



COMPUTER PERSONNEL Research Group, which met at Sandia Lab Feb. 7-8, attracted representatives from private industry, government agencies, and universities. Discussing characteristics of programmers are (l to r) Walter Brown, Equitable Life Assurance Society, New York City, S. H. Peres (3133), D. K. Robbins (3454), and Robert N. Reinstedt, Rand Corp., Santa Monica, Calif., who is chairman of the group.

Study of shock conditions

Artillery But No Artillerymen Located at Tonopah Test Range

The roar of a cannon shattered the crisp dry stillness of the morning air. Overhead, streaking toward a target eight miles down range, was the 127th projectile fired from the Livermore Laboratory gun facility at the Tonopah Test Range in Nevada.

Not far from the gun emplacement, three men stood by a concrete bunker, waiting impatiently for the smoke to clear away. They were not concerned with marksmanship; they were interested in the projectile itself. The men were not artillerymen, they were engineers and technicians from a Livermore Laboratory Test Projects Group. Their mission: to fire special projectiles loaded with telemetry components and obtain information on the effects of high acceleration and shock conditions on the components.

The three—Art Thomas, Jim Shindelar, and Ed Healey (all of 8121-4), plus a fourth member of the Test Project Group, Mary Brieske—had never fired the big guns before joining Sandia. Art served in the Air Force, Jim was in the Army Engineers, Ed worked for the Navy, and Mary was in the Navy. But after a brief session, boning up on Army field manuals, now they can load, aim, and fire the guns along with the best of them.

Three Guns

The guns—one 155mm gun and two 155mm howitzers—provide a unique shock testing facility. They are the only facilities which can produce the high shock conditions called for. When the firing button is pushed, a force equivalent to 12,000 times the weight of the projectile can be exerted by the exploding propellant charges. This force hammers against the base plate of the projectile, ramming it out of the gun.

Miniature telemetry components are being developed at Livermore Laboratory to survive this initial



CHECKING STRAIN GAGE instrumentation on barrel of 155 mm gun are Ed Healey, Art Thomas, and Jim Shindelar, all of 8121-4. The gages, placed two-feet apart along the length of the barrel, will obtain data on the acceleration of projectiles fired through the cannon barrel.

shock and continue to operate in flight—and, in some cases—after impact.

To design telemetry components to withstand these severe conditions, it is first necessary to find out accurately just how severe the conditions are. This is one of the main purposes of the gun tests.

Before shot No. 127 was fired, Jim, Art, and Ed spent several days instrumenting the gun barrel. They placed strain gages two feet apart along the entire length of the barrel. Since the barrel would expand as the projectile traveled through it, this expansion could be picked up at each strain gage. By plotting the expansion against a time base, they could measure the acceleration of the projectile inside the barrel.

Information from these tests, when completed, will be passed on

to Test Project Group and Telemetry Component Section 8122-2, where the rugged telemetry components are being designed.

Twice Weekly

The guns are fired on the average of twice a week. In some tests, the long-barreled 155mm gun is used to lob a projectile as far as 15 miles down range. For other requirements, the two 155mm howitzers are put into action to fire almost vertically, or directly into a sawdust-filled "berme" box a few yards away. For additional elevation, the guns are mounted on specially-constructed ramps, increasing the normal 60-degree maximum elevation to 83 degrees. This reduces the range and limits the impact area for ease in recovery.

Supporting the Livermore Test Projects Group at the range are (Continued on Page Eight)

Trinity Section ANS to Present Talks by Group of LASL Scientists

Trinity Section of the American Nuclear Society will sponsor a half-day program of technical talks by scientists from Los Alamos Scientific Laboratory at Sandia Laboratory on Feb. 21.

The presentations will start at 1:15 p.m. in Theater Building 815. The talks will be non-classified and interested persons are invited to attend.

R. E. Schreiber, LASL Technical Associate Director, will open the program with a talk on "The Los Alamos Scientific Laboratory."

This will be followed by: "The Rover Program at LASL" by D. P. MacMillan, N-1 group leader; "Some Possible Future Nuclear Space Propulsion Systems" by T. N. Cotter, staff member of

N-5; "Critical Assembly Facilities at Los Alamos" by J. D. Orndoff, staff member of N-2, or Hugh C. Paxton, N-2 group leader; "The Sherwood Program at LASL" by John Marshall, Jr., staff member of P-15; and "Power Reactor Program at LASL" by D. B. Hall, K division leader.

The program chairman is Ross Humphreys (LASL). D. M. Ellett (7181) is presently vice chairman of the section and Paul O'Brien (5332) is treasurer.

New Facilities to Be Constructed in Sandia Tech Areas II and III

The Atomic Energy Commission called for bids this week for construction of two new facilities for use by Sandia Laboratory.

One of the facilities will be located in Coyote Test Field and used by Physical Properties Division 1113 to examine properties of materials subjected to explosions. Main building will be of reinforced concrete and will contain about 1200 sq. ft. A metal igloo and three small buildings for high explosives storage will complete the facility.

R. G. Piper (4543-3) is the Plant Engineering Department project engineer.

The second facility will be a reinforced concrete building of about 1700 sq. ft. in Tech Area II. It will be a laboratory building for Electronic Component Development 1400.

K. D. Harper is the Plant Engineering Department project engineer.

Both projects, to be completed within 150 days after the AEC notifies the contractor to proceed, include installation of electrical and mechanical alarm systems, air conditioning, and such items as fire protection, power, lighting, and heating systems.

AEC Granted Two Patents in Names Of Sandia Men

Two patents were assigned to the Atomic Energy Commission last month in the names of C. M. Stover (7223-1), Richard O. Murdoch (1432-4), and Frank A. Record of Bomac Labs in Beverly, Mass.

Mr. Stover's invention was an aluminum oxide humidity sensing element (hydrometer) developed for use on radiosonde weather balloon flights in which extreme changes in pressure and temperature may occur in a short period of time.

The Murdoch-Record invention is a thermal relay device—"an improved electromechanical hermetically sealed reliable one shot switch" for use in environmental conditions including sudden and extreme variations in temperature, vibration, acceleration, and severe shock.

The Stover patent is No. 3,075,385; the Murdoch-Record patent is No. 3,076,078. Both were issued Jan. 29, 1963.

Swedish Scientist to Speak Before Sandia Colloquium on February 27

One of Sweden's outstanding scientists will speak on "Modern Quantum Mechanics in Physics, Chemistry, and Biology" before Sandia Laboratory's Research Colloquium on Feb. 27.

Prof. Per-Olov Lowdin is Director of the Quantum Chemistry Group at the University of Uppsala, Sweden, and is Director of the Quantum Theory Project and Graduate Research Professor of Chemistry and Physics at the University of Florida.

He serves as Director of the International Summer Institute and Symposium in Quantum Chemistry at Uppsala, and also heads the Winter Institute in Quantum Chemistry and Solid State

Physics at Gainesville and Sanibel Island, Fla.

Professor Lowdin has lectured at some of the leading educational institutes in Mexico, Japan, India, and Israel.

Other speakers scheduled for this month include: Feb. 20, C. W. Sherwin, vice president, Laboratories Division, Aerospace Corp., whose subject will be "Experimental Tests of the Relativity Theorems"; and Feb. 28, Prof. Gareth Thomas, of the University of California, Berkeley, who will lecture on "Electronic Microscopy in Metallurgical Research."

Further information is available on the regular Research Colloquium announcements.



MIGHTY BLAST of 155 mm howitzer at Tonopah was captured on film by remote control a fraction of a second after the firing button was pushed. The firing but-

ton, which triggered the camera's shutter, also set off flashbulbs seen glowing on scaffolding at right. High speed motion picture cameras also recorded projectile.

Editorial Comment

A Note on Custodianship

The nearest we can figure, the United States Government has about \$15,000 per employee invested in buildings, space, and equipment at Sandia.

The responsibility for care of this property rests heavily on all Sandia Corporation employees. We are expected to assume this charge with the same serious consideration we give our security and safety responsibilities. The fact that our duties as custodians of government property are not frequently discussed does not lessen their importance.

Value of Uncle Sam's equipment at Sandia runs into many millions of dollars, somewhere near \$80,000,000. If listed, the items would present a staggering compilation. Costs of individual pieces of property would run from a 15-cent roll of cellophane tape to a multi-million dollar nuclear reactor. In between is a vast, and frequently expensive, list of items, necessary for Sandia Corporation to do its job of "weaponizing." All this is Federal property.

Our custodianship calls for us not only to see that this equipment is handled properly, but also to see that it is used for official purposes only. This means that government property stays on Sandia premises unless there is proper authorization for removal.

It shouldn't be necessary to remind Sandia employees very often that this property responsibility is to be considered seriously. We should always be conscious of our obligations.

Requests for Translations
Call For Library Ingenuity

While the bulk of requests at both Sandia and Livermore Laboratories is for translations from Russian language publications, a great many engineers and scientists have also expressed interest in articles written in other foreign languages.

To obtain these translations, the technical library staffs follow the same procedures as for Russian language translations. First, they check the document catalog under both author and title to see if an English version is already available in the library. If not, they check lists provided by private firms and various government agencies.

These agencies include the Office of Technical Services, the Library of Congress, the AEC's Division of Technical Information Extension at Oak Ridge, European Atomic Energy Community (EURATOM), and Central Intelligence Agency's Consolidated Translation Survey.

Oral Abstracts

At Sandia Laboratory, if this search proves fruitless, the technical translator, Marcel Weinrich, and the requestor arrange a conference. At this time Mr. Weinrich scans the foreign article and orally abstracts the material within a matter of minutes. In this way, the scientist or engineer requesting the translation may know immediately if the material is pertinent to his field, and whether he wants a complete translation.

Sometimes the contents of the article may be of quite different nature from that indicated by the title. Or other times, a mere synopsis may divulge enough theoretical information to make a full translation unnecessary.

Translation of technical material requires a rare combination of skills: knowledge of the language and a certain amount of understanding of the subject. Since there are relatively few technical translation services in the country compared to the demand for this type of work, this difference can mean a six-month wait from the time the translation order is placed until the finished translation is delivered.

