

# PBFA-Z's energy bursts reach new highs, help predict nuclear blast physics, edge closer to fusion

**Sandia accelerator achieves unprecedented levels of X-ray energy and power**

By Neal Singer

Lab News Staff

For periods of ten-billionths of a second this fall, a massive accelerator at Sandia consistently emitted intense bursts of more than 40 trillion watts of X-ray power. The highest power pulse was more than 160 trillion watts — more than 30 times the combined output of the Earth's utility plants.

The accelerator, known as PBFA-Z (Particle Beam Fusion Accelerator, Z-Pinch version, an upgraded version of the former PBFA II), produced increasingly powerful bursts of energy — 1.0 megajoules in early October, 1.2 megajoules in mid-October, and 1.8 megajoules in November. A megajoule is a million joules — a unit of energy.

The powerful "shots" provide data for computer simulations used to predict the physics within, and effects of, a nuclear blast. Scientists hope to substitute this laboratory data for some of that obtained from underground nuclear explosions, which have been halted.

The blasts also move Sandia researchers closer to reaching sustainable nuclear fusion in the laboratory using the technique of inertial confinement, something that has never been achieved. Sustainable refers to a condition when the amount of energy produced by the fusion reaction exceeds the amount of energy used to create it.

"We'll use the PBFA-Z facility to conduct experiments on nuclear fusion over the next year as part of the national ICF [Inertial Confinement Fusion] Program," says Rick Spielman, a physicist

in High Energy Plasma Physics Dept. 9573 and the project manager. "We're much closer than we were a year ago."

And during the past year, study of the controlled bursts also have been useful for astrophysicists interested in getting a handle on processes that take place in stellar atmospheres.

Sandia, with machines like the DOE-funded PBFA-Z, is a world leader in generating large pulses of power. PBFA-Z uses its tremendous electrical energy to create a powerful magnetic field that rapidly implodes a plasma within what can be visualized as a tiny, gold-plated can the size of a thimble. Stopping the motion of the plasma's atoms as the magnetic field shrinks to nearly zero creates tremendous heat within the field's confines.

## Z-pinch produces X-rays

The extremely large output of power and energy was accomplished by converting the accelerator's electrical output into a dense, ionized gas (plasma) called a z-pinch, which efficiently produces X-rays.

A z-pinch is so named because it creates a magnetic field that, as it contracts around ionized gas, pinches it vertically along (to a mathematician) the z-axis.

Sandia's technology is the world's best for generating the ultra-high pulsed power needed  
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# Sandia LabNews

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Sandia National Laboratories

## Staff imbalances, funding shifts bring as many as 435 workforce realignments

Details via managers, info packets, town meetings

Hundreds of Sandia employees have begun seeking new work outside their current organizations following Tuesday's notice that DOE had approved a Sandia plan to eliminate as many as 435 positions during the next four months.



Announced to employees through their managers, the online *Sandia Daily News*, and information packets mailed to employees and managers this week, the approved workforce restructuring plan again includes a provision for a lump-sum monetary incentive (minimum \$20,000), a Voluntary Separation Incentive Program (VSIP), that allows eligible employees to leave Sandia voluntarily with money in their pockets rather than face the possibility of being "surplused" at a later date. The VSIP is intended to reduce the number of employees who might later be asked to leave involuntarily if organizational transfers and other internal resolutions don't yield sufficient results.

Employees have until Jan. 6 to apply for VSIP benefits.

Town meetings were scheduled Wednesday and Thursday at the New Mexico and California sites to provide employees information about the VSIP and realignment process.

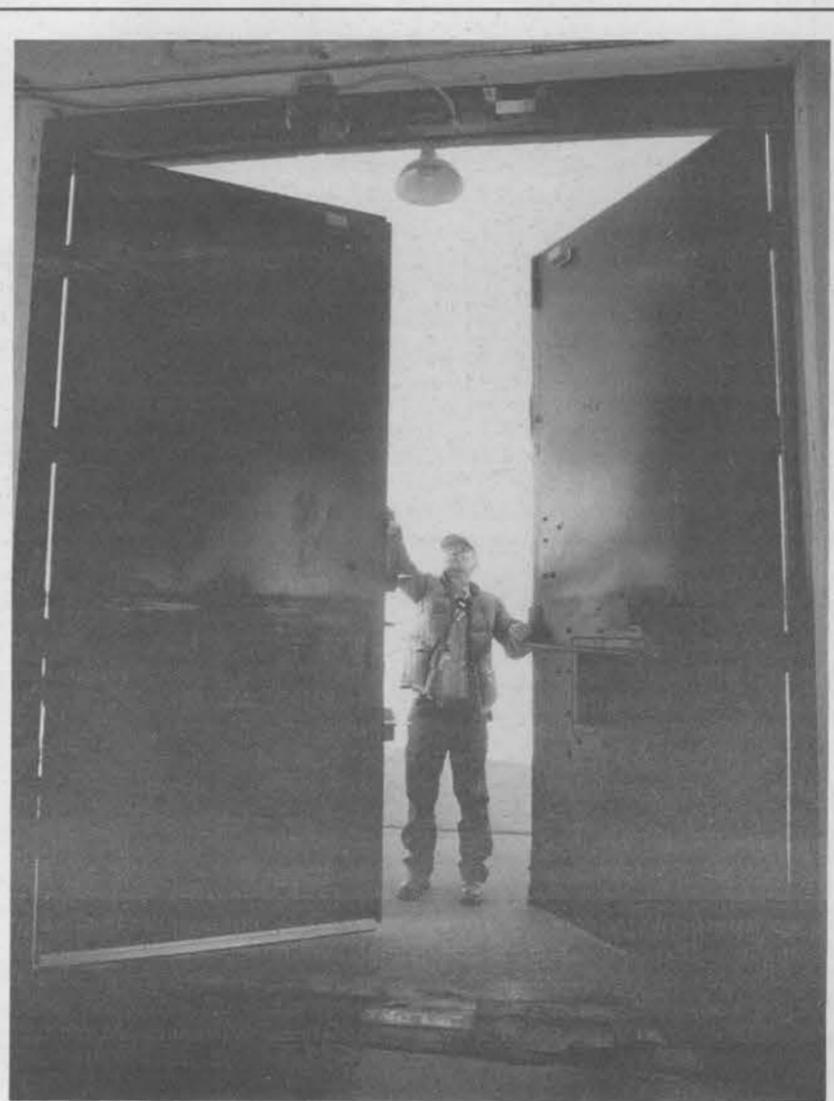
"Although Sandia did substantially better in budget income than we'd earlier expected, I'm sorry to say it was not sufficient to avoid some personnel reductions," said Labs President C. Paul Robinson in a voicemail message to employees Tuesday. "The shortfalls are primarily the result of reduced funding in a number of programmatic areas, as well as from our requirements to reduce overhead spending over a five-year period."

### Zero layoffs again the goal

Unlike last winter, when 327 positions were eliminated without layoffs, this year's staffing problems may be more difficult to resolve, according to Don Blanton, Director of Human Resources Center 3500.

"Zero involuntary separations is the goal again this year," he says, "but realistically, that's going to be more difficult this time based on the preliminary numbers."

The 435 "impacted" positions include 418 positions identified through division-level staffing plans compiled by each vice president and finalized in  
(Continued on page 4)



ABEL ANAYA, JR., of Nuclear/General Material Storage Team (7618-1) opens the doors to a bunker at the Manzano Mountain Complex, one of six bunkers where Sandia stores its nuclear materials inventory. Through the dedicated efforts of a group of Sandians, the inventory of surplus nuclear materials has been reduced by more than 30 percent (about 10 tons) since the beginning of this year. See story on page 8. (Photo by Randy Montoya)

ECP giving by employees increases to \$1.475 million this year

2

Flame process creates commercial-scale sheets of diamond

3



7

Sandia licenses top 100 this year, royalties at record level

10

New building showcases both solar, geothermal heating/cooling

# This & That

Solving your shopping problems - Looking for a friend's or colleague's holiday gift that won't break your budget? Don't forget about the popular Sandia logo items - caps, hats, mugs, and shirts - available from the Lab News office. Check with us soon while we still have a good selection (including hats to fit big-headed Sandians and even pig-headed Sandians). Most items are under 10 bucks, with several costing \$15 (golf shirts and Panama hats). See us in Bldg. 811 (north of Bldg. 800) at Sandia/New Mexico and in Mobile 50, Rm. 130 at Sandia/California. And this makes it an even-better holiday deal - all profit from the sale of these items goes to charitable causes.

Deserves publishization - Several Sandians were kind enough to send me the notice posted at the Labs by a contractor several weeks ago informing Sandians that the contractor would be working in some offices to remove old data boxes. The notice said the procedure involves "the connectorization" of certain cables. I'm not sure, but I'll bet contractors get paid more for that than for simply "connecting" the cables.

Great national press - Some outstanding new technical facilities, fascinating technical projects, and an aggressive Media Relations crew (12640) have worked together to bring the Labs lots of favorable national press coverage in the past few months. Several examples:

- In October, US newspapers and other publications with more than 8 million readers reported on our latest nonlethal weapon achievements.

- Sandia's new 73,000-square-foot Robotic Manufacturing Science and Engineering Laboratory (RMSEL, Lab News, Oct. 25) has been featured in USA Today, in dozens of other national newspapers and technical publications, and on the CBS radio network, Cable News Network, and the Discovery Channel.

- The December issue of Popular Science names the Solar Two facility as one of its "Best of What's New" environmental technologies. Developed by Sandia and Southern California Edison, Solar Two is the world's most advanced solar power plant, generating enough electricity to power 10,000 homes (Lab News, June 21).

Sandia still may not be a "household word" throughout the US, but thanks in large part to increasing national media attention, more people know something about us and our work today than ever before.

Post-retirement plans - Unless I upset too many vice presidents before then, my retirement is at least seven years away, but I'm already considering money-making ideas to supplement my retirement income. Since I probably won't want to work much then (no cheap shots about now, please), the best idea I've been able to come up with is running a Rogaine concession at Sandia's annual leadership forum. From the looks of many directors and VPs, that could be a winner, but I'm unsure whether that potion works on people who've pulled out their hair.

Larry Perrine (845-8511, MS 0129, lgperri@sandia.gov)

## Sandia gives state economies a near billion-dollar boost in 1996

Sandia pumped nearly a billion dollars directly into the New Mexico and California economies in fiscal year 1996 with employee salaries, medical and dental benefits, retiree pensions, commercial purchases, and gross receipts taxes.

Sandia paid almost \$400 million in wages to New Mexico employees during the fiscal year that ended Sept. 30. New Mexico retiree pension payments during the same period amounted to approximately \$53 million. An additional \$46 million in medical and dental benefits for Sandia employees and retirees was paid to New Mexico healthcare providers in FY96.

Corresponding payments in California were \$60 million in wages, \$7 million in retiree pension payments, and about \$5 million in medical and dental benefits.

Sandia's commercial purchases of goods and services in FY96 amounted to \$560 million, with 63 percent of that amount going to suppliers classified as small businesses. Approximately \$270 million of Sandia's total commercial purchases were made with New Mexico suppliers. More than \$87 million in commercial purchases were made with California suppliers.

Sandia also paid the State of New Mexico \$48 million in gross receipts taxes in FY96.

The above numbers do not take into account any multiplier effects. Using FY 1994 numbers, DOE and New Mexico State University issued a report in 1995 that said Sandia's annual budget supported about 6 percent of total economic activity in New Mexico.

## Employee death

Robert Lawson of Environmental Remediation for Tech Areas and Miscellaneous Sites Dept. 6682 died Nov. 16 after a battle with cancer.

He was 60 years old.

Robert was a senior technical associate and had been at Sandia since 1984.

He is survived by his wife Barbara and daughters Donna Grattino, Sondra Lawson, and Kendra Lawson.

## Sandians increase giving to \$1.475 million in ECP/United Way campaign

Employee pledges to the 1996 Sandia Employee Contribution Plan for United Way rose despite fewer employees at the Labs than last year. Individual Sandians dug deeper and pledged more. "Our participation is at 75 percent," says Juanita Sanchez (12650), ECP Program Administrator. "We did more with less, and the committee and center representatives did superb work."

As the campaign draws to a close, employee

pledges total \$1,475,000, exceeding last year's pledges of \$1,444,000. More than 700 employees increased the amount they pledged this year.

The 1996 campaign approach used data analysis of current contributions and focused on where the data pointed - Sandia leadership. "I can't begin to express the value of Sandia leadership in this year's campaign," says ECP Executive Committee Chairman Phil Montoya (2501). "Our management, from the SQLC (Sandia Quality Leadership Council) to department managers, 'walked the talk' and SQLC doubled its amount pledged. They led the campaign by example."

"Juanita Sanchez came up with the idea of a book fair to kick off the 1996 ECP/United Way campaign at Sandia," says Bruce Fetzer (12680), ECP publicity chairman. Sandians were so enthusiastic about the Employee Contribution Plan 1996 Kick-

off Book Fair that they spent more than \$60,000 on books offered by Reading's Fun Ltd. "Ten percent of the profits from the sale will be donated to United Way agencies in the form of books - one book to be donated for every 10 sold," says Juanita. Books will be donated to various United Way agencies this month.

