be driven off; volatiles come out to escape and hit against the polished collector which is at 25°C, a temperature at which some of the molecules condense. The condensed materials are visible on the polished face and the total weight of the plate and condensed material will be measured, from which we can calculate the percentage of Collected Volatile Condensable Materials. Selection of the material having the lowest mass loss and the lowest amount of condensables is a first step in keeping a spacecraft uncontaminated.

A large number of materials have been tested over the years, and this data was available, but with each additional test there was a need to review the data easily. This was accomplished after Dick Marriott prepared a computer program which listed the material, how it was cured, the manufacturer, and the outgassing data. Dick and Bill Campbell put all the data together and in a form easily available for the materials engineers. Out of this came the Technical Note, "A Compilation of Outgassing Data for Spacecraft Materials," TN D-7362. In fact, the data has accumulated so rapidly that another TN will soon be out for all the data collected to the end of this year.



CARROLL CLATTERBUCK uses a doctor-blade to spread a layer of adhesive on a test piece in preparation for low temperature testing of the adhesive.

BOB SHEEHY and Ben Seidenberg unload the latest batch of devolatilized polymer which has undergone a thermal-vacuum treatment used in removing the undesirable low molecular weight molecules.

Because outgassing is a detrimental part of materials, Ben Seidenberg decided to let the thermal-vacuum be put to good use. By heating the uncured polymer in vacuum he could drive off the undesirable low molecular weight compounds. After a devolatilizing treatment at 150°C for 24 hours he found that the RTV-602 polymer was still fluid and could be cured as before. After a sample was catalyzed and then cured at room temperature it was tested in the outgassing apparatus where it passed with flying colors. This treatment is very reliable and results in a resin that can be used as a potting compound or as a paint base. In fact, by adding white pigment to the resin Ben got a good sprayable thermal control coating, one that was used on the Nimbus-E sun shutter. Right now Bob Sheehy is regularly devolatilizing amounts of the resin which will be available for providing a low outgassing potting compound or a thermal control paint.

Among the specialized developments of the Branch, one has been used extensively. IMP-I needed an electrically conductive layer to shield a number of cables. In some cases a continuous layer was needed to connect the radio frequency shielding to the particular experiment, and this layer too had to be electrically conductive. As a result, Aaron Fisher and Carroll Clatterbuck prepared a polymer containing silver flakes, adding almost 75% silver to provide the electrical conductivity. The amount of silver had to be balanced carefully against the amount of polymer so that the mixture was conductive and would keep in all of the silver but still be slightly flexible. This method was used on a large number of the IMP-I experiments, including the Cosmic Ray Experiment and the Magnetic Fields Experiment from GSFC. Just recently, this same mixture was used to help shield the Heat Pipe Experiment on ATS-F. In this instance, a tent-like shield of a conductive cloth was placed over the main part of the experiment and the silver-filled polymer was used to make the connection between layers of cloth and to the metallic connector.

Mission in Africa

by Don Witten
Public Affairs Office

They say never mix business with pleasure!

But for those fortunate few here at Goddard who are involved in flight projects that take them to the Italian launch facility in Kenya, there is no way to avoid it.

For to go to Kenya, East Africa, and not take a trip through the game parks is almost unavoidable. And once you've done it, you appreciate the concern of conservationists who predict that many of these animals may not be on earth by the time of our great grandchildren.

The most recent group from Goddard to visit Kenya was the UK-5 (Ariel-5 in orbit) project team. They included Will Nyberg, project coordinator; Ron Adkins, launch operations coordinator; Jack Libby, technical representative for systems integration; and Steve Holt, U.S. project scientist. Dave Blanchard travelled down from Switzerland to fill in as Mission Director for UK-5 project manager Herb Eaker who was unable to be present for the launch.

My Public Affairs mission at this launch was to collect materials for a movie on the launch as well as to provide press services.

The most direct route to San Marco is by plane to Nairobi and thence to the coast by car, plane, or train.