Translation Problems

Since Livermore does not require a full-time translator, orders for the needed material may be placed with a commercial translation service or an individual translator.

Special translations are sometimes quite a problem. The Japanese, for example, have recently begun publishing considerable original work in the fields of optics and plastics. Earle Paxton (8233-2), supervisor of Livermore's technical library, received several requests recently for Japanese translations and had to search the Bay area for a qualified translator.

First, he contacted the University of California, where students had done translations for Livermore Laboratory in the past. Unfortunately, the only Japanese student there who understood the subject didn't know enough English to translate the material.

The next step was a commercial translation service in Palo Alto. Although knowledge of the language was not a barrier here, knowledge of the subject matter was lacking.

Finally, Mr. Paxton visited the publisher of a Japanese language newspaper in San Francisco. There he was given the name of a young American who was working on his PhD in Asian languages at the University of California. This student had both the technical background and knowledge of the language. At present he is working on four translations from the Japanese for use by Livermore Laboratory engineers.

Originally, Mr. Weinreich's translations at Sandia Laboratory were about evenly divided between Russian and German publications. Since the upsurge of interest in Russian articles after Sputnik, Russian translations have led. He also translates from the French, and occasionally Dutch, Polish, Spanish, and Italian.

Some of Sandia Laboratory's requests are also "farmed out." Included are monographs of over 50 pages, and all translations from Oriental languages.

At both libraries, completed translations obtained in any of the above ways are finally sent to the other Sandia Corporation Laboratory, the AEC in Oak Ridge, the Special Libraries Translation Center in Chicago, and the Office of Technical Services to prevent duplication of effort.

W. A. Jenkins Named
Member of Livermore
Planning Commission

W. A. Jenkins (8233-1) has been appointed to the City Planning Commission by the Livermore City Council. He will fill an unexpired term on the planning commission, and will serve until October 1964.

Bill has been actively engaged in civic activities since he transferred to Livermore Laboratory in 1958.

He is currently president of the Council of Social Planning, Livermore Area, and is past chairman of the statistics subcommittee of the Livermore Chamber of Commerce. He is a member of the United Bay Area Crusade Board of Governors, and was group chairman of the Crusade's Industrial Division in the Livermore area. Bill is also active in work with the Livermore Area Park and Recreation District.

Sandia
Speakers

Following is a list of speakers, titles, and places of presentation for recent talks by members of Sandia Corporation.

C. W. Quillen (2343), "How to Make Progress Capability Studies," University of New Mexico chapter of the American Society for Mechanical Engineers, Albuquerque, Jan. 16.

F. M. Smits (5310), "A Comparison of Isolated and Clustered Defects in Semiconductors," the Stanford Electronics Laboratory, Stanford University, Jan. 10.

E. H. Beckner (5153), "Shock Formation in the Flow of a Hydrogen Plasma Through a Transverse Magnetic Field," American Physical Society, Houston, Tex., Feb. 28.

O. E. Jones (5133) and J. R. Holland (5152), "Stress Relaxation During Dynamic Loading of Mild Steel," Institute of Metals Division-sponsored sessions, 1963 American Institute of Mining, Metallurgical, and Petroleum Engineers, Dallas, Tex., Feb. 24-28.

F. W. Muller (1442), "The Addition of Reliability Test to Mil Spec Qualification Requirements—Benefits and Problems," Institute of Environmental Sciences, Grand Rapids, Mich., Feb. 6.

Sandia
Authors

Current or forthcoming articles by Sandia authors in technical journals include the following:

N. J. DeLollis and O. Montoya (both 1112), "Surface Treatments for Difficult to Bond Plastic Materials," January issue, *Adhesives Age*.

E. S. Roth (2564-1), "Design and Inspection—How They Influence Manufacturing Efficiency," February issue, *The Tool Manufacturing Engineer*.

D. L. Allensworth (5152), "Novel Technique for Forming a Narrow Slit in a Metal Plate," March issue, *Review of Scientific Instruments*.

T. F. Marker (2420), "Employee Evaluation—an Abstract Model," March issue, *IRE Professional Group on Engineering Management*.

Seek Technical Papers
For Western Electronic
August Convention

A call for technical papers has been issued for the 1963 Western Electronic Show and Convention to be held Aug. 20-23 at the Cow Palace in San Francisco.

Dr. Jerre D. Noe, technical program chairman, has announced Apr. 15 as the closing date for submissions. Authors should submit three copies each of abstracts running 100 to 200 words and summaries of from 500 to 1000 words indicating related work and new contributions. IRE Professional Group classification should be noted as an indicator of the technical field into which the subject falls.

Abstracts and summaries should be sent to Dr. Jerre D. Noe, WESCON Technical Program Chairman, Suite 2210, 701 Welch Road, Palo Alto, Calif.

Circuit Theory
Group Meets at
UNM Feb. 18

David H. Anderson, supervisor of Applied Research Division 5132, will address a meeting of the Professional Group on Circuit Theory Monday, Feb. 18. He will discuss "Spectroscopy with Radio Waves" at 8 p.m. in the student lounge of the Electrical Engineering Bldg., University of New Mexico.

Refreshments will be served.

The meeting is open to anyone interested. Contact Fred Karkalik (1314), ext. 35266, for further information.

A.T.&T. Board Chairman Is
'Businessman of The Year'

Saturday Review, a weekly magazine of information and opinion, in its Jan. 12 issue saluted Frederick R. Kappel, A.T.&T. Board Chairman, as "Businessman of the Year."

The magazine noted that "... through his enlightened business leadership in both the private and public sectors, (Mr. Kappel) has consistently and effectively fulfilled the modern image of the businessman-citizen in our society, an image that *Saturday Review* regards as essential to the Businessman of the Year and to a communications leader whose responsibilities are central to the future of our country and to our way of life in the critical years ahead."

The magazine particularly cited Kappel in four main endeavors:

Space: Kappel has spearheaded his company's \$50 million commitment to Telstar since it was originally envisioned... in 1954. Telstar was more than a triumph of the modern technology of space and communications. It was also a symbol wise men could approve, of a new era in human communications, a work of peace that sought only to bring men together, not to destroy them.

Science: Through Bell Telephone Laboratories, (the Bell System) has conducted one of the most massive research and development programs in private industry, not merely to advance Bell's technical facilities, but through pure research to enlarge man's background store of scientific knowledge and make possible such A. T. & T. technological breakthroughs as the transistor, the solar battery, radio astronomy, the horn antenna, the optical gas maser, and the negative feedback...

Synergism: Quoting Kappel: "The Telstar satellite story tells the world that government and private enterprise in the United States can work together on the most complex problems. But in business must also prove, in the purposes we enunciate and the actions we take, that our private interest is not in conflict with the public interest: rather, that the goals we set, and the means we use to achieve them, point toward progress for the nation as a whole. I believe that wholehearted collaboration between government and



—Frederick R. Kappel—

industry is not only possible, but desirable."

Service: Again quoting Kappel: "Our only license to exist is public satisfaction. We must serve the public's needs better tomorrow than today... We describe it in homely, time-honored, deeply felt words—the spirit of service. It is something we intend to live by, and we do."

Saturday Review also noted that telephonic science hopes to make it possible for anyone on earth to talk to anyone else as clearly as though they were only separated by six feet. "In this simply stated aspiration," *Saturday Review* said, "lies one true hope for peace."

L. E. Snodgrass to
Chair Workshop at
ASQC Conference

L. E. Snodgrass, supervisor of Quality Control Division I, 2561, will be chairman of an Inspection Workshop during the 10th Western Region Conference of the American Society for Quality Control in Las Vegas, Nev., Feb. 21-22.

The theme, "Quality Control—Key to Industrial Survival," will be featured during the 12 technical sessions.

R. A. Ledogar Elected
President Harvard Club

R. A. Ledogar (6030) was elected president of the Harvard Club of New Mexico during a meeting Jan. 21.

Mr. Ledogar received his LLB degree from Harvard University in 1951. He has been with Sandia Corporation since July 1961 and is on loan from Bell Telephone Laboratories.

Wedding

Mary Evelyn Hunter (3341-1) and D. L. Stewart (4233-4) recited marriage vows before Justice of the Peace G. E. Atkinson (7331-2) on Feb. 2. After a honeymoon at Taos, the couple will be at home at 8117 Constitution NE.

Evelyn has been at Sandia more than eight years; Donn has been here a year and a half.



—Beverly Elrod (8212-3)—

Take a Memo, Please

Hazards and accidents go together. Look for and eliminate any hazards you encounter.

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Brilliant Diagnosis, Bold Action Gave Voice Back to Telstar

Editor's Note

An Albuquerque newsman, reporting on the restoration of Telstar operation by Bell Laboratories men, commented that they must have had a screwdriver one hundred miles long. It wasn't that simple. Here is the exciting story of what may prove to be one of the most unusual feats in engineering history.

Of the many miraculous cures in this modern age, few compare with that achieved by Bell Laboratories engineers and scientists when they reached out hundreds of miles into space to cure the ailing Telstar.

For Telstar, the communications satellite, was suffering from radiation—a sickness that apparently strikes with deadliness at both man and machine.

The 170-lb., 34-in. sphere had been launched into space last July and immediately set about performing a series of transmission feats that opened up a new era in communications history.

But in the fall, after completing hundreds of technical tests and demonstrations, Telstar gave one hint that all was not well.

A Small Malfunction

Engineers at Bell Laboratories were quick to note the first trouble. It was a small malfunction in the special circuit that tests the two command receivers and decoders.

The command receivers and decoders are the instruments that receive messages from the earth stations and translate them into action in Telstar. Without them the satellite cannot relay communications.

As a precaution against failure of one, the designers of Telstar had placed two command receivers and decoders in Telstar, and the special circuit that developed the early difficulties was used to test the individual decoders on command from the ground.

The intermittent failure of the circuit did not affect the operation of Telstar but it did mean that sometimes there was now no way to determine if both the decoders were still operating.

