

# Output of Z accelerator climbs closer to fusion levels

Progress 'astounding,' says Gerry Yonas

By Neal Singer

If the power and temperature generated by Sandia's Z accelerator were graphed like stock prices, brokers would describe them as going through the roof and still climbing.

Z (formerly called PBFA-Z) is the most powerful generator of X-rays in the world (*Lab News*, Dec. 6, 1996). In the last ten months, the machine, located in Area 4, has more than quintupled its output, going from 40 to 210 trillion watts (terawatts) for individual "shots." It took 25 years for a succession of Sandia accelerators to reach 40 terawatts per shot.

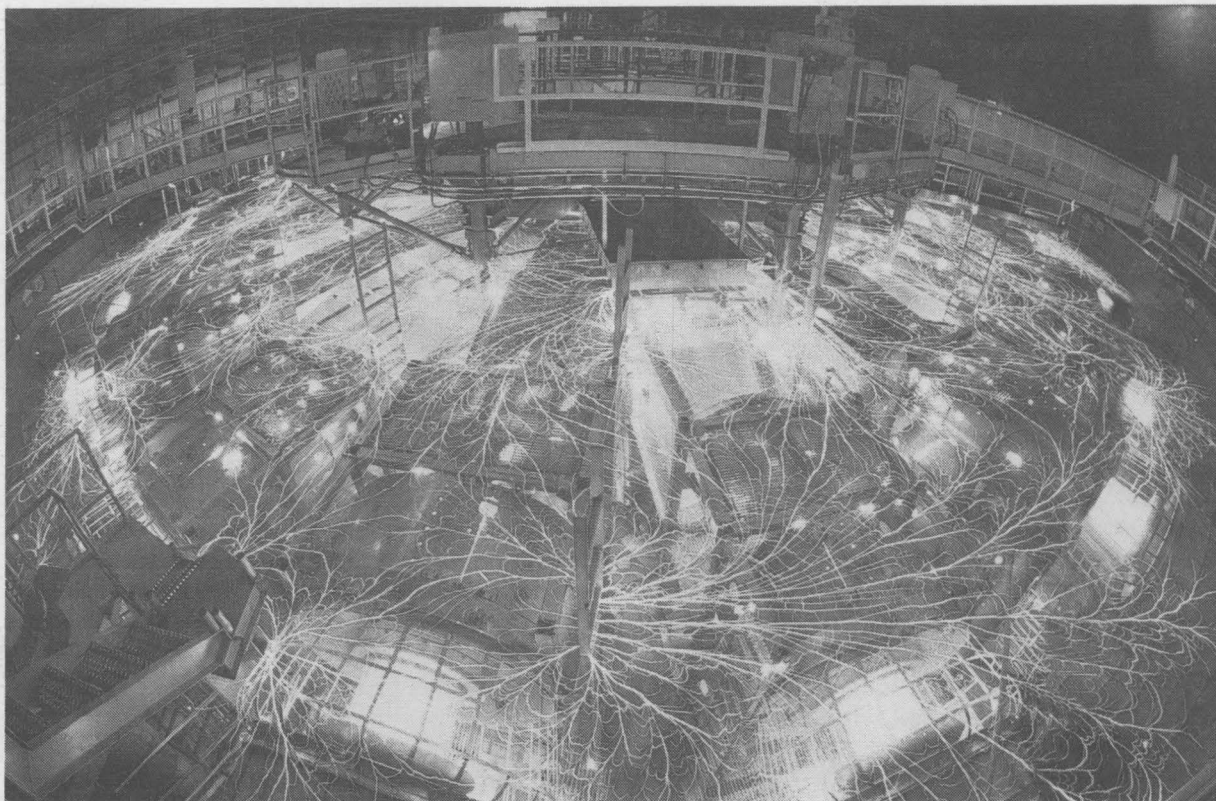
Z's output is now 60 times the world's usage of electrical power at a given moment.

*Z's output is now 60 times the world's usage of electrical power at a given moment.*

## Rapid breakthroughs

In the most recent development, Z in mid July achieved a temperature of 1.5 million degrees Celsius after languishing for many years at a mere 0.5 million degrees. Nuclear fusion requires temperatures from 2 to 3 million degrees.

