Rescue Off a Mountain, Page Five

SANDIA LAB NEWS

VOL. 25, NO. 4 FEBRUARY 23, 1973

'Routine' Operation at Edgewood

Eleven Test Units Dropped in Single Day

The pre-dawn light glinted off the snow and cast long shadows as the men of Mobile and Remote Ranges Division 9441 unloaded and set up their special equipment for the day's operations at the Edgewood Test Site, some 40 miles east of Albuquerque and five miles north of the town of Edgewood. It was cold at dawn and the heavy canvas covers over the truck beds were stiff and hard to manage.

Gordo Miller, supervisor of Division 9441, lay down in the snow and reached under a trailer bed to unfasten the catches that would release steel ramps from the rear of the trailer. Bad weather, remote locations and tough operations are routine for the Division. They've operated everywhere from the Arctic to the tropical jungles of Brazil.

Nick Perea had the radar van connected to the power line on the site and the coffee pot was on. On the road near the site, Les Harris was warming up the mobile TM station. Out on the range, Fenner Jones was setting up one of the PARC (Position and Release Control) instruments. Cal Cox had another unit a couple of miles away set up along the flight line. Terry Leighley and Joe Llamas were readying the SM-30 mobile tracking telescope.

The Beaver was due at 8:45 a.m. to drop the first of 11 test units scheduled for the day's operations.

By the time the sun peeked over the horizon, the range was ready. Instruments were warmed up and functioning, communications were established, and the coffee was hot.

Ed Stout, Section 9441-1 supervisor and test controller was satisfied. He reported to Clyde Walker, Department 9310 test program manager, that all was ready.

The Beaver is a grand old bird. The plane proved itself during WWII as an observation platform and reconnaissance craft. Sandia found this one in mothballs and had it refurbished for the special needs of Division 9441. It is operated and maintained by Ross Aviation. The characteristics of the Beaver are that it can fly low and slow, or as high as necessary. It can carry a tremendous load, and Sandia's has been outfitted with release racks on both wings and a mass of electronics in the cabin. It can also land and take off on short runways on rough terrain. And it is inexpensive to operate, compared to military aircraft or rented helicopters.

Gordo sipped his coffee and explained that Sandia has leased four sections of range land at Edgewood since 1968, and the range has paid for itself many times in terms of time and money saved. Hundreds of test drops were conducted there during the COIN development programs. Sandia brought in power lines, drilled a well, installed a telephone, and graded an airstrip. An irrigation system can saturate part of the range to provide a mud target.

When the range is in use, roadblocks are

(Continued on Page Four)

IN FROSTY DAWN men of Division 9441 unload all-terrain vehicles from trailers at Edgewood Test Site.

Afterthoughts

Sum & Substance--Consistent with our practice of keeping readers up-to-date on all news of interest, we submit herewith highlights of a 26-page report published by AT & T called The World's Telephones. Each of the 26 pages contains a lengthy statistical tabulation; thus our job here is one of perceptive editing so that we convey to you in a few lines the thrust of this report. Here goes: Total phones in service, World - 291,329,000; United States - 125,142,000; Carriacou - 80; & Pitcairn Island - 31. Total phone conversations in '71, in thousands, US - 171,797,000, avg. per person (APP) - 830 (talk about gab!); Republic of Maldives - 317, APP - 2.8 (a taciturn people); Portuguese Timor - 631, APP - 1.0 (positively close mouthed). Phones in principal cities, London - 3,782,828; Brownsville, Texas - 23,802; Lubumbashi - 3,500; Peoria, Ill. - 149,234; and Nuku'alofa - 1,073. If this doesn't give you all you need I've got the complete report in my office.

* * *

Great Ideas of Western Man--"Goat Ropers Need Love Too" (bumper sticker on car bearing Texas plates)

* * *

For That Extra Lift--We have carefully checked out the report that balloonists were overflying our Tech Area in order to gain extra lift, as it were, for free. "No thermal anomalies have been detected in the air regimes of concern above the Tech Area," states Labs meteorologist A. E. Neuman. "Of course, this does not exclude the possibility that such thermal anomalies may have developed elsewhere on the Base," he adds.

* * *

Agreed--"Had I been present at the creation, I would have given some useful hints for the better ordering of the universe." Alphonso the Learned (1221-1284) *js

For Metal People

Fractures, Flaws, and (Coffee) Breaks

Cataclysmic fracture is one occurrence we can do without. Countless losses in machinery, economic resources, even human life have been attributed — after the event — to cataclysmic fracture initiated at visible or invisible flaws. That's the foundation of the Thirteenth Annual Symposium on Fractures and Flaws to be held March 1-2 at the Four Seasons Motor Inn. It's sponsored by the New Mexico Section of the American Society of Mechanical Engineers, the New Mexico Section of the American Society for Metals, and the College of Engineering at the University of New Mexico.

The Symposium will acquaint practicing engineers with design concepts and methods built on recent applied research in fracture and flaw phenomena. The studies should be valuable to engineers involved in the design phases of modern products.

Tom Priddy (1542) is the general chairman of the Symposium; Elmer Leslie (1214) is the ASME Section Chairman who will welcome the participants. Many more Sandians appear on the program or have helped to set up the Symposium. Dale Buchanan (9310) has a supply of programs. Late registration begins at 8 a.m. on March 1.

LAB NEWS

Published every other Friday

SANDIA LABORATORIES

An Equal Opportunity Employer

ALBUQUERQUE, NEW MEXICO
LIVERMORE, CALIFORNIA
TONOPAH, NEVADA

Editorial offices in Albuquerque, N.M.
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ZIP 87115

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bill laskar takes/makes pictures
&
in livermore lorena schneider does all

Take Note

Charles Arning (7614) was recently awarded the Scouting Wood Badge — the highest mark of international recognition that may be earned in Scouting. Charles has been involved with scout work for 12 years. He is currently serving on the Manzano District Committee of the Kit Carson Council on training and camping activities. Charles has been at Sandia Labs for 15 years.

* * * *

The Kirtland AFB Toastmasters Club will offer an eight-week speech training course beginning Monday evening, March 5. The course is oriented more toward student participation than most speech training courses, yet is presented in an informal atmosphere and normally shy individuals find it easy to participate. Contact Jerry Long (9111), 296-2590, for other details.

* * * *

Sam Key, ASMECCAM. That's one way of saying that Sam (1541) is now a member of the American Society of Mechanical Engineers' Committee on Computing in Applied Mechanics. The Committee deals with the use of numerical methods and computer oriented techniques in solving research and engineering problems.

* * * *

A bus for Kathryn Street SE after all. That's the good word from the Transit Company and from Larry O'Connell (1812) and Harold Howard (1313) who pushed from this end. Starting Monday, Feb. 26, the Sandia Special No. 3 out of Arroyo del Oso will swing west on Kathryn from Louisiana to San Pedro between 7:39 and 7:41 a.m. Stand on any corner clutching 30 cents, and you'll be at Area I about 7:50 a.m. You can even get back home — get on where you got off in the morning.

AIAA Job Workshop Program Scheduled

To find a job is in itself a process that takes some amount of know-how. Bob Luna (5644) announces the American Institute of Aeronautics and Astronautics Job Workshop Program, aimed at scientists, engineers and technicians who are seeking employment. The Workshop Program consists of three seminar-type sessions, Feb. 28, March 7 and 14, from 7 to 10 p.m., in which a trained moderator discusses with a small group the optimum method of seeking employment. Similar programs have been offered by AIAA on the East and West coasts, and results have been excellent. "The thing works," says Bob. "A lot of technical people applying for employment are 'deselected' because they don't know how to go after a job — we help prepare them for the process." Sessions will be held at Del Norte High School. Call Charles Murray at the NM Employment Security Commission, 842-3271, if you are interested.

Albuquerque Speakers

F.G. Blottner and M.A. Ellis (both 5643). "Finite Difference Solution of the Incompressible Three Dimensional Boundary Layer Equations for a Blunt Body," Symposium on Application of Computers to Fluid Dynamics Analysis and Design, Jan. 3-4, Brooklyn, NY.

D.L. Caskey (5424), "Machine Recognition of Hand-printed Characters," and M.R. Scott (5222), "An Initial Value Method for the Computation of Eigenvalues and Eigenfunctions for Integral Operators," Hawaii International Conference on System Sciences, Jan. 9-11, Univ. of Hawaii.

R.R. Eaton (5643) and P.C. Kaestner (5623), "Viscous Shock Layer Flow in the Windward Plane of Cones at Angle of Attack"; H.R. Vaughn and G.E. Reis (both 5625), "A Magnus Theory," AIAA 11th Aerospace Sciences Meeting, Jan. 10-12, Washington, D.C.

J.M. Hueter (3131), "Creativity — Choice or Chance?", Ladies Night and Christmas meeting, Society of Manufacturing Engineers, Albuquerque.