- Janet Carpenter

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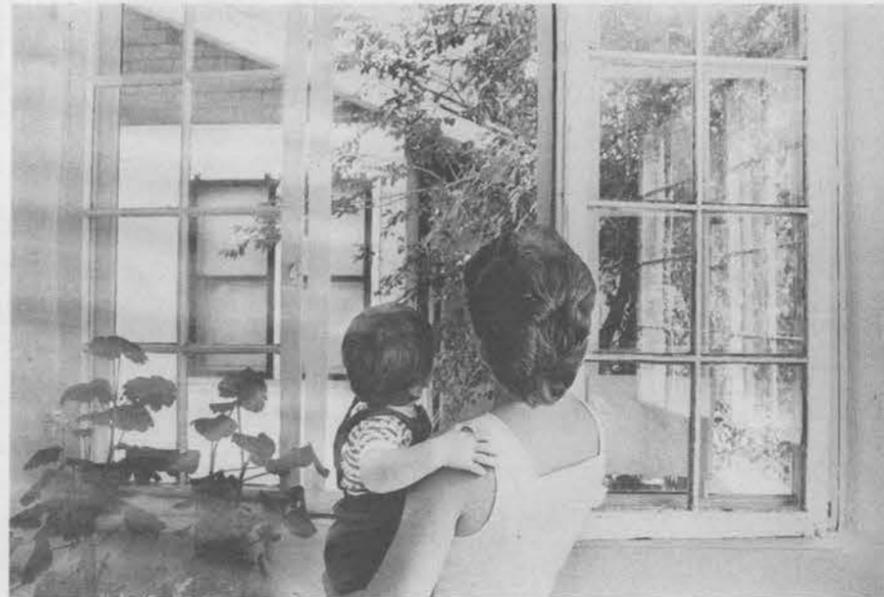
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LOCKHEED MARTIN



SAFE HAVEN - A mother comforts her child at the Women's Community Association (WCA), one of the organizations supported by United Way. WCA, which has served the Albuquerque community since 1976, shelters victims of domestic violence and provides counseling, advocacy, and support services for victims, aggressors, and their dependent children. (Photo by Randy Montoya)

# Sheets of diamond: Scaled-up diamond flame synthesis successfully demonstrated at Sandia/California's CRF

By Nancy Garcia

California Reporter

It might be a classic chemical synthesis, in which organic reagents are heated by a burner. But in this bit of alchemy, Sandia scientists have succeeded in growing commercial-scale sheets of diamond.

Diamond films, useful in microelectronic and other industrial applications, are also grown in microwave plasma or arc-jet reactors. At first, diamond flame synthesis was considered almost a novelty, because early efforts elsewhere produced only small, uneven films.

To create sheets of diamond, crystals of carbon are deposited on a substrate bathed by hot vapors of hydrogen and hot vapors such as methane. Diamond flame synthesis led to larger sheets of diamond when researchers used flat flames at low pressure, but the growth rates were too slow. David Hahn (8366) and John Wirdzek (8361) overcame engineering complexities to grow films of a commercially useful two-inch diameter at atmospheric pressure in the Sandia project at the Combustion Research Facility.

To produce sufficiently large films in reasonable time, David and his fellow researchers used a trumpet-shaped torch nozzle positioned very close to the substrate. For uniform film growth, he anchored the strained, flat flame (which otherwise tended to flare to one side and extinguish) by adding 12 pillars around the edge of the circular substrate. These pillars broke the flames into petal-shaped sections around the circumference, and allowed the flame to burn evenly. The project team also devised a water spray system to cool the underside of the substrate below its melting point.

"David was able to increase the films four times in diameter over our initial prototype," says Kevin McCarty (8716), who helped secure a variety of funding for the project.

"Sandia cares about diamond synthesis



DIAMOND MAKERS — John Wirdzek (left) and David Hahn with the device they used to synthesize sheets of diamond.

## Sandia California News

because diamond is a very good conductor of heat — at room temperature, it's the best there is," Kevin says. For instance, electronic devices might be fabricated on diamond as a heat sink. Potentially, David says, diamond could be used for three-dimensional, stacked multichip modules, because diamond is an excellent electrical

insulator at the same time that it readily dissipates heat. Also, adds Kevin, diamond is being considered for use in rebuilding electronic components in warheads.

The project successfully showed that diamond flame synthesis could be scaled up, David says. The team didn't anticipate the flame would break up, which is one complication of flame synthesis that had to be overcome. In that sense, David says, the engineering challenges were different from those found in arc-jet or microwave plasma approaches that most commercial manufacturers now use.

Working at atmospheric pressure, he was able to grow films on a heat-resistant molybdenum substrate at more than 30 microns an hour. The films pop off the substrate when cool and measure about 30 microns thick.

This approach requires about 100 liters per minute of acetylene fuel, some 50 times the amount that typically flows through a shop welder's torch. Temperatures on the substrate surface reach about 1,000 degrees Celsius, while the underside is water-cooled to about 700 degrees.

With all the various ways of synthesizing diamond, including combustion, "the costs have not come down as rapidly as everybody hoped," Kevin says. Still, he adds, there remains a great interest in using synthesized diamond to remove heat from microelectronics components and as a very hard protective coating.

In addition to Kevin, David, and John, the project included experimental modeling contributions by Mike Coltrin (1126), Andrew Lutz, Ellen Meeks, and Mary Bui-Pham (all 8345), as well as contributions by three Sandians who have moved to academia: Bob Kee (now at the Colorado School of Mines), Chris Edwards (now at Stanford University) and David Dandy (now at Colorado State University). Technical assistance in the early stages was provided by Rodney Sepulveda (8366) and Jim Boehmke (8362).

## California retirees gather for 31st annual event



RETIRES Barry Green (left) and Clyde Taylor, with guest Bernice Tingle.



REMINISCING are Ramona Andersen and Byron Murphey.

Some 417 Sandia retirees, spouses, and members of current Sandia management gathered for the 31st annual retirees' get together at Castlewood Country Club Oct. 9. After dinner they heard from California site Human Resources Manager Marge York, Retirement and Benefits coordinator Belva Mayfield, VP Tom Hunter, and Executive VP John Crawford. It was reported that 41 Sandians retired from the California location in FY96 and 30 in FY95.



DINNERTIME for Lorena Schneider (left), Bill Guntrum, and Tonni Nunley.

# Realignment

(Continued from page 1)

October. (Ongoing budget issues may raise the number to as high as 435, Don says.) The staffing plans detail each division's current and anticipated work requirements and how many (and what types of) people will be needed to accomplish that work. (See "VP Charlie Emery on the 'whys' of realignment" at right.)

Sandia's VP-level Realignment Board met Oct. 31 to review the plans and proposed to DOE elimination of 418 positions in 13 job classifications, and to offer a VSIP. (See the bar chart below for information about numbers of impacted positions by job classification.) DOE Headquarters approved Sandia's plan Tuesday.

For employees whose job functions are at risk, Tuesday's announcement marked the beginning of the 60-day Voluntary Action Period in Sandia's three-phase Workforce Realignment Process (Sandia Laboratories Policy 4100), a staffing tool designed to help resolve "skills mix" problems and funding shifts among Labs programmatic areas through a combination of internal transfers, retraining, and other staffing mechanisms. (See "A review of Sandia's Workforce Realignment Process" on page 5.)

Employees should already have been briefed by their team supervisors, department managers, or center directors about their status in the realignment process, including whether they are members of "impacted peer groups."

This year an estimated 1,600 employees have been told they are members of impacted peer groups. Those employees have until the week of Feb. 17 to try to find other work within the Laboratories, if they choose to do so, with the help of

## VP Charlie Emery on the 'whys' of realignment

Although workforce realignment places a lot of stress on the individuals who are forced to make uncomfortable career and personal decisions as part of the process, it also provides an opportunity for the Labs as a whole to adjust to evolving programmatic needs, budgetary constraints, and skills mismatches, says Human Resources VP Charlie Emery (3000).

"Some skills have become obsolete, some programs have gone away or are changing direction, more funding is being earmarked for special programs," he says. "And in some areas, we have a shortage of skilled people. Realignment is an opportunity to adjust to those changes."

On the overhead side of the Labs, process improvements and the need to reduce costs by \$250 million over five years (the "Curtis commitment") will drive further budget and

employment reductions and possible employee reductions. But an FY97 hiring program of 50 to 100 people, targeting "critical skills" needs such as computer software specialists, will help ensure that Sandia's programmatic requirements are met, he says.

Sandia is making progress, operating with about 850 fewer people — than it operated with in October 1995. The Labs likely will continue to reduce its numbers during FY97 from a current employee count of 7,950 to an estimated 7,500 by October 1997 through realignment and attrition, he says.

"By October 1997 we should be at a pretty good 'fighting weight' given our current programs and funding. We're hopeful that we'll be able to maintain that level of employment for the next couple of years."

various corporate assistance mechanisms. If a peer group's staffing problems haven't been resolved by the end of this first 60-day period, some individuals in that peer group likely would be "surplused." Surplused employees who haven't found work by the end of Phase Three, a second 60-day period, could be laid off.

Employees who receive VSIPs or who are laid off must leave Sandia by no later than April 17.

### HR helping make matches

Human Resources Manager Becky Statler (3500) emphasizes that the goal of workforce realignment is not to get rid of 435 people but to eliminate some 435 jobs that no longer meet Sandia's business needs through a combination of internal transfers and the separation incentive.

Human Resources already is helping pair managers with job openings to impacted employees who may be able to fill such jobs.

"We're committed to finding solutions to our staffing problems in an effort to avoid having involuntary separations," says Don.

In anticipation of the realignment, Human Resources curtailed external hiring

and new internal job postings Oct. 31 and has compiled a comprehensive "realignment posting" restricted to impacted employees seeking positions. Approximately 200 openings have been identified, although Becky cautions that many of the positions require special skills; less than half are likely to be filled from within Sandia's ranks. The posting is available on the Internal Web (look for the realignment link) and from the division administrative assistants, Human Resources customer service managers, and personnel representatives.

To streamline the placement of impacted employees, a separate bid line has been established for members of impacted peer groups. They may bid on openings through Dec. 12 by calling 284-5515.

HR also will be compiling a separate listing containing the job descriptions of nonimpacted employees who want to receive VSIP benefits. This posting will be available to impacted employees in mid January. (Nonimpacted employees who would like to have their job descriptions posted to improve their chances of receiving VSIP benefits should note that in the space provided on their VSIP request form.) A more flexible approach for resolving impacts by allowing nonimpacted employees to receive VSIP benefits has been added to this year's process as well. (See "Multiple linkages: A new realignment feature" at left.)

*HR plans to publish the job descriptions of nonimpacted employees who want to receive VSIP benefits.*

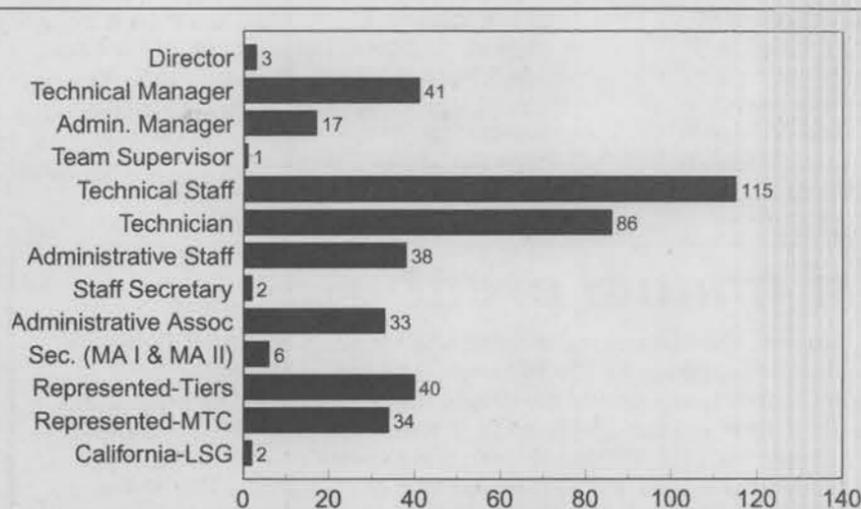
In some cases, says Becky, it may be appropriate to place impacted Sandians in positions that might otherwise have been filled by subcontractor personnel through Sandia's staff augmentation process. The Staffing department can help managers determine what situations might be appropriate for that type of transfer.

Again this year Sandia is offering an incentive, case number A299, to managers who formally and permanently accept an impacted employee from another organization. A299 can be used to pay the employee's salary for three months while the employee either is being retrained or is "on the learning curve" in his or her new organization.

For employees who need to leave the Labs, Sandia plans to open "career transition centers" at the New Mexico and California sites in early February. DOE has made its national contract with Star Mountain, a national outplacement firm, available to Sandia. Star Mountain representatives can provide help with resume writing, interview skills, career assessment, job searches, and registration with government bureaus and services.

Don adds that several of the new mechanisms — such as the comprehensive job posting, the multiple-linkages option, and a multimedia approach to getting employees timely and accurate realignment information — were added to this

(Continued on next page)



BAR CHART shows the numbers of impacted positions by job classification. (LSG stands for "Laboratory Support Group.") In New Mexico, 377 positions have been identified as impacted; in California, 41.

## Multiple linkages: A new realignment feature

During the 1995-96 realignments, some nonimpacted employees were able to leave Sandia with VSIP benefits because they demonstrated that their departure would reduce the size of an impacted peer group by one person. In other words, if Joe (who is non-impacted) wanted to leave Sandia with VSIP benefits and Mary (who is impacted) was qualified for Joe's job, Mary might be able to transfer into Joe's position (reducing the size of Mary's impacted peer group by one), allowing Joe to receive the VSIP benefits and allowing Mary to continue working.

That principle still applies, says Becky Statler (3500), but there's a new option available to nonimpacted employees who want to leave Sandia. Informally called the "Daisy Chain," the multiple-linkage option allows for even more shuffling of positions and people in order to preserve the employment of an impacted person who wants to stay at Sandia.

Here's a simple, hypothetical example:

Joe (who is nonimpacted) wants to leave Sandia with VSIP benefits. Sue (a member of an impacted peer group) wants to stay, but she

isn't qualified for Joe's position. She is, however, qualified for Jane's position, and Jane is qualified for Joe's position. If Jane agrees to move into Joe's position, and Sue moves into Jane's position, then Joe may be able to resign with VSIP benefits.