"The progress the Z-team continues to make is frankly astounding," says Gerry Yonas, VP of Information and Pulsed Power Research & Technology Div. 9000. "Time and time again, the team has made theoretical projections, done experiments faster than expected, and made improvements along the way that give even



**RAW POWER** — Electrical discharges illuminate the surface of the Z machine, the world's most powerful X-ray source, during a recent accelerator shot. In mid July the Sandia accelerator achieved temperatures of 1.5 million degrees, close to the 2 to 3 million degrees required for nuclear fusion. In the last 10 months, breakthroughs have enabled the machine to more than quintuple its output. (Photo by Randy Montoya)

better results than predicted. This is world-class science and technology."

"With the recent world-record result, the Z machine proves once again that the people at Sandia are up to the challenge of science-based

stockpile stewardship," says Vic Reis, DOE Assistant Secretary for Defense Programs. "My heartiest congratulations. Keep it up!"

Reis calls science-based stockpile stewardship, (Continued on page 5)

## Now for something completely different: Period of stability likely, Robinson says at dialogue session

By Bill Murphy

Labs President and Director C. Paul Robinson has a word of advice for Sandians who are thinking about retiring this year: Don't wait around for another Voluntary Separation Incentive Program (VSIP), because there won't be one.

"As you know, when we did the VSIP the last two times, we did not make it a universal retirement incentive," Paul said. "Still, about one out of every 10 or 11 people in the Labs had the opportunity to volunteer. Next year, I think the chance will be zero that anyone will have a chance to volunteer."

Paul's comments came Monday at the Technology Transfer Center (TTC) auditorium (Bldg. 825) during the first of a series of scheduled employee dialogue sessions.

Paul said Sandians can expect a period in which Labs-wide downsizing will not be likely.

"We are in a stable position, and that's

(Continued on page 4)

*"Next year, I think the chance will be zero that anyone will have a chance to volunteer [for the VSIP]."*

# Sandia LabNews

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## Arctic research station dedicated with handshakes, speeches, Inuit prayers

North Slope station starts gathering climate data in next few weeks

By Bill Murphy

A new global climate change research station on Alaska's North Slope is officially in business, and in the next few weeks should start gathering the data it was designed to collect for the next seven to ten years.

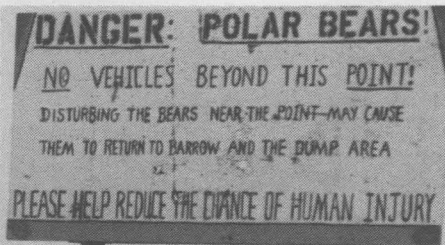
A contingent of Sandians traveled to Barrow, Alaska, to participate in the July 1 dedication of the North Slope of Alaska/Adjacent Arctic Ocean (NSA/AOO) Cloud and Radiation Testbed (CART) site. The facility at Barrow is part of DOE's Atmospheric Radiation Measurement (ARM) program.

Among Sandians on hand for the dedication was Bernie Zak of Environmental Charac-

terization/Monitoring Systems Dept. 6612, who is the NSA/AOO site program manager. Martha Krebs, Director of the DOE Office of Energy Research, also attended and participated in dedication ceremonies, as did Peter Lunn, program manager for ARM.

In addition to DOE and several of its national laboratories, institutions with research interests related to the NSA/AOO effort participating include the National Oceanic and Atmospheric Administration (NOAA) Climate Monitoring and Diagnostics Laboratory, the NOAA Environmental Technology Laboratory, the National Weather Service (Alaska Region), the Barrow Arctic Science Consortium, the National Science Foundation,

(Continued on page 4)



**BEAR COUNTRY** — At Barrow, polar bears are taken very seriously. A hand-painted sign warns visitors of the dangers. All DOE personnel scheduled to serve at the North Slope CART site underwent polar bear awareness and self-defense training. A polar bear was seen prowling around during the CART site dedication ceremonies.

DoD's Harold Smith lauds Labs' work with FSU nuclear materials 2

Retaining & attracting the best: Study looks into work life quality 3



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Ombuds plus: Mediation Cadre to help resolve workplace troubles 9

# This & That

**Aging arms** - Because the US isn't building new nuclear weapons, the average age of stockpiled weapons will become the highest in history next year and will reach 15 years before the year 2000. If new systems aren't produced, stockpiled weapons should reach an average age of more than 20 years in about 2005 (see the historical chart on page 9).

Because Sandia has primary responsibilities for ensuring the continuing viability and safety of the stockpile, our weapons organizations are very much concerned about the aging systems. If that chart doesn't make a good case for maintaining a strong stockpile stewardship and maintenance program, I don't know what does.