R.J. Baughman (5154), "The Inside on Man-Made Crystals," Jan. 9, Albuquerque Rock Hound Club.

R. Stromberg (1212), "Solar Thermal Conversion Workshop," National Science Foundation, Univ. of Maryland, Jan. 11-12, Arlington, Va.

R.G. Easterling (1643), "Principles of Statistical Data Analysis," 1973 Annual Symposium on Reliability, Jan. 1973, Philadelphia, Pa.

D.M. Schuster (5314), "Properties and Behavior of Composite Materials," ME Dept. Colloquium, Jan. 19, Texas A&M Univ.

T.F. Marker (6010), "The Process of Invention," Museum of Albuquerque employees, Dec. 4.

H.C. Monteith (9344), "ESP Research in Russia, England, and America," Eldorado HS science class, Dec. 5, and Mental Health Center employees, Dec. 21.

J.E. Houston (5332) and R.L. Park (5331), "A Comparison of the Soft X-Ray Appearance Potential Spectra of the Transition Metals," 2nd Annual Symposium on Applied Vacuum Science and Technology, Jan. 30-Feb. 2, Tampa, Fla.

M. Sparks (1), "Transistor Technology and Communications," Joint Meeting of the American Physical Society-American Association of Physics Teachers, Jan. 29, New York City.

W.S. Saric (5643), "Stability of Liquid Films Interacting with Supersonic Streams: Theory and Experiment," Guggenheim School of Aeronautics, New York Univ., Dec. 12, 1972; and Dept. of Mechanics and Mechanical Aerospace Engineering, Illinois Institute of Technology, Dec. 13, 1972, Chicago.

G.C. McDonald (7623), "Energy Versus Environment-An Overview," N.M. Society of Professional Engineers, Santa Fe - Los Alamos Chapter, Jan. 25, Santa Fe.

R.G. Easterling (1643), took part in a debate on the "Use of Bayesian Methods of Reliability," at the annual Reliability and Maintainability Symposium, Jan. 24, Philadelphia.

N.J. DeLollis (5332), "Metrication and International Standards," New Mexico Chapter meeting of the Society for the Advancement of Material and Process Engineering, Jan. 31, Albuquerque.

C.J.M. Northrup, Jr. (5322), "Thermodynamics of the Uranium-Hydrogen and Uranium-Deuterium Systems," ARAZ Meeting, Feb. 1973, Livermore.

Livermore Speakers

Randall German (8313), "Scanning Electron Microscopy of the Open Porosity Network in a 93 Percent Dense Stainless Steel Flow Restrictor," American Society for Metals' International Metallographic Exhibit, Cleveland, Ohio, Oct. 1972.

Larry Weirick (8313), "Effect of Annealing Treatment on Surface Condition and Subsequent Corrosion of 304L Stainless Steel," 142nd Meeting of Electrochemical Society, Miami, Fla., Oct. 1972.

Walt Bauer (8334) and Ron Musket (8313), "Study of Aluminum Oxide Films by Ion-Induced X-Rays and Rutherford Back-Scattering," National Symposium of American Vacuum Society, Chicago, Ill., Oct. 1972.

Al West (8313), "Scattering of Diatomic and Polyatomic Molecules from the (100) Crystal Face of Platinum," Nineteenth National Vacuum Symposium, American Vacuum Society, Chicago, Ill., Oct. 1972.

Bill Ashurst (8354), "Non-Equilibrium Molecular Dynamics: Shear Viscosity and Thermal Conductivity," American Physical Society meeting, Los Angeles, Calif., Dec. 1972.

Sympathy

To Chuck Sage (8421) on the death of his father, in Livermore, Jan. 30.

LIVERMORE NEWS

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ENGINEERS (from left) Sam Cummins (8155), Dennis Rathbun (8137), and Joe Grant (8332) talk over details of their temporary assignments with AEC in Bethesda, Md.

Three Sandians to AEC; Will Do Reactor Work

Following a recruitment program within the AEC complex, three Livermore engineers, Sam Cummins (8155), Joe Grant (8332), and Dennis Rathbun (8137), are leaving the Labs for two-year assignments with AEC's Director of Regulation in Bethesda, Md.

Reporting to the Deputy Director for Technical Review, the three will be involved in licensing activities for nuclear reactor power plants. Primary responsibility of the Technical Review organization is to make judgment as to whether nuclear power plants proposed by industry are acceptable from the standpoint of safety and engineering.

The recruitment program was undertaken by the AEC to help expedite applications currently on file for both construction permits and operating licenses. The effort hopefully will reduce the time required to obtain such AEC approval after an application has been submitted.

Each of the three Sandians will be on loan in different areas. Sam's assignment is with the Quality Assurance Branch, his field for the past 18 years; he'll review requirements and safety instrumentation relating to reactor facilities.

"I'll have the opportunity to see the nuclear reactor question from two sides," says Sam. "There's the view of the companies who build the reactors and the view of the ecologists and AEC is somewhere in the middle. It's bound to be interesting.

In the Structural Engineering Branch, Joe will be reviewing and approving reactor design changes. "Major changes are occurring in reactor design," he says. "Essentially, they're going from water-cooled to gas and liquid sodium-cooled reactors. One interesting proposal calls for placement of reactors underwater off the East Coast. Some sort of protective wall would be built around the reactor. In this job it appears I'll have a complete overview of the work being done in the nuclear industry today."

Dennis will be assigned to the Cost Benefit Branch in which ecological and economic impact statements for nuclear power plants are compiled. Says Dennis, "The courts have ruled that the AEC must look not only at public safety, but at other aspects of nuclear power plants as well, for example, economic. Any time you locate a plant of this type, representing an investment of millions of dollars, you alter the local economic picture, for instance, the construction market, the tax base, and so on. There are many complex problems which will offer an interesting challenge." • ls

Authors

Sheridan Johnston (8354), "Turbulent Gas Mixing Measurements Using a Laser Schlieran Technique," AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS JOURNAL, Nov. 1972.

Bob Setchell (8354), "Investigation of Shock Strengthening in a Conical Convergent Channel," JOURNAL OF FLUID MECHANICS, Dec. 1972.

Ron Musket (8313) and Walt Bauer (8334), "Oxide Thickness Determination by Proton-Induced X-ray Fluorescence," JOURNAL OF APPLIED PHYSICS, Vol. 43, p. 4786.

Congratulations

Mr. and Mrs. Bill Sanders (8175), a son, Ronald Alan, Jan. 9.

ALL-TERRAIN VEHICLES take recovery crews into the impact area at Edgewood Test Site to recover test units.

BEAVER takes off from county road with six test units. A short runway is sufficient. Roadblocks are posted during operations.

PARC (Position and Release Control) instruments which bring the Beaver onto target and signal release time of test units are operated here by Gordo Miller, left, and Cal Cox.

RELOADING WING RACKS on Beaver aircraft, Ed Stout, test controller, talks with Jack Kiker and Clyde Walker, test manager. Beaver has landed on County Road 472 adjacent to Test Site.

Continued from Page One

Eleven Test Units Dropped at Edgewood

set up along the County Road 472 and a surveillance radar keeps track of all aircraft in the vicinity. The site is relatively clear of air traffic.

At 8:45 contact was made with the Beaver. The craft was lined up with the PARC instruments and guided over the target area. The dummy run looked good, so the next one was live. The unit dropped from 2000 feet and buried itself in the frozen target area.

The next drop unit incorporated a new onboard telemetering package. The signal was questionable, so this unit was temporarily bypassed and another was dropped. The Beaver can carry six units on its wing racks.

After this drop, the Beaver landed on the county road (the air strip adjacent to the road was beginning to thaw). Leo Dunn, loading supervisor for the Beaver, checked the projectile that hadn't been dropped. Adjustments were made, and five more units loaded onto the racks. Within an hour the Beaver was airborne again.

The plane landed again at mid-day and the men broke out lunch buckets augmented with a spread of C-Rations. Someone built a bonfire.

In the meantime, trips to the impact area had been made in several all-terrain vehicles: two Terra-Tigers, a Coot and a PacTrack. These versatile vehicles skim over snow and mud on wide low-pressure tires, leaving the surface virtually undisturbed.

"We try to protect the grass around here for the rancher," Ed Stout says.

Pictures were taken of the impacted projectiles and several were recovered.

Later in the afternoon, the rest of the units were dropped without incident. The rest of the units were dug up.

"Routine," Ed says.

The men reloaded the equipment, put out the fire, buttoned up the trailers, and headed back to Albuquerque. By 5 p.m. the site was empty. It had been a long day.

"Edgewood is a very useful range," Gordo says. "The Beaver is only a half-hour away. We can fix units and get them back in the air quickly. If we need something we can go get it. We have telephone communications with anyone at the Laboratories. It's convenient, quick and inexpensive." • dg

INSPECTING IMPACT POINT, penetration and parachute at target area are, l to r, Clyde Walker, H.H. Patterson, Ted Botner and George Adkins.