Heavy Radiation

But Telstar was encountering a lot of high-energy electrons in space. Its orbit passed through the heart of the Van Allen belt, made up of two natural bands of radiation extending upward from the earth's atmosphere for thousands of miles. The bands are made up of energetic electrons and protons trapped by the earth's magnetic field.

During late November additional difficulties — very important ones this time — appeared. The command circuit began to operate intermittently. At that time the satellite was in view over the ground station at Andover, Me. It would make a series of four successive passes and then go out of view of Andover during the next five. Engineers found that the command function failed to operate during the first pass or two in each series.

Satellite Silenced

Then, on Nov. 23, the mounting difficulty silenced the satellite after its 1,242nd orbit. Efforts to awake the satellite with repeated radio signals from the ground station proved futile.

Fortunately, the difficulties did not affect telemetry transmission, which continued to operate properly. Telemetry sends back reports on the amount of radiation in space, the condition of the satellite and its electronic components, temperature readings, and the effects of radiation on the solar cells and transistors.

Search For Trouble

What had happened to Telstar? Was the difficulty of a permanent nature, or could it be corrected? Scientists and engineers at the Laboratories were not certain.

But in their early analyses of the trouble they felt that radiation



THE TROUBLE WAS HERE — The effects of radiation on transistors, such as that which took place in the ailing Telstar, are explained to newsmen by W. C. Hittinger, executive director of Bell Laboratories semi-conductor device and electron tube laboratory. He is using a greatly enlarged model of a transistor to explain exactly how the detrimental effects take place.

might be the cause of the trouble. As early as October 1961, scientists had learned that certain detrimental changes take place in some transistors as the result of exposure to radiation.

Based on these tests and other findings, the scientists and engineers concentrated on the transistors in the decoders. These transistors appeared to be the most vulnerable. They knew that when high energy radiation penetrates the enclosure of a transistor it can ionize the gases and other substances within the enclosure. The ions thus created can collect on the surfaces and cause detrimental electrical changes. When a certain kind of voltage is put on them—as it was frequently in the case of the decoder transistors—these detrimental effects are greatly accelerated.

This and deductions made from the behavior of the circuit indicated to engineers that it was the "surface effects of radiation" on one of the transistors in the decoder that was responsible for the difficulty.

Sometimes Recover

In the studies it was found that transistors sometimes recover from such surface effects of radiation when the radiation intensity is reduced. Therefore, it was hoped that when Telstar moved into its highest orbit point, away from the heavy radiation, it might be possible to get the decoder to respond to signals from the earth.

With this plan in mind, an effort was made to awake Telstar while it was in high orbit over the

southern hemisphere. At the NASA tracking station at Johannesburg, South Africa, engineers sent signals to the sleeping satellite. But the decoder refused to respond and Telstar continued on, out of command.

Laboratory Studies

But there was still hope. The studies also indicated that transistors affected with surface radiation can recover toward their original operating condition when the voltage is decreased or removed from them. Was there some way that the voltage could be removed from the transistors in the decoder? Without current they might throw off the effects of the radiation.

At first glance this appeared virtually impossible. The only means known to do this was to disconnect the satellite batteries or by circuit operation. But to do this it was necessary to command the satellite in some small degree.

Scientists and engineers, however, would not accept defeat, and a search was therefore started to find a way to trigger the command decoder circuits into operation despite the inoperative transistors.

Trouble Duplicated

At Bell Laboratories a command decoder similar to that used in Telstar, with its normal voltage applied, was placed in a radiation environment. Just as expected, the decoder developed symptoms similar to those of Telstar's decoders.

Detailed testing then revealed which portions of the circuit were most sensitive. Particularly sensitive was a transistor in the "zero gate," a circuit that recognized the "zeros" in the one-and-zero code used to command the satellite.

After learning this, the engineers then assumed this transistor was afflicted and applied themselves to finding some way to bypass the ailing transistor by using a special form of command signal. Spearheading this effort were engineers Robert H. Schennum, Henry Mann, and John S. Mayo.

In the code used by the satellite, a "one" is a long pulse; a "zero" is a short pulse. The problem the men faced was to send some sort of signal that would register zero.

Solution Hit Upon

The solution hit upon was to send as a "zero" a long pulse with a dip, or notch, in the middle. They tried it on the duplicate decoder in the laboratory and it worked—tricking the decoder and registering a "zero."

With this success behind them, they decided to make a test of the signal on Telstar itself. Normally, 15 commands are sent to the satellite on a pass over the ground



THE FIRST PICTURE relayed by Telstar after six weeks of silence is shown here being viewed by James W. Cook, vice president of A.T.&T. It was a video tape of a waving flag before the Andover, Maine, radome, a repeat of the first picture beamed by Telstar last July 10. The flag is shown displayed here next to the television receiver.

station. To test the "notched pulse" idea they would send only two commands and see what happened. The two commands would not turn off the batteries but would be sufficient for a trial.

Pulse Idea Works

Therefore, at noon on Dec. 20, with Telstar passing overhead they sent the two commands. The first one worked. It turned a switch, and indication of this was received from the satellite by telemetry.

Elated with their success, they planned to prepare a complete program of all 15 commands on tape. Eventually and with caution they would send a command up to Telstar to disconnect its storage batteries.

It was a momentous decision.

In turning off the batteries there was a chance they couldn't turn the batteries back on. If that happened, the satellite couldn't store up sufficient power to operate its communications equipment and Telstar might never again be able to serve as an orbiting relay tower.

If it worked, it might remove all power from the satellite during periods when Telstar was in darkness and this might enable the radiation effect to diminish.

The decision was to go ahead—trick Telstar into turning off the batteries. They prepared the program on tape and began to send the commands to the satellite.

But they had overlooked one thing. Telstar had a trick up its sleeve, too.

Acts On Its Own

In receiving the commands, Telstar misinterpreted the signals on two occasions. It disconnected its batteries ahead of time.

As Eugene F. O'Neill, director of satellite communications at Bell Laboratories, said, "Telstar took matters into its own hands."

As it turned out, Telstar knew what was good for it. After several passes through eclipse, when the satellite was in darkness and without power, it was found that normal command performance was partially restored.

The treatment was purposely repeated again on Jan. 2 and again on Jan. 3. The result was complete restoration of the normal command function.

On the Job Again

Restored to health again in what may be one of the most unusual feats in engineering history, Telstar is back on the job, working with the same perfection. On the second day after recovery, it was already relaying live television back and forth across the Atlantic.

As someone said after seeing the satellite's first demonstration on Jan. 4 after six weeks of illness, "It's good to see Telstar up and around again."

Telstar II to Join Reactivated Telstar I

Come spring, the successful never-say-die Telstar I will be joined in space by an even more sophisticated, higher-orbiting Telstar II.

The new communications satellite will be designed to ward off the excessive radiation that caused the first Telstar to keep quiet for several weeks. Also, Telstar II's planned higher orbit should keep its sensitive circuitry above the most intense radiation areas in near-earth space.

As before, A.T.&T. will pay the National Aeronautics and Space Administration to launch the new satellite. In addition, A.T.&T. will provide NASA with complete scientific data pertaining to Telstar's operations and its discoveries in the space environment.

Presumably, Telstar II will have some new experimental equipment aboard, as well as equipment to carry on the work begun by Telstar I. Since a more powerful Thor Delta rocket will place the latest satellite into a higher orbit, somewhat different operating conditions will exist.

A.T.&T. is cooperating with NASA in conducting experiments to discover just what equipment will best serve the purposes of a worldwide space communications network. Bell Laboratories also intends to make available to the general scientific community all scientific information collected by the Telstars.



TELSTAR SPEAKS AGAIN — Bell System engineers manning control panels at the Andover, Maine, ground station keep their eyes fixed in the television monitors above them as they see the pictures sent by Telstar after six weeks of silence caused by radiation damage. Daring engineering restored the satellite's operation.

Here's how it's done

Sandia Purchasing Important to New Mexico Economy



K. S. SPOON (right), Sandia Corporation Purchasing Agent 4300, reviews a contract proposal with J. P. Seay, Assistant Purchasing Agent (4320). During 1962, Sandia Purchasing placed 74,645 orders. This amounted to \$13 million in the state of New Mexico alone.



DECISIONS TO BUY can't always be made on the basis of clear-cut price quotations. Services and time considerations also have bearing on the decision. Comparing quotations are (from left) Leroy H. Huenfeld (4325-1), Chenault Davison (4361), and Phillip M. Alarid (4361-1).



SUPPLIER CONFERENCE is conducted by John W. Justus (1431), second from left. Supplier representatives are (second from right), a Buyer in Subcontract Department III. Technical assistance is provided by Allen F. Hurford (1431), second from left. Supplier representatives are Arthur G. Reilly, left, and Richard W. Viesser, right, of Chatham Electronics, Division of Tung-Sol Electric Inc.

Sandia Corporation operates two laboratories and a test range engaged in research and development of the ordnance phases of nuclear weapons design.

This is a job of considerable magnitude. To keep Sandia's R&D effort moving forward takes a lot of "doing." Procurement of the hundred-thousand-and-one items necessary to Sandia progress is a big part of this doing.

Sandia Corporation Purchasing Agent, K. S. Spoon (4300) and his staff of procurement specialists have this responsibility.

Mr. Spoon, though located in Livermore Laboratory, Livermore, Calif. F. R. Moon, as manager of the Security, Safety, and Purchasing Department is Assistant Purchasing Agent at Livermore and W. H. Ryan is Senior Buyer.

"Sandia buys a wide variety of items," Mr. Spoon says, "ranging from simple to complex commercial items. In addition, the Company issues subcontracts for services, design, development, research, and fabrication of extremely complex assemblies of our own design."

The Purchasing organization's job is much bigger than just doing the shopping and buying. Purchasing must be knowledgeable with respect to market conditions, suppliers' capabilities, suppliers' performance, and government (AEC) procurement regulations. The buyers must search out and select qualified suppliers, negotiate terms of purchase, and administer the contracts. That still isn't the end. After an audit, Purchasing settles suppliers' accounts, maintains cost analysis of purchase proposals, and conducts the seemingly endless number of transactions necessary to the proper administration of purchase orders.

