

Editorial Comment

A Christmas Gift for '64

A suggestion: This year give the gift that costs no money, cannot be wrapped in pretty paper, but can be passed on from person to person—endlessly.

Give the gift of tolerance, fair play, and sound judgment to a country needing them ever so badly.

How do we give such a gift? Two ways. Pass it on through our personal actions and, second, instill these three virtues in our children.

This is asking little enough. It surely must be the way the Creator of this world intended that the inhabitants of his creation conduct themselves.

Equal opportunity is the subject at hand. The gift of equal opportunity to all Americans is the gift of which we speak.

After years devoted to seeking equal opportunity for all we have realized failure. Now it is necessary to legislate the desired equality. This too will fail unless Americans recognize the difference between what things are and what things ought to be. This is the time for demonstration of our belief in the equality of opportunity—pious protestations are not enough.

Thus we suggest this gift for Christmas 1964. Surely if enough good people do something to create an atmosphere where equal opportunity can flourish the cause will be won.

Edmund Burke put it this way: "All that is necessary for the forces of evil to win the world is for enough good men to do nothing."

Where Do These Christmas Customs Come From? Here're A Few Answers

Mention Christmas to any one of us and immediately we form a mental picture of one of our own favorite Christmas customs. There have been gradual changes to these customs and traditions and in some instances origins cannot be traced. And so today there are many tales and legends of the spirit of Christmas, and from these we choose the following:

The story of the Christmas stocking seems to be the result of a happy accident—One Christmas Eve, jovial St. Nick accidentally dropped gold coins down a chimney. Normally they would have fallen on the hearth, but instead, the money went into a stocking left by the fireside to dry, and a tradition was born.

One explanation of the Christmas tree comes from a German folk tale: The good Saint Winifred, who was preaching Christianity in Northern Germany, came upon a group gathered about a huge oak tree, intent upon offering a human sacrifice in one of their pagan rites. The legend continues that he cut down the tree, and, as it fell, a fir appeared in its place. The event was hailed as a miracle and, from that time on, it became customary for German families to gather about tall evergreen trees on Christmas Eve.

The custom of decorating and lighting the Christmas tree also is believed to have originated in Germany. The first person to decorate a tree may have been Martin Luther. Walking home one night shortly before Christmas, he felt a strong tie between the starry night and the love of God. At home, he placed candles on a little evergreen tree to help his children experience the same wonder. The custom grew and spread through Northern Europe, then to America.

Holly, a Christmas decoration since the Middle Ages, was also thought to have protective powers. Six or seven hundred years ago, young maidens fastened a sprig of holly to their beds at Christmas time to protect them from evil during the coming year.

From Mexico comes this enchanting story: One Christmas Eve long ago there was a poor little girl who was very sad because she had no gift to give the Infant Jesus when they went to church that evening. On the way to church, she gathered an armful of pretty weeds for her gift. With great devotion she placed the weeds at the foot of the Christ child and in-

stantly they burst into brilliant floral blooms. Those who saw the miracle called the blooms, "The Flower of the Holy Night." We call them poinsettia after Joel E. Poinsett, the Ambassador to Mexico who brought them to this country over a hundred years ago.

The music of Christmas has grown and has passed from one generation to another. A favorite of almost everyone, "Silent Night" was composed in the early 19th century by Franz Gruber and Fr. Joseph Mohr in Arnsdorf, Austria. Father Joseph was a priest in the little parish church and Franz Gruber was the organist. But as Christmas approached that year, there was no organ. For age and vermin had destroyed its bellows and it could no longer be played. The two good men wanted something special to compensate for the lack of proper music for the parishioners. So Father Joseph wrote a little poem of three verses, and Franz Gruber set them to music. On Christmas morning, to the strains of Franz Gruber's guitar, Father Joseph sang the beautiful hymn for the first time.



Mary Ann Whitlock

Take A Memo, Please

Take extra care during the coming weeks to guard against accidents which could mar your holiday season.

Sandia Speakers

R. R. Prairie of Statistics and Components Division, "Experimental Designs to Estimate Variance Components and to Reduce Product Variability for Nested Classifications," Dec. 27-30, annual meeting of the American Statistical Association, Chicago.

W. J. Zimmer of Statistical Research Division, "2² Factorial Experiments with the Factors Applied Sequentially," Dec. 27-30, annual meeting of the American Statistical Association, Chicago.

D. G. Kitzinger of Aerospace Nuclear Safety Division II, "Determination of Fission Product Inventory in an Aerospace Nuclear Reactor Used as a Power Source," University of New Mexico Nuclear Engineering Seminar, Nov. 3, Albuquerque.

James M. Peek of Atomic Interactions Research Division, "The Dissociation of the Hydrogen Molecule Ion During Fast Collisions," Joint Institute of Laboratory Astrophysics, Dec. 8, Boulder, Colo.

Paul H. Adams of Area III Laboratory, "Selection of Experimental Stress Analysis Methods," seminar series of the Mechanical Design Division of the Mechanical Engineering Department, University of California, Dec. 2, Berkeley, and North California Section of the Society for Experimental Stress Analysis, Dec. 3, Hayward.

A. C. Littleford of Reliability and Engineering Design Practices Division, "The Role of Reliability in Design Activities," Reliability Program Management Seminar, U.S. Army Management Engineering Training Agency, Nov. 30-Dec. 4, Rock Island, Ill.

Congratulations

Mr. and Mrs. Flaviano Saavedra (4622), a son, Flaviano Jr., Nov. 25.
Mr. and Mrs. Mike Silva (4511), a son, Dec. 9.

TO EACH OF YOU...

OUR BEST WISHES FOR CHRISTMAS AND THE NEW YEAR!

S. P. Schwartz

Paul W. Anderson

R. C. Helcher

B. S. Briggs

J. L. Bice

Glenn A. Fala

F. W. Draper

R. H. Hill

W. R. Campbell

F. Christen

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LAB NEWS
DECEMBER 18, 1964

SANDIA CORPORATION

LAB NEWS

ALBUQUERQUE, NEW MEXICO • LIVERMORE, CALIFORNIA

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Sandia Corporation Will Give Technical Assistance to JTF-2

Sandia Corporation will be providing technical assistance to Joint Task Force - 2, established by direction of the Secretary of Defense and directly responsible to the Joint Chiefs of Staff. JTF-2 will direct and evaluate low level capabilities tests of tactical and strategic aircraft weapons systems and defense against such systems.

Broadly outlined, Sandia's efforts will include, but not be limited to:

1. Providing general systems engineering and analysis in the preparation of detailed test plans.
2. Designing instrumentation systems for use in aircraft and ground equipments at ranges and other test sites. Assuming responsibility for procurement, installation and maintenance of such equipments as requested by JTF-2.
3. Providing on-site monitoring and observation of data.
4. Debriefing of test personnel, and collection and assembly of data.

5. Data processing, analysis and interpretation of data.

6. Aid in preparation and publishing of reports.

Sandia Corporation will establish an organizational unit specifically for the JTF-2 program. This task amounts to an extension of Sandia's existing test and analysis activities and will be complimentary to the weapon development program of the Laboratory.

Maj. Gen. George S. Brown will command JTF-2. He was recently commander of the Eastern Transport Division of Military Air Transport Service and also served as military assistant to Defense Secretary Robert S. McNamara.

Deputy commanders will be Rear Adm. T. J. Walker and Army Brig. Gen. Howard E. Michelet.

Announcement will be made in the near future of the composition of the Sandia organization to work with JTF-2.

Christmas Giving to Needy Goes Full Steam at Sandia Laboratory

Still more Christmas charity projects are being reported to the Lab News.

Cost and Accounting Department is collecting cash and new or used clothing for the Albuquerque Clothing Bank for Needy Children, a non-sectarian organization. The money will be used to purchase shoes. The clothing should be for children from 6 to 16 years of age.

The Bernalillo County Juvenile Detention Home will benefit from the efforts of four divisions: Staff and Management Development Division, Employee Research and Testing Division, Personnel Development Division, and Personnel Processing and Reports Division. Gordon Ross is chairman of the project. The group has several goals: \$85 cash to help the home replace a trampoline; clothing for ages 12 and up (especially jackets and sweatshirts); games; books; and fresh fruit. A similar project was carried out last year and participants felt their

contributions were put to good use.

The two sections of Classified Information Distribution Division have been operating a "country store" in their work area during the noon hour. Homemade baked goods, jams, and jellies have been contributed as well as "white elephant" objects and used paper-back books. Proceeds of the sales will be used to purchase athletic playground equipment for the Casa Linda Day School (for mentally retarded children) and food for several needy families. A similar project last year netted \$500 for the school.