\* \* \*

**Unanswered questions?** - If you couldn't attend one of Paul Robinson's employee dialogue sessions this week, check out Bill Murphy's page 1 story, based on Monday's first Sandia/New Mexico session (it's the only one Bill could cover and still get the story into this issue).

Some Sandians who submit potential topics and questions for these sessions wonder why they don't get discussed. Each session lasts only an hour or so, and Paul simply can't cover every topic suggested. Also, some involve personal or personnel questions and issues that aren't appropriate to cover in a public forum.

However, you can get an answer to all reasonable questions. Sandia managers at all levels reply to your inquiries (submitted anonymously if you prefer) through the Feedback system. I can't guarantee you'll always like the answers, but you will get them. For info, call Feedback administrator Janet Carpenter at 844-7841 or see the Feedback Internal Web page at <http://www-irn.sandia.gov/corpdata/feedback/fbindex.html>. (Even if you don't have a question, there's always interesting reading there.)

\* \* \*

**Underpowered locomotive or just loco?** - I realize my thought processes don't run on the same track as many people's. In fact, some smart aleck said recently that the locomotive pulling my train of thought is obviously underpowered. But such comments don't stop me from thinking. Here are a few questions that have wandered into my brain recently:

- Does the chiropractic outfit that gives you a hundred bucks after your auto accident and that runs the same irritating TV commercial over and over and over also give you \$10 after a bicycle wreck, \$25 after a go-cart accident, or \$50 after a motorcycle wreck? Aaaaaaah!

- If you're arguing with your spouse, and she/he doesn't hear you, are you still wrong?

- Does a pig really sweat a lot?

- Are most teenage boys and college-age guys named Bro and Dude? You'd think so from listening to their conversations.

\* \* \*

**Call if you remember** - Speaking of thoughts, will the person who told me about that over-the-counter memory-improvement pill give me a call. I'm pretty sure I need it, but I can't remember your name, its name, where to get it, or how to get there.

- Larry Perrine (845-8511, MS 0167, [lgperri@sandia.gov](mailto:lgperri@sandia.gov))

## DoD's Harold Smith commends Labs for Cooperative Threat Reduction work

Assistant to the Secretary of Defense Harold Smith lauded Sandia for its Cooperative Threat Reduction Program (CTRP) work helping states of the Former Soviet Union (FSU) in their efforts to dismantle nuclear weapons and move nuclear material from those weapons to secure storage facilities.

During a visit to the Labs last week, he said nuclear weapons from Belarus, Kazakhstan, and Ukraine have been moved to Russia "safely, thanks in great part to Sandia," which designed the containers to hold the weapons, railcars that moved them, and instrumentation that monitored them en route and at their storage facilities.

The project has involved 12,500 weapons and 50,000 weapon components, Smith said, adding, "This program is not foreign aid; we're being generous to ourselves."

There are still, however, 17,000 nuclear weapons at 50 sites in Russia, making it the "number-one nuclear proliferation concern in the world," he said, adding that "underfed, underpaid, poorly led, low-morale Russian soldiers" are the only obstacle between those weapons and many well-heeled buyers who would like to get their hands on them.

### Sandia commended for work

Following his colloquium, he presented a letter of commendation that said, in part, "Sandia National Laboratories was a leader in beginning the dialogue and cooperative projects with the Russian nuclear weapons laboratories and continues today under the Nunn-Lugar Cooperative Threat Reduction program to transfer the knowledge, procedures, and hardware for safeguarding Russian nuclear materials."

The letter, presented to his host, Roger Hagenbruber (VP 5000), was addressed to Laboratory Director C. Paul Robinson.

The CTRP was initiated in 1991 by Sens. Richard Lugar, R-Ind., and now-retired Sam Nunn, D-Ga., to help in the reduction, control, and elimination of weapons of mass destruction in the FSU. Sandia's contributions to CTRP include soft armor blankets, secure railcars, containers and storage facilities for fissile material, and emergency response programs.

Smith is assistant to the secretary for Nuclear and Chemical and Biological Defense Programs. He is responsible for the planning, modernization, security, and survivability of the nuclear weapons stockpile. He oversees programs for chemical and biological defense, destruction of chemical weapons, acquisition of counter-proliferation technology, and management of arms control treaties.

He also has responsibility for the safe and secure dismantlement of weapons of mass destruction of the FSU. —Howard Kercheval

## Dan Arvizu moves from 6200 to 1800

Bob Eagan, VP of Electronics, Materials Research, and Components Engineering Div. 1000, announced last week that Dan Arvizu has been named Director of Materials and Process Sciences Center 1800.