In Fiscal Year '62, Sandia Corporation Purchasing placed 74,645 orders. Of these, 17,746 were orders to produce special Sandia designed items or to perform research for Sandia. Not including negotiations for these orders (referred to as sub-contracts), it took an average of 1.4 hours to process each purchase order. Cost of Purchasing activities per dollar committed averaged 1.9 cents.

Community Impact
In New Mexico during the 1962 calendar year, Sandia spent \$13 million. This does not include funds spent with other AEC contractors in this state. Approximately 97 per cent of this, or \$12.6 million, went to Albuquerque firms. New Mexico firms doing business with Sandia Corporation numbered about 1073. All but 115 were located in Albuquerque.

"Sandia Corporation is important to the local economy," Mr. Spoon believes. "Most local industry depends, to some degree, on the Sandia payroll and direct business. A reasonable number and variety of local enterprises are healthy for Sandia, the government, and the community."
"Some of the advantages to Sandia of doing business with local firms," Mr. Spoon continues, "are found in savings in freight charges, travel time, and administrative and technical liaison costs. It is also advantageous to have capable local firms ready in case emergency requirements arise."

Subcontract Departments
The job of placing the hundreds of daily orders is shared by four Subcontract Departments and the Commercial Department. Assistant Purchasing Agents heading these organizations are J. E. McGovern (4310), J. P. Seay (4320), C. R. Pritchett (4340), E. C. Pace (4370), of the subcontracting departments, and W. R. Rosenberg (4360), Commercial Department.

Function of the four Subcontract Departments is similar. They procure the specially-designed products necessary in the research and development phases of nuclear weapons design.

Purchasing considerations enter early planning stages of Sandia design work. As a weapon design program develops, requirements are determined and, with the technical assistance of the engineering organizations, possible suppliers are selected and evaluated.

In these early stages, Purchasing works with the Programming 2600 staff, which coordinates weapon development programs. As designs progress, work is underway for process and tooling development, design of production testers, gage designs, handling equipment, and determination of raw material needs. For each of these activities, Purchasing and Engineering are evaluating the capabilities of possible suppliers.

Because of the unknown in design and process areas, contracts with suppliers become complicated. Specifications are tight and reliability requirements high. These evaluations determine potential suppliers' ability to meet Sandia's unusual requirements.

The buyer works closely with the concerned line organizations while preparing specifications for suppliers' quotations.

Once a firm agrees to quote on a Sandia contract, the buyer and design engineering group work with the company until the job is understood.

Purchasing confers with Sandia Legal and Auditing organizations on proposed contracts.

This interchange of information usually is conducted against a

tight time scale and can create problems.

"We are dealing with things unique to Sandia," J. E. McGovern (4310) explains. "In many instances, such high reliability and close tolerance are required that it is quite difficult to define the entire scope of the work we desire. Adequate drawings and narrative specifications may not be ready at the time we place our first order. We may be required to change test requirements after the supplier is in production. Acceptance criteria may not be clearly defined at the time we must issue our original purchase order."

Kinds of Contracts
To cover these contingencies, Purchasing uses several types of contracts.

The cost-plus-fixed-fee contract is generally used for research and development work. Here, scope of work, although broadly defined initially, is usually subject to change. Control of these contracts is maintained through a monthly progress and financial report and close administrative contact with the supplier. An audit provides financial information on costs and establishes a base for later consideration of firm-price orders or reasonableness of future cost estimates.

When the product is fully defined, a firm-price contract is used if quoted prices can be analyzed and supported by good cost history.

A time and material contract is used only in limited areas where the scope of work is not defined sufficiently to reasonably estimate cost and fee.

Recent provisions in government regulations stress cost-cutting and offer bonuses to suppliers who achieve significant savings in the production of an item. This brings in incentive-type contracts, which allow suppliers larger shares in the cost savings accomplished. Sandia is currently studying the application of this type of contract.

"In all our subcontract awards," Mr. Spoon explains, "emphasis is on allocating business without favorites and obtaining the most capable sources available in the country."

The work load of the four Subcontract Departments in 4300 is divided by type of commodity to be purchased or by assigned service to a particular Sandia organization. Dollar-wise, these departments account for the bulk of Sandia buying.

Commercial Department
In purchase orders placed, Commercial Department 4360 handles more than half of the total. Items that can be purchased from commercial sources are usually purchased by Department 4360.

In FY '62, the 13 Buyers and Assistant Buyers in Department 4360 placed 44,753 orders. This volume of orders coming to 4360 brings department personnel into close contact with large numbers of employees.

Price and Cost Analysts work with a variety of Sandia personnel when studying supplier quotations. "In the team effort," Mr. Krug said, "to supply information to the Sandia buyer, we draw on the services of Sandia auditors, engineers, production specialists, etc. We seek information from other AEC contractors and government agencies. Our job is to help the buyers determine and negotiate a fair and reasonable price. The buyer makes the final decision on whether the price he is willing to pay is reasonable and therefore acceptable."

During the calendar year 1962, approximately 400 purchase actions were reviewed by Department 4350, totaling over 38 million dollars.

Administrative and Traffic Department
The second service organization within Purchasing is Administrative and Traffic Department 4330, managed by L. R. Neibel. One portion of Department 4330 work is in reporting. In addition to conducting audits of Sandia Purchasing procedures and preparing special information for Sandia and AEC management, Department 4330 periodically issues and performs the following:

Quarterly and annual reports, monthly order volume report, report of unplaced orders held 30 days or longer, production delivery schedule, suppliers' ratings, facility surveys, plant visits, unpriced commitments, contract closeouts, facilities and materials reports, quarterly savings reports, and 4300 budget.

The department keeps the Purchasing organization informed of federal, AEC, and Sandia policies concerning purchasing policies, procedures, and methods.

To assist the people in Purchasing, Department 4330 conducts three types of training programs. One is an orientation program for staff members new to Purchasing, another is an advance program, and the third type is depth courses given, as the need arises, on new or changed material.

Selection of the right suppliers is an important consideration for Sandia. Department 4330 personnel serve as chairmen of Sandia supplier evaluation teams.

These teams evaluate the supplier's organization, functions, procedures, equipment controls and techniques in relation to Sandia and AEC requirements. The type of surveys performed are pre-contractual surveys, supplier quality development surveys, laboratory surveys, and follow-up surveys. These surveys are performed to assure the buyer that the product will meet the quality, reliability, and delivery requirements.

Supplier evaluation teams also install Sandia-developed day-control method in suppliers' plants. Day control graphically shows the condition of schedules, inventories, and extent of production. This in-

formation is forwarded to Sandia at regular periods.

Department 4330 maintains a Supplier Relations office in the lobby of Bldg. 800 as a point of contact between all supplier representatives and the Sandia staff.

Many times Sandia provides special tooling and raw materials to a supplier. Control and accounting of these is a 4330 responsibility. Since June 1961, the function has been automated and periodic reports on the materials are provided.

The Department provides liaison service between Sandia Laboratory and Livermore Laboratory Purchasing organizations. As an Assistant Purchasing Agent Mr. Neibel reviews and approves certain Livermore procurement actions. Livermore is provided access to the Sandia files through 4330. The department also prepares special reports for Livermore Purchasing.

Office services are provided to the Purchasing organization by Department 4330. This includes typist services, maintenance of log books, document and numerical files, catalog files, and all record keeping.

Department 4330 also provides delivery information to ordering organizations.

Department 4330 handles Sandia transportation services. Traffic expeditors consult with buyers and suppliers in arranging the schedules consistent with security and delivery requirements.

Transportation and living accommodations for Sandia employees traveling on company business are handled by the five clerks in Travel Reservation Section 4335-1.

"During and since World War II, scientific developments have moved at a rapid rate," Mr. Spoon

relates. "As science progresses, the purchasing job becomes more complex and demanding."

"Years ago, purchasing consisted of buying raw materials and off-the-shelf items. Now, it is a demanding job requiring broader knowledge and higher capabilities"

"In the past few years, there has been an expanding recognition of Purchasing's position on the management team. It is a fact that every dollar Sandia Purchasing saves is a dollar of the taxpayer's money saved. In private industry purchasing activities frequently make the difference between profit or loss."

KEEPING NUMERICAL FILES of all purchase orders is one part of the duties of Office Service Division 4333. LaVerne Hunter (4333-2) pulls an order from the files to help a Buyer compare prices.

DETAILS of a proposed contract must be thoroughly understood before a supplier can make a quotation. Eldon E. Ritterbush (4372-1), left, defines specifications for supplier representatives R. I. Elledge and Ted Stensland, Jr. (right), of Gulton Industries, Inc., Albuquerque.

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AT LOCAL SUPPLIER'S PLANT, Senior Buyer F. A. Bentz (4325), right, and J. A. Bedingfield (4325-2), second from right, discuss specifications of a machine part. Technical Assistance is provided by Earl Buss (4211-1),

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For The National Defense

70 Per Cent of AEC Moneys Go Into Weapon Program

At midnight, Dec. 31, 1946, the newly-created Atomic Energy Commission took over the responsibility for the nation's nuclear energy program. Since then, accomplishments in the field have been nothing short of spectacular. Foundations for steady advances in reactor technology were laid. The same year, hearings were held by the Joint Committee on Atomic Energy which laid the foundation for the revision of the original Atomic Energy Act of 1946.

The Atomic Energy Act of 1946 and its 1954 revisions require that all AEC activities be subject at all times to the "paramount objective" of making the maximum contribution to the "common defense and security."

In fulfilling this obligation, the United States has become the principal nuclear armorer of the Free World. The United Kingdom has a limited nuclear weapons program and recently France has acquired a measure of weapon capability. Since the first Soviet detonation in 1949, the USSR has developed a program comparable to that of the United States.

About 70 per cent of current AEC expenditures are for the weapons program. The devices are designed in the Los Alamos Scientific Laboratory and Lawrence Radiation Laboratory, engineered at Sandia Corporation's Sandia and Livermore Laboratories, and tested in proving grounds in the Pacific and in Nevada. Production reactors supply the plutonium and the material for hydrogen bombs. A large industrial effort supports the weapons program.