A sign outside Nairobi proclaims it as "The City in the Sun." And driving through that city on the lefthand side of the road is not unlike driving through many European cities until you spot a dead African buffalo bloating in the roadside sun. He must have wandered from the game preserve just outside of the city.

If you fly, your next stop is Mombasa, a major seaport of Kenya, and then on to the ultimate destination of Malindi. The twenty-minute flight from Mombasa to Malindi takes you up the coast of the Indian Ocean where the clear blue and green waters of Kenya's Marine National Park glint in the sunlight.

This offshore park is a scuba diver's haven where some of the world's most beautiful fish and seashells are found. Collectors have paid up to 35,000 Kenya shillings ($5000) for a single rare shell from here, and marlin fisherman have unusually good luck in these waters.

In Malindi, the hotels are reasonable and right on the ocean. Many Europeans spend the extra airfare to travel here for the cheaper hotels and food than can be found in the Mediterranean.

From Malindi, the San Marco base camp is about a half hour's drive north over a primitive road which takes you past bare-breasted women balancing heavy waterjugs on their heads, a waterhole that serves as a social center, and finally past a seaside village.

It's all a photographer's delight if the Kenyans are approached diplomatically and with care. Because of a belief that their souls will be captured in the picture, many people absolutely refuse to be photographed. Some, not so resolute in these beliefs, will allow you to "capture their souls" for a price, usually several shillings ($.28).

A launch at San Marco can be viewed either from the shore or from the Santa Rita control tower. Both the control tower and the San Marco launch platform are located about three miles off the coast of Kenya.

Carrying its valuable Ariel-5 payload, the Scout roared into the rich blue sky towards orbit just several seconds after its predicted liftoff time of 10:47 a.m. Kenya time on November 15.

For the return trip to Nairobi, an overland route was planned through the back bush country and the Tsavo National Game Park. Keeping the sun on our right rear and the mountains to the left front, Mike Mandella, a photographer from the Applied Physics Lab, and I pushed our small Toyota across miles of single-lane dirt roads, heavy with rich red dust.

Instructions to carry plenty of water and a packed lunch were heeded with thanks, and a check of the spare tire before departing proved invaluable because of the flat tire halfway across the park. Only two other cars were observed in the bush during the entire day's drive.

THE SUN RISES on the day of the launch as engineers on the San Marco launch platform prepare the Scout Rocket.

Curving around a left turn in the road brought us directly to two large spotted giraffes who blocked the road. The curious animals stood and stared for minutes before loping off into the bush at a movement of the car.

Following the Galana river paid off because the season had been dry and the elephants and other animals kept close to its banks. At one point, a huge brown elephant stood not more than ten yards from the roadside. With the motor running, cameras were trained on the great hulk and shutters clicked. With his ears lifted, he observed us. Then his trunk was raised in a more ominous sign and the car was driven on down the road.

Great herds of zebras thundered across the road, only to stop in curiosity on the nearest hilltop. Antelopes of all sizes bounded back and forth in front of the car hood as mile after dusty mile disappeared beneath the wheels.

A hand-lettered sign promised crocodiles and hippos farther up the road. From a lookout point above the Ganana river, we scanned the barren rock shores of the other side. Our talking disturbed what at first appeared to be a huge rock but which turned out to be a 13-foot croc that ambled into the shallow water. Small white birds which had been pecking food scraps from the croc's mouth scattered into the air only to resettle near the huge reptile.