Al Hachigian, chairman of Military Liaison's annual Shoes for Kids drive, reports that \$357 was collected this year. Members of Quality Control Department 2510, who were formerly in Department 2340, decided to continue to contribute to this project, which makes possible shoes for many children at the Riverview Elementary School.

Artist Recalls Early Christmases To Design Lab News Cover Drawing

How would you decide on a theme for the Lab News' annual Christmas cover?

Gordon Snidow, in creating this year's cover, "...decided to depict what Christmas means to me."

There are the Three Wise Men, the Star of Bethlehem, holly and tree decorations, packages and candy canes, a drummer boy and a teddy bear Gordon gave his daughter, and many other things remembered from past Christmases.

From an artistic standpoint, the modern holiday is represented by the modern type used for the greetings and the modern design of the entire cover. The "old" is represented by the line drawings of holly, sleighs, and the drummer boy copied from early advertising art in America. A copy camera was used to repeat both the original art drawn by Gordon and the examples of early Americana.

Since becoming a technical illustrator at Sandia in 1960, Gordon has won numerous awards for his illustrations and has had wildlife studies printed in *Famous Artists* magazine and *New Mexico Outdoorsman*.



THE Lab News' Christmas cover looked like this when artist Gordon Snidow was part way through the drawing and design work.

Sandia Remembers Seriously Ill Employees Again This Christmas

As in previous years, Sandia Corporation will send baskets of fruit to all employees seriously ill or hospitalized during the holiday season.

The names of these employees are provided by department managers. Benefits and Services Division will have the baskets in Bldg. 610, Rm. 3, between 9:30 and 11:30 a.m. on Dec. 24 for delivery to the ill employees by their own supervisors.

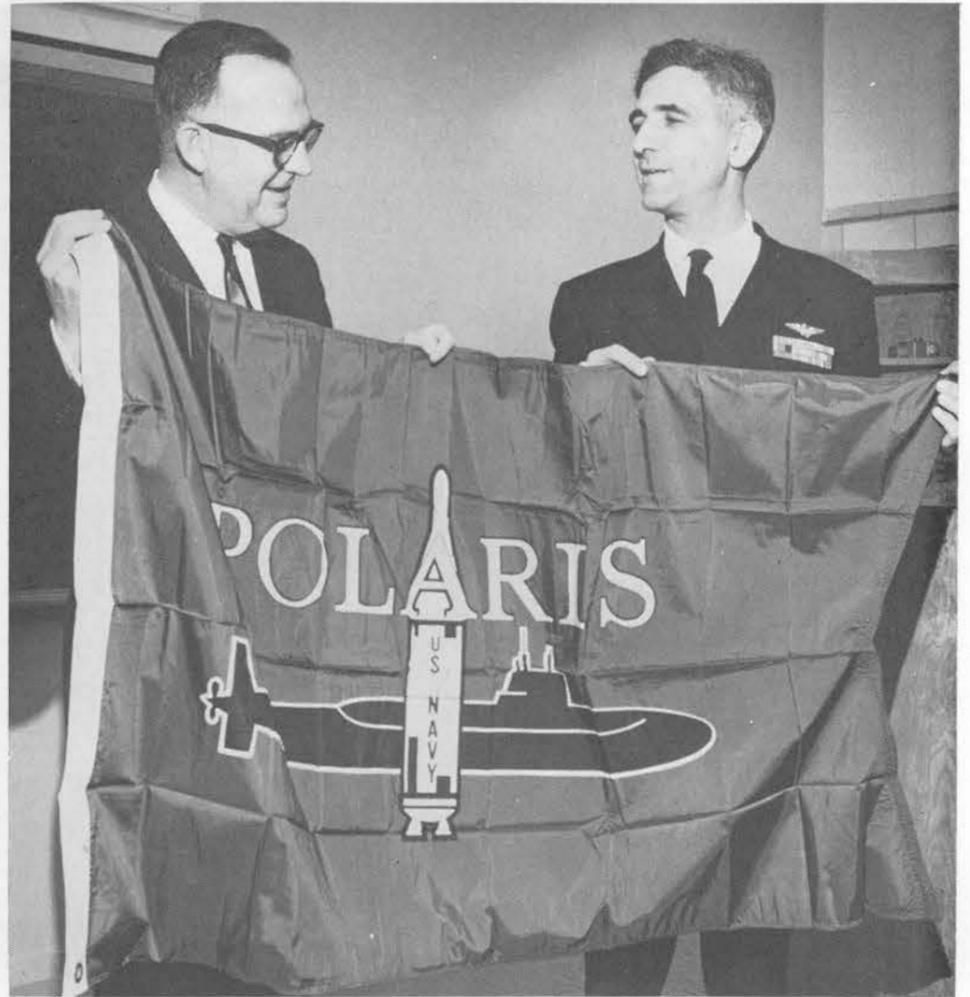
Patent Granted AEC For Work Done by Sandia Employee

A patent for a Barkhausen Oscillation Elimination Means has been assigned to the Atomic Energy Commission in the name of John P. Hoice and George L. Anderson.

Mr. Hoice is in Electronic Development Division and Mr. Anderson was formerly a Sandia employee.

The invention is deemed of particular importance because of the improvement realized through its use in the performance of blocking oscillators in radar systems. The principle of operation is adaptable also to other circuits to eliminate unwanted electron oscillation.

The patent is number 3,158,815.



BADGE OF MEMBERSHIP—Special Project Office, Department of Navy, Washington, D.C., presented the Polaris Flag to Sandia Corporation last week for the support received from Sandia Corporation which has enabled the Polaris Team to meet demanding schedules on time. Cmdr. Alexander Julian made the presentation to R. W. Henderson, Vice President, Weapon Programs, who accepted in behalf of the many Sandia organizations contributing to the Polaris effort. The letter accompanying the Polaris team flag is reproduced below.



DEPARTMENT OF THE NAVY
SPECIAL PROJECTS OFFICE
WASHINGTON 25, D. C.

IN REPLY REFER TO

DEC 07 1964

From: Director, Special Projects

To: Sandia Corp.
Albuquerque, N.M.

Via: Branch Office, Inspector of Naval Weapons
204 Greater Arizona Savings Building
112 North Central Avenue
Phoenix, Arizona 85004

Subj: POLARIS Team Flag

Encl: (1) One Polaris Flag

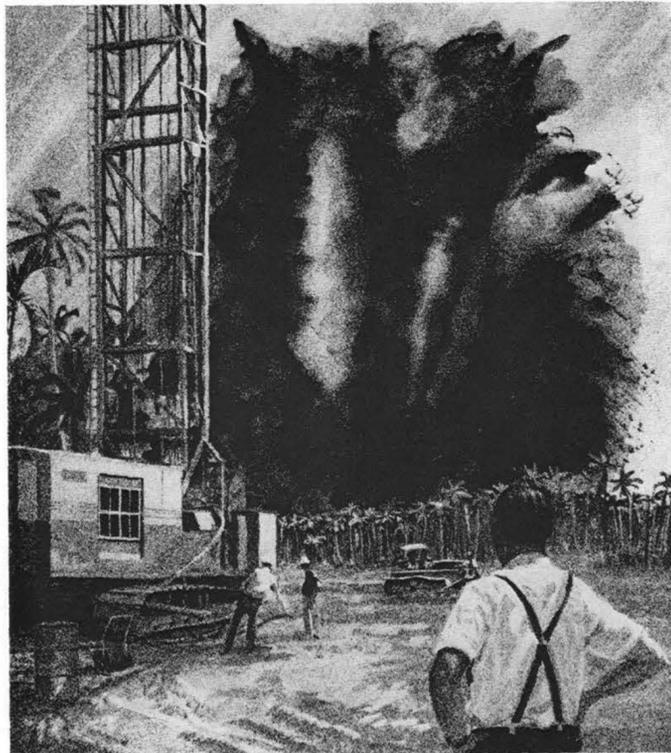
1. The size and scope of the tasks scheduled to be completed by the Navy-Industry Polaris Team during calendar year 1964 clearly mark this year as one of our most demanding yet. At the same time, it must be recognized that the excitement of development work, which has served as an important motivational force, has virtually disappeared. These tasks are now largely production-oriented.

2. The enclosed flag has been designed as an aid in motivating the men and women of the Polaris Team. Displayed from the Sandia Corporation flag staff this flag will be a visual reminder to them that they are at work on the nation's number one deterrent weapon system. At the same time, it will be visual evidence to others that the employees at the Sandia Corporation have this special distinction.