Within reason, says Becky, there can be as much position shuffling between Sue and Joe as is necessary to make everyone happy. It's like a "domino effect," she says.

"We're not requiring this of anyone, but it's another option if everyone involved, including the employees' management, agrees to such an arrangement," she says.

Recognizing and pursuing appropriate multiple-linkage situations is the responsibility of employees and their management, she adds. The Human Resources customer service managers and personnel representatives also may be able to help recognize possibilities within their organizations.

For more information, call Jerry Gallegos at 844-3030 or Gay Hill at 844-1156 (in New Mexico) or Beverly Kelley at 294-2251 or Holly Stryker at 294-2126 (in California).

(Continued from preceding page)  
year's process in response to employees' comments following last year's restructuring.

"We heard what many employees had to say about last year's process and what they thought could be improved," he says. "The new features are a direct result of that feedback."

### Minimum VSIP amount increased

This year's minimum VSIP amount has been increased. Employees granted a VSIP will receive a lump-sum payment equal to the greater of \$20,000 (minus tax and other deductions) or 1.5 weeks' pay for each year of Sandia service to a maximum of 27 years (equivalent to 40.5 weeks' pay for employees with 27 or more years of service). Last year's minimum VSIP was \$15,000; the years-of-service formula is unchanged.

Again, the VSIP package provides for continued health benefits (under a cost-shared formula) for three years, as well as educational assistance (up to \$2,500 in tuition reimbursements per year) for four years. A portion of the funding for VSIP benefits is being provided by DOE's Office of Worker and Community Transition.

Eligible Sandians may apply for a VSIP by filling out request

forms mailed to them as part of the Official General Announcement Package. VSIP request forms may also be obtained from managers. (Submission instructions are included on the form). All forms must be received by the Employee Development Center (in New Mexico) or the Human Resources Department (in California) by 5 p.m., Monday, Jan. 6.

Applicants from impacted peer groups will be considered first. If a sufficient number of volunteers is not obtained from within a particular peer group, VSIP applications from nonimpacted

*Again, the VSIP package includes health care and educational benefits.*

employees will be considered. A nonimpacted employee will receive a VSIP only if his or her departure from Sandia would reduce the size of an impacted peer group by one person. If more VSIP applications are received than there are impacts in a particular peer group, applicants with the most years of service (or seniority for represented employees) relative to other applicants in that group will get the available VSIPs.

Employees whose VSIPs are granted will be notified immediately by way of an approval letter from Human Resources.

### For more information . . .

Human Resources is making details of the Workforce Restructuring Plan and the VSIP available to employees via several media.

On Monday (Dec. 2), most Sandia managers (including team supervisors, managers, directors, and VPs) were briefed about employees' and managers' roles during the realignment; information is available from them. In addition, two detailed realignment information guides have been mailed, one for employees and another for managers. The employee announcement package contains information all employees need to consider before applying for VSIP benefits.

A new icon on Sandia's Internal Web home page contains links to a variety of realignment-related news and information, including current job openings, answers to frequently asked questions, and a spreadsheet that calculates an employee's net VSIP payment after deductions.

Staffing's new menu-driven Info Line at 844-7067 also can provide a variety of information about the realignment and VSIP.

If you have specific questions that can't be answered through one of these sources, contact Jerry Gallegos at 844-3030 or Gay Hill at 844-1156 (for New Mexico employees) or Beverly Kelley at 294-2251 or Holly Stryker at 294-2126 (for California employees).

The *Lab News* will continue to cover realignment-related developments as they occur.

—John German

## Realignment: The process

### Phase 1: Identification of the problem

- Division offices (via staffing plans) identify business-driven impacts on people
- Departments, centers, divisions attempt resolution within their organizations
- Remaining problems referred to the Realignment Board

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### Phase 2: 60-day General Notification/Voluntary Action Period

- Employees in "impacted" peer (skill) groups informed, given option of seeking new work at Sandia or applying for a VSIP (an addition to the normal realignment process); some VSIPs approved
- Management looks at realignment from a corporate perspective, considers retraining/transfer when possible
- Potential surplus employees identified
- After 60 days, proposed lists of surplus employees submitted to Review Board

### Phase 3: 60-day period for placement of surplus employees

- Individuals informed of their "surplus" status
- Surplus employees transferred, retrained where possible
- Realignment Board determines action for remaining surplus individuals

Termination (no severance pay)

Layoff (severance pay)

## A review of Sandia's Workforce Realignment Process

The Workforce Realignment Process (SLP 4100), a staffing tool proven during Sandia's successful round of realignments a year ago, was designed to provide a fair, no-surprises process for solving a variety of staffing issues, says Karen Gillings, Manager of Staffing Dept. 3535.

The three-phase plan "formalizes the process by which Sandia moves the right people to the right places within Sandia, and lets go of those people who don't quite match Sandia's business needs," she says. "It also ensures that every employee is given every opportunity to adjust to Sandia's changing needs and gets treated as equitably as possible."

In Phase One (see graphic above right), the divisions identify their "people impacts" and make every attempt to resolve these issues within the division. Impacts that cannot be resolved are submitted to a VP-level Realignment Board chaired by Human Resources VP Charlie Emery. Based on the division data, the Board identifies certain groups of people, called "peer groups," whose members share common job functions that are considered "impacted" — meaning Sandia intends to reduce the number of people providing those job functions. A peer group includes employees in the same job classification performing the same kinds of work and with the same or similar skills.

(Karen emphasizes that the VSIP provision is an addition to Sandia's realignment process designed to reduce the number of people who might later be asked to leave Sandia involuntarily if internal transfers, attrition, and other realignment mechanisms don't yield sufficient results.)

Phase Two, known as the "General Notification/Voluntary Action Period," begins when all employees in impacted peer groups are notified of their "impacted" status. This general notification does not identify any particular individuals whose jobs are at risk; rather, the numbers of

positions within particular job functions are being reduced. For 60 days, individuals in impacted peer groups can search for new jobs in other Labs organizations with the help of various corporate assistance mechanisms (see main story). If an individual chooses, he or she can opt to do nothing.

Near the end of the 60-day Voluntary Action Period, the VPs reassess employment levels in the impacted peer groups. In many cases, the "staffing problem" may already have gone away if several employees have found work elsewhere. "Or a ten-person problem may have become a two-person problem since the notification," says Karen.

### Surpluses only if necessary

When the 60 days ends, a working group called the Review Board convenes to review VP proposals detailing which individuals remaining in the impacted peer groups are to be "surplus." That decision, says Karen, is based on a variety of employee characteristics, including job knowledge, transferability of skills, work practices, and performance relative to the performances of other peer group members. (This methodology applies to nonrepresented employees; procedures for identifying "surplus" represented employees are spelled out in the labor agreements with Sandia's bargaining units.)

The Review Board, chaired by Don Blanton (3500) and supported by Legal and various Human Resources organizations, is a built-in checkpoint intended to ensure that individuals are treated fairly, says Karen.

"Managers who identify employees as surplus must appear before the Review Board to present their choices based on business needs and documented evidence," she says. "The Board is there to make sure decisions are objective and that other circumstances don't inter-

fere with a manager making the right business decision."

If the Review Board OKs a VP's proposed list of names, individual Sandians on the lists are notified that they are considered "surplus," and Phase Three begins. During the next 60 days, surplus employees can continue to search for work within or outside of Sandia. "Sandia will make every effort to help surplus employees find jobs they are qualified for," says Karen.

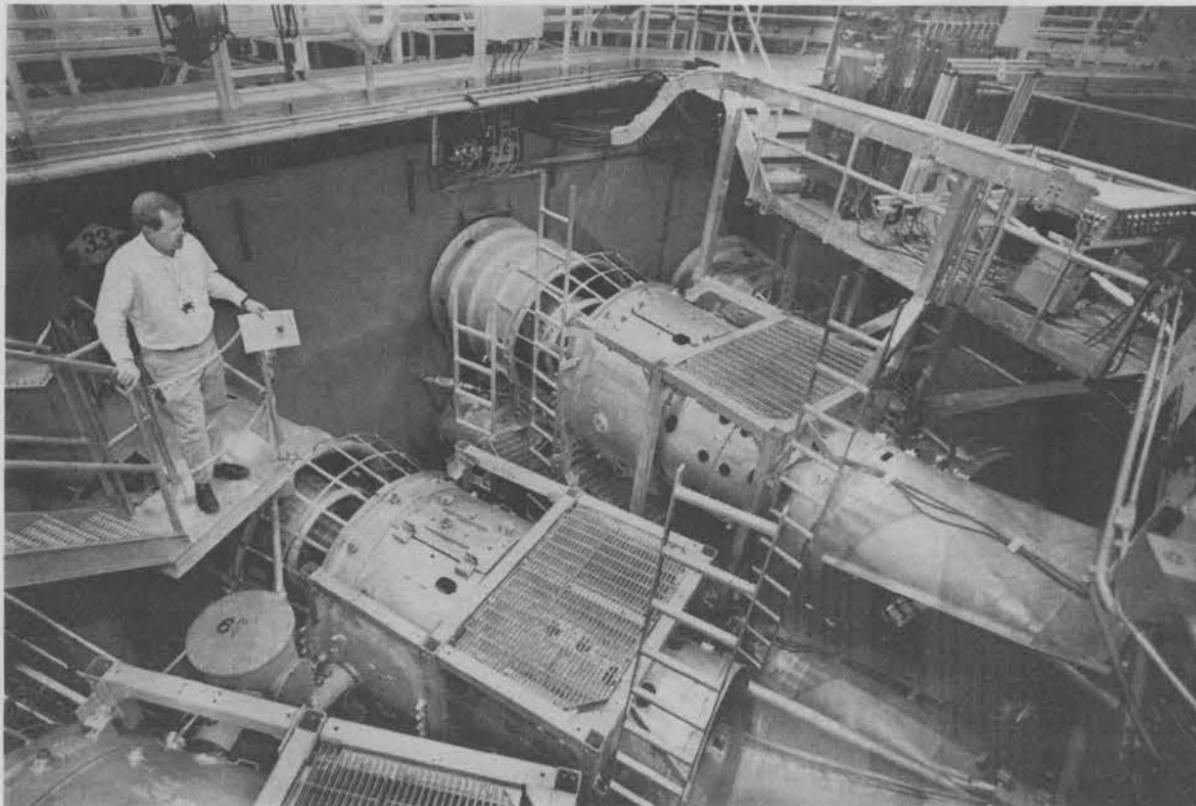
For surplus employees who aren't placed by the end of Phase Three, several options are available to the Realignment Board, which convenes to review each employee's case and to make sure the realignment process so far has treated each employee fairly.

If an employee has made a concerted effort to find work elsewhere within Sandia but couldn't, that employee likely would fall under Sandia's layoff program, meaning he or she would leave Sandia with the normal layoff allowance (severance package).

If, however, an employee was offered a job within Sandia with equal pay at a reasonably similar job level but opted not to accept it, that employee likely would be terminated, meaning the employee would leave Sandia without severance pay.

"Employees are hired here with the understanding that they are employees of Sandia, not of any particular organization or job function," says Karen. "The Labs isn't going to reward people for being inflexible."

Human Resources VP Charlie Emery (3000) says the Workforce Realignment Plan proved itself an effective tool during last year's realignment. "We're pleased with the way the process worked both for Sandia and for employees, and we're hopeful it can achieve similar results this year," he says. (See "VP Charlie Emery on the 'whys' of realignment" on page 4.)



**POWER PACKED** — Project leader Rick Spielman checks a section of Sandia's PBFA-Z accelerator, which has produced record-high bursts of X-ray energy and power. The accelerator shots aid computer simulations of nuclear-explosion physics and also move Sandia closer to reaching sustainable nuclear fusion in the laboratory.

## PBFA-Z results

(Continued from page 1)

for z-pinch experiments. Achievement of its high-energy goals have advanced dramatically from a year ago, when Sandia generated 0.5 megajoule with the Saturn accelerator, an earlier version of PBFA-Z.

"The concept of a z-pinch as a radiation source is qualitatively like that of an old-fashioned flash bulb energized by a capacitor discharge, but emanating X-rays instead of visible light," says Gerry Yonas, VP for Information and Pulsed Power Research and Technology 9000. "The other difference is that our z-pinch puts out as much radiated power as 100 billion ordinary flashbulbs."

In one of life's ironies, Sandia researchers ultimately lit upon using tiny tungsten filaments — similar to those used in an ordinary incandescent

*"... our z-pinch puts out as much radiated power as 100 billion ordinary flashbulbs."*

light bulb — for their "flash" material to create the powerful effect. The filaments, rather than getting hot and radiating light as in a light bulb, instead vaporize, become a plasma, and implode.

### Offset loss of underground testing

With the nation's decision to stop all underground nuclear testing, Vic Reis, DOE Assistant Secretary for Defense Programs, challenged the three nuclear weapons laboratories to devise new technologies to help offset the loss of testing and continue to retain a credible nuclear deterrent. "These new results are one of the ways that Sandia is responding to the Reis challenge," says Gerry.

High-energy laboratory sources of X-rays are necessary because "simulations based upon inaccurate, low-energy data could mislead us," Gerry says. "The danger is that without the validating experiments, simulations might provide decision makers with an unrealistic basis for action."

For national defense purposes, Sandia scientists are interested in understanding the effects of nuclear explosions, and scientists at Los Alamos and Lawrence Livermore national laboratories are faced with the need to use laboratory sources of X-rays to replace experiments they can no longer carry out using nuclear explosions. So, all the accelerator's power is focused into a tiny cylindrical target to generate X-ray environments.

"The technical foundation for our moving forward is not just energy output, but also power output in a useful geometry, and although that has yet to be shown, we are moving closer to our goal every day as the new results have already validated much of the theoretical basis for our work," Gerry says.