Rescue Off A Mountain

There's a special quality about high places. In the mountains, the sky is a deeper blue, the air — what there is of it — is clearer, and the immense scale of the mountain mass clarifies your view of your place in the universe. Mountains are soul-satisfying places. And more and more people, sensing this, are taking to the hills.

Trouble is, not all of them come back. Because mountains, besides being enchanting, can be dangerous. Don Mattox, head of Surface Physics and Chemistry Division 5332 and chairman of the Albuquerque Mountain Rescue Council, comments: "Three people died in the Sandias last year — one from a fall, one was hit by a falling — or thrown — rock, and one from hypothermia — exposure. More people are using the mountains and the Rescue Council anticipates more and more action. Fortunately, most of our calls involve lost or overdue hikers, or simple injuries — not a death. Broken legs, dislocations, and the like."

* * * *

To see how the Rescue Council performs its rather exotic specialty — the evacuation of an injured person from a high mountain location — we followed a crew during a recent practice exercise. The simulated victim (one of the crew) had chosen to injure himself on Lake Peak, elevation 12,409 feet and just north of the Santa Fe Ski Basin. Lots of snow and the temperature was 10-20 degrees, with winds of 20-30 mph.

The USGS quadrangle for Aspen Basin shows Lake Peak to be about 1½ miles from the Ski Basin parking lot, not a great distance, but there is an elevation gain of some 1800 feet and the snowshoe trek from the parking lot to the rescue site took a couple of hard hours. Timberline is passed several hundred feet below the summit, and the bare, open slope, scoured of snow by constant winds, can be walked. Our victim was near the summit.

The Council's rescue kit is ingenious. To tote the victim over snow, a lightweight metal toboggan with long handles fore and aft is used. This toboggan is broken down, erector-set style, into several parts for back packing. It can be assumed that the victim will be cold; indeed, his condition of shock may be more serious than the basic injury, and to counteract this condition the group has the only sleeping bag I've ever seen with plumbing: a network of half-inch plastic tubing throughout the bag in which hot water is circulated. It's the job of one crew member with stove to maintain the supply of hot water — no mean trick in itself on a wintry mountaintop.

Other paraphernalia include climbing ropes, ice axes, snow flukes and the assorted mountaineering gear necessary to get a body off high and rough terrain.

The exercise went smoothly: victim loaded and secured in the toboggan, hauled up a near vertical snow-covered chute, and taken down the mountainside. Time elapsed, about six hours; conduct of operation, very professional. If you must get yourself injured, do it on a nearby mountain where your friendly AMRC can come get you.

* * * *

Besides Don, the 40-member Rescue Council has a bunch of Sandians: Walt Herrmann, Ed Clark, Gary Tisone, John Allen, Stu Asselin, Sam Beard, Doug Drumheller, Jack Hickman, Don Lundergan, Dave Overmire and Al Sattler. Much of their equipment is costly — $275 for the toboggan described above — and except for an occasional donation the expense is borne by the members. Right now they're hungrily eyeing some 2-way radios. Don figures a thousand or so would fit the bill. • js

DON MATTOX pointing.

RESCUE SLED, right, is hauled up by rope pivoted around ice axes stuck in snow.

How Do Inventors Invent?

Have you ever thought what a different world this would be if there hadn't been an Alexander Graham Bell or a Ben Franklin? Or, for that matter, a Charlie Goetz? (Charlie invented a process for whipping cream, lather, etc.).

To promote invention and an appreciation of innovation, Congress has ordained National Inventors Week, observed last week.

Sandia Labs has produced many notable inventions, and we thought it would be interesting to explore the invention process with some Labs inventors. What follows are their accounts of this thing called invention.

* * * *

TOM MARKER, manager of Patent Department 6010, is the man at Sandia most concerned about inventions. An electrical engineer and an inventor in his own right, Tom holds two US patents and four foreign ones.

Inventors and innovators are really a small subclass of the set of human beings who are creative. The set comprises artists, writers, painters, musicians as well as the discoverers, mathematicians and inventors. It is select since it is unlikely that more than 15 percent of the population possess a substantial creative drive. While the epoch in which he lives and the surrounding environment may help or hinder the creative person, creativity is nonetheless a gift and not an acquisition.

Perhaps the foremost stimulus to invent is the recognition of a need and a way to fulfill the need. Edison clearly saw the benefits of the incandescent lamp and in spite of many failures solved the problem. Gene Newlin (6011) puts it well. He says that people invent because they reflect — "I wish I had. . ." and "what would happen if. . ." The Japanese, who have the highest invention rate per capita, appear to channel their talents to definable needs on a worldwide basis.

Some invention truly happens by instantaneous conception — the flash of genius. For a long time our patent laws only recognized true invention as a "flash of genius." In the late 1950's this requirement was removed from the law since it really is not always decidable and is by no means the only inventive thought process.

The musician-comedian, Victor Borge, tells about an uncle who invented a cure for a disease that doesn't exist. This is often a fact of life. Alexanderson of the alternator fame, as early as 1905, patented some of the essential features of magnetic core memories used in modern computers. He solved then a problem that didn't exist until 1950. Patent examiners with glee have cited Alexanderson against latter-day patent applicants who haven't done their homework.

CECIL LAND of Solid State Electronics Division 5113 is an electrical engineer. At Sandia 17 years, he holds 46 US and 38 foreign patents issued or pending on ferroelectric devices.

The romantic notion of the lone inventor meditating, drawing upon some mysterious inner creative force, conceiving an invention of major proportions and rushing into his laboratory to build a working model is largely fictional. Inventions are usually the outgrowth of patient study and systematic investigation of problems. The fact is that the inventive process may be triggered in an individual or group by any of several mechanisms.

The discovery of a new physical phenomenon or a previously unknown property of a material may result in a series of inventions. These may be new or improved components, devices, materials or processes — all of which are based on the discovery.

An example at Sandia is the discovery of the electrooptic properties of ferroelectric ceramics. This has led to the invention of several new devices and processes, and even to a new family of transparent electrooptic ceramics. Other inventions stem from the work of experimentors seeking to validate a new theory.

In the past decade or two, inventions have rarely been the outgrowth of the work of a single individual. Patents with broad and effective claims are more often issued to two, three or sometimes more inventors.

The old saying, "Necessity is the mother of invention," is perhaps as applicable today as in the past. Most inventions now are conceived and implemented as a result of specific need. Research and development programs in many of the world's major laboratories — Bell Labs, RCA, IBM, Phillips, Plessey and Hitachi to name a few — are becoming increasingly systems oriented. By this I mean a system is first conceived to perform a needed function, and then all the required materials, devices and components that are beyond the present state-of-the-art are invented. These inventors have wide knowledge of the state-of-the-art in a specific field, plus as broad as possible background in related fields. The inventive process here is two-fold — an in-depth study of systems requirements and concerted efforts by a group to satisfy those requirements by novel means.

* * * *

WILLIS WHITFIELD, supervisor of Applied Sciences Division 1742, is one of those rare inventors who has seen his invention give rise to an entire new industry. Today the manufacture of laminar flow clean rooms, benches and hospital surgery suites to control airborne contamination totals more than $20 million.

I too believe that necessity is the mother of invention.

An urgent need existed for the laminar flow clean room. Sandia was experiencing component failure from dust that could be seen with the naked eye — it was present in the very best clean rooms at that time. Much effort and money was being spent to improve the old-style clean rooms, but it was very difficult to keep dust levels below 100,000 particles per cubic foot (0.5 micron and larger-sized particles) even with stringent controls. Someone had even proposed assembling microcircuitry components in a vacuum chamber with personnel wearing pressurized suits. Obviously a new approach was needed.

I remember that I spent a couple of weeks analyzing the problem. I continually went over the same ground trying to look at it fresh each time. The solution, when it finally came, was built upon this thorough understanding. What was needed was some means to "wash" the dust particles out of the room to avoid accumulation. I remember thinking about a stream or a river. The solution, of course, was a stream of air continuously filtered. It seemed so beautifully simple that I spent a couple of days checking to find out if anyone else had tried it and, if so, why it had failed. No one had, so we built a new kind of clean room. It worked so well that at first we thought that our measurement equipment was faulty. It read less than 100 particles per cubic foot, which proved correct.

So I would say that invention is the result, first of all, of an urgent need. Then follows a period of investigation until the problem, the real problem involved, is fully understood. It's an evolutionary process. The more you learn about the problem, the more possible solutions occur. A broad range of knowledge is useful at this point. New devices are rarely invented without a thorough understanding of basic principles.

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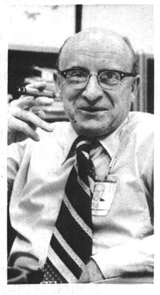


OTMAR STUETZER, manager of Exploratory Test Instrumentation Department 1440, holds 20 US patents and at least eight foreign ones. (Who keeps count? he asks.) An exuberant, quick man with energy to spare, he calls living a creative process. A mathematician by training, he is also physicist and engineer. He is a Fellow in the American Physical Society and the IEEE.