The Manhattan Engineer District and the Navy tested the effects of nuclear weapons on warships in the Pacific in 1946 but the first trial of improved devices came at Bikini in the Marshall Islands in 1948. In 1951, the principle of fusion bombs was proved. The Soviets matched this a short time later.

Steady progress was made in increasing the efficiency and versatility of nuclear weapons. By 1953, the Army, Navy, and Air Force had devices tailored to their respective needs. These, including nuclear warheads for missiles and rockets, are being improved.

During the entire period of post-

war development of nuclear weapons, the United States has tried continuously to get the Soviet Union to agree to a workable formula for control of nuclear weapon manufacture. As a step toward that objective, proposals for banning tests have been discussed since 1955. The AEC has provided technical leadership in these negotiations which continue to this day. Soviet obsession with secrecy has been the major factor preventing an agreement on any type of international control plan or test ban which would provide workable safeguards against violation.

The next installment of this series reports on the versatile isotope. As of September 1962, there were more than 7000 licensed users of radioisotopes in the United States. Isotopic power has operated instruments in unmanned weather stations near the Arctic Circle and in the Antarctic. It is clear that radioisotopes will affect our lives and those of our children in the years to come.

Science Students From Two Towns Will Visit Livermore Lab March 2

Livermore Laboratory will invite a representative group of 26 top science students and their teachers from Livermore and Pleasanton High Schools to tour technical facilities at the Laboratory March 2.

The unclassified tour, scheduled for the first Saturday after National Engineers' Week, Feb. 17-23, has been arranged to show students the practical industrial applications of scientific theory studied in school.

The theme for National Engineers' Week, "America's Engineers Build for the Future," will be stressed in the tour. Students will see environmental testing facilities used in the development of weapon systems to safeguard the future of the free world.

Demonstrations will include the Laboratory's data center, telemetry systems, high speed photography and instrumentation techniques, data reduction facilities, vibration facilities, and the high altitude simulation chamber.

Coordinating the program will be Clyde Walker (8121), Don Skinrood (8123), and Dick Dick-

Lincoln's Humor Gets Deep Study in W. Lee Garner's PhD Dissertation

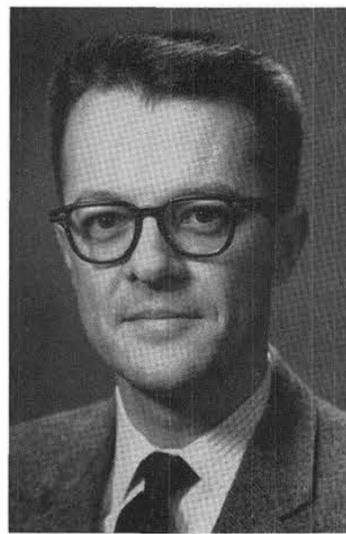
A doctorate degree was conferred "in absentia" upon W. Lee Garner during commencement exercises Feb. 2 at the State University of Iowa. His dissertation was entitled "Abe Lincoln and the Uses of Humor."

Mr. Garner (3423 assigned to 9100) previously received his Master's degree in English from the same school and his Bachelor's degree from Oberlin College in Ohio. He started work on his doctorate while teaching for six years in the English Department at the State University of Iowa. He has been at Sandia since September 1958.

"Since Christ, Lincoln, and Napoleon are the people the most words have been written about, it was a sizeable task gathering my material," he noted.

During two years of reading and taking notes, Mr. Garner used a large collection of books on Lincoln recently donated to the university by a private collector, other books at the Lincoln National Life Foundation in Fort Wayne, Ind., photostats from the Illinois State Historical Society, and publications borrowed (through the university library) from the Library of Congress.

"I found that Lincoln used his jokes to accomplish a definite purpose or to illustrate a particular point," Mr. Garner said. "Typi-



cal of the time were long stories which steadily built up interest until the humorous ending. Today's rapid-fire comedians try to get a joke in almost every sentence, which is an entirely different type of humor."

Mr. Garner's original manuscript has something over 300,000 words. His next task is condensing the material in the hope of interesting a publisher in this biographic data.

Bids Received for Drilling Work in Project Dribble

Big Chief Drilling Company of Oklahoma City, Okla., was apparent low bidder Jan. 17 for drilling six holes at the Project Dribble site near Hattiesburg, Mo.

According to the AEC's Nevada Operations Office, the bid was \$548,345 for drilling six holes of 10-in. minimum diameter to depths ranging from 1000 to 4000 ft. in the Tatum salt dome.

In addition, the AEC has called for bids (to be opened Feb. 19) for reworking five existing instrument holes and preparing them for scientific use. These holes vary in depth from 3000 to 4500 ft. Estimated cost for this project is in excess of \$60,000.

Project Dribble is part of the Vela Uniform program of seismic research to improve means for detecting and identifying underground nuclear detonations. Joint AEC-Department of Defense plans call for underground detonation of three nuclear devices; however, there has been no final authorization as yet.

Sandia Corporation will be concerned with seismic instrumentation, and earth motion studies. A. D. Thornbrough (7251-1) has been named project engineer, and W. R. Perret (5412) will be scientific advisor.

son (8233-1).

The tour will be the second "Science Youth Day" to be held at Livermore Laboratory and will be the third tour to be conducted for high school students. The first Science Youth Day program was held in February 1960. Last year, 50 students and teachers attending the Livermore convention of the California Scholarship Federation took part in a similar program.

Nation's Engineers Call Attention to Group's Contributions

"America's Engineers Build for the Future" is the theme of National Engineers' Week to be observed Feb. 17-23. Sponsored by the National Society of Professional Engineers and the New Mexico Council of Technical and Scientific Societies, Engineers' Week will call attention to the contributions of the engineering profession to the nation's social and economic progress.

The history of the engineering profession since the turn of the century has been one in which the engineer has assumed an ever-greater responsibility for the nation's productive efforts. In 1900 there were 255 industrial workers for each engineer. By 1955 the number of industrial workers per engineer had shrunk to 55.

With the increase of engineers employed by industry, the purchasing power of the individual workers has shown a striking increase, due to the increased utilization of process and product engineering.

"It can be seen," Jack Barber (7323), local Engineers' Week chairman, said, "that the growth of the engineering profession is one measure of the overall growth of 20th century technology and industrial achievement."

To spotlight engineering profession accomplishments, Jack and his committee plan a general publicity campaign during National Engineers' Week. In addition, several displays will be placed in downtown locations.

As in the past, the 13 member societies of the Tech Council have contributed to a fund to bring New Mexico high school students to Albuquerque to participate in Engineering Open House activities at the University of New Mexico on Feb. 22-23.

Last year, the Council's funds provided transportation for about 500 students.

Karl F. Krug to Head Discussion At AMA Seminar

Karl F. Krug, Assistant Purchasing Agent, Price and Cost Analysis Department 4350, will lead discussion at a Cost-Price Analysis workshop seminar, Mar. 20-22, in New York City. David M. Nason, materials manager for the Submarine Signals Division of Raytheon Co., Portsmouth, R. I., will also serve as discussion leader.

The seminar, sponsored by the American Management Association, will examine in depth the following areas of price analysis: preparation, responsibility, performance, and negotiation. Techniques for increasing the effectiveness of price analysis as a purchasing tool will be investigated at the seminar.

Sessions will be held at the Hotel Astor.

Congratulations

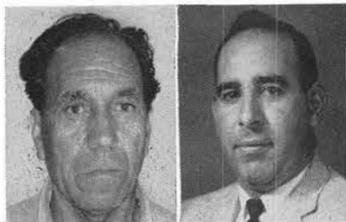
Born to:
Mr. and Mrs. K. David Nokes (2451-2) a daughter, Katherine Anne, on Jan. 23.

Mr. and Mrs. Robert Swanson (4233) a son, Robert Lee, on Jan. 28.

Mr. and Mrs. J. E. McCreight (2542) a daughter, Penny Dawn, on Jan. 19.

Service Awards

15 Year Pins



Antonio Jinzo
4573
Feb. 10, 1948

F. G. Gabaldon
4574
Feb. 17, 1948



William A. Otero
4624
Feb. 17, 1948

James R. Dillard
4623
Feb. 18, 1948



Clarence E. Foster
2531
Feb. 18, 1948

C. J. McGarr
4600
Feb. 24, 1948

10 Year Pins

Feb. 16-28

Julian T. Chavez 3242, Donald A. McCoy 7324, Elwin L. Schaefer 4543, Erma G. Campbell 4333, David E. Henry 7232, Kenneth O. Crays 7214, Karl E. Lindell 2534, Andrew J. Alderete 2643, Pasquale A. Liguori 4412, Melvin H. Brock 7222, and Lee F. Parman 3421.



ARCHERY ENTHUSIASTS for the past two years have been L. B. Jolly, left, and Herb Jewett (both 4221-1). They compete regularly in Sandia Archery Club competition and also enjoy hunting with bow and arrow.

Sandia Archery Fans 'Shoot 'em Up' In Regular Monthly Competition

Use of bows and arrows for hunting and warfare dates back some 5000 years to the early Egyptians, but archery as a sport developed relatively late.

In 1673 the first archery tourney, "Ancient Scorton Arrow," was founded in England and it was 1879 when the year-old National Archery Association sponsored its first American tourney in Chicago.

"Archery is a sport that appeals to all ages and is fine for family participation," is how Herb Jewett (4221-1) accounts for the growing popularity of this ancient recreation.

Herb, L. B. Jolly (4221-1), and a number of other Sandia Laboratory employees are members of the Sandia Archery Club. They shoot regularly at the Base archery range, located just east of the Sandia rifle range.

Club membership is open to beginners or experts alike. The archers have free use of the range, but must help maintain the facility. "The range is open all day, and sometimes we even have archery enthusiasts using flashlights to see the targets in the dusk," Herb said.