3. This flag is not presented as an award, but as a badge of membership in a unique and vital team dedicated to the defense of our country and the preservation of peace.

4. The support which is received from the Sandia Corporation has enabled the Polaris Team to meet demanding schedules on time and to provide our country with the finest weapon system in the world today.

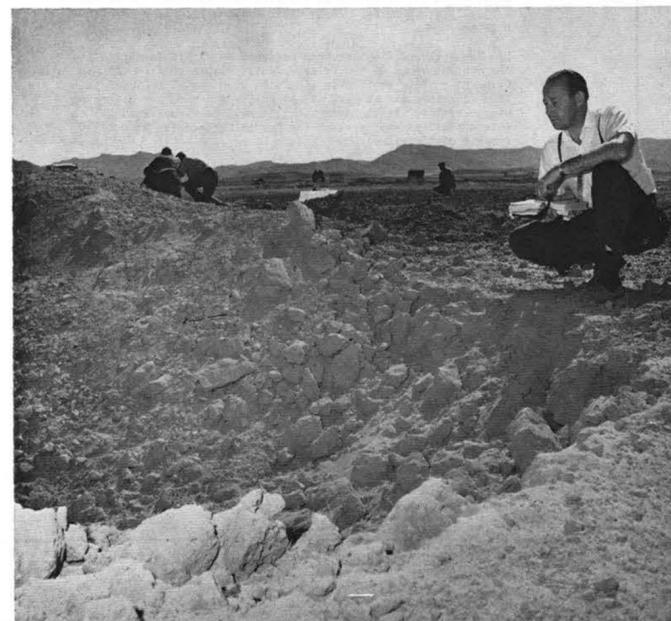
I. J. Galantin
I. J. GALANTIN



PERHAPS SOMEDAY the long and careful efforts of scientists will result in a nuclear detonation—the first step in creating a mammoth new waterway between the Atlantic and Pacific Oceans. The following article tells of what may come to pass—and discusses how it might be done.



COYOTE TEST FIELD at Sandia Laboratory's back door has served as an outdoor laboratory in the study of excavation by explosives. Small charges of conventional explosives tell scientists what might happen if nuclear devices are used to move earth.



CANALS IN MINIATURE were excavated by conventional explosives in studies concerning possible use of nuclear detonations to dig a new canal between the Atlantic and Pacific Oceans. L. J. Vortman, who is in Sandia's Underground Physics Division of the Nuclear Burst Physics Department, is shown here examining one of the cratering experiment results.

Atom may provide . . .

A Bigger, Better Shortcut

The Panama Canal is an impressive monument to man's attraction to shortcuts. History doesn't reveal who first conceived the idea of this famous shortcut, but it was almost certainly Balboa, who crossed the Central American isthmus in 1513 and discovered the South Sea or the Pacific as Magellan later called it.

A navigable passage across this slender strip would have shortened the route to the Indies and the riches of the East by some 7000 miles, a fact undoubtedly communicated to the King of Spain. At any rate, King Charles V initiated the first investigation of such a passage in 1523, and in 1530 ordered the Governor of Panama to make a survey of the route following the Chagres and Rio Grande rivers, the general course which the Panama Canal takes today.

The Governor made a discouraging report, and the King wisely abandoned his plan to unite the two oceans. Many others considered or even attempted such a project in subsequent years, but it remained for the U. S. government to finally get the job done. Work on the canal began in 1904 and commercial shipping started passing through the locks on Aug. 5, 1914. Net cost of the project was \$380,000,000.

Now the canal has reached its 50th birthday, talk has shifted to a bigger and better shortcut—a sea level canal, possibly dug with aid of nuclear explosives. Such a canal would accommodate ships of every size (some 500 ships are now too broad to pass through the 110-ft.-wide locks of the present canal) and would be much cheaper to operate and maintain. Locks, which now lift ships 85 ft. above sea level for the cruise across the 50-mile-wide isthmus, would not be needed, thus eliminating delays which occur because of overcrowding. The present working force of about 10,000 could be cut to about 300 and the \$45 million payroll drastically reduced.

Sandia Suggests
History has also failed to record who first suggested the use of nuclear explosives to dig a new canal. However, one of the first men to take any action on such a project was the late James W. McRae, president of Sandia from 1953 to 1958. Mr. McRae was interested in whether a canal could be excavated across Nicaragua with nuclear explosives. While at Eniwetok for the Redwing nuclear tests in late spring 1956, he asked E. F. Cox (former Sandian and manager of the Weapons Effects Department) to have someone look into the problem. Mr. Cox assigned the task to L. J. Vortman of Underground Physics Division, who immediately set about preparing a report, which he had ready by that November. It was the first report ever published on this subject.

"I simply took the crater dimensions from the military handbook," says Mr. Vortman, "assumed that the craters formed by a burst were always parabolic, and then determined how much the craters should overlap to produce a fairly level channel."

"It was an absurdly simple and naive approach, but it did lead eventually to our efforts to learn how far apart charges should be spaced in a row and at what depth they should be placed for optimum effect."

The work on spacing and burial of row charges was done in Coyote Canyon using conventional high explosives. Coyote Canyon Operations Section, originally headed by D. G. Palmer and now by W. L. Hyde,

directed the experiments. Much of the work was carried out by H. J. Plage, L. A. Hitchcock, and R. E. Fay. Studies of air blast created by row charges are now being conducted at Tonopah Test Range by Rocket & Ordnance Section, headed by R. C. Holland.

Mr. Vortman also designed an experiment in Coyote Canyon using a 1/200 model of a mountainous, 4.9-mile section of Sardi-Morti Route (17), one of the routes proposed for a nuclear excavated canal across Panama. Sixteen high explosive charges ranging from 10 to 260 lbs. were arranged in a row and detonated to show that spacing information gained from row charge experiments in flat terrain was applicable where terrain was not flat.

Plowshare Contribution
Information from this experiment, from the previous row charge experiments in Coyote Canyon, and from the Sedan and Danny Boy nuclear cratering shots at Nevada Test Site form the basis of Mr. Vortman's latest report on use of nuclear explosives to excavate a sea level canal. The 75-page publication, the latest and most comprehensive of many reports on this subject, is part of Sandia's contribution to the Plowshare program.

As a means of excavation, a nuclear explosion has one tremendous advantage over conventional methods—touch a detonator and in the twinkling of an eye the material to be excavated is deposited on the edge of the excavation. Conventional means of excavation involve a great deal more time and effort.

In view of this, the layman is apt to conclude that digging a canal with nuclear explosives is a simple though perhaps hazardous operation. You simply locate a flat stretch of ground far away from populated areas, bury a bunch of bombs in a row, and set them off like a string of firecrackers. Presto, you have a canal, which needs only water to be complete. Radioactivity is the only thing you really have to worry about.

This simple picture doesn't take into consideration dozens of questions of staggering complexity. Would it be cheaper and less hazardous to combine mechanical and nuclear excavation? How much over-excavation is needed to provide a suitable channel after slides and weathering have occurred? Should the canal be relatively narrow (and hence expensive) in order to keep the nuclear yield down or should it be wider and more inexpensive although a greater yield is required? Is it better to choose a short, mountainous route, or a longer, flatter route? Should you use large yields which move more dirt, but which can be fired only on certain days when the atmosphere does not refract damaging air blast waves or use small yields, which move less dirt, but which can be fired almost at will?

Fallout Minor Problem
These are just a few of the questions which must be answered before a new canal can be built. As for radioactive fallout, it may prove to be one of the simpler problems.

"The trend for Plowshare explosives is toward greater cleanliness," says Mr. Vortman. "By the time we get around to digging a canal, the radioactive output of the devices would have become very, very small. Sufficiently small so that air blast and seismic effects will constitute the greater safety consideration."

Mr. Vortman considers nine possible canal routes in his report—Route 1, across Mexico at the Gulf of Tehuantepec; 8, across Nicaragua near Costa Rica; 16, 17, 18, and 19, all across Panama between the present canal and the Colombian border; 23 and 24, which utilize the Tuira river in Panama and the Atrato river in Colombia; and 25, across Colombia. All cross the Continental Divide at elevations ranging from 470 to 1100 ft. Channel

widths of 750, 1000, 1250, and 1500 ft. were computed for all routes.

Channel widths, slope stability, and combining nuclear and mechanical excavation had never previously been examined in any detail, although Mr. Vortman's report shows just how important they are. For instance, he notes that to provide a suitable channel (at least 60 ft. deep and 750-1500 ft. wide) after slides and weathering have occurred requires an average increase in yield of 30 per cent over that required when slope stability is not considered. Cost and number of nuclear devices used remain about the same, however.