* * * *

I don't know how an inventor invents. We build something new when there is no other way to do a certain job. Or maybe we observe a phenomenon that no one else has seen. Then we ask what is it good for. I observed once that ions have very low mobility in liquids — surprisingly low mobility. What useful device would this produce? The answer was an ion drag pump, useful as a laboratory tool.

I use a "combinatoric" approach. By this I mean I combine possibilities and keep combining ideas until a solution appears that seems possible. In this process, you have to be absolutely honest. If you want it to work, then you can't fool yourself from a flaw in your reasoning.

I do this at home, after dinner when I'm relaxed or on Saturday morning when things are quiet. I can't think when phones are ringing and there are meetings to attend and people to talk with. I have to be alone, with a cigar. A large cigar for a large problem, a smaller cigar for a small problem.

Naturally, the more possibilities that you know about in the physical sciences, then the more apt you are to find solutions. And you have to be practical and honest. The device that you envision must be able to be built, and usually it must be possible to build this device economically. Lots of inventions are just too damned expensive to be useful. What good are they? Some judgement is helpful here. You don't patent junk.

Sympathy

To Don Marchi (5335) on the death of his mother in Albuquerque, Jan. 12.

To Ed Barber (7613) on the death of his father in Philadelphia, Feb. 9.

Congratulations

Mr. and Mrs. Ernest Duran (4512), a daughter, Stephannie Dianne, Jan. 10.

ONLY little boys play with balloons, right? Not so exclaims Charley Hines (3148), he of the mustache in the shot at left. H.J. Plagge of Sandia's meteorology group looks on. Labs weather people provided wind data for the hot-air balloon contest, which attracted more than a hundred balloonists from US and foreign countries. Above, Kate Young (3141) chats with Cyril, Ian, Manny, and Roger of what appears to be the English team.

Bach Si, Rock No

ALSO Symphony Members Play for Fun

Each Monday evening at 7:30, the Albuquerque High School band room is a scene of mass confusion. After a few minutes people and instruments sort themselves out and the Albuquerque Lesser Symphony Orchestra (ALSO) begins its practice session.

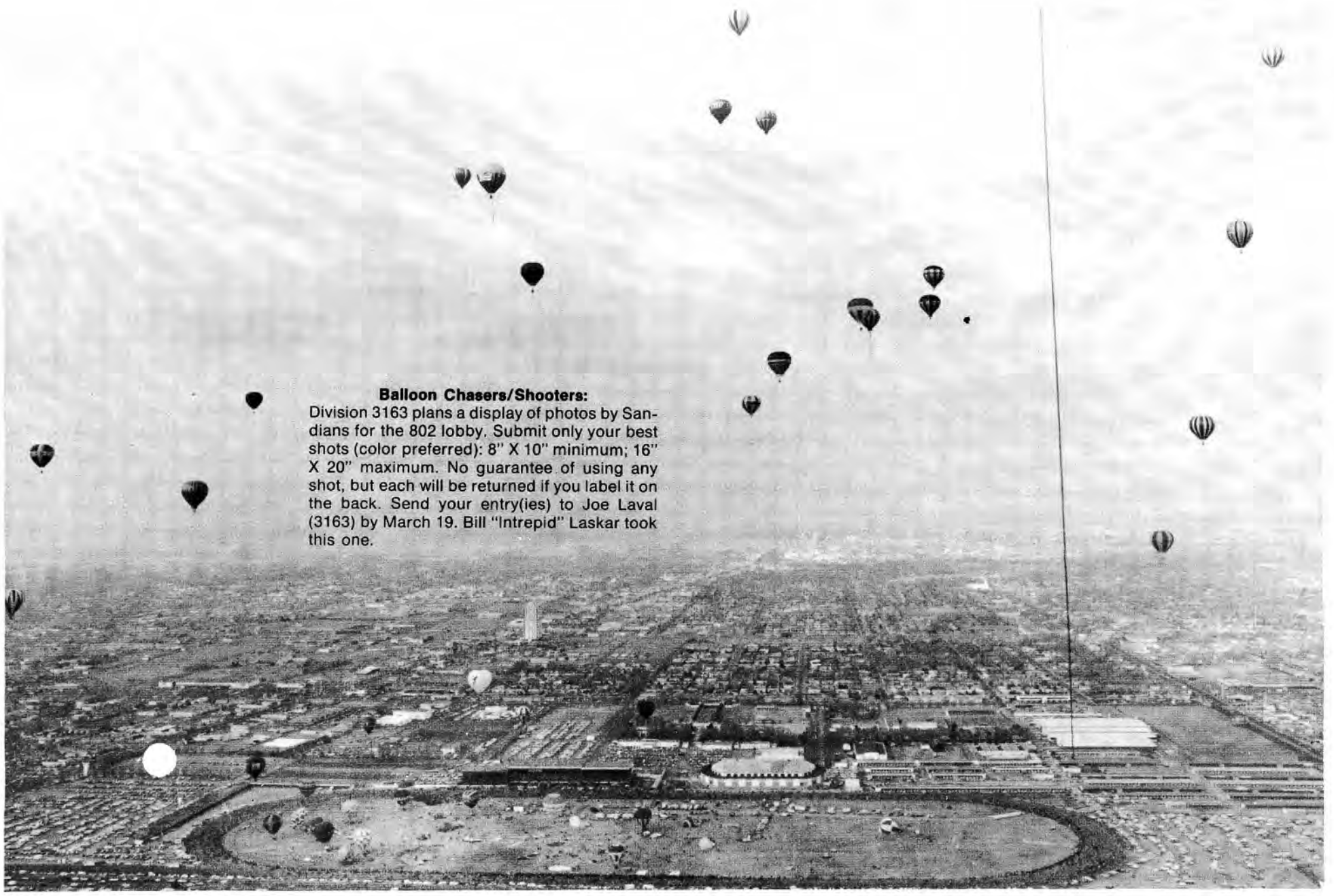
About 60 members regularly attend these sessions, including five Sandians and three wives of Sandians: Paul Field (1325), flute; Ian Fritz (5132), cello; Pete Palmer (5213), cello; Ken Touryan (5640), violin; Mark Percival (5323), timpani; Mrs. Percival, trombone; Mrs. Pete Kaestner (5621), cello; and Mrs. Ray McVeety (5623), violin.

Conductor for the group is John Gaston, a violinist in the Albuquerque (Greater) Symphony, and choir director for Trinity Methodist Church.

"We are an amateur group," Ken Touryan says, "and we meet and play for fun. We have no sponsor or funding — all members contribute a small amount to pay for our sheet music. Actually we sound a little ragged right now, but we have some people with excellent musical backgrounds, we have a good distribution of instruments, and we have a fine conductor. We plan to begin giving concerts next fall. Albuquerque is large enough to support another orchestra, and we hope to soon qualify for that distinction.

"Interested Sandians are welcome to join us any Monday evening. There's no auditioning – just come and play for fun." • nt

SANDIANS (l to r) Paul Field, Ian Fritz, Mark Percival, Ken Touryan and Pete Palmer play weekly in Albuquerque Lesser Symphony Orchestra, a low key (no pun) alternative to Civic Symphony.



Balloon Chasers/Shooters:
Division 3163 plans a display of photos by Sandians for the 802 lobby. Submit only your best shots (color preferred): 8" X 10" minimum; 16" X 20" maximum. No guarantee of using any shot, but each will be returned if you label it on the back. Send your entry(ies) to Joe Laval (3163) by March 19. Bill "Intrepid" Laskar took this one.

AACTION in the Arts

Sculpture, painting, crafts, drama, music, dance. These arts and others are the province of Crawford MacCallum, 5231. He's not the quintessential Renaissance man nor is he artist's artist. But, as current chairman of the Albuquerque Arts Council (AAC), he's deeply involved with the exploitation, if you will, of the city's many artistic resources.

Presently, under Crawford's direction, the Council is working on: an art exhibit (probably at the Museum of Albuquerque) for maverick artists — those not showing at any local galleries; an Arts Festival modeled after that held at the Convention Center opening last fall; a proposal which would involve the state's arts in the nation's bicentennial in 1976; a study of the impact of the arts in the metropolitan area — arts of all kinds flourish here but their economic impact is seldom recognized; an exploration of the relationship that could be developed between the arts and cable TV — cable TV looks like an ideal means by which to deliver art to the living room; a project designed to put real live artists of all kinds into public school classrooms; and, tentatively, a book containing early photos of Albuquerque buildings and other scenes.