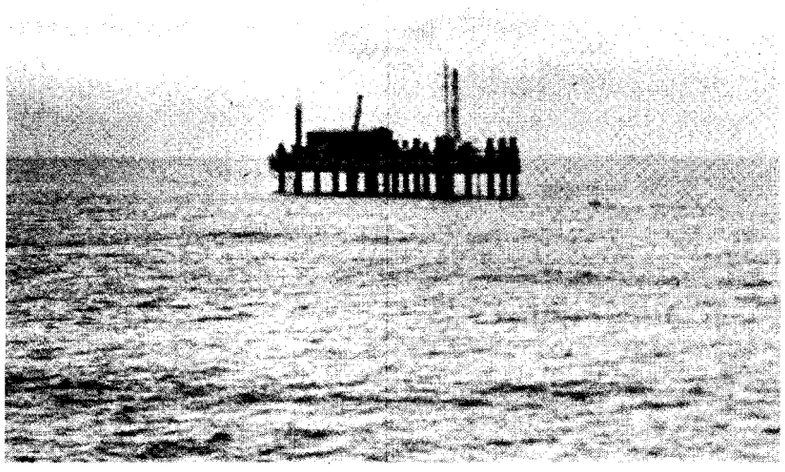
After making up for a wrong turn which cost us 30 miles, we finally found the main road from Mombasa to Nairobi. Following that road for an hour or so, we re-entered Tsavo on the west side and eventually reached the Kilaguni Lodge just an hour before dark to spend the night.

The view from this lodge is magnificent. To the left is Mt. Kilimanjaro looming 20,000 feet with its peaks often in the clouds. Directly in front are several waterholes and a huge thorn tree. That evening, the elephants moved in. There were several families with a half dozen calves. Giant birds took to the air to move from the path of the ambling giants.

As the sun disappeared behind Mt. Kilimanjaro, groups of zebra ambled up to the hole. Then there was a rhino, followed by a number of warthogs with their long curving tusks for burrowing in the ground.

Next morning on the way to Nairobi, herds of cattle blocked the road as the tall and proud Masai moved their animals from one pasture to another. More photographs and more shillings.

And then it was over. The 747 climbed to altitude in the midnight sky as seasoned travellers moved to the left of the plane for the coveted three-in-a-row seats that can be converted for sleeping by lifting the arm rests.



THE NASA SCOUT ROCKET lifts off right on time carrying the Ariel-5 into a good equatorial orbit. A CBS photographer records the event along with other newsmen.

A FAMILY OF ELEPHANTS gathers at the waterhole in front of the Kilaguni lodge in Tsavo Park West.

A MIXED HERD of Impala and zebra view the park visitors with curious eyes.

A LARGE MALE ELEPHANT warns the writer not to approach any closer. Park visitors are advised to remain in their cars.

MIKE MANDELLA, an Applied Physics Lab movie photographer, photographs the remains of an elephant for use in a movie.

Laboratory Safety Course Held at Goddard

Goddard's Health and Safety Engineering Office sponsored a laboratory safety course here during the period of October 29 through November 1. The first three days of the course were presented by faculty members of HEW's National Institute for Occupational Safety and Health (NIOSH), of Cincinnati, Ohio. Presentations during the final day of the course were made by staff members of the GSFC Health and Safety Engineering Office.

Forty-three Goddard employees completed the course which highlighted such subjects as: Chemical Hazards; Legal Aspects of the Occupational Safety and Health Act (OSHA); Safety Program Management; Threshold Limit Values; Laboratory Ventilation Principles; Man as a Sampling Instrument; Hazard Control; Compressed Gasses; Refrigeration Hazards; Vacuum/High Pressure Operations and Cryogenics; Glassware Hazards; Electrical Hazards and Explosion-Proof Equipment; Non-Ionizing Radiation and Laser Safety; Solid Liquid, and Chemical Wastes; Personal Protective Equipment; and Carcinogen Hazards and Controls.

Dr. William G. Esmond of Aberdeen Proving Grounds, Paul C. Stearn of the National Institutes of Health, and Henry C. Kennedy, Jr., of the Naval Research Laboratory audited the course at Goddard for their respective organizations.

INSTRUCTOR William H. Perry of the National Institute for Occupational Safety and Health addresses Goddard employees on glass hazards in the laboratory.

CROP INVENTORY. . .From Page Four

lished to provide overall management and guidance. The day-to-day management of the experiment itself will take place at Houston under a LACIE Manager selected by NASA.

Although each LACIE task will require integration of efforts of at least two of the three agencies involved, each agency has certain lead responsibilities, including that of the Department of Agriculture in defining output product requirements and in evaluating the utility of output products, NOAA in developing and evaluating yield models and in providing climatological and meteorological data, and NASA in developing the sampling, classification, and measurement systems, and in acquiring and processing ERTS data.