Computing Costs
Costs which result from combining nuclear and mechanical excavation are difficult to compute because of uncertainty as to how much mechanical excavation would cost per cubic yard. Mr. Vortman calculated mechanical costs on two levels—50 and 25 cents a yard—but found that nuclear-mechanical excavation for a 1000-ft. channel never exceeds all-nuclear excavation costs regardless of cost level used, and is considerably less expensive—37 per cent less for the Tuira river routes—when the lower cost is used. Mechanical excavation was assumed for all elevations up to 30 ft. above sea level, except where geologic information indicates that rock extends higher than 60 ft. below sea level.

Use of nuclear-mechanical excavation also reduces the number of nuclear devices which would be needed—about 25 per cent fewer for routes 17 and 25 and approximately 55 to 65 per cent fewer for route 23. Yield reduction would be small, however, since mechanical digging would replace only the small yields used at lower elevations; large yields would still be needed for the higher elevations. Radiation would, however, be reduced considerably because the small yields have a larger percentage of radioactive products.

Cost Oddity
Mr. Vortman's calculations highlight one oddity of nuclear excavation—it costs less to dig a wide channel than a narrow one. For example, doubling the width of a channel from 750 to 1500 ft. (slope stability considered) reduces cost about 20 per cent, increases total yield about two and one-half times, and reduces the number of devices 30 per cent. Or, as Mr. Vortman explains it: "The wider the channel, the larger the yield must be; the larger the yield, the farther apart the devices can be placed; the farther apart the devices, the fewer needed; the fewer needed, the lower the cost."

It's this kind of reverse economy that prompts users of nuclear explosives to



TRANSISTHMIAN ROUTES—Studies reveal several possible routes for nuclear-excavated canals. It has been determined that if canals would be dug by such means, excavation costs could be reduced as much as 90 per cent and the total cost by as much as 65 per cent.

think big. If the job isn't big, nuclear explosives probably aren't economical. The canal job qualifies as a big job since it will likely involve moving some five to ten billion tons of soil and rock.

Mr. Vortman figures construction of a 1000-ft. canal with aid of nuclear explosives would, in some cases, run nearly 65 per cent cheaper than construction of a 600-ft. canal built by conventional means. For example, route 17 would cost \$1,833,000,000 with use of mechanical-nuclear excavation, \$5,132,000,000 with conventional excavation only, or 180 per cent more. Route 25 would cost \$2,189,000,000 for mechanical-nuclear, \$5,261,000,000 for conventional, or 141 per cent more.

Mr. Vortman's report not only contains a wealth of new information, but pinpoints areas where future study must be concentrated.

"For instance," he says, "we don't know how to predict the exact size of craters which result from varying amounts of nuclear explosives. We are now using two methods of scaling ($W^{1/3.4}$ and $W^{1/4}$), but we don't know which is the more nearly correct."

"We will have to find out which is the more correct because the two produce radically different results. $W^{1/4}$ would require yields 250 to 300 per cent greater than would be needed if $W^{1/3.4}$ scaling is correct. Blast and seismic safety problems would thus be considerably more difficult. Cost of excavation would not be greatly affected, however."

"To solve the scaling problem, a number of nuclear experiments will have to be made. High explosive experiments will yield a great deal of information, but refinements will have to come from nuclear cratering. The test moratorium is a roadblock in this respect."

Possible Canal Routes Analyzed

Route	Location	Length	Maximum Elevation	Number of Devices	Maximum Single Yield (Megatons)	Total Yield (Megatons)	Excavation Cost (Million \$)
1	Mexico	163 (8)	812 (4)	1010 (9)	20 (3-5)	921 (9)	1084 (8)
8	Nicaragua	168 (9)	760 (3)	957 (8)	20 (3-5)	657 (8)	1093 (9)
16	Panama	39.4 (1)	1100	114 (1)	50	537 (7)	231 (1)
17	Panama	45.6 (2)	1100 (7-9)	196 (2)	50 (7-9)	347 (4)	301 (2)
18	Panama	46.5 (3)	1100	204 (3)	50	363 (5)	308 (3)
19	Panama	49.7 (4)	720 (2)	234 (4)	15 (2)	321 (3)	330 (4)
23	Panama-Colombia	127 (7)	470 (1)	373 (6)	3 (1)	204 (1)	721 (6)
24	Panama-Colombia	125 (6)	957 (6)	361 (5)	20 (3-5)	275 (2)	705 (5)
25	Colombia	104 (5)	932 (5)	510 (7)	30 (6)	384 (6)	844 (7)

Calculations for all routes are based on 1000-ft. channel width, $W^{1/4}$ scaling and long-term slope stability. Calculations for all routes except 1 and 8 are based on mechanical excavation (at 50 cents a cubic yard) to an elevation of 30 ft. above sea level. All nuclear excavation is figured for routes 1 and 8 because mechanical excavation is very small.

Excavation costs cover only expense of mechanical or nuclear excavation and are not to be confused with total costs.

Numbers in parentheses give the relative merit for the item shown.

Sandia is now conducting air blast studies (primarily by Jack Reed and Larry Smith of Aerospace Physics Division) and Mr. Vortman notes that results from these and other seismic and blast effects experiments must be examined before the maximum permissible yield for any route can be established. Excessive yields would, of course, cause property damage in populated areas.

"Offsite seismic problems must be explored by firing small charges of high explosives at points where nuclear explosives will be fired, then recording signals at points of potential damage," Mr. Vortman says. "Air blast can be determined by microbarographic measurements of small high explosive charges or by rocket probes of the ozonosphere."

"Experiments must be conducted which will determine if distant air blast and seismic signals can be reduced by sequential firing of charges in a row. If so, the optimum delay interval should be determined. Obviously, all the charges can't be fired at once. This would create an insurmountable blast safety problem."

"It's now impossible to state just what length of channel might be excavated at one time. This will depend on elevation, atmospheric conditions, proximity of populated areas, etc. Sections excavated sequentially in one operation might range in length from a few hundred yards at high elevations (because of greater yields needed to dig down to below sea level) to several miles at lower elevations."

More Mapping Needed
Mr. Vortman also points out the need for more thorough mapping of the isthmus.

"All surveys to date were made with mechanical excavation in mind," Mr. Vortman says. "These surveyed routes might be the same for nuclear excavation or they might not. The route eventually chosen for a sea level canal will likely be one of the nine (in the report), but it might be partly or entirely different."

Mr. Vortman feels it's still unwise to single out one of the routes as the most feasible for a nuclear-excavated canal.

"Based on current knowledge it's much too early to select a particular route," he says. "No one route has an overwhelming edge when all factors are considered. Every route has at least one major disadvantage."

"For instance, the shortest routes—16, 17, and 18—have the highest elevation, 1100 ft., and thus would require the largest single yield—some 50 megatons. Route 16 requires the largest total yield of the shorter routes and would be the most difficult operationally since it is only 30 to 50 miles from heavily populated areas in the Canal Zone. The route, however, would be the least expensive."

"Routes 17 and 18 are the next least expensive, are fairly remote, and like route 16, involve less radioactivity because they require a small number of devices. Route 19 is in the middle of the road on all counts."

"Route 24 is the next most costly if low-lying regions (below 30 ft. above sea level) can be excavated for 25 cents a cubic yard. The area is remote, the total yield would be quite low, the maximum yield would be the lowest for any route,

but the number of devices would be large in comparison with other routes.

"Route 25 would cost about twice as much as route 17 by the least expensive method of excavation. The total cost, number of devices, and the total yield are dependent upon the extent to which mechanical excavation is combined with nuclear excavation."

Mr. Vortman believes all nine routes are technically feasible (although safety problems vary in complexity), but notes that routes 1 (Mexico) and 8 (Nicaragua) have significantly higher costs.

"These two routes are practical only if political factors are of over-riding importance," he said. "Route 1 would also trim some 1200 miles off the shipping distance from our east to west coasts, but this is of dubious value since only a small percentage of the overall usage of an isthmian canal is for such shipping."

(See accompanying table for further ranking of routes.)

Will a sea level canal ever be built? Mr. Vortman thinks so.

"Despite the hazards, the advantages of a canal dug with nuclear explosives are too great to overlook," he says. "The reduction in costs, up to 65 per cent, is in itself a tremendous advantage. Inexpensive operation and maintenance is another important factor as is the ability to accommodate ships of any size."

"However, such a canal isn't apt to be built in the next two or three years. If there were an emergency, the U. S. could perhaps blast out a canal using bombs instead of Plowshare explosives, but this could only be done by over-designing and by working beyond desirable safety thresholds."