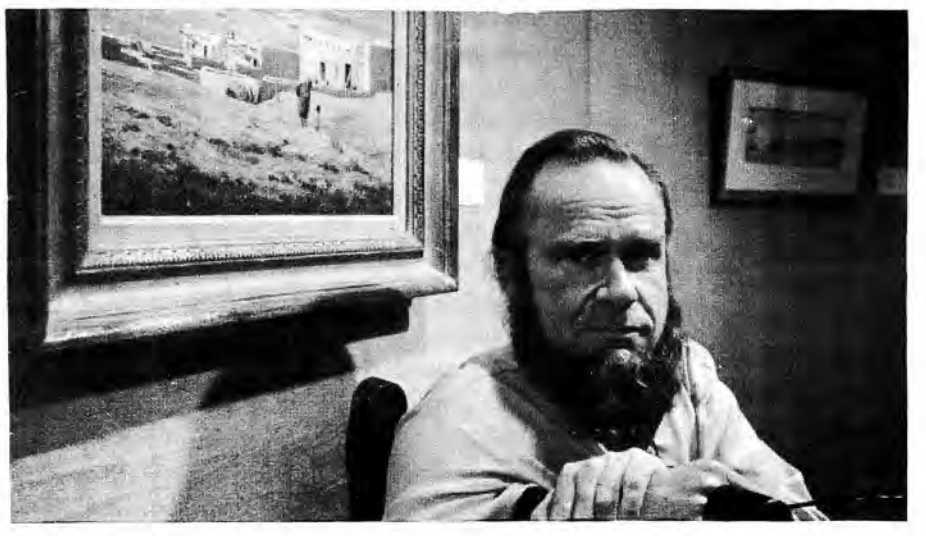
Obviously, Crawford cannot be personally and directly involved with all of these. But the ACC serves as a forum for people in the arts to share ideas and to stimulate each other — what Crawford calls the exponential effect in a townhall meeting atmosphere. "I guess I've carried over into AAC the philosophy I used when I was running Old Town Studio," he says, "if it's interesting and has a chance of succeeding, go ahead and do it."

All the work going on might lead to the assumption that Crawford is either drill sergeant or gospel preacher. He's not. He's usually soft-spoken, generally non-directive. Except for a preference for pendant over tie or bolo, he looks like the nuclear physicist he is at Sandia. But his enthusiasm has a way of inspiring not only the 20 people on the Council but also the many "come on by and see what's happening" types — AAC meetings (every second Wednesday night at the Convention Center) are wide open.

* * * *

The AAC began a couple of years ago as a Junior League project. The group's major undertaking was an arts calendar which now tells some 16,000 people a month what's happening in the arts in the area. (LAB NEWS uses the calendar in compiling the Events Calendar.) Publishing the calendar proved expensive, but thanks to a $3 subscription fee plus membership dues from many of the groups included, the calendar is now nearly self-supporting. And soon the Chamber of Commerce will assume the printing expense — the Chamber is already furnishing a desk, phone, and part-time secretary at their Convention Center offices.

Crawford was elected chairman in the traditional American way. When prospects appeared grim and several AAC members were ready to give it up, Crawford said, "No, there are things to be done, and we can do them." He was chairman ten minutes later. And things are indeed being done. • bh



A PAINTING at the Museum of Albuquerque furnishes background for Crawford MacCallum (5231). As chairman of the Albuquerque Arts Council, he's involved with arts and artists all over town.

1841: On To Santa Fe, The Hard Way

In a modern automobile you can drive from Austin, Texas, to Las Vegas, N.M., in two days. It's a long drive but you can be comfortable — air conditioning in summer, a heater in winter and there are all kinds of roadside restaurants and rest stops. The scenery is monotonous: endless plains, some rolling hills.

In the summer of 1841, the journey was a life and death affair for 320 men, volunteers of the notorious Texas-Santa Fe expedition. Twenty were killed — scalped by Indians — and more than 100 others died before their long ordeal was over.

Their mission is still obscure. Some historians insist that they came as conquerors, determined to put New Mexico under the rule of the brand-new republic of Texas. Official documents, signed by Mirabeau Buonaparte Lamar, president of Texas, proclaim that the mission was peaceful. Its ostensible purpose was to open a new trade route which would be shorter than the Santa Fe Trail from Independence, Mo., to the New Mexico capitol. Anticipated trade was estimated at $450,000 annually, and the bankrupt young republic of Texas desperately needed money.

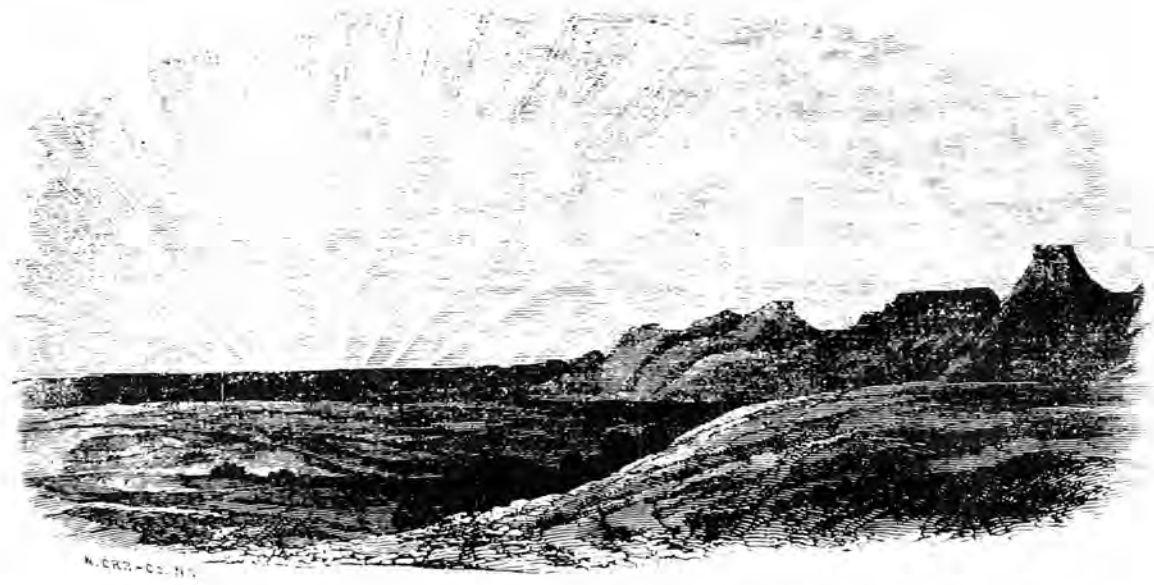
But unofficial sources — letters, records of conversations — say that Lamar planned conquest. Texas claimed all territory to the Rio Grande headwaters (in Colorado) after its war of independence with Mexico. And Lamar thought the natives of New Mexico would welcome Texas-style liberty. At the time New Mexico was ruled by a petty tyrant named Manuel Armijo who had grabbed the governorship in a plot that revolved around the rumor that his predecessor was going to levy a tax on a man sleeping with his wife. A very tricky gentleman, Manuel Armijo.

No doubt exists that the Texans constituted a military expedition; they were commanded by 27-year-old Col. Hugh McLeod, Lamar's brother-in-law. However, all the men were volunteers, and all furnished their own horses and weapons. Only a handful of seasoned frontiersmen accompanied the expedition. Most were young men in their twenties and at least half were under 20 years of age.

Colonel McLeod did not employ Indian guides. He took his men and wagons into an uncharted wilderness — the vast blistering llano of Texas and Eastern New Mexico, an area controlled by fierce Comanches and Kiowas who had learned to survive with scant water in its heat and emptiness.

The expedition left Bushy Camp near Austin late in June after bombastic speeches by Lamar and other Texas dignitaries. Sam Houston opposed the expedition.

Hope and spirit were high. The men were off on a great adventure, with riches and revelry ahead. Two months later, after near starvation, days without water, loss of horses Indians stampeded them — loss of 20 men to the same Indians, and loss of wagons through accidents and stampedes, the men were a miserable, disheartened lot. They had lost faith in their commander and their mission. Discipline was gone. Bogged down by the formidable caprock near Tucumcari, the expedition faced a still worse ordeal.



STAKED PLAINS and caprock near Tucumcari were a formidable barrier to the near-starving members of the expedition after two months of wandering in the barrens of West Texas and Eastern New Mexico.

The command was split, and 90 of the most able men, riding what horses remained and with five days of slim rations, climbed the caprock and headed west for Santa Fe. Their joy knew no bounds when they encountered Mexican sheepherders near Anton Chico. It was shortlived. They were fed, but stripped and put in chains. Deserters from the ranks of the Texans had reached San Miguel, a village not shown on modern maps but located near Las Vegas, and spread the story of the approaching military force.

Armijo, forewarned, met the force and tricked them into giving up without firing a shot. He was bent on execution on the spot but was restrained when his officers voted to send the prisoners to Mexico City.

Further trickery developed. Edward Lewis, a respected member of the expedition, turned traitor and talked the remainder of the force into surrenduring. McLeod's pitiful group was straggling toward San Miguel when they were surrounded by a larger force of New Mexican militia under a Captain Salazar.