Dan succeeds longtime Sandian Harry Saxton, who recently left the Labs to become president of

Lockheed Martin Nevada Technologies, headquartered at the Nevada Test Site. Dan had been serving as Director of Advanced Energy Technology and Policy Center 6200.

"I'm honored by the trust Bob and senior management have shown in offering me this exciting opportunity," says Dan. "Eighteen hundred is core to the Labs' future, and it's professionally stimulating for me to be able to participate this way in that future."

"Of course, I have mixed emotions because I am very invested in our excellent energy group," he added, "but I'm also looking forward to being part of this great 1800 team."

He will officially move into the new position effective Sept. 5.

Meanwhile, Joan Woodard, VP of Energy and Environment Div. 6000, anticipates no changes in Center 6200 and plans to begin right away selecting a new director to succeed Dan.

## Sandia LabNews

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**LOCKHEED MARTIN**

## Congratulations

To Vicki (9117) and Dan (2123) Porter, a son, Justin Henry, May 28.

To Berlinda (14308) and Ken (2643) Eras, a daughter, Elise Lucille, June 16.

To Kathy (1823) and Todd (1811) Alam, a daughter, Zoe, June 17.

To Raylene Goodson and Jeffrey Wall (9761), married in Albuquerque, July 26.

## Recent Patents

David Campbell (1272) and Eric Snyder (1276): On-Clip High Frequency Reliability and Failure Test Structures.

Peter Esherick (1314) and Kevin Lear (1312): Integration of Photoactive and Electroactive Components with Vertical Cavity Surface Emitting Lasers.

Stephen Wheat (9224): Dynamic Load Balancing of Applications.

Ernest Garcia (2643) and Jeffrey Sniegowski (1325): Microfabricated Microengine for Use as a Mechanical Drive and Power Source in the Microdomain and Fabrication Process.

Timothy Boyle and James Voigt (both 1846): Non-Aqueous Solution Preparation of Doped and Undoped Lixmnyoz.

James Purvis (5845), Keith Miller (2418), and Donald Wilkes (dec.): Device for Adapting Continuously Variable Transmissions to Infinitely Variable Transmissions with Forward-Neutral-Reverse Capabilities.

# 'Quality of Life' study looks at employee concerns

Two-month committee effort identifies workplace issues, makes recommendations

By Barry Schrader

Everyone can offer an opinion about it, and the Dilbert comic strip makes fun of it. But an ad hoc committee has conducted a study on the Quality of Life at Sandia/California and now recommends actions that might be taken to improve the environment at work.

The two-month study was done at the request of VP Tom Hunter and 8500 Director Pat Smith, who share a concern about the ability of Sandia to attract and retain the best people needed to carry the site into the future, as well as exciting those already working at Sandia.

Sixteen Sandians representing all job classifications were brought together to form the Quality of Life study team, and an additional 40 were involved in four focus groups as resources for the committee. Kevin McCarty (8716) chaired the group with help from Holly Stryker and Bev

Kelley (both 8522) in Human Resources.

Kevin says he hopes this will be a long-term improvement process where first a decision had to be made that workplace issues are important to this lab.

"The world has changed greatly in the past seven or eight years and Sandia hasn't kept up with the changes," he says. "Our environment is going to continue to change and a continuous improvement process is needed to be proactive in dealing with the changes. The group recommended a few things to work on initially and then a way of measuring progress. The worst thing that could happen, in the opinion of those surveyed, is to do nothing with the results."

## Important that employees like it here

Pat Smith agrees. "Tom, Paul Brewer, Mike Dyer, and I have this as part of our Performance Management goals, so we consider it important enough to do something about. We are finding it

more difficult to attract the kind of people needed due to the increased level of competition in the job market. It's important that current employees are satisfied with their environment. Then, when prospects come on site for interviews, they should be able to pick up the sense of excitement and enjoyment from people already working here."

The focus groups that provided input to the study were divided into four main areas: applied research, weapons system engineering, administrative and facilities support, and engineering sciences. Data were also used from a Basic Energy Sciences-funded (BES) study at both Sandia sites along similar lines. The groups were asked to discuss what factors contribute to a quality environment in a national science and engineering laboratory, and how to assess and improve their environment.

The 10 top factors found contributing to the quality of life at Sandia include: salaries, resources/funding, benefits, vision/mission, management credibility, education/mentoring, time to do the job, simplifying processes, quality of management, and quality of staff.