Final evaluations and results of the experiment will be published in the usual manner in the scientific and technical literature.

The experiment is designed to determine the degree to which the relatively new remote sensing and data processing techniques may enhance the Department of Agriculture's crop forecasting programs.

The results are expected to contribute substantially toward determining the benefits and costs of employing the new methods and their usefulness for meeting future requirements of the Department of Agriculture and other resource-management agencies.

If the experiment proves them effective, the new techniques, in combination with current crop estimating methods and historical production data, could benefit both producers and consumers by helping to reduce the annual uncertainties affecting the management and marketing of major crops. Faster, earlier, and more accurate forecasts could assist in rational planning for the most effective use of supplies as well as in emergency food distribution.

Goddard Mourns. . .

William H. Simms died on November 24, 1974, of cancer. He was a mechanical engineering technician in the Experiment Development Branch of the Laboratory for Planetary Atmospheres.

Dr. Fletcher Thanks Goddard for Outstanding CFC Support

Dr. John F. Clark
Director
Goddard Space Flight Center
National Aeronautics and Space Administration
Greenbelt, MD 20771

Dear John:

Needless to say, I was most pleased at the verbal report we received last week and your letter report that you had topped your fair-share goals in this year's Combined Federal Campaign for the National Capital Area and Central Maryland.

The sum of your contributions and pledges to date of $175,395 for 101 percent of your fair-share goal of $173,000 for the National Capital Area CFC is especially a most gratifying and generous response by your employees to the needs of others.

I want to thank you for your leadership and support which made such campaign results possible. Please extend my thanks to all of your staff, particularly to Mr. John Devlin, who served again as your campaign general manager, and to your other campaign workers for their part in conducting a very successful campaign.

Sincerely,

James C. Fletcher
Administrator

INTERESTING PEOPLE

Shirley Kammerer: Personnel Management Specialist

Shirley W. Kammerer, Goddard's new Coordinator of the Handicapped, has worked in the Manpower Utilization Division since 1960.

A member of the Personnel Services Branch, Mrs. Kammerer assists Branch Head Howard Ottenstein in the overall operation of the branch. Her specific duties include coordination of the Goddard Merit Promotion program, employee records, Goddard health and NEBA insurance programs and the operation of the Personnel Reception Desk. She is also responsible for the recruitment and placement of new clerical employees at Goddard.

As coordinator for the Selective Placement (handicapped) Program, she is responsible for an affirmative action plan that was organized in accordance with the Rehabilitation Act of 1973. In this capacity she provides guidelines to Goddard management for the hiring of handicapped persons from initial recuritment through job placement to evaluation of positions as they become vacant to see if the job can be done by the handicapped.

Mrs. Kammerer first came here in December of 1960 following a varied career at the Department of Agriculture, the Department of Commerce, Riggs National Bank and the Treasury Department. For years she was the Special Examiner for Goddard's Special Examining Office for the Interagency Board of Washington, D.C.

A native of Washington, D.C., Mrs. Kammerer is a graduate of Eastern High School there and has attended undergraduate night school at the University of Maryland.

Until recently she was very active in the East Pines Area Boy's Club as secretary and bowling coach, she is a past president of the Riverdale Wood's Women's Club, and has held several offices in the P.T.A.

Her hobbies include all sports—especially water skiing and snow skiing—reading, bridge and drama. She is a member of Goddard's Music and Drama Productions and has appeared in two of MAD's plays, "Spoon River Anthology" and in the chorus of the recent musical "Oklahoma."

Her husband Leo R. Kammerer is a salesman. They have five children—Sandra, Richard, Douglas, Kathy, and Thomas—ranging in age from 26 to 19. The family lives in Riverdale, Maryland.

Credit Union Art Show

Maxine Marshall, wife of Tony Marshall of the Fabrication Engineering Branch, is having a display of modern and traditional paintings in fresco and encaustics during December and January in the Goddard Credit Union. Her work has been seen in professional shows locally and from Maine to Florida. She takes the ancient fresco and encaustic techniques and uses not only the traditional school of painting, but also the non-representational and abstract, in an effort to incorporate today's world in her paintings.