There are villains in history. Captain Salazar is one of them. He marched the Texans to El Paso. He marched them in bare feet, many with minimum or no clothing, with little rest and little food, and personally killed three stragglers and ordered the execution of two more. He cut off their ears to provide an accounting. During one 90-mile stretch, he marched the prisoners without a stop of more than an hour's duration at a time. Many died on the way and their bodies were left for the wolves and buzzards.

At El Paso, the survivors were met with mercy. A kinder commander allowed them rest, issued them clothing and fed them well. Still, it was a long way to Mexico City. More men died from smallpox. In Mexico City, finally, they were housed in prisons or in compounds with lepers and consigned to hard labor.

On June 13 — almost a year to the day from their start — 113 were released. It was Santa Anna's birthday, he was again dictator of Mexico and was in a magnanimous mood.

MEMBERS of the ill-fated Texas-Santa Fe expedition are marched to Mexico City after their capture.

Actually, foreign diplomats in Mexico City were applying strong pressure for the release of the prisoners, and the Mexican War with the United States was imminent. Santa Anna needed all the friends he could get.

Of the survivors, many distinguished themselves in the Mexican War and later as soldiers of the Confederacy in the Civil War. One of them — George Wilkins Kendall — founded a newspaper, the New Orleans Picayune, wrote a two-volume account of the expedition and lived a long and productive life as an editor.

None of the men was aware of the larger consequences of their journey. The story of the prisoners' treatment aroused great wrath among Texans, great sympathy from the United States, and contributed to the high feelings leading to the Mexican War. That war added the territory of New Mexico, Arizona, Colorado and California to the United States. • dg

Relating to Plating (Paint, Too)

Vast vats, yes. Chemical stench, no. A highly useful function, definitely. It's the Plating and Paint Lab in Bldg. 841. It's the place where all kinds of items — large and small, simple and complex — get a thin coating which protects them against corrosion or wear, or provides lubrication or conductivity.

Coating an item is seldom as simple as cleaning it, dipping it into a vat, and then hanging it up to dry. The plating process is an electrolytic one. That is, it involves placing an item — steel, aluminum, or brass, for example — into a vat of solution (generally a metal salt dissolved in water) and then applying direct current. This gives the item a negative charge which makes it into a sort of magnet. The ions of the metal in solution are attracted to this cathode and lock themselves to it — and it's plated. Thickness of the plating depends on the amount of current, on the length of time it's applied, and on the metal itself that is being plated. (If an oxide coating is desired, the item gets a positive charge and is therefore an anode; this process, logically enough, is anodizing.)

"We plate materials for any good engineering reason," says Shary Holmes, 7122-4 supervisor. "Sometimes it's to distinguish one part in a prototype from another, once in a while it's aesthetics, but usually it's to keep the piece from corroding or to make it resist wear better."

Cadmium or zinc is often used to plate steel where corrosion is a problem — near salt water, for example. Cadmium and steel have a sacrificial relationship, that is, the cadmium must be almost totally eaten away before the steel it's protecting begins to corrode.

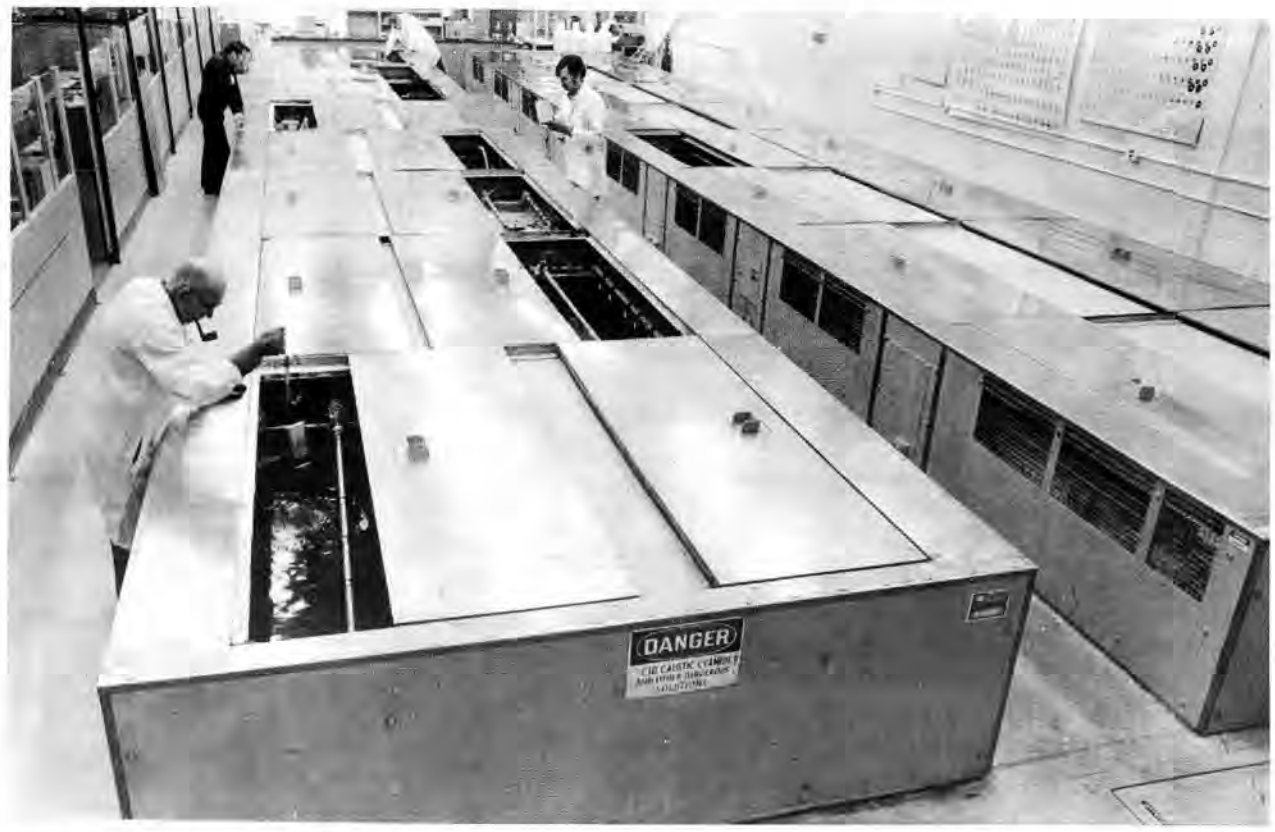
Neither cadmium nor zinc is wear resistant — or pretty — so nickel is often used to plate steel that needs protection against wear. If aesthetics are important too, a thin layer of chrome goes on over the nickel. With or without the chrome flash, the steel first gets a layer of copper which bonds the nickel to the steel. Steel, copper, nickel, chrome — just like a car bumper.

The long rows of similar-looking vats in the lab conceal a wide variety of liquids, most acids, alkalis, and metal salts in water. They're arranged in order so that, for most common plating jobs, the plater can simply immerse the item for the required time, lift it out, rinse it (in water or acid, depending on what's to be rinsed), and dunk it in the next vat.

When a higher order of precision is necessary, a series of smaller vats is used. This group is instrumented to allow exact control over temperature, time, and composition of the plating substance.

Another series is designed mostly for precious metals. Here the containers are smaller yet and are used for plating miniature and sub-miniature components. The instrumentation here permits extremely close tolerances; for example, a component could get a gold flash that's only 20 millionths of an inch thick.

The plating process may play an important role in collecting solar energy. The lab's Russ Smith is currently experimenting with aluminum disks, each of which is coated with a precise amount of heat absorbing material such as copper oxide. The coatings are designed to have high absorbtivity but low emissivity — that means they take in much more heat than they give off.



THREE PLATERS plating (front to back, Roy Hansen, Russ Smith, and Pete Ferketich); supervisor Shary Holmes (in dark shirt) contemplating.

WORTH A NICKELPLATE are a couple of test samples. Russ Smith prepares to dunk them.

The lab paints as well as plates. Satellites contain, among other things, little black boxes. Weight is always critical, so boxes are generally made of the lightweights, magnesium or aluminum. And they need to be flat black for heat absorption. It's not simply a matter of painting the boxes with a can of spray paint from the supermarket. First the surface has to be immaculately clean; acid does an excellent job. It does, however, create an oxide on the aluminum. So a surface conversion treatment is necessary — chromic acid solutions convert the surface to chromate ions which, in turn, provide good adhesion for black paint.

Plating or painting, the lab can do it — and does. • bh

Credit Union Bulletin Board

IRS & SSN — From the local IRS office: "To assure proper credit of tax payments, you should put your Social Security number on all checks or money orders you make out to the Internal Revenue Service."