The core committee then identified potential actions to deal with each area of concern. Their guiding principles for action were to put people first, tell the whole story, trust people, manage to the best employee not the worst, help people be successful, finish what you start, and exercise leadership.

## Two recommendations, four themes

Two recommendations and four theme areas emerged. First, create a sitewide communications plan that conveys messages about what people think is important through sitewide meetings, Q&A brown bag sessions, center meetings, electronic missives, and a rumor line.

Second, establish a continuous improvement process to implement sitewide and center-wide, identifying a few areas for improvement, developing baseline tests, taking action, measuring progress, communicating the results, and then repeating the process.

The four general theme areas are:

- invest in staff
- invest in management & improve credibility
- improve business practices (balance direct and indirect costs)
- establish a compelling, enduring mission

Now that the most important factors in a quality work environment have been identified, the next step is to implement some of the recommended actions. Kevin hopes that ownership of the actions will be assigned to appropriate directors and a town meeting will be held to roll out the plans for tackling the areas of greatest concern.

Pat says that will happen. She praised the study committee. Their work was "extraordinary in many respects — they had a very short time frame, produced tangible results, were able to apply some tools already designed for the BES study, and generated a lot of energy within the group."

Members of the team along with Kevin, Holly, and Bev, were Harold Radloff (2254), Bruce Nevin (2266), Richard Wheeler (8112), Kit Schmitz (8240), Yon Perras (8250), Carla Fugazzi (8352), David Chandler (8353), Don Hardesty (8361), Tonja Eaton (8417), Mary Clare Stoddard (8419), Carmen Pancerella (8920), Steve Binkley (8000), and Devon Wyler from the Washington office.

## Sympathy

To Roger Everett (2263) on the death of his father in Pleasanton, July 8.

# Sandia California News

## Feedback

The Feedback Program provides a communications channel to management from employees who have questions and comments about Sandia policies, procedures, benefits, and work environment. If you have an unclassified question or comment you'd like answered, contact the Feedback Administrator by interoffice mail at MS 0165, by e-mail at [jacape@sandia.gov](mailto:jacape@sandia.gov), or through the new Feedback page on the Sandia Internal Web at <http://www-irn.sandia.gov/corpdata/feedback/fbindex.html>. Answers to topics of general interest may be published on the Internal Web Feedback page or in the Lab News. Include your name and return address to receive an answer to your question from the Feedback Administrator. Submitters' names are never published and, unless otherwise requested, are kept confidential by the Feedback Administrator. If you do not include your name with your Feedback, you will not receive an answer nor will your question be published, but your feedback will be forwarded to the appropriate director for his or her information only. For information about Feedback, call Janet Carpenter (12640) at 844-7841.

**Q:** I attended Paul Robinson's quarterly dialogue session at the TTC on Feb. 26 and am a bit puzzled by Sandia's policy for dealing with poor performers. The VSIP figures Paul showed revealed that VSIP applications were accepted from 15 "poor performers." If Sandia is rewarding poor performers by giving them generous separation packages, what message are we sending to our good performers? This policy seems to contradict good business practices and Sandia's corporate values of integrity and respect for the individual.

**A:** The incentive payment offered as part of our Voluntary Separation Incentive Program (VSIP) was not a reward for either poor performance nor for good performance. It was a monetary incentive paid to employees whose voluntary departure would reduce the size of an identified impacted peer group by one and therefore enable the Laboratories to resolve the impacts without involuntary layoffs. The fact that 15 of the volunteers approved for the VSIP had also received a BP or UN rating in the last performance review carries no message other than that they were able to reduce the size of an impacted peer group (as were the 339 other volunteers who had a higher rating). — Don Blanton (3500)

**Q:** Several newly retired Sandians have expressed dismay that the company has discontinued retirement gifts. Yes, I know you still get several minor gifts.