The range has 28 targets. These range in size from six-in. to 24-in.

diameter, and the distance from shooting mark to target varies from 15 to 80 yards. At least one tournament is held each month.

Instruction is available for beginners. Herb estimates that a beginner could be "outfitted" for the following figures: second-hand bow, \$25 to \$40; second-hand aluminum arrows, \$5 a half dozen; arm guard, \$1.25; and glove, \$1.50 to \$2. A quiver is desirable, but not absolutely necessary. He recommends a bow with 10 to 15-lb. pull for youngsters, 20 to 30-lb. for women, and 36 to 45-lb. for men.

"The main requisites for becoming a good archer are steady nerves, the will to learn, and time to practice," he said.

Practically all of the 23 active club members hunt big game with bow and arrow. "Hitting a moving animal is quite different from making a bull's eye on a stationary target," Herb explains. "We have one woman member who scores poorly at the target range but she's downed three antelope in a row."

The Sandia Archery Club meets once a month at members' homes. Prospective members can obtain additional information from Herb.

Deadline Today For Women's Tournament

Today is the deadline for women bowlers to enter the Women's Handicap Bowling Tournament scheduled April 20-21 and 27-28. The tourney is open to women employees of Sandia Laboratory and AEC/SAO.

The tourney will be held at the Coronado Club and will include singles, doubles, and all events competition. Only members of WIBC (Women's International Bowling Congress) may compete.

To enter, contact Services and Benefits Division 3122, ext. 29157, today.

All-Star Bowling Team Selected for Interbase Tourney

Sandia Laboratory's first All-Star Bowling team was selected last week. The team will compete in an Inter-Base Tournament scheduled Mar. 24 at Manzano Base. Sandia Laboratory, Manzano, Sandia Base, and Kirtland AFB teams will compete.

Sandia team members are Herb F. Sisson (1414), captain; Ken R. Jones (4411), alternate captain; Warner H. Jones (3432); J. F. Reed (7132); E. J. Dadian (4361); Max M. Gasta (1313); and Richard M. Dayhoff (7134).

Coronado Club Offers Seafood Buffet Tonight

The Coronado Club's special Seafood Buffet will be featured at the Club this evening following social hour (5:15-7:30 p.m.). Price of the buffet, which begins at 6:30 p.m., will be \$1.50 per person.

Saturday evening, Feb. 16, the Club will feature a Men's Sports Smoker with a ski theme. The evening will feature a guest speaker and complimentary snacks.

Next week's social hour will be held Thursday, Feb. 21, and will feature a \$1.25-per-person chicken buffet and the music of Sol Chavez.

On Mar. 2, the Club's annual Hofbrau festivities, including German food and free beer, will be held.

Nebraska U Alumni Have Charter Dinner At KAFB Tonight

The University of Nebraska Alumni Club of New Mexico will hold its annual Charter Day Dinner tonight in the Candlelight Room of the Kirtland Air Force Base Officers' Club.

Special guests will include Perry Branch, the Director-Secretary of the University of Nebraska Foundation, and his successor, Harry Haynie.

The agenda for the evening includes a social hour from 6:30 to 7 p.m.; dinner from 7 to 8; and from 8 to 8:45, a program of football movies from the University's successful 1962 season. Dancing will begin at 8:45.

Sports Car Fans To Award Trophies

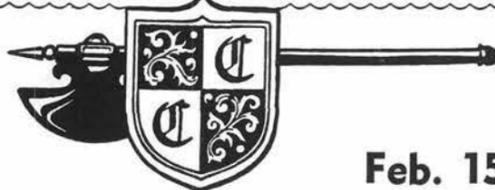
Trophies will be awarded this evening to winners of the recent gymkhana sponsored by the Rio Grande Region of the Sports Car Club of America.

Presentations will be made at a meeting at 7:30 p.m. at Wells Automotive, 310 San Pedro, S.E. Refreshments will be served.



COLORFUL SAFETY SIGN, 16-ft. long, was completed last week by signpainter Kenneth B. Stiver (4513). The sign will hang in the entrance hall of Bldg. 887 as part of the continuing Department 4510 safety campaign.

coronado club



Feb. 15 - Mar. 2

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
17	18	19	20	21	22	23
	Duplicate Bridge 7:30 p.m.	Adult Dance Instruction Basic—7:00 Advanced—8:30	Game Night 8 p.m.	Social Hour 5:15-7:30 Sol Chavez Special \$1.25 Chicken Buffet Bridge Lessons	Washington's Birthday Club Opens at Noon	Men's Sport Smoker Ski Theme 7:30 p.m. Dance Classes 1-3 p.m.
24	25	26	27	28	1	2
Special Dinner \$1.50 4:30-6:30 Movie "Sally & St. Anne" 6 p.m.	MMP Bridge 7:30 p.m.	Adult Dance Instruction Basic—7:00 Advanced—8:30	Ladies Bridge 1:15 p.m. ACF Bridge 7:30 p.m.	Bridge Instructions	Social Hour Buffet	Hofbrau German Food Free Beer

EVENTS

SHOPPING CENTER

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

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

FOR SALE

3 BDR, garage, walled, carpet, a/c, \$11,250 FHA appraisal. Higgins, 2412 Elizabeth NE, AX 9-4302.

TENOR BANJO, Slingerland May Bell, deluxe, gold plated, pearl inlay, w/case, \$125. Tallman, AL 6-0597 after 5 p.m.

LADY'S BOWLING BALL, 13-lb.; size 6 shoes; bag, \$35; figure skates, size 6, \$15; roller skates, size 6, \$20. Ayers, 1010-A Palomas Dr. S.E.

COIN COLLECTION, face value plus 25%; rifle, .22 Remington bolt-action, Model 550, 18-22 shot magazine. Vilella, 299-6261 evenings.

HEATHKIT Model SG-8 R.F. signal generator, \$15. Melick, AL 6-4449.

'53 PLYMOUTH 2-dr. sedan, needs some repair, \$100 or best offer. Blain, AL 6-7114 after 6 p.m.

'59 STUDEBAKER 1/2-ton pickup 6, OD, aluminum cover on 6' bed, \$750. Graham, AM 8-8967 after 5:30 p.m.

'62 T-BIRD, 10,000 miles, all power accessories, electric windows, a/c, etc. Chandler, AX 8-5069.

'58 FAIRLANE 500, 4-dr., R&H, auto. trans., \$725. Willis, 1408 Mesilla NE, AM 8-7867.

'49 FORD TRUCK, rebuilt by Ford Motor Co., see after 6 p.m. Callender, CH 3-4892.

'57 OLDS ENGINE, (3 carbs) and stick hydro transmission, mounted on '52 Olds (free with above). Bechtel, 268-7409.

COMPLETE H. O. layout on 5x9 train board, includes remote control switches, cross-over, locomotive and cars, \$60. Wacek, AM 8-8579.

RECORD PLAYER, portable, automatic changer, 3-speed, \$25. Thayer, 1424 Hoffman Dr., NE, AX 9-3127.

BLOND MODERN B. R. suite, book case headboard, box springs, mattress, \$65. McCarty, CH 2-8289.

SCOPE, Jana variable 2 3/4-8X, excellent for low power rifle, \$15, coated optics one-inch tube. Baker, 299-3403.

ONE frosted glass bathroom and four 37x38 steel casement windows w/glass, crank openings. Larsen, AX 9-3496.

10-SPEAKER STEREO SYSTEM, 3 channels, stereo AM-FM and multiplex tuner, 40-watt amplifier, mahogany finish. Martin, 299-8707.

'61 MERCURY, Meteor 600, standard transmission a/c, low mileage, original owner. Mrs. Schikowski, AM 8-0645.

3-BDR, 2 bath, adobe home, LR, DR, den, radiant heat, patio, carpets, built-ins, sprinklers. Lavanier, CH 3-6386.

REFRIGERATOR, Shelvador, 11 1/2 cu. ft. w/cross-top freezer, \$70. Berger, 298-4234.

'58 VOLKSWAGEN 2-dr. sedan. Boring, 265-0070 after 5:30 p.m.

'49 PONTIAC 2-dr. sedan, 8-cyl., \$75. Faw, AX 9-7360.

FURNITURE: 40" electric push-button range; formica table, 2 chairs; bookcase; student desk chair; triple dresser; nightstand; lamps. McDowell, AX 9-6222.

1700 SQ. FT. HOME, VA loan, 3-bdr, den, LR, hw/floors, landscaped, pitched roof. Coonce, AX 9-2026.

3-BDR MOSSMAN, a/c, fireplace, covered patio, dishwasher, double garage, 3500 Georgia NE. Gardner, 268-5747.

'58 MGA, 15,000 miles, never raced, new tires, wire wheels, no body, \$250. Netz, AX 9-7036.

GIRL'S 26" bike, \$15. McCulloch, AX 9-5463.

UNIVERSAL vacuum cleaner w/attachments; Roto-Broil 400 rotisserie; 2-burner hot plates; 2 card tables, 2 single-size mattresses. Schuette, 265-0463.

'55 OLDS 4-dr. sedan, Hydraulic, R&H, PB, new license, carburetor, and tune-up. Fueger, 525 Texas SE, AL 5-3679.

7-ROOM HOUSE, family room, 1 1/2 bath, covered patio, walled, 1580 sq. ft. living area, \$1400 down, Paradise Hills, Wright, 898-2298.

SOFA and chair set, \$70. Boal, AM 8-8271.

21" TV, 3-way comb., walnut. Martinez, DI 4-6994.

'54 BUICK SPECIAL 4-dr. sedan, \$295; Bytheway, AX 9-2791.

TWO AQUA studio couches, \$17.50 ea. Grey chair, \$5, black chair \$5, coffee table, \$7.50. Hurt, AL 5-5949 after 5:30 p.m.

INDIAN WAR ITEMS, bow, \$12; arrows, \$2/ea.; quiver, \$20; Civil War bayonets and edged weapons. Smitha, AX 9-1096.

TWO twin bed sets of mattresses and innersprings; 1 maple double bedstead. Sherwood, AX 9-2169, 2326 Hoffman Dr. NE.