"Aside from such a quick and dirty project, I'd estimate that a canal excavated with nuclear explosives is considerably further away. After emplacement of devices it would probably take from two to five years before the canal is ready for use."

Mr. Vortman is not even sure that a sea level canal built with nuclear explosives is the next step in canal technology.

"The proposal to construct a third lock, which would accommodate larger ships and cost a great deal less than a sea level canal, has a lot of merit for the immediate future," he says. "Also, the cost advantage of a sea level canal in a new location over conversion of the present canal to sea level by mechanical methods could be offset by the price a host nation might ask for a new site."

Despite these reservations and the restrictions imposed by the test moratorium, Mr. Vortman feels studies of a nuclear excavated sea level canal should move ahead as rapidly as possible.

"We can't sit on our hands until we need such a canal," he says. "The job is much too complicated and takes too much time for that. In the intervening years, we should be surveying, core drilling, selecting routes and working with high explosive charges of varying sizes and in different media. Also we need to work with nuclear explosives as early as permitted."

"If we do all this, I am sure we'll eventually have a canal which will accommodate any ship at any time with a minimum of difficulty." In other words, a perfect shortcut.

Drop Tests in Nevada Desert 'Prove-in' Sandia's Weapon Designs

Three to five tests are conducted at Tonopah Test Range weekly and each is a cause for intensive preparation.

"A lot rides on each test," says Dick Browne, range manager. "Failure to get the required data can be costly in both time and money."

"The flying time, test components, equipment preparation and operation, and data handling involved in each test add up to several thousand dollars, but probably more important is the way a test failure can affect development programs."

"Most ballistic test programs are on a tight schedule. Failure to get test data on time could cause design and development engineers to miss their schedule. This is one of the reasons why special attention is given to preparation for a test."

Data from the test, which consist of rocket firings and high and low altitude drops from aircraft, cannot be obtained from other kinds of tests.

"Flight test data confirm design criteria

worked up on paper or in related tests," says Dick, "and the design engineer must have this information in order to have full confidence in the design."

"Many different tests have been designed, but as yet there is no substitute for full flight tests such as those conducted at Tonopah."

Approximately 680 drop tests and 555 rocket tests have been conducted at the range since February 1957. All or part of the required data have been obtained more than 95 per cent of the time.

Sandia employees who would like to take a part in these tests may request of their supervisors for consideration for transfer to Tonopah Test Range. Presently a staff member electrical and several staff assistants electrical are being sought for work at the range.

Preparations are made for about 10 tests each week, but approximately half of these are cancelled or postponed for a variety of reasons. Yet all require the same amount of preparation time.

A typical drop test takes only about two hours from start to finish, but planning and plant and equipment maintenance keep the 40-man staff busy the remainder of the time. Keeping the intricate data gathering systems—tracking telescopes, radar, photo-theodolites, TM receivers, etc.—in peak operating order is a major task in itself.

A test may take place at any time, but low level, close-in drops are usually conducted early in the morning, high altitude drops at mid-day, and rocket firings in the late afternoon. These times have been judged best for the various tests because of lighting conditions.

Tracking cameras and other high speed cameras placed geometrically around the main target areas and in some instances in the test vehicle itself are used to record the behavior of the vehicle from the time it leaves the aircraft until it impacts. Data on aerodynamic stability, separation from aircraft, acceleration and impact are gathered in this manner.

The roll, pitch, and yaw of the ballistic case during flight are measured by gyroscopes within the case and this information is relayed to ground receiving stations where it is recorded on oscillographs and magnetic tape.

Data on pressure, structural strain, voltages, switching functions, external and internal temperatures and vibration effects at critical points within the weapon are also obtained and transmitted to the ground stations.

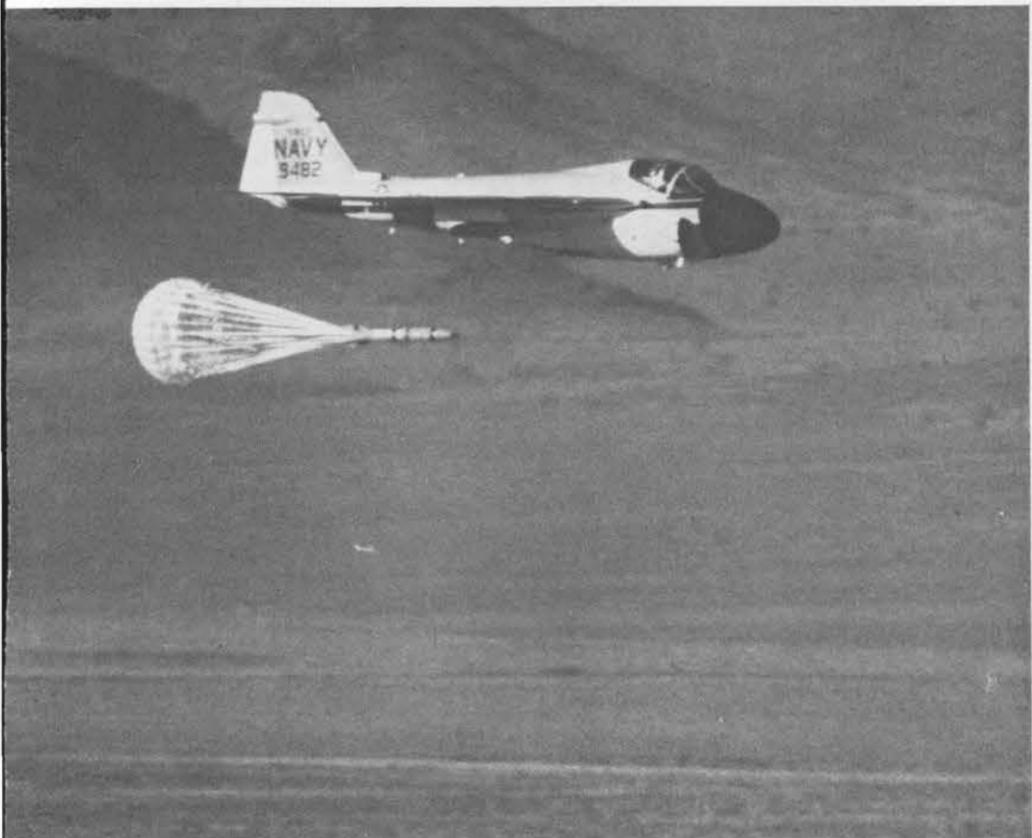
The same equipment is used to obtain similar data during rocket firings. The solid propellant rockets, fired at altitudes up to 300,000 ft., are used to subject test specimens to greater speeds and altitudes than would be possible by drops from aircraft.

Once a test is completed the data is packaged and forwarded to Albuquerque for analysis and distribution to the cognizant or responsible organizations involved.



CONTROL POINT at Tonopah Test Range coordinates optical, electronic and telemetry systems to ensure that all are functioning properly as countdown progresses. Contact is also maintained with test aircraft. From top to bottom are: John Lindman, Ken Nielsen, R. R. Petri (standing), Rush Robinett, and Fred Steele.

TRACKING TELESCOPE records release of test vehicle from aircraft during test drop at Tonopah Test Range.

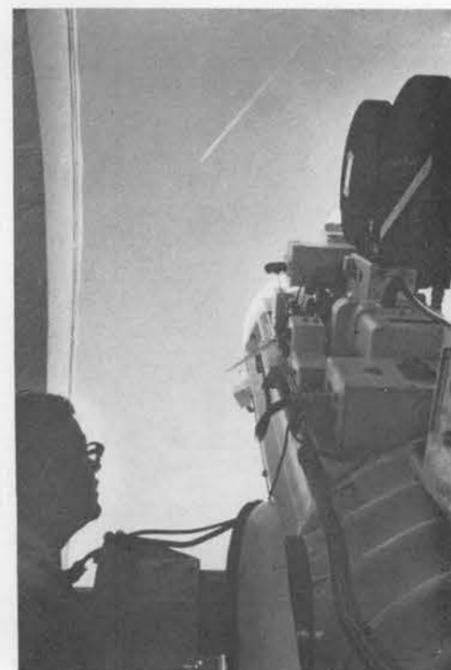


SILHOUETTED AGAINST AFTERNOON SUN is an AN-MPS-25 radar, located on Radar Hill some 700 ft. above the dry lake which comprises the main target. The one megawatt radar has a maximum range of 500 miles and a 12-ft. diameter parabolic reflector. Operators are Grant Gardner, left, and Bill Moore, Special Facilities Section.