**A:** Contrary to what some have understood, Sandia has not discontinued a retirement recognition program. Last year this program was reviewed

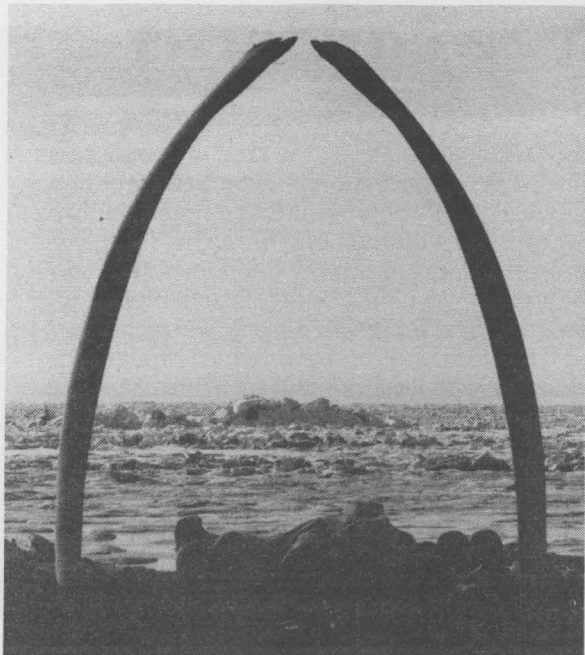
and the content revised to reflect current industry practices. We have retained funds to support a retirement celebration, the memory book to catalog comments from peers, and a variety of Sandia-related mementos — these have long been viewed as important to Sandians. The single significant change was the elimination of the "gift" portion, a practice no longer common in industry.

In response to expressed concerns about this change in the retirement gift portion, Sandia is in the process of designing a special gift that would be specifically for retirees to further recognize their contributions to the Labs.

If you have further comments, please contact Carlos Griego, Manager of Benefits Administration Dept. 3344. —Larry Clevenger, MD (3300)

**Q:** Why do we have options for hiring named contractors when the only way to hire the contractor is through staff augmentation? We are in the process of renewing a contract and have tried Option 2 (contract specialist) and Option 3 (sole source). Both were rejected by the purchasing organization. If we only have one option why play games, just say so. The time and effort of several people, all the way to VP, are not worth the frustration or waste of dollars in time spent preparing documentation and providing approvals.

**A:** The three alternative methods (options) for accessing personal services of contractor personnel (contractor specialist, sole source, and the corporate standard staff augmentation contracts available through Human Resources) that have been identified are indeed available and are being used. However, the requested services must meet strict requirements for contractor specialist or sole source or those alternatives cannot be used. A determination that the alternatives to the corporate standard staff augmentation process were not available would have been made only after careful consideration of the specific circumstances by Purchasing and Human Resources personnel. Usually, Purchasing Dept. 10241 contracting representatives or Human Resources Dept. 3535 staffing specialists are able to guide the requester to the appropriate method with a telephone conversation or office visit without the need for the employee to waste time and money preparing documentation and attempting to obtain management approvals. Please contact Gordon Graham, Manager of Purchasing Dept. 10241, or Jon Bedingfield, Manager of Human Resources Dept. 3535, if additional information is required. —David Palmer (10200)



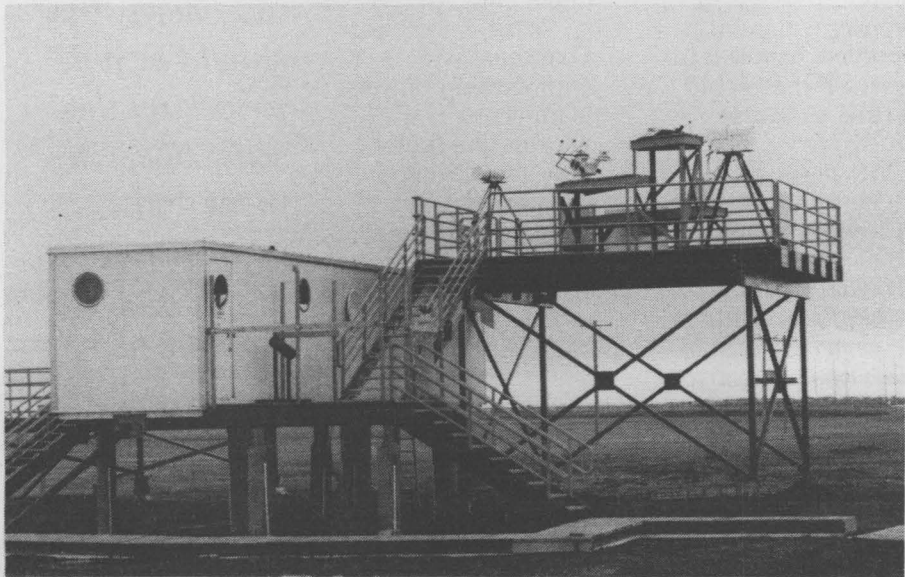
THE ARCTIC SEA, seen through the rib bones of a bowhead whale, will be the site of the SHEBA experiment, in which an instrument-laden icebreaker will spend a year studying the interactions among sea, ice, and atmosphere. (See related sidebar at right.)