This is one of a series of displays by Goddard artists in the Credit Union. Watch for others in the future.

OKLAHOMA HAMS. The cast of Goddard's MAD (Music and Drama) Productions fall dinner theater "Oklahoma!" gather during a final act. Over 2,000 people, primarily Goddard employees, friends and families, saw the show in the Goddard Recreation Center. Thirteen performances were given in November.

HOSTESSES for "Oklahoma!" kept things moving during the dinner part of each evening. Shown here (from left) are Linda Campbell, Doris Clemons, Nancy Mengel, Hostess Captain June Pennoyer, and Linda Cox. Not shown are Donna Day, Lisa Hodge and Agnes Smith.

BOWLING HIGH SCORE. Harry "Skip" McMurdy, a Bendix Voice Control employee in Building 14 recently rolled a near-perfect bowling game with a score of 296. His score for that set was 670. Bowling in the Thursday Night Goddard Guys and Dolls League as a substitute, Skip started his series with a 202 game, followed by a 172 second game (ironically ending it with a strike). He then rolled eleven strikes in a row for a 296 third game. Skip's over-all bowling average is 171.

NASA Employees Club 1975 Travel Plans

The NASA Headquarters Employees Club has decided to sponsor three tours for 1975. All NASA employee, their immediate families and direct affiliates, and in some cases, friends will be eligible. Included are winter, summer and fall tours:

Russia, 8 days, February – March 1975
Orient, 19 days, June – July 1975
Holy Land, 14 days, Fall 1975

Detailed information can be obtained by writing B. Maggin, Chairman, Travel Committee NASA Headquarters Employees Club, Code R, NASA Headquarters.

Technology Utilization Honor Roll

Innovations by NASA employees and contractors that may be of use to American industry and other government agencies are announced in the form of NASA Tech Briefs. Recently the monetary award for each innovator, for the publication of a Tech Brief, has been increased to $50. Awards have recently been presented to the Goddard employees listed below with the title and number of each Tech Brief. Copies may be obtained through the Goddard Technology Utilization Office, extension 6242.

GREMEX Update, Tech Brief B73-10162, by Michael J. Vaccaro and Milton F. Denault describes the most recent computer program and documentation of the Goddard Research Engineering Management Exercise.

Automatic Device for Shell Freezing Liquids, Tech Brief B73-10253, by Burton Kelbaugh, Clifton Owen and Grace Lee Picciolo, describes a device for shell freezing liquids such as those containing bio-organic compounds for extended storage without manual operation.

A Magnetically Focused Image Tube Employing an Opaque Photocathode, Tech Brief B73-10255, by C. Bruce Johnson and Kenneth L. Hallam describes an image converter for optical images in the infrared or ultraviolet which uses an opaque photocathode for improved efficiency.

Cosmic Dust or Other Similar Outer-Space Particles Location Detector. Tech Brief B73-10282, by Siegfried Auer, describes an improved cosmic dust detector.

Eutectic Bonding of Sapphire to Sapphire, Tech Brief B73-10284, by John J. DeLuca describes a technique that effectively reduces the possibility of contamination in the production of rubidium maser cells.

An Electric Motor with Magnetic Bearings: A Concept, Tech Brief B73-10304, by Philip A. Studer describes a new concept in electric motors that uses the magnetic fluxes that drive the rotor as a rotor bearing.

A Multidegree-of-Freedon-Vibrational Apparatus, Tech Brief B73-10332, by James J. Kerley, Jr., describes improvements that make a "shaker table" vibrational testing apparatus more durable.

Millimeter-Wave Antenna System, Tech Brief B73-1033, By Jack Evans and William I. Gould, Jr., describes the use of Carbon Fiber Reinforced Plastic in millimeter-wave antennas to reduce distortion caused by uneven thermal expansion between sunlit and shaded parts in space.