Exceeding the production of 1.7 megajoules of X-rays, while an important milestone, is simply one more step in a series of accelerator improvements based on continually improving Sandia expertise in high-energy-density physics and pulsed-power engineering that stretches back

## PBFA-Z, z-pinch, and X-rays

PBFA-Z, located in Area 4, uses its tremendous electrical energy to create a powerful magnetic field that rapidly implodes a plasma within what can be visualized as a small can with gold-plated innards.

The intense magnetic field squeezes the plasma down to the thickness of the wire in a paper clip, and creates tremendous heat by very quickly stopping the plasma's rapid motion within the field's confines.

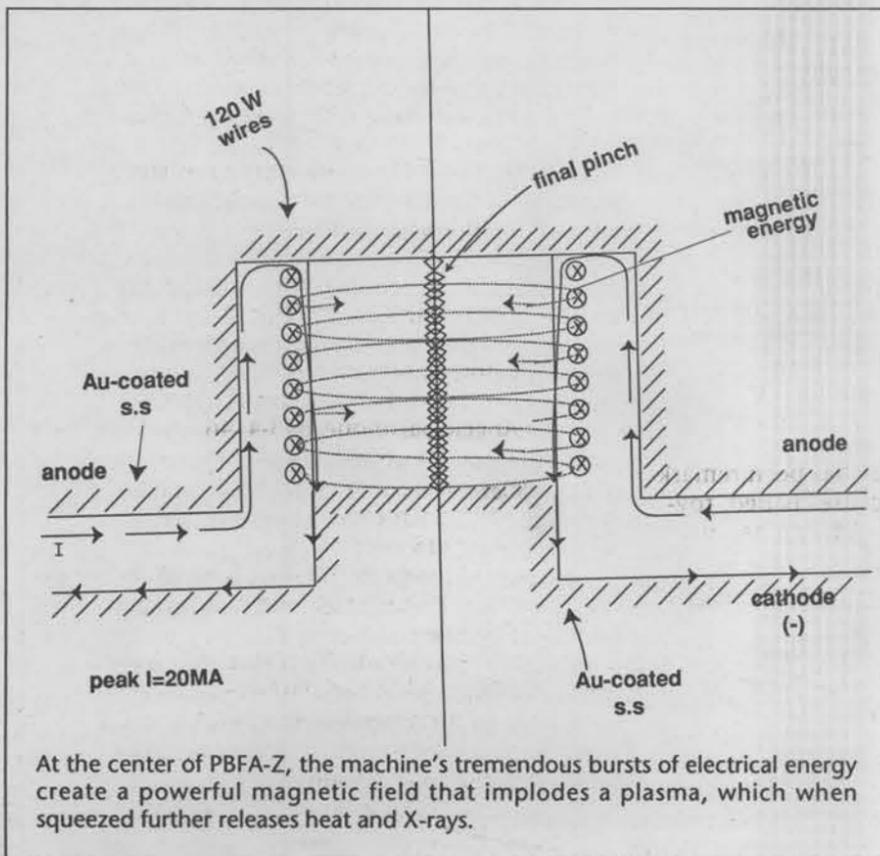
The process starts when PBFA-Z takes approximately two minutes to store wall-current electricity in 36 large capacitor units called Marx generators. When discharged, these generators deliver a peak voltage of five million volts to the power lines that form the electrical pulse.

The lines release the current — 17 million amperes — over a very small time interval (just 100 billionths of a second) and into a very small target, thereby magnifying the power exerted in that mini-moment.

The extraordinarily large burst of electricity passes vertically through a cylindrical container four centimeters in diameter and two centimeters long. Inside the can, whose inner surface is gold plated, is a network of 120 fine tungsten wires in a cylindrical array. The entire assembly is in vacuum.

The electric current passes downward through the can wall and runs back through the tungsten wires inside the can, immediately vaporizing the wires and generating an ionized tungsten gas or plasma, and simultaneously creating an enormous magnetic field. Driven by the magnetic field located between the lining of the can and the periphery of the wires, the wire plasmas are pushed rapidly inward by the field's intense pressure. This compresses the tungsten plasma, increasing its density and temperature.

By compressing the plasma suddenly, the contracting magnetic field rams tungsten atoms from one side of the can into tungsten atoms driven in by the contraction of the far side. These collisions bring the ionized atoms to a sudden halt and generate heat, just as applying brakes to bring a speeding car to a screeching halt produces tires and brakes hot to the touch. The heat is released in the form of X-rays.



more than a decade.

The study of z-pinch driven by pulsed power devices goes back about 30 years when several labs considered exploring such sources of X-rays and began theoretical and experimental research, but many limitations existed. The pinches were so unstable in most cases that results were difficult to reproduce and fell far below expectations.

In 1986, Sandia accelerators could generate only 0.1 megajoule. By 1989, Sandia generated 0.4 megajoule but with relatively low power levels, and in 1995 Sandia discovered, using its Saturn accelerator operating first with an array of fine aluminum wires and subsequently with fine tungsten wires, that the powerful electrical pulses at seven million amperes could be used to reproducibly create much more powerful X-ray pulses than ever had been achieved.

In October, after a cost of \$13 million to upgrade its 11-year-old PBFA II accelerator in order to more than double the z-pinch current to 17 million amperes, Sandia first passed a milestone in exceeding generation of 1.0 megajoule. The design goal for PBFA-Z — a bit over 1.5 megajoules — was reached early in November.

These results were publicly presented for the first time on Nov. 11 by Keith Matzen, Manager of Target & Analysis Theory Dept. 9571, at the annual meeting of the American Physical Society Division of Plasma Physics.

# Licensing of Labs' intellectual property enjoyed 'watershed year' in FY96

101 licenses represent a sustainable level, promise growing returns

By Bill Murphy

Lab News Staff

Sandia in FY96 enjoyed a "watershed year" in its ongoing initiative to license intellectual property developed at the Labs, says Kevin Murphy, Manager of Partnership and Licensing Dept. 4211.

During the year, he says, Sandia surpassed the "magic number" of 100 licenses, issuing 101 licenses for 89 discrete intellectual (i.e. copyrighted and patented) properties.

The 125 Sandia authors and inventors of those properties will be special guests at Sandia's annual licensing and royalty payments distribution banquet on Dec. 12 at the Sheraton Uptown hotel in Albuquerque and on Dec. 18 at the Pleasanton Hilton in California.

Kevin says the 101 licenses represent a "watershed" because they surpass the 100-license threshold that is deemed a viable level for Sandia to sustain on a perennial basis.

While license fees and royalty payments will yield about \$738,000 this year, Kevin says, if the current level of activity is maintained and if commercial sales are realized, annual income from fees and payments could reach \$10 million within five years and could even reach \$50 million per year within 10 to 15 years. The \$738,000 generated in FY96 compares to \$419,000 in FY95; the 101 licenses compares to 26 issued the previous year. (See chart, this page.)

"We're on track to maintain the 100-license level into the foreseeable future," Kevin says.

## Effort increased under Lockheed Martin

Sandia is a relative newcomer to the licensing business. Only since the early '90s, and particularly since Lockheed Martin's arrival on the scene in 1993, has serious attention been directed toward licensing intellectual properties, Kevin says. Over the past three years, the licensing initiative has become a much more formalized, less ad hoc process.

The commercial licensing team, which includes seven licensing professionals and four support staff from three departments, earned a Sandia President's Quality Award (Turquoise Award) in FY96 for its efforts in shepherding the dramatic increase in licenses issued over the past three years.

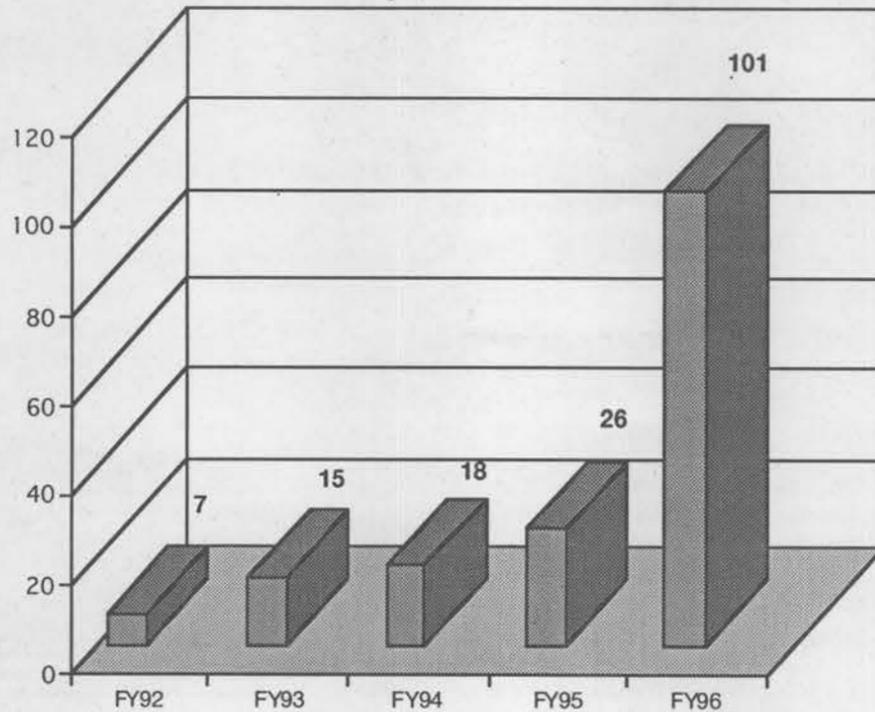
"We are now recognizing our intellectual properties as a strategic asset and are starting to manage it as such," Kevin says. "We're now viewing our intellectual properties in the same way we've always viewed our staff — as a strategic asset we can use in attracting and cultivating quality partnerships. There's come a realization and conviction that our intellectual property is terribly important in this process."

In the past, Kevin says, it was said (only partly in jest) that "we never met a CRADA [coop-

erative research and development agreement] we didn't like." That doesn't cut it anymore, Kevin says. "Through the strategic management of our intellectual properties, we are much more focused on forging partnerships that leverage our capabilities and complement the capabilities of our potential partners."

The end goal of leveraging our intellectual properties in this way, says Warren Siemens, Director of Technology Partnerships and Commercialization Center 4200, is to enhance San-

Commercial licenses issued, by year



dia's ability to successfully carry out its mission as a primary steward of the nation's nuclear weapons stockpile.

"Sandia's intellectual property assets can be used to attract and retain strategic partners, and we want to work with the line and program management to help them meet their business objectives," says Warren.

To encourage a continued flow of intellectual property from the Labs' line organizations, Sandia has established a revenue distribution plan that rewards the inventors and authors of these properties, and their contributors, along with their divisions.

"The idea here is to reward the inventor and his or her supporting technical organization, with the thought that the discretionary income to the division will be invested in such a way to further increase our portfolio of intellectual properties," Kevin says.

Kevin expresses confidence that in the years ahead Sandia can continue to generate about 100 new commercial licenses per year. To do so, though, he says he would like to see the line organizations encourage more disclosures of potentially patentable work and software. He says many commercial and university labs routinely disclose everything that might remotely end up in a patent application; that's good practice and vital in establishing prior claim when patents are filed for, he says.

In fact, in a process that has been remarkably on-goal in terms of licenses issued, royalty and fee income generated, and patents applied for, the 214 disclosures filed in FY96 fell short of the goal of 300 the Labs was aiming for.

"Based on recent benchmarking, we'd like to see that number up around 500," says Kevin, a level he believes the Labs is perfectly capable of sustaining. "We'll still aim for about 100 patent applications per year — that's about the limit our staff can realistically handle — but with more disclosures, we should be able to pick and choose the very strongest work."

At this time, Sandia's copyrighted software accounts for most of the licenses issued, and just two licenses account for some two-thirds of the earned royalties paid. Indeed, Kevin says, research into the issue suggests that the vast majority of an institution's earned royalty payments are based on the commercial success of just a handful of its licensed properties.

## The one that got away

As in every good fish story, Sandia has its own tale of "the one that got away." To set up the story consider this: the University of California issues about 100 licenses for its intellectual properties each year, and it receives some \$70 million in fees and royalty payments. A big chunk of that is due to UC's ownership of the recombinant DNA process. The lesson there, says Kevin, is that a big winner in the commercial market can pay big, big dividends.

Sandia, too, had a big property — its clean-room technology, a basic enabling technology developed at the Labs in the early 1960s that has made possible the colossal microprocessor/semiconductor industries, which in turn have made possible the worldwide personal computer explosion.

"We gave that away," he says.

## Sandia's licensing and partnership contacts

If you have a project you think has value as intellectual property, you can find guidance on the relevant patent, copyright, licensing, and partnering agreement processes from one of Sandia's licensing and partnership professionals.

For each technical area, Partnership and Licensing Dept. 4211 has a team comprising a licensing specialist who assists you with intellectual property management and licensing, and an agreements specialist who helps you determine the best agreement type for your project and is responsible for all nonlicense agreement types for your organization.

Start by contacting the licensing specialist if you have a commercially viable technology. Contact the agreements specialist if you have a technology that could benefit from the involvement of an industry or university partner. If you don't know which is more appropriate, call anyone listed below.

Here's a list of contacts along with their areas of expertise:

### Advanced information technologies/computation/energy

Team leader/licensing specialist:

Gordon Leifweste, 843-4144

Licensing: Mark Allen, 843-4168;

Michael Harper, 843-4156

Agreements: Vic Weiss, 843-4216;

Toni Kovarik, 843-4150

### Electronics/microelectronics/ photonics/pulsed power

Team leader/licensing specialist:

Angelo Salamone, 843-4146

Licensing: Don Jones, 843-4154; Craig

Sheward, 843-4159; Art Verardo, 843-4172

Agreements: Deborah Belasich,

843-4145

### Advanced manufacturing/engineering sciences/engineered materials and processes

Team leader/licensing specialist:

Walter Schimmel, 843-4147

Licensing: Glenn Baird, 843-4151

Agreements: Steve Grieco, 843-4148

### Sandia/California

Licensing: Subra Subramanian,

294-2311

# Sandia reduces inventory of surplus nuclear materials

Since the beginning of this year, Sandia has reduced its inventory of surplus nuclear materials by more than 30 percent, doing away with costly maintenance and hazardous waste disposal costs by finding off-site uses for the material.