Events Calendar

Feb. 24 — N.M. Mt. Club, snowshoe trip, Santa Fe Ski Basin, Gulf Mart, 7 a.m.
Feb. 25 — N.M. Ski Touring Club, downhill skiing techniques, Gulf Mart, 8 a.m.
Feb. 26 — ASUNM, "Godspell: A Musical Adaptation of the Gospel According to St. Matthew," 8:15 p.m., Popejoy Hall.
Feb. 27 — Friends of Art Lecture, "Today's Art Scene," coffee 7:45, lecture 8 p.m., UNM Art Museum.
Feb. 27 — June Music Festival presents the Juilliard Quartet, 8:15 p.m., Popejoy Hall.
Feb. 28 — Great Plays on Film, "The Importance of Being Earnest," 7:30 p.m., Popejoy Hall.
March 1-4 — Old Town Studio, "The Caine Mutiny Court Martial," 8 p.m., 242-4602.
March 4 — National Theater of the Deaf, 8:15 p.m., Popejoy Hall.
March 4 — N.M. Mt. Club, 3-Gun Canyon, Western Skies, 8:30 a.m.
March 6 — Third Concert, UNM Orchestra, Max Madrid conductor, 8:15 p.m., Popejoy Hall.
March 7 — ASUNM Lecture Series, Merle Miller, author and speaker for homosexual minority, 8 p.m., Student Union Ballroom.

Retiring?

LAB NEWS is planning a special retiree supplement to our March 23rd issue. Sandians who are retiring on or before that date will have their pictures in this special supplement.

Authors

S.R. Booker (7452), "Recent Refinements & Developments in Kerr System Electrical Measurement Techniques," Vol. IM-21, No. 4, IEEE Transactions on INSTRUMENTATION AND MEASUREMENT.

G.S. Snow (1335), "Fabrication of Transparent Electrooptic PLZT Ceramics by Atmosphere Sintering," Vol. 56, No. 2 (1973), JOURNAL OF THE AMERICAN CERAMIC SOCIETY.

R.G. Kepler (5510), "Comments on Diffusion Theory of Luminescent Emission from a Doped Solid," Vol. 55, No. 2 (1973), PHYSICA STATUS SOLIDI.

V.L. Dugan (1741) and R.E. Trujillo (1742), "Synergistic Inactivation of Viruses by Heat and Ionizing Radiation," Vol. 12, 92-113, BIOPHYSICAL JOURNAL.

J.A. Borders (5111), "Helium Ion Stopping Cross Sections in Gold," Vol. 16, 253 (1972), RADIATION EFFECTS.

R.E. Hollenbach (5163), "An Optical Fiducial System for Shock-Wave Interferometry," Vol. 43, No. 12, THE REVIEW OF SCIENTIFIC INSTRUMENTS.

D.R. Smith (5642), "Experimental Observation of Heating of a Hydrogen Plasma by a Relativistic Electron Beam," Vol. 42A, No. 3, PHYSICS LETTERS A.

R.E. Allred and D.M. Schuster (both 5314), "The Impact Toughness of Discontinuous Boron Reinforced Epoxy Composites," Jan. 1973 issue, JOURNAL OF MATERIALS SCIENCE.

J.W. Guthrie (1413), "Ion Microprobe Measurements of Concentration Depth Profiles of Erbium Oxide on Thin Film Erbium Metal," Vol. 30, No. 2, JOURNAL OF LESS-COMMON METALS.

S.L. Erickson (5521), "Determination of Phosphorus in Phosphazenes and Phosphines," Vol. 19, pp 1457-1460, (1972), TALANTA.

D.M. Wilkinson (4541), "Central Monitoring of Plant Equipment," Vol. 26, No. 19, PLANT ENGINEERING MAGAZINE.

G.E. Pike (5155), "On the A.C. Conductivity of Glasses," Vol. 28, p 1449 (1972), PHYSICAL REVIEW LETTERS.

R.A. Graham (5132), "Strain Dependence of Longitudinal Piezoelectric, Elastic, and Dielectric Constants of X-Cut Quartz," Vol. 6, (Dec. 1972), PHYSICAL REVIEW B.

B.L. Hulme (1722), "Discrete Galerkin and Related One-Step Methods for Ordinary Differential Equations," Vol. 26, No. 120, MATHEMATICS OF COMPUTATION.

F.C. Perry (5325), "Gruneisen Tensor of an Anisotropic Composite," Vol. 6, No. 2, JOURNAL OF COMPOSITE MATERIALS.

J.M. Freedman (1541) and L.M. Keer (Northwestern Univ.), "Vibratory Motion of a Body on an Orthotropic Half Plane," Vol. 39, Series E, No. 4, Transactions of the ASME, JOURNAL OF APPLIED MECHANICS.

H.C. Walling, M.J. Forrestal and W.K. Tucker (all 9324), "An Experimental Method for Impulsively Loading Ring Structures," Vol. 8, No. 6, INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES.

R.G. Easterling (1643), "Book Review on Reliability Mathematics; Fundamentals; Practices; Procedures," Feb. 1972, TECHNOMETRICS.

G.C. Tisone (5246), "Energy-Loss Cross Sections for 500eV Electrons in the Continuum of O_2 and CO," Vol. 57, p 3686 (1972), JOURNAL OF CHEMICAL PHYSICS.

H.J. Sutherland and R. Lingle (both 5163), "Geometric Dispersion of Acoustic Waves by a Fibrous Composites," Vol. 6, p 490 (1972), JOURNAL OF COMPOSITE MATERIALS.

H.J. Sutherland, A. Bedford and R. Lingle (all 5163), "On Theoretical and Experimental Wave Propagation in a Fiber Reinforced Elastic Material," Vol. 39, Series E, No. 2, JOURNAL OF APPLIED MECHANICS.

D.E. Munson (5163) and R.P. Reed (9116), "Stress Pulse Atenuation in Cloth Laminate Quartz Phenolic," Vol. 6, pp 231-257, JOURNAL OF COMPOSITE MATERIALS.

J.L. Wurtz (1413), P.E. Pierce (1412) and C.M. Tapp (1430), "A Technique of Surface Characterization for Secondary Electron Emission Measurements During Positive Ion Bombardment," Vol. 43, No. 8, JOURNAL OF APPLIED PHYSICS.

R.T.G. Lassiter, J. Danclovic and C. Andes (all 3131), "Sandia Laboratories Tests Another Model: Continuing Professional Development," Vol. E-15, No. 2, IEEE Transactions on EDUCATION.

G.P. Steck (1723), "Solution to Problem E2313," Vol. 79, p 907 (1972), AMERICAN MATHEMATICAL MONTHLY.

L.S. Nelson (5324), "Techniques for Studying Liquid and Solids at Extreme Temperatures," Vol. 4, pp 171-218 (1971), ADVANCES IN HIGH TEMPERATURE CHEMISTRY.

L.S. Nelson and N.L. Richardson (both 5324), "Formation of Thin Rods of Pyrolytic Carbon by Heating with a Focused Carbon Dioxide Laser," Vol. 7, pp 971-976, MATERIALS RESEARCH BULLETIN.

R.I. Ewing (9112), "Guidelines for Pump Selection," Jan./Feb. issue (1973), JOURNAL OF VACUUM SCIENCE AND TECHNOLOGY.

Recreation Notes

FUN & GAMES

Bill Saric (5643), vice president of the Sandia Golf Association, announces that the SGA membership drive is now underway. He points out some of the advantages of SGA membership, at $3/yr. (retired employees receive free membership).

—affiliation with the Albuquerque Golf Association, the New Mexico State Golf Association and the U.S. Golf Association (USGA).

—under the USGA system, your handicap is computed twice monthly and is recognized and accepted at any USGA event.

—you are eligible to play in 16 SGA tournaments and to participate in evening and weekend league play.

—you can attend the year-end free banquet.

Persons interested in joining SGA should contact Bill on ext. 2844.

* * * *

A group of Sandians who like to play basketball just for fun entered their team, the "Rough Riders," in competition in the recent Los Lunas Jaycee Invitational Tournament — and they came home with first place trophy.

Team members are: Jim Landavazo, Leo Webb, Joe Maes, John Baca, Leroy Holmes (all 7131), and Joe Gonzales (5411).

JUNK • GOODIES • TRASH • ANTIQUES • KLUNKERS • CREAM PUFFS • HOUSES • HOVELS • LOST • FOUND • WANTED • & THINGS

CLASSIFIED ADVERTISING

Deadline: Friday noon prior to week of publication unless changed by holiday.

A maximum of 125 ads will be accepted for each issue.

RULES

1. Limit: 20 words
2. One ad per issue per person
3. Must be submitted in writing
4. Use home telephone numbers
5. For Sandia Laboratories and AEC employees only
6. No commercial ads please
7. Include name and organization
8. Housing listed here for rent or sale is available for occupancy without regard to race, creed, color, or national origin

FOR SALE MISCELLANEOUS

MARTIN 000-28 made in 1948 w/hard shell case, $500; Les Paul custom w/hard shell case, $450; Gibson super 400 made in 1936 w/hard shell case, $1500. Snyder, 264-7181.