'60 BSA Scrambler motorcycle, \$375; 2 15" wheels for Chevrolet, \$8. Wilson, AX 8-0049.

NEXT DEADLINE
 FOR SHOPPING CENTER ADS
 Thursday Noon, Feb. 21

'52 PONTIAC, 9 passenger station wagon, hydramatic, 2 new tires, new brakes, \$225. Fisher, AX 8-0526.

'61 FALCON station wagon, white, 4-dr., R&H, standard shift, \$1300. Gise, AL 6-4411, ext. 33185.

'52 PLYMOUTH Cranbrook 4-dr. sedan, \$150. Wiesen, 256-7973.

4-BDR HOME, den, 1 1/2 bath, pitched roof, hw/floors, landscaped, sprinklers, near schools, La Sala Grande addition, \$21,500, 2908 La Palomita NE. Williams, AX 9-5967.

ALFALFA HAY: 310-gal. butane tank. Crosby, 344-3098.

COFFEE TABLE, \$25; matching end tables, \$20/ea., gray finish, glass tops, all for \$50 cash. Fuller, 1000 Chama NE, AL 5-2114.

'53 STUDEBAKER V8, stick. DeHaan, DI 4-4805 after 6 p.m.

KAMP KING COACH on 3/4-ton '59 Ford pickup, extras, sale forced by illness. Visic, DI 4-6243.

VTVM: 1-wheel trailer, 2 handguns, 2 rifles, tape recorder, stereo. Ernst, 268-9414.

8x10' OVAL cotton braided rug, \$10; 8x10' oval wool braided rug, \$20; Jacobsen power lawn mower, \$18. Clark, 298-6461.

JEEP workshop manual, new, covers all model jeeps, \$3. Laskar, AX 9-1024.

SOFA BED. Pitti, AL 6-1629.

3 BDR, 1 1/2 baths, mahogany cabinets in kitchen, lr carpeted, corner lot, sprinklers, ac, \$1500 down, assume 4 1/2% loan. Booth, 298-2107.

LOT in mountain subdivision, close in. Becker, AX 8-0045.

SELL OR TRADE '58 English Ford escort station wagon; Singer Slant-o-Matic sewing machine; Singer Golden-Glide vacuum cleaner. Naumann, 298-6476.

GAS RANGE, 36" Garland, \$35. Kross, 256-0223 after 5 p.m.

SEARS CASEMENT WINDOW air conditioner; Hot Point window air conditioner; Magicair mobile evaporator cooler; bassinet; car bed; play pen. Richardson, AM 8-0519.

'57 FORD 4-dr. Custom 300, V-8, R&H, w/w tires, automatic transmission, \$550. Hobing, 299-8061.

'53 BUICK, new battery, \$75. Raburn, 298-3351.

'57 PLYMOUTH Belvedere, 4-dr., AT, R&H, \$475. Mackenzie, 299-1806.

BOAT, car top, alum., 14', 4 seats, 130#. Windham, AL 6-9455.

ROPER GAS RANGE, full size, \$40. Castillo, AX 9-8063.

3/4 TON AIR CONDITIONER, 110 volt. Workman, 298-3604.

MOVIE CAMERA, Keystone 8mm turret model K35, three lens, \$37.50. Kutzley, AL 5-3572.

PORTABLE SEWING MACHINE, \$30; Mouton Lamb coat, size 14-16, \$35; TR-3 shop manual, \$6. Svensson, DI 4-7700.

ACCORDION, 120 bass, \$100; baby feeding table, \$20; crib, \$10; car bed, \$5; 2-burner electric hot plate, \$15. Sisson, AX 9-4217.

EARLY AMERICAN brown upholstered platform rocker; pair copper ceiling lamps; white upholstered headboard w/bed frame, twin. Burks, AM 8-5613.

'57 3/4-TON PICKUP, rebuilt GMC engine 270 cu. in., w/custom cab over 9' camper, sleeps 4, fully equipped, \$1995. Sarason, AX 9-2443.

SMITH CORONA portable typewriter, \$25. Mohart, AL 5-7805.

SOLID MAHOAGANY dining table, hand made, \$20. Hill, CH 3-3493.

'59 FORD convertible, power, R&H, new wsw tires, blue and white. Humphrey, AX 9-0020 after 5 p.m. and weekends.

'59 RENAULT, 4CV, \$175. Cole, 236 Conchas NE, AX 8-2127.

ONE HOT POINT and 1 Kenmore automatic washing machines, \$25 each or best offer. Bishop, AX 9-0649 after 6 p.m. and weekends.

21" CONSOLE TV, \$40. McFall, AX 8-1552.

'51 KAISER 2-dr., 6-cyl., OD, new tires, \$150. Pickens, 243-0728 evenings.

HI-STANDARD .22 target pistol, Supermatic citation model w/field case, \$75; B&L yellow shooting glasses, new, \$15. Kasperik, DI 4-7520 after 7.

GUNS: Colt Frontier Scout revolver, .22 cal., \$40; Winchester Model 12 shotgun, \$75; Winchester Model 88 rifle, .308 cal., \$115. Kubiak, 256-1513.

'54 CHEV 4-dr., Powerglide, R&H, PW, \$295. Woelhart, AX 9-8816.

8-PLACE SETTING Winfield china, Dragon Flower pattern, new, won in contest. Carter, DI 4-6563.

'62 RAMBLER classic station wagon, 6-cyl. engine w/OD, best offer takes it. Massey, 298-4650.

15 HP OUTBOARD MOTOR, Sea King, new, \$275, list price, \$338. Hinman, AM 8-8550.

'58 PONTIAC station wagon, factory air, PB, PS. McKay, AL 5-5658.

'60 SANTA FE CUB CAMP TRAILER, cost \$1095, take \$595 cash. Hiser, 2811 Los Arboles ct., AX 9-1660.

4-BDR., 1 1/2 bath, NE Heights, dbl. garage, fireplace, electric built-in kitchen, carpets, patio, sprinklers, a/c, walled, landscaped, financing arranged. Bassett, 299-5685.

8MM BROWNIE MOVIE CAMERA, Brownie projector, light bar for indoor movies, filter, \$90 retail, will take \$50. Giles, 1400 Somervell NE, 299-3119.

RED AND BEIGE 9x15 wool Wilton carpet w/pad & runners. \$50 or best offer. Newman, 298-2323.

DOUBLE BED FRAME; AM-FM tuner; Heathkit pre-amp, power supply, amplifier, w/schematics, best offers. Boling, 282-3256.

3-BDR. SEPARATE DEN, 1 1/2 baths, 1600 sq. ft., \$500 down FHA, total price, \$15,500. Ray, 11017 Phoenix NE, AX 8-0408.

BUNK BEDS, maple, w/mattresses, ladder, side rail, original cost from Modesta's, \$230, sell for \$115. Hughes, 299-6674.

TWO-SPEED exercycle. Keyser, AL 6-1285.

SLENDER-EZE professional vibrator lounge, multiple frequency and volume controls, original cost \$750, sell for \$175. Schreiner, AM 8-4159.

BABY VALET CHEST; Starkline crib; Safety Server feeding table; play pen; stroller; car seat; training chair; automatic sterilizer. Randall, AX 9-3935.

BOY'S 24" bicycle, new tires, \$15. McMurray, AM 8-0259.

FOR RENT

3 ROOMS, 2 blocks from Sacred Heart Church, off 4th and Stover Ave., \$35/mo. Chavez, AL 5-5461.

BEDROOM and private bath w/kitchen privileges and laundry facilities. Pitti, 836 Georgia, SE, AL 6-1629.

3-BDR or 2-bdr. and den, partly furnished, close to bases, shopping and school. Wilhelmi, 255-2561.

TWO HOUSES: 2-bdr, stove, and ice box, close to school; small cottage, low rent. Temple, CH 2-9092.

WANTED

STURDY WOOD BUNK BEDS, with or without mattresses. Beckley, AX 9-3440.

VINTAGE MODEL airplane engines for collection, will trade or buy. Stark, AM 8-8674.

SCOUTMASTER, established NE Heights troop has coming need for a scoutmaster with successful experience. Lewis, AX 9-7217.

JOIN CAR POOL from Marquette and Palomas NE to Bldg. 894. Sullivan, AL 6-6373.

APARTMENT TO RENT, 1 bdr, furnished or unfurnished. DeHaan, DI 4-4805.

HOLLYWOOD BED, good condition, full-size, complete, \$20; extra mattress, full size, \$10. Oglesby, 344-6331.

RIDE on vicinity Kathryn and San Mateo SE to Bldg. 800 parking lot, daily. Easton, AL 6-7717.

CHILD CARE my home, day or week, 4-year old for companion, near Wyoming and Menaul. Moery, AX 9-3630.

CAR POOL from Holiday Park to gate 3 or 4. Levy, 299-4225.

TO JOIN car pool from vicinity 10324 Paseo Del Norte N.W. to vicinity Bldg. 800. Dehon, 898-2219.



NEW-OLD ADDITION to the Sandia Lab parking lot is this 1930 Reo. Jim Fife (3425/1000) recently drove the relic back from Iowa with his sister-in-law, Mary Rogers of Carroll, Ia., holding her breath all the way — as passengers often will. The car weighs nearly 4000 lbs.

Almost Ancient 1930 Reo Makes Safe Trip from Iowa

You don't realize how big Kansas is until you try driving across it at 40 mph maximum. The snail's pace didn't bother Jim Fife (3425/1000) half as much as the uncertainty of whether or not his 1930 Reo would finish the trip.

The car had been stored in Carroll, Ia., for many years by Jim's in-laws. Last summer, while on vacation, he drove the car to Iowa

City and left it with a mechanic for engine overhaul.

"On the drive home last month I averaged about 11 miles per gallon, although there was a small leak in the tank," Jim said.

The 33-year-old car made the distance without breakdown; a brand new 1963 electric fuel pump failed in Liberal, Kan.



READY TO GO, Ed Healy (8121-4) makes last minute check on howitzer breach before returning to control point. At right is Bill Bierly (7246).