Planning to dispose of nuclear materials no longer needed to support current or future DOE missions began in 1993. Nuclear materials acquired over 40 years of reactor operations, non-nuclear weapons testing, reactor safety research, nuclear fuel development, and materials science studies at the Labs were reviewed for possible disposition. A corporate surplus nuclear materials plan completed in October 1995 provided a recommended "road map" on how disposition should be accomplished.

John Sichler of Material Systems and Security Audits Dept. 7442 tackled the disposition challenge by first doing some housekeeping. "I needed to find out what we had that we didn't need and then determine where it could be sent," says John.

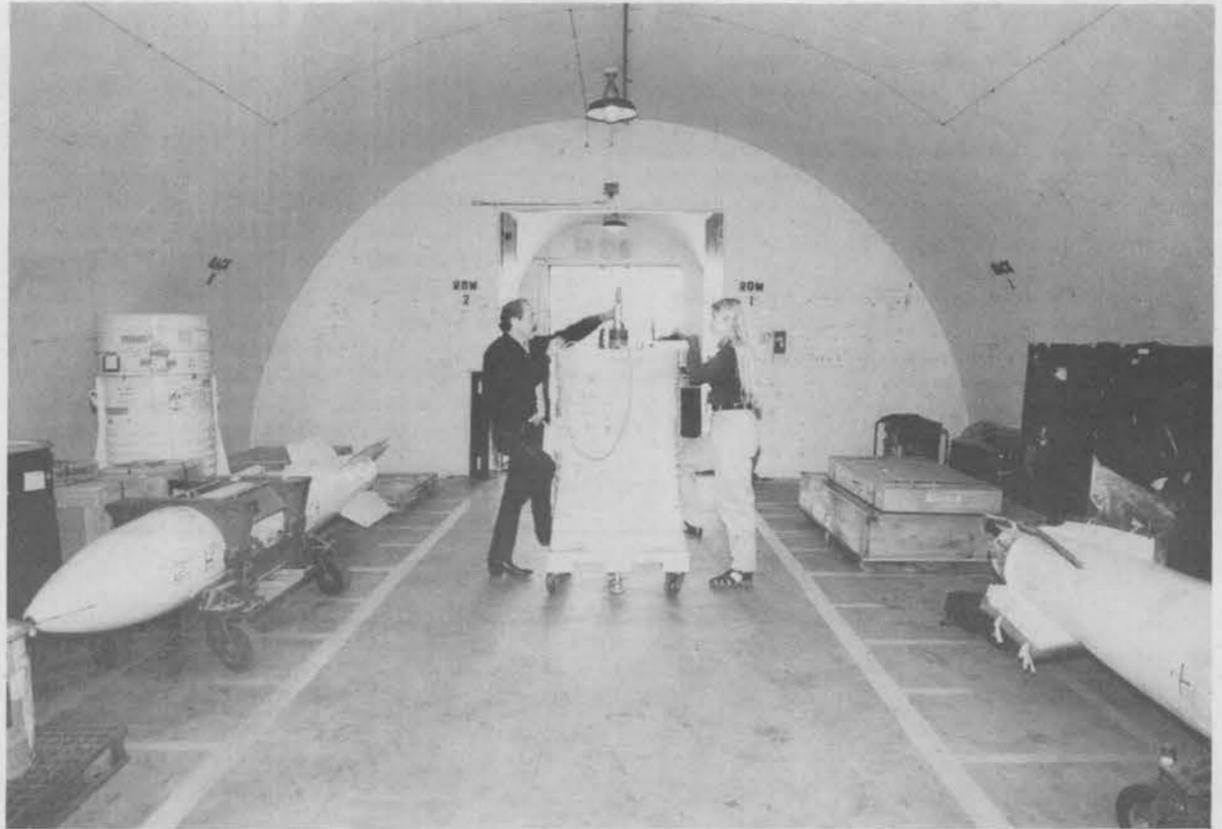
He assembled a team made up of owners of the surplus materials and those involved in planning and preparing for off-site shipment of the materials. John says it was truly a "multi-organization" effort. Others who provided invaluable historical and technical support to the team were Kenneth Reil, Manager, Reactor Safety Experiments Dept. 6423; Paul Pickard, Deputy Director for Area 5 Dept. 9360; Jim Bryson, Manager, Isotope Project and Compliance Initiatives Dept. 9361; and Pat Griffin, Nuclear Technology and Research Dept. 9363. Over nine months, the team developed a disposition plan. John also developed a database to record and track all the information gathered.

## 28 tons surplus

"We found that 28 tons of Sandia's nuclear materials, one-half of the materials in inventory, were surplus," reports John. "We also found that there were off-site disposition opportunities for about 98 percent of the surplus materials, which meant most of this material would not have to be declared waste and would not need to go through a costly hazardous waste disposal process."

Who is in the market for surplus nuclear materials? The materials are first offered to other DOE facilities, such as national laboratories and processing facilities, then to Nuclear Regulatory Commission facilities and private companies. Uses for the materials (which include depleted and highly enriched uranium) vary considerably and include research and development applications, material for storage cask fabrication, and fuels for reactors.

Since January of this year, seven shipments of surplus materials have gone out, and Sandia has



NUCLEAR INVENTORY — Manuel Trujillo and Tania Hake of Material Systems and Security Audits Dept. 7442 conduct gamma spectroscopy measurements to confirm the contents of a container in Sandia's nuclear materials inventory at the Manzano Mountain Complex. (Photo by Randy Montoya)

reduced its surplus inventory by approximately 10 tons (more than 30 percent). The original goal was exceeded by one ton, which, John says "is noteworthy. We were able to get rid of small quantities of significant materials that we didn't expect to get out."

## Seek 90% reduction in inventories

Prospects for the remaining legacy, or Cold War era, materials look promising. "Our disposition plan calls for reducing surplus nuclear material inventories by more than 90 percent in the next four years," says John. "The key to future success, though, is dependent on adequate levels of funding."

The price tag for completing the disposal plan is about \$6.3 million. Much of what remains to be done involves characterization of materials that will eventually become waste so that appropriate waste disposal methods can be arranged.

"Developing and carrying out the Surplus Nuclear Material Disposition Plan has required a great deal of commitment and dedication by the Sandians involved," says Lynn Jones, VP for Labo-

ratories Services Div. 7000. "This process has called for wading through myriad federal regulations and extensive coordination with many different organizations. The long-term benefits to Sandia are numerous — reduced overhead costs for storage, maintenance, security, and management of these materials."

— Kathy Kuhlmann

## Recent Patents

Eric Schlienger (1831): Constant Voltage Electro-Slag Remelting Control.

Narayan Doddapaneni and David Ingersoll (both 1523): Method of Producing Stable Metal Oxides and Chalcogenides and Power Source.

George Staller (6111) and Robert Wemple (ret.): Geomembrane Barriers Using Integral Fiber Optics to Monitor Barrier Integrity.

## Integrating joint activities is the goal of a new Sandia-Pantex partnership

Sandia and Mason & Hanger, the DOE contractor that manages the Pantex plant near Amarillo, Texas, are beginning to reap the benefits of a partnership between the two formalized in April, says Dennis Mangan (5314), Manager of Sandia's Materials Management and Control backbone.

The goals of the partnership as set forth by its mission statement, signed April 9 by VP-5000 Roger Hagengruber, VP-8000 Tom Hunter, and Pantex General Manager Bill Weinrich, are to take a "comprehensive, forward-looking approach" to materials management and control at the Pantex site and to better integrate the variety of joint technical activities between Sandia and Mason & Hanger. Additionally, it aims to help Mason & Hanger achieve its goal of establishing a "best-in-class" site-wide management system among DOE's nuclear weapons complex facilities.

A team of Sandia program managers met with their Mason & Hanger counterparts in

March to share their long-range views, says Dennis. From that discussion grew the mission statement, and plans are now being formulated to achieve its objectives of encouraging teamwork and communication between the facilities; promoting better use of resources; and anticipating and addressing Pantex's future safety, security, and international accountability requirements, he says. A steering committee with Mason & Hanger and Sandia representation (including Tom Sellers, 5300; Pat Eicker, 9600; Mim John, 8100; and Dennis) provides oversight and guidance and identifies integration opportunities. Steve Ortiz (5838) is the project leader.

"It may be a slow process," says Dennis, "but we are building the needed trust to make this a growing partnership that lasts." For more information, contact Dennis (845-8710 or dlmanga@sandia.gov) or Steve (845-8098 or sortiz@sandia.gov).

## COLLOQUIUM

### "TERRORISM HAS COME TO AMERICA"

An overview of domestic and international terrorism as it has impacted the US

John P. O'Neill  
Section Chief, International  
Terrorism Section  
FBI Headquarters

Wednesday, Dec. 11  
9:30-10:30 a.m.  
TTC Auditorium

Host: Dori Ellis (5500)  
Contact: Joel Carlson, 845-6285

To receive security training credit for attending, find the form on the Dept. 7437 Internal Web home page under Security Briefs.



# Stage Right Automated Guided Vehicle becomes 'hottest' new equipment at Pantex

When handling the radioactive cores of decommissioned nuclear weapons, perfection is the only standard.

That's why Manufacturing Systems Dept. 9672 developed an Automated Guided Vehicle (AGV) to aid in Stage Right, a nuclear material storage concept being implemented at DOE's Pantex plant near Amarillo, Texas.

As more US nuclear weapons are dismantled, more space will be needed at Pantex to store their plutonium "pits." Until recently, the oil-drum-like pit containers were stored, or "staged," in Pantex storage magazines upright, side-by-side, and one-high. The Stage Right concept utilizes steel pallets, informally called "four packs" and "six packs," that hold four or six drums horizontally and can be stacked on top of one another up to six drums high.

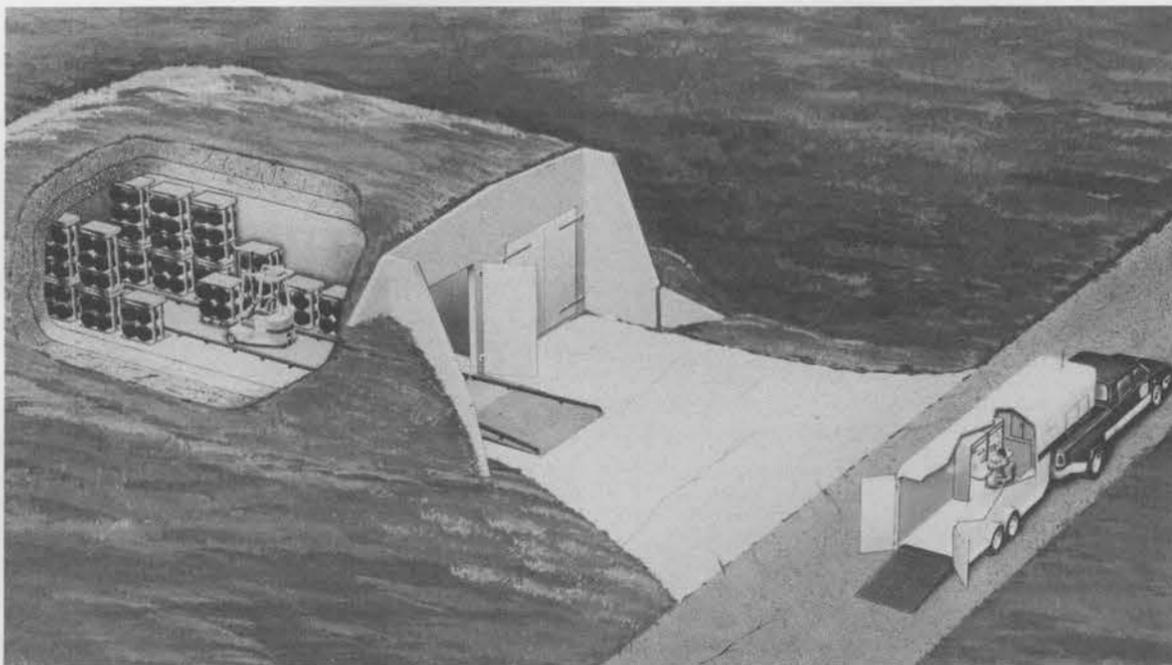
The new approach allows a typical magazine at Pantex to accommodate 76 percent more pit containers than before — as many as 424 drums each, as opposed to the 240 most magazines could hold in the past.

Increasing pit storage density, however, also increases radiation levels inside the magazines and the risk to facility workers who are responsible for pit inventory and management. By performing many in-magazine container-handling functions automatically, the AGV helps minimize human exposure.

"The AGV equipment helps Pantex achieve its storage capacity goals while adhering to ALARA principles," says Red Jones (9672), project leader of the AGV development team. (The Occupational Safety and Health Administration's ALARA concept mandates that exposure to radiation by workers remains "as low as reasonably achievable.")

## AGV became operational in June

Under development since 1992 and operational at Pantex since June of this year, the AGV looks like a forklift without the fork. In its place is a diamond-shaped boom that fits into a pallet's diamond-shaped slot to lift and maneuver the specially designed pallets around the storage magazine. The system uses model- and sensor-based



CUTAWAY ILLUSTRATION showing Stage Right Automated Guided Vehicle (AGV) operations inside a storage magazine at the Pantex Plant. The operator (located in the trailer parked outside the magazine) selects storage, inventory, and retrieval missions for the AGV, which is guided by rails along the center of the magazine.

control technologies developed in Intelligent Systems and Robotics Center 9600, in concert with commercial automated vehicle technology, to perform many pit container storage, retrieval, and monitoring functions automatically.