END PRODUCT FROM A TONOPAH TEST—Dave Schafer, left, of Tonopah Range Operations Division, and William Patriquin, Reynolds Electric Company, are identifying records received from a test operation. The data from this particular test (No. 120-29) was recorded on 8000 ft. of motion picture film and 300 ft. of 5/4-in. film. This film contained more than 128,000 individual color pictures and 10,000 black and white pictures. In addition, 2500 ft. of magnetic tape was used and 300 ft. of paper to record telemetering signals. Total time recorded on film and tape was approximately 50 seconds.

DUMMY RUN thousands of feet above tracking telescope operated by H. D. Moody, Optical Measurements Section, signals start of test drop at Tonopah Test Range.



University Seeks Holiday Homes for Foreign Students

University of New Mexico dormitories will be closed during the coming holidays. The Community Committee for Hospitality to Foreign Students is looking for "host" families to share the Christmas season with a foreign student.

"Aim of the committee is to extend friendship to every foreign student in Albuquerque," says Lane W. Peterson of Logistics Division, Quality Assurance Operations Department. "We want to give them an opportunity to know an American family, visit in their homes, learn our cultures, and have opportunities of sight-seeing. Just as important, we feel, is the opportunity of local families to get to know of foreign customs." Mrs. Peterson is chairman of the committee.

Anyone interested in helping with the project is invited to contact Lane, tel. 298-4578, or the UNM Foreign Student Advisor's Office, 243-8611, ext. 469.

PAGE SEVEN

LAB NEWS

DECEMBER 18, 1964

Luminarias Will Burn Again for Visitors to Los Altos Community

Los Altos is a unique community within Albuquerque, a one-style architectural unit along the lines of a traditional Pueblo. The 30 homes in the community are connected by their outside walls. The location at Coors Road SW and Bridge Blvd. uses the crest of a hill and various levels of the site.

It is this architecture and hillside site that makes the community one of the outstanding places to visit on Christmas Eve during Albuquerque's traditional display of luminarias.

For several years now, the families of Los Altos have placed luminarias throughout the community. Florencio Baca, supervisor of Janitor Services Section, is chairman of the Los Altos decorating committee this year.

"Eight thousand luminarias will glow Christmas Eve at Los Altos," he says. "We'll be using long-burning candles and

Italian Woodcarvings In Nativity Scene Pictured Here

Lab News photographer Bill Laskar took the accompanying Nativity scene at Winrock Shopping Center. The figures are part of a display of 15 which occupies a central location in the shopping center mall.

The hand-carved figures, about 60 in. high, are imported from Ortegui, Italy. This village, and those nearby in the Italian Alps, compose "the woodcarving capitol of the world." Generations of artists have taught their art from father to son.

To achieve the soft effect and create the glowing star in the photograph, Bill used a nylon stocking over his Nikon lens. The "star" is actually a flash bulb.

Make Reservations Now for New Year's Party at Coronado Club

Reservations are now being taken for the Coronado Club's annual New Year's Eve ball.

The big event will feature dancing to Jack Shearing's Orchestra in the ballroom from 9 p.m. to 1 a.m. Tommy Kelly's Orchestra will be playing in La Cana room.

Tickets include champagne, favors, and breakfast and are priced at \$7.50 per couple for club members and \$15 per couple for guests.



"When they saw the star, they rejoiced exceedingly with great joy; and going into the house they saw the child with Mary, his mother, and they fell down and worshipped him."

—Matthew 2:10

SHOPPING CENTER

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 Corporation 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

TWO DRESSERS; trailer hitch; mattress: hide-a-bed and chair; Boston Bull Terrier w/shots. Naumann, 298-3559.
24" GIRL'S BIKE, \$15; 3-burner Coleman gas stove, \$12.50. Hawley, 255-0332 after 5:30.
TWO PAIR ladies shoe-type ice skates, 1 pr. shoe size 5 - 1 pr. shoe size 7. Martinez, 299-1918.
3-BDR., 1 1/4 bath, LR, DR, attached garage, new carpeting, a/c, w/h, \$2000 down, assume loan. Durgin, 298-3581.
COCKTAIL TABLE, large round blond mahogany; drum table, blond; lamp table, blond, formica top. Avallone, 256-0405.
STEREO TAPE RECORDER, Voice-of-Music, 4-track, 2-track, and add-a-track, 3 3/4 and 7 1/2 ips, automatic cutoff, current model, \$98. McIntire, 298-6145.
BLACK MINIATURE FEMALE POODLE, 3 mos. old, registered. Howard, 255-9489.
'59 WESTINGHOUSE ELECTRIC STOVE; grey and white dinette; rose beige sectional and chair. Smeltzer, 296-3908.
COLT DERRINGER, \$20; German hunting knife, \$4; dagger, \$8; sword, \$10; fine German Luger, \$75; want Flintlock pistol. Smitha, 299-1096.
KENMORE AUTOMATIC WASHER, '59 model, \$75. Hosterman, 256-9560.
ABC ELECTRIC CLOTHES DRYER, single speed, \$35; Kelvinator washer, bearings need replacing, otherwise good, \$10. Yates, 299-7117.
TWO LARGE LOTS Tres Pintas Canyon, title insurance, cash or terms. Weir, 299-1160.
'63 PONTIAC Sport Sdn., original owner, fully equipped including factory air, can transfer 10,000 mile factory warranty to buyer. Browning, 299-6384.

BICYCLE, girl's 26" Texas Ranger, thornproof tubes, almost new, \$30. Elliott, 256-7909.
DINETTE SET, 4 chairs, \$40; walnut bookcase, \$8; floor lamp, \$4.50; beige nylon frieze chair, \$35. Fite, 255-6943.
TWO 9x12" foam backed rugs, used 6 mos., paid \$60 ea., sell both for \$60. Sanchez, 12224 Pineridge NE, 298-3130.
POLAROID MODEL 80 Land Camera w/Model 281 flash and diffuser and Polaroid leather carrying case, \$30. Bartlett, 268-6138.
'63 HONDA, 1500 miles, \$225 including helmet; radio controlled airplanes w/accessories, transmitters and receivers; boy's suits, sizes 10 and 12, \$10 ea. Reed, 299-1684.
.22 CAL. SUPERMATIC, two weights, extra barrel, carrying case, holster, cleaning kit, Hi-Standard booklet, 250 round ammo, all for \$65. Alvino, 255-6339.
DRAPES, 3 prs., 90" wide, 83 3/4" length. Merrell, 299-0348.
'53 BUICK Special series 40, snow tires and trailer hitch, \$125 cash; Gilbert 180 watt mixer w/fruit juicer and meat grinder, \$25. Butler, 299-1316.
12" CRAFTSMAN band saw w/1/2 HP motor and stand, \$80. Oliver, 299-8853.
'55 CHEVY, 4-dr., stick shift, R&H, \$275. Salazar, 255-1301.
AMANA upright deep freeze, 12 cu. ft.; Kenmore washer-dryer console; Crosley radio-phonograph-TV console. Johnson, 255-0262.
CAR TOP LUGGAGE CARRIER, 4x6', heavy duty canvas cover, zipper side opening, \$20. Courtin, 299-9056.
PARTS, '63 Renault, carburetor, generator, distributor, voltage regulator, two 5.00x5.75 15" tires. Sweatman, 2017 Cagua NE, 256-0300.
SKI BOOTS, Dolomite, size 10, \$10. Bolek, 298-8531.
BICYCLE, girl's 26" English Racer, \$20. Gumley, 298-1667.
10" RADIAL ACCRA ARM SAW w/sabre saw attachment and molding set w/heads and cutters, all for \$190. Neun, 299-9188.
'54 FORD SEDAN, AT, radio, \$130. Rakoczy, 256-0433.
BLUE POINT SIAMESE kittens. Swaim, 268-2035.
SKIS, poles and boots, size 9, \$40. Wagner, 268-7868. after 5.
'59 GERMAN FORD TAUNUS station wagon, \$295. Wilder, 256-7045.
'61 BMW MOTORCYCLE, R-50, 500 cc., 25HP, \$795 or \$500 and take over payments. Harris, 299-8067.