SEARS Kenmore self-cleaning elec. range w/Broan hood w/light & 2-spd. fan, 5 yrs. old. Beck, 299-7225.

DRAWING TABLE, $10; Royal elite typewriter, $30, trailer towing mirrors, $12. Johnson, 255-5427.

SEARS Kenmore port. dishwasher, $50; Brownie uniform, tie, belt, hat, size 8, $5. Wilde, 344-6079.

SINGLE maple bedstead, springs & mattress, will deliver in Alb., $50; lg. living room chair, T-cushion, turquoise, $45. Heath, 869-2181.

HAVE $315 merchandise credit at major city jeweler; will sell for $285. Nelson, 298-5761.

CRIB, Kantwet, chest, $40; walker, $2; carseat, $15; stroller, $15; dbl. bed, chest, N.T., $60; Yashica 8mm movie projector, $25; rug, $10. Rack, 294-1751.

AKC Malamute, male, 2 yrs. old, make offer; 2 7.50x16 tires; small refrig.; vacuum cleaner; screen door, 32"x80". Janes, 265-8153.

CAMPER, Cavalier, 8' long, slide-in, ice box, closets, interior & exterior lights, 1970 model. Vigil, 296-3590.

JAPANESE sword, battlefield relic, $25; German sword, $45; Indian & western oil paintings; Japanese magazine rack, $6. Smitha, 266-9977.

TORO power mower, reel type. Hole, 255-1444.

3" TELESCOPE, $29; bongo drums, $17; film editor, $19; Hi Fi stereo speakers, $299. Winblad, 344-3109.

ACCORDIAN, Hohner, 120 bass w/case, $75. Johnson, 344-9369.

BABY BUTLER high chair, stroller, auto. swing, walker, infanseat. Bridge, 296-2310.

STRUM RUGER 22 LR auto., long barrel, adjustable micro sights, $50. Kahn, 299-3377.

CONVERTER, 150 watt, 12 volt DC to 110 volt AC, never used, $100 or best offer. McKinley, 294-0541.

ADMIRAL AM-FM console stereo w/turntable, walnut cabinetry, $75. Karen, 266-4665 after 5.

WEIMARANER PUPS, AKC reg., whelped Jan. 22. Zarucki, 865-9857 after 7.

EADY LOAD bumper-mounted motorcycle rack, $25. Waldorf, 344-1017.

FOR SALE TRANSPORTATION

'69 VW BUG, convert., yellow w/black top, 47,000 miles, one owner. Zickert, 898-3475.

'58 DODGE 300, V8, modified dairy truck, repainted, ideal to make into a camper, $400. Wakeland, 299-2519.

318 CU. IN. DODGE truck engine, $150. Flowers, 281-3458.

'69 PONTIAC GP, loaded, best offer; '71 Yam. 125 MX, extras, $425. Lutheran, 294-3297.

DATSUN PICKUP, camper shell, factory air, heater, pushbutton radio, overload springs, 6-ply tires,-9010 miles, mirrors. Hackley, 299-2333.

'66 PONTIAC Bonneville, 2-dr., 2-tone, HT, PB, PS, AC, tinted glass, radio, $995 or reasonable offer. Thompson, 255-3634.

'67 MONZA Corvair, 4-dr., AT, AC, R&H, new C7813 4-2, new shocks, 18,000 miles, $1000. Mortensen, 299-0806.

'64 IMPALA, R&H, AT, 2 new tires, make reasonable offer. DeMoss, 299-2916 after 5:30.

'67 DODGE Dart GTS, 383 cu. in., disc brakes, AT, runs great but only 10 mpg, make offer or possibly trade. Stoker, 299-7221.

'71 FORD 4-dr. Custom, PS, PB, tinted glass, 400 cu. in. V8, AT, below book for quick sale. Jones, 299-4900.

BICYCLES: 1 10-spd. Schwinn needs work, $45; 1 Sting-Ray Schwinn, $20. Martin, 296-7894.

'56 FORD wagon, orig. owner, currently used daily, $100. Martin, 299-7045.

350 HONDA Road Racer, fairing, 5-gal. fiberglass tank, clip ons, 120 mph, offer/trade for dirt bike; Gates Go-Cart w/o engine, $100/offer. Lucero, 243-7517.

'72 MAZDA RX 3 wagon, radio, radial tires, bluesilver w/white interior, will consider 1967 or later VW bug, trade in. Campbell, 268-8445.

'54 3/4 ton pickup, V8, 4-spd., runs, $250. Martinez, 299-1918.

GIRLS bicycle, 26", $32. Inglat, 877-1146.

'68 PLYMOUTH stn. wgn., factory air, AT, PS, NADA wholesale book. Copeland, 344-1133.

GIRLS 26" Schwinn Collegiate 5-spd., used only 1 semester. Jones, 255-6190 after 5.

'66 TRIUMPH, MK2, w/2 tops & tonneau covers, $550. Kirchmeier, 344-5783.

'65 FORD stn. wgn., 8-passenger, AT, Schubeck, 298-6697.

FOR SALE REAL ESTATE

2-BDR. HOUSE, carport, storage bldg., lg. wb fp, carpet, drapes, new ceramic tile bath, refrig., stove, trailer, access, $15,500. Anderson, 299-7782.

SECLUDED ADOBE, 2-bdr., 2 Mexican tile baths, 2 fp, brick floors, vigas, 60x150' walled corner, near Base, golf, swimming. Burns, 242-2407.

WANTED

VIOLIN, good condition. Fletcher, 298-2142.

LEAD BULLET casting & sizing equip. (furnace, moulds, sizer). Krenz, 298-0619.

DOG HOUSE for medium size dog. Jellison, 296-9155.

PICKUP, Ford, 1967 to 1971, lwb, minor repairs OK. Weems, 268-1702.

OLD upright piano, preferably an old player-piano, any kind, any condition. Howard, 299-5761.

'68 COUGAR XR-7 shop manual. Tippy, 298-3758.

LEFTOVER. washable new scraps for quilts, washable used clothing for rug-making & clean old sheets for quilt backing for charitable project. I'll pick up. Bontrager, 281-3427 after 6.

GOOD 383 engine or short block for 1966 Chrysler. Latta, 299-9380.

TWIN BED in good condition. Zanner, 294-7613.

TRADE: guns and accessories to trade for power woodworking tools; also have accordion to trade. Long, 296-2590.

FOR RENT

UNFURNISHED, deluxe 1 bdr. apt. w/total convenience elec. kitchen, $145., favorable rent reduction w/lease. Furney, 298-5803.

Soul Session Tomorrow

Coronado Club Activities

HAPPY HOURS — Tonight, Oriental Buffet, Christopher on Bandstand, Yolanda in Lounge. March 2 — Special entertainment from 6:30 to 7:30, "Los Copacabanos," Young Swinging Group with Outstanding Girl Singer, Mexican Food Buffet, Sol Chavez on Bandstand, Denny In Lounge. March 9 — Italian Buffet, Country Images on Bandstand, Barbara Clark in Lounge.

SOUL SESSION TOMORROW — Scorpio Playing Big Rock Sound from 8:30 to 12:30, Happy Hour Prices, Super Sandwiches Available, Members Free, Guests $1.

TEEN GO GO — Saturday, March 3, from 7:30 to 10:30, "Sunset" for Dancing, Don Nelson, KQEO, master of ceremonies.

TRAVEL — Twenty Seats Open for Malaga, Spain, Package May 17-25, Package Price $254 Double Occupancy for Nine Days on Beautiful Costa Del Sol. Sign Up Immediately.

Transportation Only Trip to Europe June 5-26 for $288. Land in London, Be Picked Up Three Weeks Later in Paris. $100 Deposit Due Right Away.

Joy McConnochie

Air Force Assn. Meeting on Space Shuttle

The Air Force Association dinner meeting on March 6 features Bastian Hello, Vice President and Program Manager, Space Shuttle Program, North American Rockwell Corporation, whose illustrated talk on technical aspects of the space shuttle will also cover economic and scientific implications of the shuttle.

NASA's space shuttle is the first reusable space transportation system. North American is integrating the system and developing the shuttle's payload-carrying orbiter stage under a six-year, $2.6 billion contract. The shuttle includes the orbiter stage, capable of carrying 65,000 pounds of cargo into earth orbit; an external tank, and two solid rocket boosters. The orbiter lifts off from earth like a rocket and, upon return, lands like a conventional jetliner.

The meeting will be held at the Officer's Club, KAFB-West, with cocktails at 6:30 p.m. and dinner at 7. Other sponsors include ASME, AIAA, ASQC, and the Chamber of Commerce.

For more information call John Dishuck (1651), president of AFA, 264-4476. Reservations may be made by calling 264-1330.

TANK JETTISON — Space shuttle orbiter jettisons external fuel tank shortly after reaching orbital altitude above Earth. The tank, which carries propellants for orbiter's main engines, re-enters atmosphere to impact in preselected ocean area.