The vehicle is controlled from the system's mobile control station, a computer-instrumented trailer parked outside the magazine, where an operator employs a graphical user interface (with a point-and-click map of the magazine) to dispatch the AGV on storage, retrieval, and inventory missions. The operator monitors AGV movements using images provided by video cameras mounted on either side of the AGV; if something looks wrong, the operator can shut down the AGV and take corrective action.

Inside the magazine, rails on either side of the vehicle guide it and ensure it can't stray from its programmed path. Various sensors determine whether all is well — whether pallets are correctly

loaded onto the boom and whether they are safely staged or stacked precariously in the magazine. Sensors on the vehicle's front and rear also shut the system down if they detect something is wrong. If anything is amiss, the system shuts down automatically and recommends a recovery course of action that can be performed by the operator from the control station.

Bar codes listed in a manual are scanned by the operator to call up a magazine's map, contents, and available space. The AGV also is compatible with a Radiation and Physical Inventory Pallet, developed by Systems Technology Dept. 5914, that employs a gamma ray spectrometer to inventory the pallets' radioactive contents.

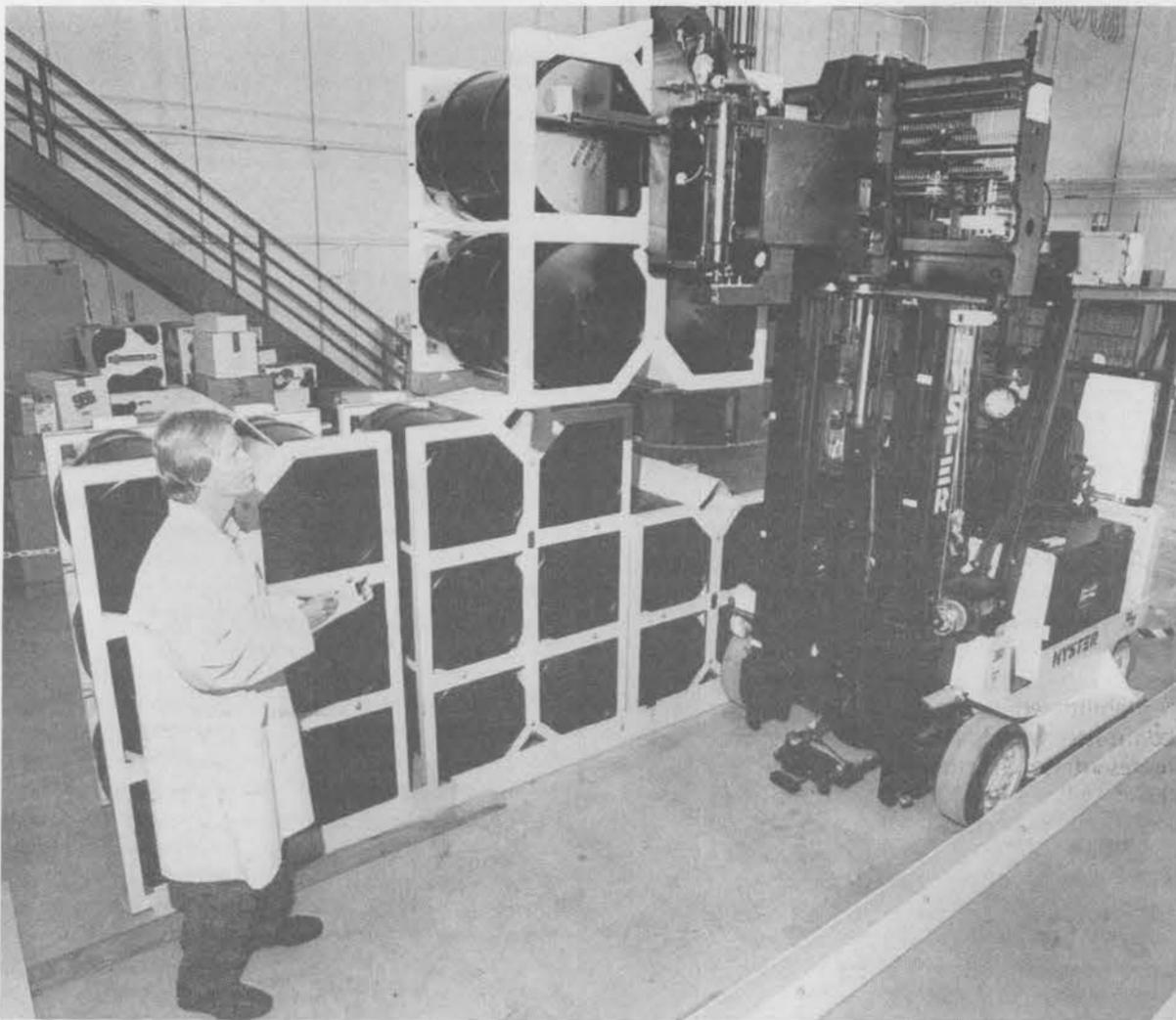
## Concept may be used elsewhere

The Stage Right AGV and control station were built according to Sandia's requirements by Hyster Corp. of Danville, Ill. Manufacturing Systems Dept. 9672 supplied the graphical interface and video cameras and performed final systems integration, installation, testing, and field support. Sandia's work was funded through Dennis Mangan's Nuclear Materials Management backbone (5314).

Pantex supplied the operations expertise by characterizing staging processes and developing procedures and implementation plans, all of which fed back into the AGV's development, says Red. Pantex also designed and built much of the equipment that permits the AGV to operate inside the magazine, including alignment ramps, pallet handling and qualification equipment, and magazine modifications.

Pantex is planning to use the Stage Right AGV concept for storing special nuclear materials (SNM) at its new Component Staging Facility. DOE is evaluating AGV technology for use at several other SNM storage facilities across the complex as well.

—Philip Higgs and John German



IN A MAY 1995 *Lab News* photo, Red Jones took notes while a prototype version of the Project Stage Right Automated Guided Vehicle (AGV) practiced stacking and retrieving pallets of pit containers in an Area 4 lab. The Sandia-developed AGV is now operational at Pantex.

## ★ Congratulations

To Stephanie (12111) and Kelly Willis, a son, Kody Matthew, Oct. 13.

To Karen (10405) and Doug (5799) Nordquist, twins, Roger Allen and Irene Jeslyn, Oct. 26.

To Caryn (10401) and John (2526) White, twins, Suzanne Evelyn and James Edward, Oct. 27.

To Tricia (5838) and Dan (1274) Sprauer, a son, Scott Patrick, Nov. 1.

To Lori (6822) and Rick Dotson, a daughter, Kaitlin Taylor, Nov. 21.



# Sandia building showcases renewable energy technologies, geothermal heating and cooling

Few passerbys would suspect that Bldg. 848, the ordinary-looking building inside the Labs' "photovoltaics compound" (north of G Ave.), is also a unique experiment that is putting a handful of renewable energy technologies to the test.

Sandia's photovoltaics research program requested the new 3,400-square-foot, energy-efficient building in 1992. Its original design included passive solar design features, innovative use of natural light, heavy wall insulation, low-volume toilets, and high efficiency lighting. Architecture and Engineering Dept. 7832 designed the facility.

The building was already under construction in early 1994 when David King of Photovoltaic System Components Dept. 6219 and Bill Sullivan of Geothermal Research Dept. 6111 approached Facilities with a special request: Why not use an existing experimental photovoltaic array in combination with a geothermal heat exchange system to heat and cool the building? The photovoltaic array could help offset the energy requirements of the geothermal heat pumps. The modification, they said, would require minimal building retrofits and would help Sandia evaluate some emerging renewable energy technologies.

Sandia has been investigating geothermal heat exchange as part of DOE's renewable energy program since 1992. An alternative to evaporative coolers, air conditioners, and gas, propane, and electric heaters, geothermal heat exchange systems use the temperature of the earth — nearly constant year-round in New Mexico at about 61 degrees F for depths of 10 feet or more — to heat or cool water circulated through underground pipes.

During the summer, water cooled underground is pumped through heat exchangers in the building's circulated-air system. The water captures heat energy from the building's air, and the conditioned (cooled) air circulates through the building. The warmed water cycles to an underground field of heat exchangers, where it discharges some of its heat energy underground and returns to the surface (again at nearly 61 degrees) to be cycled through the building's heat exchangers. During the winter, the opposite occurs: cool water is heated to nearly 61 degrees underground, then is returned to the surface where it transfers some of its heat energy to the building's air. The hotter or colder the outside air temperature, the more efficiently the system works, says Bill.

## Innovative solutions

Facilities was cautious. What about the cost of drilling 18 250-foot-deep boreholes required for the geothermal system? If the system breaks down, how will the building be heated or cooled? Who would pay for the building modifications? Would the retrofit cause delays in the building's construction?

The photovoltaics and geothermal groups set out to resolve the concerns. Bob Wemple, Bob Meyer, and Gail Martinez (6111, all retired) handled the outdoor geothermal modifications, including designing the heat exchangers, having the wells drilled, installing pipes, and grouting the boreholes (backfilling the area between the pipe and the borehole boundary). These modifications



**UNDERGROUND EXPERIMENTATION** — From left, Bill Sullivan of Geothermal Research Dept. 6111, Rico Ortiz of Architecture and Engineering Dept. 7832, and Michael Quintana of Photovoltaics System Components Dept. 6219 examine the instrumented piping leading to underground heat exchangers, part of an experimental renewable energy system that helps heat and cool Bldg. 848 (background).

were paid for as a discretionary R&D activity.

The photovoltaics group, including Michael Quintana (6219), helped Facilities couple the DC power supply from the photovoltaic array to the building's AC electrical distribution system using recent advancements in photovoltaic inverter (DC to AC) technology. Facilities made sure all internal design modifications were completed, including providing conduits for incoming geothermal pipes and interfacing the system's plumbing with the heating, ventilation, and air conditioning (HVAC) system.

"It was a risky undertaking," says Bill, "but to Facilities' credit, construction was completed on time and under budget despite the last-minute changes. Their cooperation has been super." The building was occupied early this year.

The building's passive solar and insulation features are so efficient that when the heating and cooling system was first turned on last winter, the system was running in the air conditioning (cooling) mode. "The Trombe wall and the combination of massive walls and four inches of insulation maintain a very stable temperature requiring little more than air circulation, especially during a mild winter," says Michael. "The Facilities team did a great job in designing this building."

Essential to the project's success, says Bill, were Roy Hertweck, Rico Ortiz, Bill Kitsos (all

7832), Darrick Jones (7822), Roger Watley (7906), Pam McKeever (7933), and Pat Gronwald (6111).

## Improving efficiency

Geothermal heat pump technology is not new, adds Bill; thousands of the systems are installed worldwide each year. The goal of Sandia's small geothermal research program is to experiment with different pipe layouts, grouts, borehole liners, heat exchangers, pumps, and other features to improve the systems' heating and cooling efficiencies and reduce overall life-cycle costs so the technology can compete with traditional heating and cooling approaches.

"We're interested in how these systems stand up over time," he says.

Today's best geothermal exchange systems now use about 25 percent less energy for cooling than state-of-the-art air conditioning systems and 40 percent less than older, more typical systems, he says. For heating, they use about 60 percent less energy than electrical systems and 20 percent less than propane systems, and they about break even based on natural gas costs in New Mexico.

"In terms of renewable energy, those are fairly good numbers," he says.

Still, he says, geothermal heat exchange has a ways to go before it becomes a viable alternative to conventional heating and cooling systems. "Because of the large initial investment required, the most favorable period of time the investor might achieve payback on one of these systems is three years, but it's more likely about 10 years," he says.

Bldg. 848's geothermal exchange system is heavily instrumented so its long-term performance can be measured, and the borehole field employs three different thermally enhanced grouts. (The building also demonstrates

the photovoltaic inverter technology.)

DOE is a "big supporter" of renewable energy technologies in general and geothermal technologies specifically, says Bill. Bldg. 848 is the first building within the DOE complex to utilize such a system.

"We're both showcasing and experimenting with some of DOE's renewable energy technologies," he says.

—John German

## Fun & Games

**Tennis** — Sandia employees and retirees and their families and friends played in the Coronado Club Round Robin Tennis Tournament Nov. 2 at the Coronado Club tennis courts. Here are the results: Men's doubles 3.0-3.5 ranking — First place, David Sealey (7437) and Barry Schwartz (7500); second place, Elliot Schwartz and Jesse Herron; Men's doubles 4.0-4.5 ranking — First place, Barry Schwartz and John Wolfe (5921); second place, Roy Palmer (4918) and Wendel Archer (1251); Women's doubles — First place, Ruth Tillerson and Julie See; second place, Andrea Schunk and Linda Slutz; Mixed doubles — First place, Glenna Hickman (3535) and Wendel Archer; second place, Fred Cericola (ret.) and Sara Cericola.

# Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

## MISCELLANEOUS

28.8 MODEM for Macintosh (Power-Mac), never used, shrink wrapped, paid \$265+tax, sacrifice for \$200 OBO. Lujan, 299-2218.

NORDICTRACK AB WORKS MACHINE, \$100 OBO. Tapia, 857-0475.

DINING SET, territorial solid oak, 8 chairs, hutch, stained-glass windows, \$1,500; refrigerator, cooktop, dishwasher, \$150. Cieslak, 856-1614.

SOFA SLEEPER, neutral colors, looks new, \$100. Roherty-Osmun, 293-8127.

OAK ROLLTOP DESK, 33-in. deep x 56-in. long x 50-in. high, 5 regular drawers, 2 file drawers, 27 small drawers, hidden compartment, great condition. Mulligan, 291-8539.

MADAME ALEXANDER DOLLS, selling private collection. Anderson, 296-3352.