BOY'S 24" and 26" bicycles, balloon tires, \$10; English 3-speed, \$32; 21" TV Philco console, \$50. Barth, 299-2668.
'55 GMC 1/2-ton pickup, 4spd., hydromatic, heavy duty rear bumper, steel bed, complete rebuilt engine and transmission. Robinson, 256-2903.
5-PIECE OAK BEDROOM SET. Williams, 344-1161.
26" BOY'S bicycle, \$15. Cowham, 298-4249 after 5:30.
SPORTS CAR HEATER, 12 volts, will fit MG, Triumph, etc., \$10. Laskar, 299-1024.
AMERICAN FLYER electric train; Tiffon crystal, Belvedere pattern. Arnot, 252-5025.
SKIS, 6'9" w/Cubco bindings, Kastinger ski boots, size 9 1/2 D, all \$30; maple 4-drawer dresser, needs refinishing, \$30. Arthur, 299-7044.
'59 MERCEDES BENZ 190 sedan, beige w/red leatherette upholstery, \$1095. Akin, 299-4242. after 6.
30 CARBINE, NRA good, w/o magazine, \$40; 30-06 heavy weight Match rifle, marksman stock, less sights, NRA good, \$95. Milton, 299-4562.
SKI BOOTS, man's size 9E, Swiss-made Henke, \$15. Burns, 242-2407 after 6.
'58 CHEV. IMPALA, 2-dr., R&H, auto., \$650 cash. Sanchez, 256-1064.
GIRL'S BICYCLE, 26" w/basket and stand, ready to ride, \$10. Drake, 299-0743.
ENCYCLOPEDIA AMERICANA, complete 30-vol. set, 1952 ed., \$50. Miller, 255-7716.
POODLE, miniature, female, black, eight months, AKC registered, \$39, will hold till Christmas; dining set, sabbled oak, \$69. Winblad, 344-3109.
COMBINATION radio and record player, Zenith radio and Cobra-Matic changer, \$35. McCabe, 255-6872.
FREE KITTENS; '55 Ford. Tatum, 877-0997.
CONN SPINET ORGAN w/bench and beginner's lessons, walnut finish, \$600. Helwig, 242-8393.
FEMALE GERMAN SHEPHERD, AKC, black and silver, 7 mo; transister inter-com, battery operated, ideal for camper. Calvery, 255-9545.
LIONEL TRAINS, 3 sets and extras, one steam freight, two other units. Bonk, 265-4808.
TIRE CHAINS, size 8.00x14, 7.00x15, new \$7.50; ladies bowling bag, new, \$2.50. Latta, 299-9380.
TWIN BEDS, maple, headboards, footboards, and extra long sideboards, \$40; registered 3/4 Arabian colt, \$450. Galbreath, 898-0644.
ELECTRIC ORGAN, retail \$110, Italian made, \$60; light weight steel double laundry tubs w/steel cover, \$10. Morgan, 299-2850.

SELL OR TRADE; '59 MERCURY Parklane or '56 Dodge Coronet. Elder, 268-7479 after 5.
HI-FI, Wehcor table model w/removable legs, 3 speakers, 3 speeds, mahogany, \$35. Sektan, 298-0373.
'63 CHEVY CORVAIR 4-dr., AT, transistor radio, 17,800 miles, one owner, \$1295. Banos, 256-6613.
WESTINGHOUSE REFRIGERATOR, 9 cu. ft. w/small freezer compartment, \$40 or best offer. Chavez, 298-0674.
TRAIN, Marx 0.27, 6 unit, \$15 or compromise; Books of Western World, 14 assoc. vol., \$200. Haycock, 268-0818.
HAVE SEVERAL ITEMS TO TRADE for school bus, any size, any year, any make, any condition. Ernst, 268-9414.
BICYCLE, 26", 10 speed, w/headlight and generator, double thick inner tubes, \$47. Magruder, 255-2078 after 5.
'61 CHEVROLET Bel Air Station Wagon, V8, full power and extras. Capaldi, 318 Mesilla NE.
SWAN 400; tuner 406 UFO; power supply No. 512 and bandspanner. Silva, 298-8039 after 6.
'58 FORD 2-dr., HT, AT, R&H, transistorized ignition system installed, \$400. Carmichael, 4904 Pershing SE, 268-6083.
'60 FALCON station wagon. Montano, 344-3797.
'57 OLDS 98 convertible, \$275. Barefoot, 898-0260.
'58 CHEVROLET Biscayne, 2-dr., sed., 283 V-8 engine, AT, PS, R&H, new tires—brakes, muffler, 52,000 miles, \$650. Guzman, 344-9287.
'57 DODGE 2-dr., rebuilt engine, transmission, w/four new tires, make offer, call collect, 112-983-6819 or Anderson, 264-1731.
DINETTE SET, table and four chairs, formica top, \$25. Smart, 298-0987.
'55 CHEVROLET V-8, Powerglide, R&H, \$225. Sanchez, 255-2912.
'55 OLDS 88, R&H, Hydro, \$250. Palmer, 256-3164.
TRAIN, American Flyer, w/uncoupler and re-railer, \$15; chest, three large drawers, \$15. Bright, 256-6733.
'54 MERCURY Monterey, new shocks, R&H, AT, HT, \$125. Jensen, 299-9476.
GOLD and burnt orange brocade modern 2-piece sectional, \$45; kitchen table, 30 x 45" w/4 red chairs, \$35. Paul, 256-6228.
KAY ELECTRIC GUITAR, dual pickup, w/amplifier, \$70; Heath HW-20 Pawnee two-meter transceiver. Rea, 299-9315.

'58 CHEVROLET, 6-cyl., stand. trans., recent overhaul, new tires. Roth, 255-9817.
BELL AND HOWELL 8mm projector, screen and bar light. Austin, 299-8598 after 5 p.m.
LUGGAGE, 5 piece set ladies, J. C. Higgins Taperlite saddle tan, \$40. Taylor, 299-2281 after 5:30 weekdays.
TYPEWRITER, Unerdwood portable, \$20; infant seat, \$1.50; baby car seat-swing combination, \$3.50. Gragg, 298-0267.
MOUTON LAMB COAT; maternity blouse, both size 16; playpen pad, 2 sets crib bumper pads. Svensson, 344-7700.
SIMPSON PIANO. Hall, 298-3774.
'53 OLDSMOBILE 98, 4-dr., PS, PB, R&H, automatic light dimmer, Hydromatic, \$350. Robertson, 298-2388.
CHINA three four-piece place settings, York Rose by Castleton, \$15 per setting. Conrad, 299-2432.
'54 OLDS. Morrisett, 298-2884.
AKC REGISTERED German Shepherd puppies, 6 wks. old, Dec. 23, \$50 up. Brown, 299-0315.
BOY'S BICYCLE, 26", thorn proof tubes, \$15. Hof, 255-5915.

WANTED

RIDE from San Pablo SE to Bldg. 805-806. Dey, 256-1970.
WINCHESTER or Remington shot gun, 12 ga., pump, 28" barrel, modified. Bear, 298-2744.
FEMALE ROOM MATE to share rent and utilities. Rico, 242-7741.
RIDE from 880 parking lot to San Pedro and Trumbull SE. Pezzillo, 265-0918.

FOR RENT

HOME, 3-bdr., furnished, redecorated, landscaped, fenced, near bases, schools, \$125. Wynant, 298-5042 or 344-3328 after 7.
ROOMS for two men, convenient to bases, private bath. Roberts, 299-7407 after 4.
COLLET PARK SCHOOL DIST., 3-brd. house, den, 2 baths, double carport, carpets, drapes, \$125. Butler, 299-5626.

LOST AND FOUND

LOST—Parker pen, beige cloth button, starrett scale, IBM template, man's brown hat, man's prescription glasses, blue knitted slipper sock, Plymouth car keys. LOST AND FOUND, tel. 264-2757.
FOUND—Lady's clear prescription glasses, auto bracket. LOST AND FOUND, tel. 264-2757.

Sandia Hams Prepare to Compete In CQ-WE Radio Competition

Fifth annual CQ-WE contest for licensed amateur radio operators will be held in January 1965, according to E. G. Stewart of Plant Systems Division, Sandia Laboratory contest coordinator. The contest is open to all active or retired Sandia Corporation, Western Electric, and Bell Telephone Laboratories employees.

Host for this year's contest is the Columbus Works of Western Electric Co. All participants are eligible to compete for the individual trophy, which goes to the operator with the highest point score, and to contribute toward the Works Trophy, which goes to the location whose hams amass the largest number of points.

Hawthorne of WE is defending the Works Trophy this year, having won in 1964 with a total of 7118 points collected by 32 participants who submitted logs. Top individual scorer in the contest was Bob Sprung of Hawthorne who collected 1600 points.

Other prizes to be awarded are special certificates to the top-scoring novice and technician operators. Certificates will also be issued to all who participate and submit logs.