Continued from page one

Tonopah Test Range Artillery

Ralph Holland, Mike Winfrey, K. W. Valley and Bill Bierly of Tonopah Test Range Division 7241, headed by Bob Statler. Photographic coverage of the tests is provided by Paul Van Dyke, Dick Gray, and Dave Abrahams, all of Photographic Section 8122-1.

Because of the short distance from Livermore to the range—only 380 miles by direct route—the men in the Livermore Laboratory Test Projects Group consider themselves to be commuters. They can get to the range by car in less than 10 hours. Air travel requires a layover in Las Vegas to make connections with the light plane operating between Tonopah and Las Vegas.

The 155mm cannons at the range are operated year-round through blazing desert heat and bitter-cold winters. In the winter,

snow covers the gun emplacements, making the area resemble the siege of Stalingrad.

All of the artillery pieces used at the range were obtained by Livermore Laboratory from the Army. The first two long-barreled 155mm guns were shipped from Benecia Arsenal in California. Two shorter-range 155mm howitzers were added later, obtained from Fort Sill in Oklahoma.

The first 155mm cannon at the range is now used by Applied Aerodynamics Section 7131-2.

Marlin Pound (8212-2), personnel representative, acted as technical consultant in the selection of the cannons. From 1955 to 1957, he served as an assistant commander of a self-propelled 155mm battery at the Marine Corps Artillery Unit at Twentynine Palms, Calif.

G. M. Wing Author Of Recently Released Mathematics Book

A Sandia Laboratory mathematician, G. M. Wing (5421), is the author of a book titled "An Introduction to Transport Theory," published recently by John Wiley and Sons.

The book is an outgrowth of research begun by the author at Los Alamos Scientific Laboratory, continued during his service as a consultant for the RAND Corporation, and completed recently at Sandia Laboratory.

Mr. Wing was associated with LASL from 1951-58, with the University of New Mexico from 1958-59, and has been with Sandia Corporation since 1959.

"The book avoids application of neutron transport theory to specific fields," he says. "My approach is based on construction of a set of simple mathematical models related to physical situations, in the belief that study and understanding of these idealized models will clarify the basic aspects of transport theory for the reader."

Mr. Wing received a BA degree in 1944, and an MS degree in 1947, both from the University of Rochester. He received the PhD degree in mathematics from Cornell University in 1949.

Supervisory Appointment

JOAQUIN A. De VARGAS is supervisor of Operations Section I, 3452-1, Electronic Data Processing Department.



"Jake" has been with Sandia since August 1955 and was originally assigned to the Auditing Department. In 1956 he was given a leave of absence for military service and, upon his return in 1959, was assigned to the Electronic Data Processing Department.

While on leave he served in the Air Force as a B-36 navigator for Strategic Air Command.

Prior to employment at Sandia, Jake attended the University of New Mexico where he received a Bachelor's degree in business administration. He is a member of Alpha Kappa Psi and Beta Alpha.

Instrument Society of America Seeking Answers, New Approaches

This is another in a series of articles describing the activities of member organizations of the New Mexico Council of Technical and Scientific Societies.

Some 100 engineers, physicians, medical researchers, and instrument manufacturers met this week at Lovelace Clinic to discuss "Medical Measurement Techniques." The program was arranged by the Albuquerque Section of the Instrument Society of America.

"It was an information exchange," James H. McCutcheon (1321), ISA president, said. "We tried to provide answers and new approaches to medical instrumentation problems ranging from recording of astronauts' body temperatures while in space to new techniques for measuring lung capacity."

"This meeting illustrates the purpose of ISA," Jim continued. "The organization was formed in 1946 to help advance the science and technology of instrumentation and to disseminate information. ISA also encourages technical education and the development of professional standards."

Nationally, ISA has 109 sections with more than 13,000 members. The Society's primary publication is the *ISA Journal*, published monthly. National conferences and exhibits, programmed to present the widest range of instrumentation subject matter, are held each year in different cities.

"The Albuquerque Section of ISA enjoys the reputation of being one of the most active technical so-

cieties in the area," Jim said. "We currently have 70 members, some from as far away as Las Vegas, Nev., and Tucson, Ariz., and we are working to establish a student ISA chapter at the University of New Mexico."

The Albuquerque Section was organized in 1949 with Lee Deeter (2440) serving as the first president. The chapter schedules monthly technical meetings and holds two special events annually.

"We concentrate on arranging one educational conference each year," Jim said. "The programs feature technical experts who thoroughly explore a particular aspect of instrumentation. Last year's program dealt with potentiometers and standards during four days of conferences held on alternate weeks."

The second annual event is an equipment display by instrumentation manufacturers.

"Tours, talks, seminars, and socials round out our program," Jim said. Other Sandians who are officers of the Albuquerque Section are John Smalley (5311), treasurer; John D. Patrick (7312), national delegate; Robert W. Healy (5311), alternate delegate; George Baker (7131), educational chairman; James Stoever (7325), program chairman; and Robert P. Baker (2441), publicity chairman.

Major Construction Planned For Livermore Laboratory

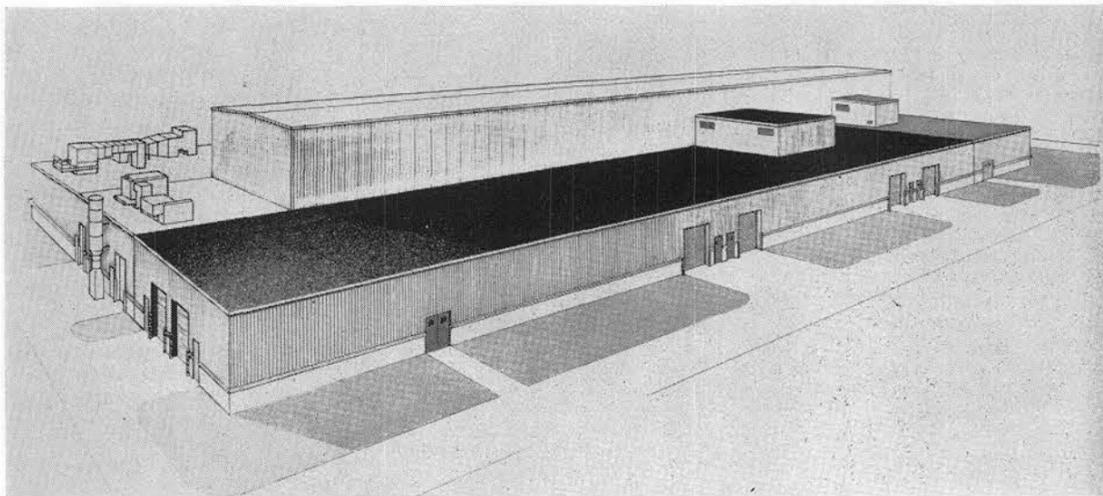
Three major construction projects at Livermore Laboratory have been authorized by the U.S. Atomic Energy Commission. Total cost of the construction work is expected to approach \$2 million.

Bids will be invited later this month by the AEC's San Francisco Operations Office for the construction of a 24,000-sq.-ft. extension to the Laboratory's model shop building. Completion date is scheduled for January 1964.

Authorized for construction later this year will be a 23,000-sq.-ft., two-story addition to the Labora-

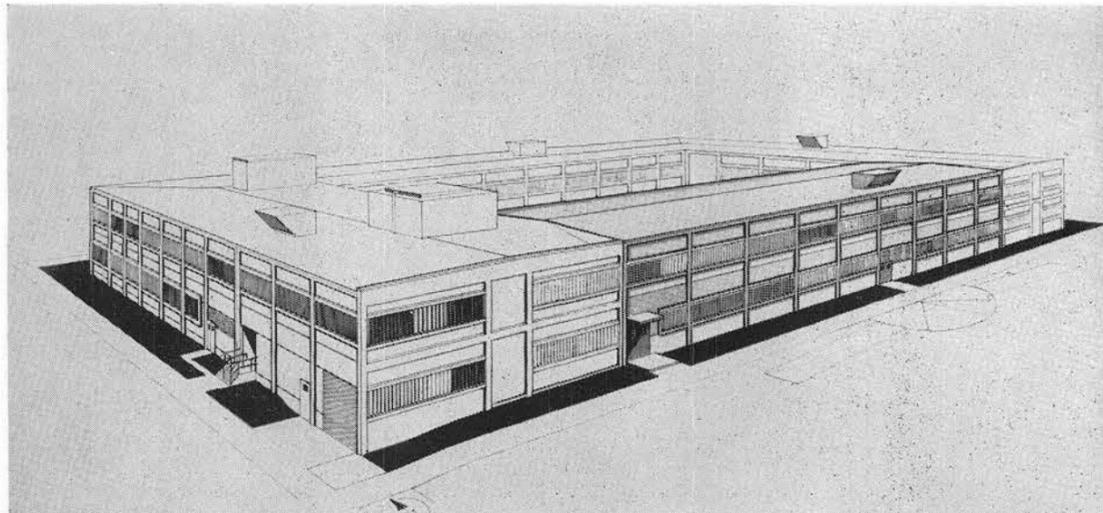
tory's engineering building. When completed in 1964, the new wing will complete the quadrangle on the existing U-shaped building.

The third project calls for the construction of an extension to a testing facility building in Area 8, south of the Laboratory's main technical area. The extension to the north and east side of Bldg. 972, will enclose the centrifuge facility and provide additional laboratory space. Bids for this project are expected to be opened in May. Construction is expected to be completed in November 1963.



EXTENSION to the model shop building will provide 24,000 additional square feet for office and laboratory

facilities. The extension is expected to be completed in January 1964, the Atomic Energy Commission reports.



ARTIST'S CONCEPTION of the way Bldg. 912 will look when a new wing is completed in 1964 is shown.

Sandia's Safety Record

Sandia Laboratory HAS WORKED 1,015,000 MAN HOURS OR 29 DAYS WITHOUT A DISABLING INJURY

Livermore Laboratory HAS WORKED 858,000 MAN HOURS OR 166 DAYS WITHOUT A DISABLING INJURY