FIREPLACE SCREEN & TOOLS, brass-toned, excellent shape, perfect for an older-style fireplace, \$25 OBO. Parrott, 255-3614.

QUEEN BED, bookcase headboard, rosewood-stained ash, Simmons Platinum mattress & box spring, 3 yrs. old, \$1,200 new, asking \$500. Sturtevant, 275-0170.

INFANT CAR SEAT, Century, \$15; child car seat, \$20; Little Tikes high chair, slide, Graco swing, more. Ota, 828-3663.

COUCH & LOVESEAT, cream w/tan stripes, good condition, \$300 OBO; 2 end tables, wrought iron, glass tops, \$150 OBO. Williams, 296-4124.

FORMAL DINING SET, pecan china cabinet, table, 6 chairs, curio cabinet, \$2,000. Olona, 268-3604.

WHEELS & TIRES from '95 Cherokee, 5 ea., 15x7, only used 20K miles, \$700 OBO. Schultheis, 275-7284.

AMPLIFIER, Marshall JCM 800 lead series head (50W), w/matching 4x12 stereo tilt stack, excellent, \$750. Dempsey, 281-9101.

TWO LEATHER SADDLES, excellent condition, \$250 ea. Bender, 281-1989.

BLACK & WHITE TV, 9 in., \$25. Pasterczyk, 255-2066.

MACINTOSH SE/30, full-portrait monitor, extra HD, modem, original software, carrying case, original boxes, \$950 OBO. Ho, 237-2668.

AKC SPRINGER SPANIEL PUPPIES, black & white, 6-wk.-old stocking stuffers for Christmas, \$300 ea. Sharp, 243-1498.

MACINTOSH CLASSIC, \$50; HP Desk Writer printer, \$75; 2400 baud modem, \$2. Compton, 899-0679.

HP DESKWRITER PRINTER, w/AppleTalk for Apple Macintosh computers, manuals & software, \$150. Nordberg, 294-1246.

SATELLITE ENTERTAINMENT SYSTEM, General Instrument Videocipher II, 3 receiver units, 8 ft. dish, cables, \$600. Narath, 821-4939.

CERAMIC KILN, Ducan Energy Save Model EA120 Artist Plus, w/supplies, \$150. Adams, 823-1845.

RANCH MINK, below-hip jacket; size 16/18, \$400. Robbins, 823-2492.

BABY ITEMS: call for list & prices; 36 professional movers' boxes, \$20. Armstrong, 271-8302.

E-FORCE CROSSTRAINER, w/video, perfect condition, paid \$250, asking \$125 OBO. Smith, 837-1752.

REFRIGERATOR, '83 GE, 22 cu. ft., good condition, \$125; trailer, 4-ft. x 8-ft. bed, needs new tire, \$125. Knowles, 856-5987.

GRACO PACK&PLAY, \$45; Tough Traveler baby pack, \$50; 18-in. x 36-in. pool table, \$75; '30s reproduction AM/FM radio, \$25. Crafts, 831-5234.

SOFA & LOVESEAT, leather, teal, more blue than green, contemporary style, good condition, \$650 firm. Smith, 275-8185.

SUPER NINTENDO, control deck, controllers w/6 games, \$75. Thomas, 237-0467.

ELECTRIC POWER SNOW BLOWER, rotating impeller, up to 20 ft. throw, \$15. Meeks, 828-9825.

NORDICTRACK 505, \$200 OBO; bicycle trainer, \$25 OBO; small weight bench, \$10 OBO. Rosul, 281-4114.

EPSON ACTION PRINTER, #3250, 24-pin dot matrix, \$40; 200MB Seagate HD, \$25; child's "step 2" rocking fish, \$15. Parson, 291-8394.

SOFA SLEEPER, queen-size, neutral color, comfortable, \$100; Sears recliner, large brown, \$50. Wood, 271-9967.

BASS GUITAR AMPLIFIER, Peavy TKO 80, 80-watt amp., 7-band equalizer, \$225. Schwartz, 271-1450.

SWISS-MADE WATCH, Raymond Weil, Geneve model watch, gold/silver band, new in box, retail \$700, sell for \$275 cash. Kelly, 271-9589.

MAC LC COMPUTER, 40MB, internal HD, 10MB RAM, external 14.4 modem, \$325. Silverman, 298-1308.

COMPUTER, DECstation 5000/120, 1024x864, 16-in., 8-plane Trinitron, 32MB RAM, 1GB HD, Unix O/S, MIPS 32-bit CPU, FPU, \$900. Key, 856-1588.

HAMILTON PIANO, 45-in. tall, dark finish, \$900; Wurlitzer console organ, w/MIDI ports, light finish, \$600. Reynolds, 281-2106.

LARGE CHUNKS COTTONWOOD, free, you haul; 80 records, 45s, from '60s, \$10 all. Bazar, 898-1467.

LASER PRINTERS: HP LaserJet (serial), \$125; LaserJet Plus (parallel/serial), \$165; both with full toner cartridges. Schkade, 292-5126.

JENN-AIR ELECTRIC STOVE, works great, \$375 OBO; Conn organ, works great, \$150. Gallegos, 293-8885.

SOLDERING GUN, heavy-duty, w/wire brush paste & wire stripper; Kirby vacuum, w/attachments, needs some repair. Pitti, 256-1629.

WAGNER AIRLESS SPRAYER KIT, used once, \$50; 3 air sprayers, quart-size, 1 new, \$4 ea. Hayes, 299-1200.

GAS WELDING/CUTTING OUTFIT, \$50; propane fuel setup for vehicle, w/82 gal. tank, \$250. Bentz, 857-0728.

COREL WORD PERFECT SUITE 7, on CD, new OEM edition, \$60, Corel Print House CD, \$10. Molecke, 296-5850.

EXIDE BATTERY, heavy-duty, 75-month warranty, used 1 month, 900 amps at 32 degrees, \$60 new, \$35. Stamm, 255-2640.

TV, 19-in. w/6-ft. wood console, w/radio & record player, \$70; Peugeot bike, 19-in., \$50. Healer, 298-6967.

SEGA GENESIS, w/4 games & 2 controllers, \$75. Lynch, 299-2509, ask for James.

TABLE SAW, Craftsman, cast iron, 2 extensions, stand, 5 blades, old but good, \$150. Markwell, 821-5768.

ELECTRIC WATER HEATER, 40-gal., (retail \$160), \$85; 7 electric baseboard heaters, 3-9 ft., (retail \$230), \$125; some new, all working. Williams, 286-1988.

SLANT-TOP DESK, traditional-style, w/shelf, 3 drawers, fruitwood brown, \$225 OBO. Preston, 821-8028.

BOOMBOX, 2-15-in. "Power" woofers, 300-watt max., 4-ohm, 100-watt crossovers, included in box, charcoal gray, \$150. Aguilar, 238-0567.

CHEST OF DRAWERS, 59"W x 17"D x 29"H, 9 drawers, oak formica finish, \$40; TV, 13-in., color, good condition, \$20. Kajder, 298-9353.

SANDIA MEMORY GARDENS, 2 adjacent lots, \$950 for both OBO. Hodgden, Box 11, Lovelady, TX 75851, 409-636-2351.

LAWN MOWER, Craftsman, 3 yrs. old, excellent condition, rear bag, mulch adapter, gas can, \$105. Reed, 884-4505.

EXERCISE/PHYSICAL THERAPY TRAMPOLINE, has support handle, \$100. Hudson, 884-7621.

COLLECTORS: Hitachi 4-head VCR, Model #VT-18A, instructions, remote, approx. 18 yrs. old, fine condition, \$75. Duvall, 881-4406.

DRILL PRESS, J.C. Penny, 8-in. w/3/8-in. chuck, variable speed, bench top, \$30. Perry, 884-7405.

PFALTZGRAFF DISHES, Sky pattern, 12 complete place settings plus many extras, \$265; hardwood rocking chair, \$35. Fitzgerald, 275-0521.

TABBY CAT, free to loving home, 2-yr. old sandy-colored female, spayed & declawed. Hogan, 292-8879.

**DEADLINE:** Friday noon before week of publication unless changed by holiday. MAIL to Dept. 12640, MS 0165, FAX to 844-0645, or bring to Bldg. 811 lobby. You may also send ads by e-mail to Nancy Campanozzi (nr campa@sandia.gov). Questions? Call Nancy at 844-7522. Because of space constraints, ads will be printed on a first-come basis.

### Ad Rules

1. Limit 18 words, including last name and home phone (We will edit longer ads).
2. Include organization and full name with the ad submission.
3. No phone-ins.
4. Use 8 1/2" by 11-inch paper.
5. Type or print ad; use accepted abbreviations.
6. One ad per issue.
7. We will not run the same ad more than twice.
8. No "for rent" ads except for employees on temporary assignment.
9. No commercial ads.
10. For active and retired Sandians and DOE employees.
11. Housing listed for sale is available without regard to race, creed, color, or national origin.
12. "Work Wanted" ads limited to student-aged children of employees.

SEGA GAME GEAR, w/2 games, rechargeable battery packs, \$70. Munson, 822-1497.

STEREO EQUIPMENT, pair of 3-way floor speakers, \$120, Sansui receiver, 4 channel, \$100; AKAI 9-band graphic equalizer, \$60; all for \$250. Smith, 888-8811.

LUMINARIAS, Boy Scout Troop 285 will deliver the weekends of Dec. 14 or Dec. 21, \$4/dozen. Clark, 298-8737.

CHANGING TABLE, hardwood w/oak stain, w/nice changing pad, \$40; Century infant car seat, w/removable base, colorful jungle print, head support, \$25. Diltz, 899-3943.

TELESCOPE, Odyssey Compact, 10 in., f4.5, dobsonian mount, \$300; trailer hitch for '91-'95 Chrysler minivans, \$35. Ludwigen, 294-7076.

TOYS: large Duplo collection (w/specialty pieces); Playmobil train, accessories, table; maple blocks; miscellaneous; all excellent. Filter, 823-1232.

HOME GYM, Universal Marcy EM-II, weights, bench, butterfly, \$400. Blanton, 856-2076.

AQUARIUM, 15-gal., tropical setup, \$25. Payne, 291-0124.

AUTO GREASE GUN; foot locker trunk; trailer hitch; aluminized mylar film for windows. Moss, 298-2643.

WOODSTOVE, Orley, heats 1,200-1,800 sq. ft., \$300; 2 Fisher-Price car seats, \$10 ea. Nickerson, 298-5634.

CALORIC GAS RANGE, almond, \$50. Hebron, 281-2901.

'96 HOLIDAY BARBIES, 3/\$75 ea.; '95 Holiday Barbies, 2/\$100 ea. Padilla, 281-9550.

CRIB, great condition, almost new, w/mattress & bedding set, \$100 OBO. Otero, 865-6654.

GORTEX JACKET, by Sequel, great for skiing, \$150; oak roll top desk, great shape, \$250. Morrison, 298-0347.

SPODE CHRISTMAS DISHES, 12-buffet sets, \$25 ea.; 4 cereal bowls, \$3 ea OBO. McKenna, 899-4218.

## TRANSPORTATION

'79 CORVETTE, must sell, must see, extra clean, \$7,500 OBO. Yoder, 899-2962, after 5 p.m., ask for Jeff.

'39 DODGE DELUXE, 4-dr. sedan, 1 owner, all original, 51K miles, always garaged, \$2,995. Evans, 281-3864.

'91 FORD F-150 XLT, Supercab, V8, 5-sp., 4x4, 60K miles, \$13,000. Riley, 821-4035.

'95 FORD F250 XLT, Supercab, 4x4, PowerStroke diesel, loaded, \$25,000. Haley, 767-2448 or 281-2898.

'85 BMW 325e, black w/black leather interior, PW, PL, cruise, AC, sunroof, alarm, \$6,995. Heise, 867-5652 or 228-1994.

'93 DODGE DAKOTA LE, extended cab, 2WD, 3.9L V6, 5-sp., top-pper, 54K miles, new tires, clean, \$12,700. Brosseau, 896-3801.

'88 SAAB 900, red, 103K miles, all records, new tires, CD player, \$3,500 OBO. Bowman, 299-4324.

'94 CHRYSLER LEBARON, convertible, V6, excellent condition, security system, PL, PS, leather, tilt, cruise, AC, \$13,000. Bujewski, 856-6101.

'79 FORD FIESTA, 4-sp., excellent condition, runs well, \$1,000. Avila, 275-9572.

'95 DODGE TURBO DIESEL, 3/4-ton, extended cab, PW, PL, alarm, brush guard, gooseneck hitch, \$30,000. Rivers, 864-2335.

'77 TOYOTA PICKUP, long bed, AC, AT, bedliner, cap, radio, 93K miles, excellent work car, \$1,695. Becktell, 884-5237.

'91 CHEV. CAPRICE CLASSIC, V8, fuel-injection, AT, AC, PW, PB, very clean, \$6,100. Dayton, 343-9719.

'77 JEEP CJ-7, new paint, hardtop, runs great, very good condition. Szklarz, 294-3769.

'87 JIMMY SIERRA, 4WD, 80K miles, tan & cream, \$4,800. Simon, 299-8468, evenings.

'89 TOYOTA TERCEL LT, 3-dr., blue, manual transmission, excellent condition, \$3,000. Case, 293-5466.

'93 NISSAN SENTRA E, 4-dr., PS, PB, AC, great shape, must sell, at loan value, \$5,600. Smith, 857-0750.

'95 DODGE NEON, tinted windows, white, AT, loaded, has extras, must sell, \$9,500. Garcia, 861-2477.

'88 CHEV. CELEBRITY, white, AT, AC, PS, FWD, 4-dr., V6, 58K miles, new tires, brakes, PS, tune-up, NADA \$4,300, must sell, \$2,800. Baker, 856-6228.

'86 CHEV. CAPRICE BROUGHAM CLASSIC, 74K miles, excellent condition, all options, \$3,800. Magnuson, 821-5330.