The schedule calls for three two-hour sessions on the weekends of Jan. 9/10 and Jan. 16/17. The schedule for novices, VHF, and RTTY is slightly different: one four-hour operating session on Sunday, Jan. 24.

Some of the operating rules and scoring methods have been changed this year. At the request of numerous operators, the rules now provide for simultaneous CW and phone operations and this new dual-mode schedule should encourage all licensees to participate 100 per cent of the time.

The scoring to determine the winner of the Works Trophy has been changed. In the past, the location with the largest number of licensed operators was favored in the scoring. To alleviate this, the aggregate scores will be multiplied by a "participation factor" this year. The factor is to be equal to the number of logs received from each location divided by the total number of licensees associated with the location. Lo-

cations with fewer licensees—if they can generate real enthusiasm and high participation—will be able to obtain very high factors, and thus place their locations in more favorable positions for winning.

This raised a problem at Sandia, Mr. Stewart says, since the total number of licensed Sandia amateur radio operators is unknown. He urges that all hams contact him as soon as possible. His mailing address is 4915 Palo Alto SE, telephone 256-9290.

Members of the Albuquerque Amateur Radio Club will be active in the CQ-WE contest in Albuquerque. President John Hoice of Electronic Development Division or Treasurer Ed Bales of System Test Development Division I will distribute contest schedules and provide additional information. Licensed operators at Sandia are urged to contact one of the three men listed.

At Livermore Laboratory, radio hams may contact A. L. Pearson of Plant Maintenance Division for contest information.

AEC Granted Patent For Ultra-Clean Room Of W. J. Whitfield

A patent for an Ultra-Clean Room has been assigned to the Atomic Energy Commission in the name of Willis J. Whitfield of Advanced Manufacturing Development Division.

Since the AEC filed for the patent in 1960, Mr. Whitfield's laminar flow theory has been used by numerous manufacturers in designing clean rooms, work stations, and portable units. By utilizing a down-flow of air, it is possible to reduce contamination by microscopic dust particles to low levels never before attainable in clean room facilities.

The invention has been considered a significant breakthrough in a field of increasing importance for assembly of complex and miniaturized components.

The patent number is 3,158,457.

This Expert Help Surely Must Be Appreciated by S***a C***s

With a hearty "Ho, ho, ho" Ray Smelich proceeded to explain the fun he's had during the past 17 years, visiting private homes, club groups, and organizations on Christmas Eve in his role of S***a C***s (his true identity is hidden to protect young children).

"It all started here in Albuquerque in 1947 when I was in the insurance business," Ray said (he's now supervisor of Technical Information Distribution Section). "I thought it would be in the spirit of Christmas—and also a goodwill type of thing—to visit my policy holders as S***a C***s." So for two or three weeks before Christmas, Ray and his wife purchased trinkets and wrapped packages. They had made prior arrangements with the 25 families to arrive at a certain time and in many instances the families left gifts under trees or bushes or inside the family car for S***a C***s to pick up and personally hand to the young recipient.

The first year Ray borrowed the traditional fur-trimmed red suit and wore a full face mask. "When I talked to one little boy at close range he asked why I wore the mask. I told him that when it was very cold I had to protect my face. The next year I bought an appropriate suit and wore whiskers," Ray continued.

Children frequently inquire about S***a C***s' reindeer. "I explain that they are out in the sky above a vacant lot, but it's too dark to see them," he said.

One year this S***a C***s literally stopped traffic. As Ray was visiting a house he saw five or six youngsters throwing lighted luminarias into the street. Our bewhiskered friend stepped into the street and proceeded to berate the mischief-makers.

Another time he was approached as he left one house and asked to visit another home three blocks away. "I could tell the people were poor, but the home was spotless. They had a large candle in place of a Christmas tree, and when I handed the three small children some striped candy canes I always carry, their eyes were as big as saucers," he recalled.

Through the years Ray has found he requires progressively smaller pillows to fill out the costume to customary roundness, and his 18-year-old son has started

pinch-hitting in the role. But his actions remain the same: a rap at a front window, distributing gifts from his sack, talking to the children, saying a little prayer with them, and singing Christmas songs.

"To me it typifies the spirit of Christmas," said St. Nick, his bells a-jingling down the hallway.



COMBING HIS BEARD for the big night, Ray Smelich looks back on 17 years in this important role.

AEC Granted Patent In Name of Sandia's William C. Monday

A patent for a timing mechanism has been assigned to the Atomic Energy Commission in the name of William C. Monday.

Mr. Monday invented the mechanism while assigned to Timers and Special Devices Division. He has been on leave of absence for the past two years to complete work on his doctorate at Oklahoma State University.

The patent is number 3,156,851.

Retiring from Sandia...

Alice Warder



Alice Warder will retire at the end of December after seven and a half years at Sandia. She is a library assistant in the Technical Library.

She and her sister live together at 933B Louisiana SE and they plan to vacation in Florida the month of January. Upon their return Mrs. Warder will take a part-time job with the Lovelace Foundation Library. Sewing, reading, and bridge will occupy some of her spare time.

Mrs. Warder has three married daughters in New Jersey, Kansas, and New Mexico, and 10 grandchildren. She'll spend Christmas with the daughter in Farmington and other members of the family.

J. M. Houston



It will be home for the holidays for J. M. Houston, who will retire from Sandia at the end of December. "Home" in this instance will be Charlotte, N. C., where he will be vacationing.

Mr. Houston has been at Sandia nearly 11 years and has been with Field Services Division most of the time. His work there has called for frequent travel throughout the world. "I've seen a lot of places," he says, "but I haven't had time to look at them."

While he has been traveling, his wife remained in North Carolina, where she teaches school. Both are amateur archaeologists, and Mr. Houston hopes to study more in this field after his retirement. He also enjoys photography and making jewelry. In 1966 the couple plans a trip around the world.

On Dec. 31, Mr. Houston will also retire from the Navy. He is presently a lieutenant commander in the Naval Reserve, but previously saw active duty on aircraft carriers, mostly in the Pacific.

Injury Ends Sandia Lab's Safe Hours Worked At 4 Million Mark

Sandia Laboratory's safety record of more than 4,000,000 man-hours dropped to zero last week when an employee suffered deep laceration of his right wrist. He was struck by a spinning tape reel which had come off the recorder during playback. The reel struck his wrist.

The employee was taken to a local hospital by Sandia ambulance, accompanied by a member of the Medical staff. After several days, he was released from the hospital. He is now convalescing at home.

Take Note...

K. E. Sutton of Security Information and Education Division led a workshop on "The Company's Understanding of Placement/Recruitment" at the Southern College Placement Association meeting in New Orleans, La., Dec. 10.

Dr. Stuart Over, formerly of Sandia's Medical Organization, has fulfilled a life's ambition: he's sold a short story. "The Old Man in the Next Bed" appears in the January 1965 issue of *Ellery Queen's Mystery Magazine*. The magazine's editor, in a foreword, calls the story "unusual and interesting."

According to Albuquerque friends, Dr. Over has signed on as a ship's doctor for six months and is presently in the Pacific.

T. B. Harris



T. B. Harris, a Sandia employee for 13 years, retired Dec. 7. He was a layout operator in the salvage yard (Org. 4622).

Mr. Harris moved to Albuquerque in 1935 and started a glass company, which continues to be operated by his wife and son. The firm will soon open a branch in Santa Fe, so Mr. Harris will use this occasion as a chance to "boss a little bit."

A second son lives in California and they have a married daughter in Albuquerque. There are seven grandchildren. Mr. and Mrs. Harris live at 1205 Central NE.

Ilva Baldwin



Ilva R. Baldwin, supervisor of Typing Services Section, will retire Dec. 31 after more than 16 years at Sandia.

She was first employed as a department secretary, was promoted to secretary for a Superintendent, and 11 years ago was put in charge of the typing pool. At one time there were 20 girls permanently assigned to the pool, but in recent years there have been only 15 or 16. Mrs. Baldwin's first office was in the "West Lab" and 15 moves later she is in Bldg. 838.

Mrs. Baldwin and her husband Homer, who retired several years ago from Sandia Corporation, live at 4309 Marquette Ave. NE. They have two married daughters living in Taos, N. M., and Rapid City, S. D., and "almost nine grandchildren."

Mrs. Baldwin enjoys gardening, but otherwise has no definite plans for her retirement days.

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LAB NEWS

DECEMBER 18, 1964

Sandia's Safety Scoreboard

Sandia Laboratory:

7 DAYS

245,000 MAN HOURS

WITHOUT A

DISABLING INJURY

Livermore Laboratory:

118 DAYS

610,000 MAN HOURS

WITHOUT A

DISABLING INJURY