## North Slope

(Continued from page 1)

the National Aeronautics and Space Administration, ARCUS (Arctic Research Consortium of the United States), and the geophysical Institute of the University of Alaska.

ARM is an ongoing research program to improve understanding of the processes and uncertainties related to global climate change. ARM is DOE's principal contribution to the US Global Change Research Program; ARM's main role in the larger program is to improve the treatment of clouds in global climate models, looking at their influence on radiative energy flows and on how clouds form, evolve, and evaporate.



ABOVE THE PERMAFROST — Perched on stilts high above the tundra near Barrow, Alaska, DOE's Cloud and Radiation Testbed facility stands poised to gather high-latitude atmospheric data. A suite of sophisticated instruments is deployed on the elevated platform at the right of the structure. At the very left of the photo, a second set of stairs is visible; they lead to a second door, which might prove useful if a polar bear is camped out near the other door.

## Robinson dialogue

(Continued from page 1)

important to all of us in management and I hope it's important to you as well," Paul told a packed audience at the TTC. He said several factors have contributed to that stability: Sandia's budget support — particularly spending on weapons-related work — appears to be on secure ground; the last round of VSIPs was intentionally designed to cut a little deeper than might have been necessary to meet the Labs' immediate budget projections; and income from Work for Others (WFO) work has been on an upswing.

Paul showed a chart indicating that funds-in from WFO shows an increase from \$215 million in FY97 to \$250 million in FY99.

"That's a small but very significant reversal

## Pssst. Wanna free trip to the arctic — in winter?

If SHEBA had an Uncle Sam, he would want you.

SHEBA, the Surface Heat Budget of the Arctic experiment being conducted in conjunction with DOE's North Slope of Alaska climate research, will involve locking the Canadian icebreaker N.G.C.C. *Des Groseillier* in the perennial arctic ice pack during early fall 1997. The SHEBA instruments on the ship will measure the energy flows between the ice, the atmosphere, and the sea until fall 1998. Those instruments need to be tended. To line up a cadre of volunteers, the project has published a recruitment ad, headlined: "All expense paid arctic cruise courtesy of ARM."

The ad, aimed at Sandians and others involved in the SHEBA project, asks, "Interested in cruising the Arctic Ocean on an icebreaker?" The ad says the project is looking for "several outstanding individuals willing to devote two or more months of

their lives" to tend SHEBA's instruments on the *Des Groseillier*. The ad notes that two weeks of that time will be devoted to training on similar equipment at Barrow, Alaska. Tours of duty on the ice will be six to eight weeks; crews will be rotated to the ship via Twin Otter aircraft; it will land on a rough strip hacked out of the ice near the ship.

"Since the ability to get hands-on help from the outside world will be limited, individuals with substantial experience operating, maintaining, and fixing a wide variety of instrumentation are preferred," the ad says.

It concludes: "Food is expected to be excellent; the opportunities for solitude, impressive. Summer temperatures will oscillate around 0° C. Winter temperatures may plunge to as low as -50° C. Triple-digit wind chill factors sometimes occur. Polar bear visits are likely. The polar night and the summer day will each last for months."

ARM is funded through the Environmental Sciences Division of DOE's Office of Energy research and is administered for DOE by Pacific Northwest National Laboratory.

CART sites have now been established in three locations — the US Southern Great Plains, the tropical western Pacific, and the Alaska site. The three locales were identified as representing the range of climatically significant regimes in which observational programs should be conducted. Scientists use the CARTs to collect and analyze data essential to understanding the effects and interactions of sunlight, radiant energy, and clouds on temperatures, weather, and climate.

The NSA/AO CART site will provide data about cloud and radiative processes under cold conditions where water occurs primarily as ice. These data will be used to refine computer climate models as they relate to the arctic, antarctic, and the upper atmosphere worldwide.

Although the NSA/AO work will be centered at Barrow, the facility will be linked to a number of remote instrument sites spread over a large part of the North Slope region. The Adjacent Arctic Ocean will be probed by the Surface Heat Budget of the Arctic (SHEBA) experiment, a multiagency program led by the National Science Foundation and the Office of Naval Research.