Active Tuning Circuit, Tech Brief B73-10334, by Leonard L. Kleinberg describes a low-cost, inductorless, high Q active tuning circuit.

Structural Heat Pipe, Tech Brief B73-10364, by Stanford Ollendorf describes the use of heat pipes as an integral part of the structural support of insulation systems to equalize heat.

Alphanumeric Character Generator for Oscilloscope, Tech Brief B73-10370, by Donald C. Lokerson and Ronald E. Boston describes a portable alphanumeric character-display device that can be used with any general-purpose externally-triggered oscilloscope without the need for Z-axis modulation.

Ankylosis-Stabilized Oscillator, Tech Brief B73-10392, by Leonard Kleinberg describes an oscillator design that indicates both long-term and short-term stability at a reasonably low price.

Welded Printed Circuit (PC) Stick, Tech Brief B73-10393, by Fred Kreis, describes the use of a printed-circuit stick module to cut fabrication time and improve the quality of semiconductor IC packages.

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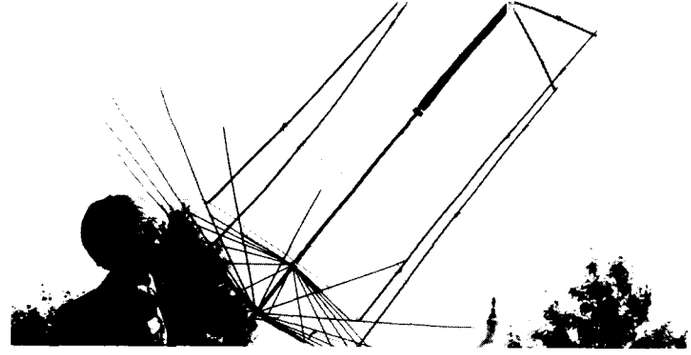

INEXPENSIVE EQUIPMENT which can be used for communication through a space satellite consists of a simple antenna built on the frame of a golfer's umbrella along with a hand-held walkie-talkie. In a recent demonstration in Washington, D.C., this equipment was used to beam a message more than 50,000 miles through NASA's Applications Technology Satellite-3 (ATS-3).

Safety '76 Award Program Announced

"Safety '76" is a new government-wide accident prevention program which succeeds the "ZERO-IN On Federal Safety" Program. In support of this program, the Health and Safety Protection Council is sponsoring a GSFC Safety "76" Award Program.

The purpose of the GSFC "Safety '76" Award Program is to create awareness of the "Safety '76" Program and its accident prevention objectives. To encourage broad participation in this program, the Goddard Health and Safety Council will award $200 in cash to individuals recommended by their Directorates and selected by the Council. Ten such awards are available on a semi-annual basis.

Directorates are responsible for submitting individual selections to the Health and Safety Protection Council by January 15, 1975, July 15, 1975, January 15, 1976, July 15, 1976 and January 15, 1977. The Council shall review and approve Directorate selections. Selection shall be based on individual achievement and contribution. Examples worthy of consideration include the following:

1. An invention, development, or research project which leads to improved safety engineering/design.
2. Development or implementation of safety policies, procedures, checklists, etc., which contribute to accident prevention.
3. Safety management.
4. Outstanding performance of safety duties or responsibilities such as implementation of safe practices, education/training, safety inspections and surveys.

Individuals may be nominated by supervisors, Division Chiefs, FOM's, etc. Nominations should be submitted to Directors of with a concise, but complete statement, indicating: (a) what was done, (b) how it was done, and (c) its contribution to safety.

The name of the first selected employee for the July-December 1974 period, together with a proposed citation from each Directorate, is due by January 15, 1975. Your support and active participation is essential to the success of this important program.

GODDARD NEWS is published monthly by the Office of Public Affairs at the Goddard Space Flight Center, Mail Code 202, National Aeronautics and Space Administration, Greenbelt, Maryland 20771. Deadline for contributions for the January, 1974, issue is Wednesday, December 18.

Nancy Mengel, Editor
Patricia Ratkewicz, Secretary, Phone Extension 4141

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