'90 NISSAN, Parting Out. Chavez, 861-0712.

'96 EXTENDED CAB DUALY, Cummins diesel, fully loaded, electric seats, 4 months old, 7,200 miles, \$28,500. Cobb, 877-3490, ask for Ray.

'84 HONDA PRELUDE, 137K miles, new clutch, light body damage, CD player, no AC, \$2,300. Brown, 298-8447.

'95 CHEV. TRUCK, extended cab, stepside, 2WD, Silverado, loaded, under warranty, 25K miles, \$20,995. Madrid, 891-1509.

'88 SUBARU WAGON, AT, AC, PS, PW, AM/FM, new tires, low mileage, great condition, \$5,200. Luetters, 822-1601.

'92 GMC PICKUP, 4x4, V8 350, AT, 49K miles, AC, loaded, extended cab, campershell, immaculate. Dulski, 296-4126.

'89 MERCURY COUGAR LS, excellent condition, low miles, power everything, AM/FM/CD player, new engine, tires, brakes, \$6,200 OBO. Foster, 292-5044.

'90 FORD RANGER XLT, 4WD, AT, super cab, towing, \$7,500; '81 Chev. pickup C20HD, w/camper, \$2,000. Hilborn, 220-2400.

'87 FORD F-150 SWB, 4.9L, 6-cyl., EFI manual, OD cruise, AM/FM cassette, dual-tanks, \$3,800. Dodson, 294-2143.

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'87 CAMPING TRAILER, Starcraft, 23 ft., excellent condition, \$6,000. Chavez, 865-4556.

AIRPLANE, '46 Taylorcraft, 1/5 share, low & slow tail-dragger, hangared in Edgewood \$2,700. Lorenz, 281-9321.

MOUNTAIN BIKE, Mantis Pro Floater, 18-in. full suspension, loaded w/top-of-line extras, \$1,800 OBO. Arakaki, 822-0812.

WOMAN'S ELAN SKI PACKAGE: skis/boots/poles/bindings, size 7, used 4 times, \$100; porta-potti, \$25; outdoor camping solar shower/enclosure, \$15. Platzbecker, 299-6096.

SKIS, 190cm Elan 630s, w/Saloman 727 bindings, \$50; bicycle, 21-in. frame, 12-sp. bicycle, \$40. Custer, 298-4948.

TIMESHARE, Breckenridge, luxury 5 star 1-bdr. condo, LR, DR, FP, washer/dryer, garage, available Feb. 14-21. Siegal, 821-5766.

HAWAIIAN VACATION, 5 star resort on Big Island, any week in April, must reserve by Dec. 19, \$570. Givens, 292-2058.

HONDA CT90 TRAIL BIKE, 1K miles, immaculate condition, \$425. Perkins, 899-8766.

SKI BOOTS, Lang, like new; man's size 6-1/2 Prolite Dynafit; man's size 8 Z-Flo, \$30/pair. Dahms, 275-9478, ask for Shannon.

SKI BOOTS, Rossignol, size 8-1/2, used 3 times, paid \$300 new in '95, asking \$60 OBO. McGirk, 884-4592.

'82 HONDA GOLDWING, excellent condition, low mileage, \$2,800. Robles, 294-6904.

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## REAL ESTATE

2-BDR. '93 MOBILE HOME, must sell, beautiful, must see, 2 miles/KAFB, appliances w/washer & dryer, ready for occupancy, \$22,200. Sisneros, 296-7823.

3-BDR. HOME, 1,350 sq. ft., corner lot, RV pad, upgrades, new carpet, paint, doors, windows, AC, roof, water system. Garcia, 299-7803.

3-BDR. PLACITAS HOME, 2 baths, 2 acres, 3,140 sq. ft., fireplace in kitchen, greatroom & study/office, 2 wet bars, vigas, latillas, 3-car garage, \$399,000, owner/agent. Hanks, 815-777-3441 or 815-273-8842.

3-BDR. MOBILE HOME, '80 Marshfield, 2 baths, 14' x 80', recently recarpeted & repainted, garden tub. Brooks, 828-1117.

3-BDR. HOME, 2-story, 2-1/2 baths, remodeled, SW corner Indian School/Chelwood, 1704 Sandler NE, open house Sat. 10 a.m.-2 p.m., \$125,000. Barn

## Sandia News Briefs

### Lalit Chhabildas wins ballistics award

Lalit Chhabildas of Shock Physics Applications Dept. 9575 was presented the Aeroballistic Range Association (ARA) Ballistics Award at the annual meeting of the association in October in St. Louis, France. The award citation credited Lalit's efforts in "advancing ballistic range technology internationally, and for his dedication to the Aeroballistic Range Association." The ARA is an international group of organizations that meets annually to discuss the operation, safety, and application of high-velocity gun launchers. Sandia has been a member since 1981.

Send potential Sandia News Briefs to Lab News, Dept. 12640, MS 0165, fax 844-0645.

## Around the corporation **LOCKHEED MARTIN**

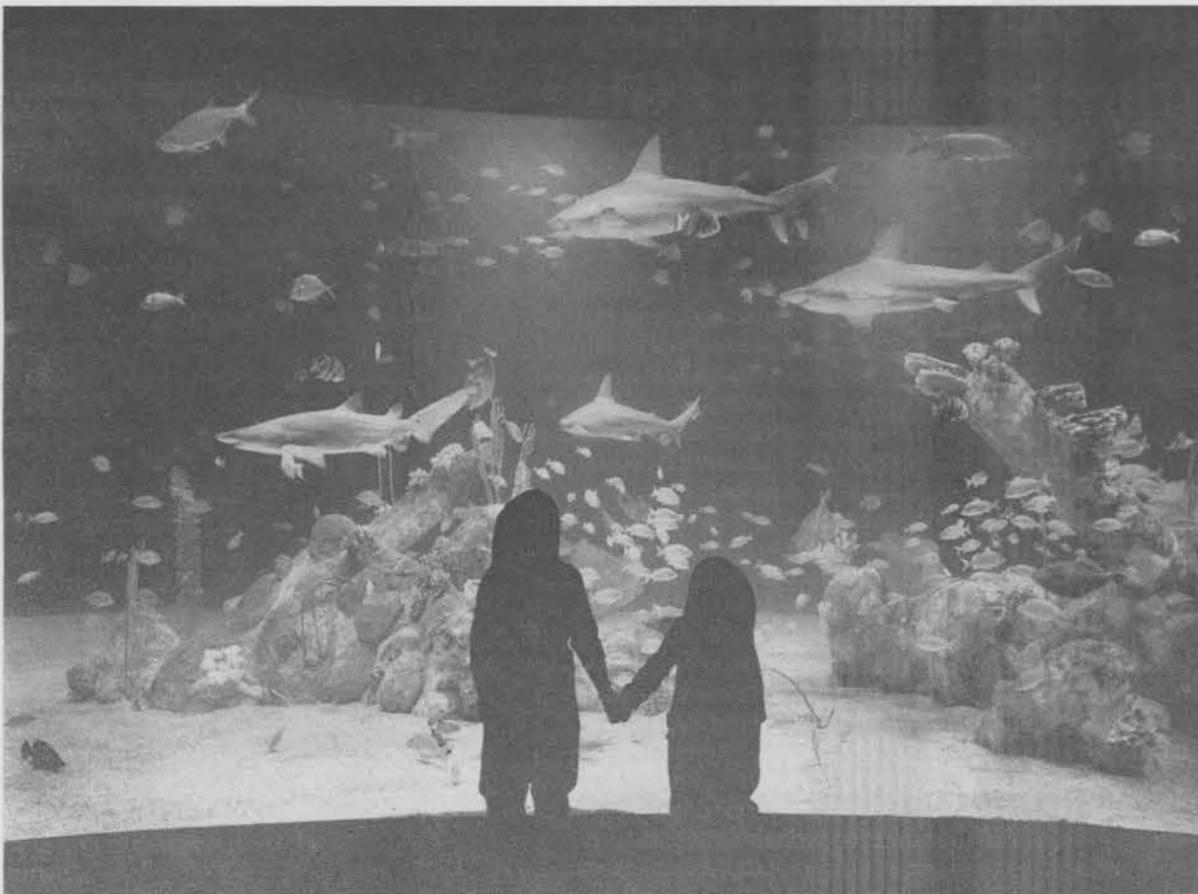
### Joint Strike Fighter work to draw on Skunk Works expertise

Lockheed Martin, close to freezing its design for the Joint Strike Fighter (JSF), plans to assemble two prototypes at the company's famed Skunk Works in Palmdale, Calif., with involvement and input from engineers at its Marietta, Ga., and Fort Worth, Texas, facilities. Paul Martin, vice president of tactical aircraft programs, says about \$500 million of Lockheed Martin's \$1.4 billion contract award will be devoted to building two prototypes.

The company's first prototype, scheduled to debut in 1999, will be the Marine Corps/Royal Navy version, equipped to make short takeoffs and vertical landings. The second will roll out with the Air Force's conventional takeoff role but will be converted later to the carrier-capable Navy configuration.

The Defense Department selected Lockheed Martin and Boeing — based on preliminary designs, production plans, and other factors — to compete for the contract to build the JSF, expected to be the primary warplane of the US military and the Royal Navy well into the 21st century. Some industry analysts have estimated the lifetime value of the contract at more than \$1 trillion.

McDonnell Douglas also submitted a JSF proposal, but was not selected to compete for the final design.



**SHARK TANK VISTA** — Two visitors to a pre-grand opening tour of the Albuquerque Aquarium gaze in wonder at the 285,000-gallon shark tank, which holds 15 to 20 sand, tiger, brown, and nurse sharks along with many other species of fish. The aquarium was scheduled to open to the public this week. The shark tank is the centerpiece of the aquarium, which along with the new Rio Grande Botanical Garden and Rio Grande Zoo constitute the Albuquerque Biological Park. Lockheed Martin is a major corporate sponsor of the shark tank; it has pledged \$100,000 over the next four years for management and maintenance of the facility. (Photo by Randy Montoya)

## Review/Approval Web site now available

Sandia authors and other employees who need to release new information can now find out what they need to do and how to go about it by accessing the new Sandia Corporate Review and Approval for Communication Web site: <http://www.sandia.gov/SandiaOnly/RevApprov/RevApprov.html>. The site can also be accessed by clicking on "Services," then on the link under "Communications."

The review and approval site is intended to help ensure approved release of information from Sandia. Employees who follow the guid-

ance can prevent unintended release of classified or sensitive information, preserve intellectual property rights, communicate a professional corporate image, ensure compliance with DOE directives, and more. The site also provides "common look and feel" guidance. Primary sections include:

- Choosing the Right Process
- Guidelines, Form, Policy
- Contacts and Feedback

For more information about the Review and Approval procedure or site, contact Manny Ontiveros (12630) at 844-8535.

## Coronado Club

**Dec. 5-20** — New Year's Eve Party reservations on sale; \$30/couple; prime rib dinner, music by Midnight Magic. Tickets available at Club office.

**Dec. 5, 12, 19** — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

**Dec. 6** — "Western Night" dinner/dance. \$7.95 all-you-can-eat buffet, 6-9 p.m. Music by Isleta Poorboys, 7-11 p.m.

**Dec. 13** — "Western Night" dinner/dance. \$7.95 all-you-can-eat buffet, 6-9 p.m. Music by Midnight Magic, 7-11 p.m.

**Dec. 15** — Sunday brunch buffet, 10 a.m.-2 p.m. \$6.95 all-you-can-eat buffet. Kids 3-12, \$1, under 3 free. Music by Bob Weiler, 1-4 p.m.

**Dec. 20** — "Big Band Night" dinner/dance. \$7.95 all-you-can-eat buffet, 6-9 p.m. Music by Westside Sound, 7-11 p.m.

**Dec. 22** — Sunday brunch buffet, 10 a.m.-2 p.m. \$6.95 all-you-can-eat buffet. Kids 3-12, \$1, under 3 free. Music by Bob Weiler, 1-4 p.m.

**Dec. 24** — Close-down party, main bar, 4-10 p.m.

## Sandia Web Watch



**Web site features mini movies about micro-machines** — Major achievements in minuscule machines have been made in recent years by Sandia researchers, producing the world's smallest steam engine and a micromotor that's not much larger than

the thickness of a few human hairs.

Now anyone with access to the World Wide Web can learn more about these miniature machines and Sandia's related R&D work by accessing the micromachines site at <http://www.mdl.sandia.gov/Micromachine>.

Sections include:

- **Featured Attractions**, described by the researchers as "our 'gee-whiz' page, highlighting all sorts of tiny little things that we think are cool." This section features the world's smallest microsteam engine, a six-gear chain that runs at a mind-boggling 250,000 rpm, and the world's smallest "mite-go-round," showing microscopic dust mites on a tiny optical shutter.

- **Industry Recognition**, describing recent awards received by Sandia and its micromachines researchers. One is a coveted 1996 R&D 100 award, sponsored by R&D magazine. R&D 100 awards recognize the 100 most technologically significant R&D events each year.

- **Movie Gallery**, which allows cybervisitors to actually view some fascinating little miniflicks, including one of those dust mites riding the "mite-go-round."

- **Tour the Facilities**, which shows and describes Sandia's state-of-the-art Microelectronics Development Lab where most of the micromachines R&D is done.

The micromachines site can also be found from Sandia's main External Web site (<http://www.sandia.gov>) by clicking on the Research & Technology icon, scrolling down to the Manufacturing category, and clicking on Micromachines. — Larry Perrine

## Help us recognize Sandians

The *Lab News* wants to recognize Sandia employees and retirees who receive honors and awards. Call Bill Murphy at 845-0845 or send him a note with a few details to Dept. 12640, MS 0165, fax 844-0645. In Livermore, contact Barry Schrader (8522) at 294-2447, MS 9111.