The SHEBA instrument package is housed in a Portable Arctic Atmospheric Radiation and Cloud Station, which was prepared for its mission at Sandia (*Lab News*, March 14). The PAARCS unit will soon be installed on the deck of the Canadian icebreaker N.G.C.C. *Des Groseillier*. This fall, it will steam almost 400 miles due north of Bar-



DOE DIRECTOR of the Office of Energy Research Martha Krebs, right, and local dignitaries launch a weather balloon to mark the dedication of the new CART facility.

row and allow itself to become locked in the ice. For the next year, a rotating team of scientists and ship's crew will keep the station up and running. SHEBA, whose data will be integrated with the North Slope ARM data, is specifically examining the energy budget of the polar ice — energy flows to and from the atmosphere as well as to and from the underlying ocean. ARM concentrates on the former.

During the site dedication ceremonies, DOE's Krebs praised the international, inter-agency, interdisciplinary nature of the ARM program.

"This is a project that is beyond any single agency, beyond any one region of our country, beyond any one nation," she said.

In an invocation at the ceremony, North Slope elder Kenneth Toovak said of the researchers, "Give them wisdom and knowledge in using their hands and minds so they can learn more and more."

in the trend in our work for other agencies," Paul said, a trend the Labs would like to see continue.

"As a national laboratory' we'd like to be national in every way. We love working for the DOE, but if there are interesting problems that need science and technology solutions to assist them in other agencies, we'd like to have a chance to be a part of the solutions."

### IJS results, ultimately, will be good

On the subject of the imminent implementation of the Integrated Job Structure, Paul said, "I think someone once said the road to hell is paved with good intentions." The intentions of the IJS, he emphasized, were good, and the results ultimately will be positive. Besides, he said, the Labs didn't really have a choice about adopting an IJS-type approach to job classification, because a commitment had been made to DOE to bring

salaries into line with the marketplace.

Paul emphasized the significance of the Sandia/California site for Sandia in general. "As our window on industry and window on California, both with industry and with universities there, I think that site is very important to us."

Among other points made during the dialogue session:

- Sandia, in compliance with California law, does not discriminate against persons based on their sexual orientation at any of its sites. "I believe that's the right way to treat people," Paul said.

- Are we getting faster, better, cheaper? Yes, Paul said. Sandia is way ahead of its commitment to DOE to save \$250 million in indirect costs over the next five years. Current projections peg those savings at \$370 million.

- The Labs can support the Comprehensive Test Ban Treaty, likely to come up for debate in

(Continued on next page)

# Z accelerator

(Continued from page 1)

which the Z machine contributes to, "perhaps the greatest scientific challenge of the next decade. It is our foundation for maintaining nuclear deterrence, as well as the basis for much of our arms control and nonproliferation objectives in the post Cold War era. It clearly requires the best and the brightest."

The Z accelerator is designed to lay the groundwork to achieve a sustainable fusion reaction in a larger machine called X-1, to provide high energy-density environments to study the physics of nuclear explosions, and to create in miniature the effects of the explosion of a nuclear weapon. The goals are to advance basic science and to provide data to test US defenses without the necessity of physically exploding large-scale nuclear devices.

## Kudos from customers

Carl Ekdahl, program manager of the high-energy density physics program at Los Alamos National Laboratory, says, "It's wonderful work. Sandia researchers are way ahead of schedule. They fill a niche that no other facility in the world fulfills. My program is and will continue to be one of the largest users of Z for weapons physics."

David Hammer, a physics professor at Cornell University, was quoted in the July 18 issue of *Science*: "I think it's spectacular what they [at Sandia] have done. The implications are only beginning to dawn on people."

Says Jeff Quintenz (9502), manager of the inertial confinement fusion program at Sandia's pulsed power sciences center, "There's a band in the spectrum — a profile of X-ray energies — that we are not able to adequately reproduce with today's X-ray generators. We lost that capability when we ceased underground testing. We need that band to certify our microchips are hardened against the effects of a nuclear explosion. These new results from Z bring us closer to producing the required output in the appropriate energy band."

Sensors produce data to be used in Sandia's supercomputer — the fastest in the world — and in computers at Los Alamos and Lawrence Livermore national laboratories so that computer

*"I think it's spectacular what they [at Sandia] have done. The implications are only beginning to dawn on people."*

codes realistically can portray variations in the complex physics related to high-intensity emissions. Realistic data are needed to check the properties of materials, using an iterative series of prediction and experiment that close in on physical properties as yet unknown. These checks ensure that computers accurately model the physical world rather than produce logical but wrong conclusions.

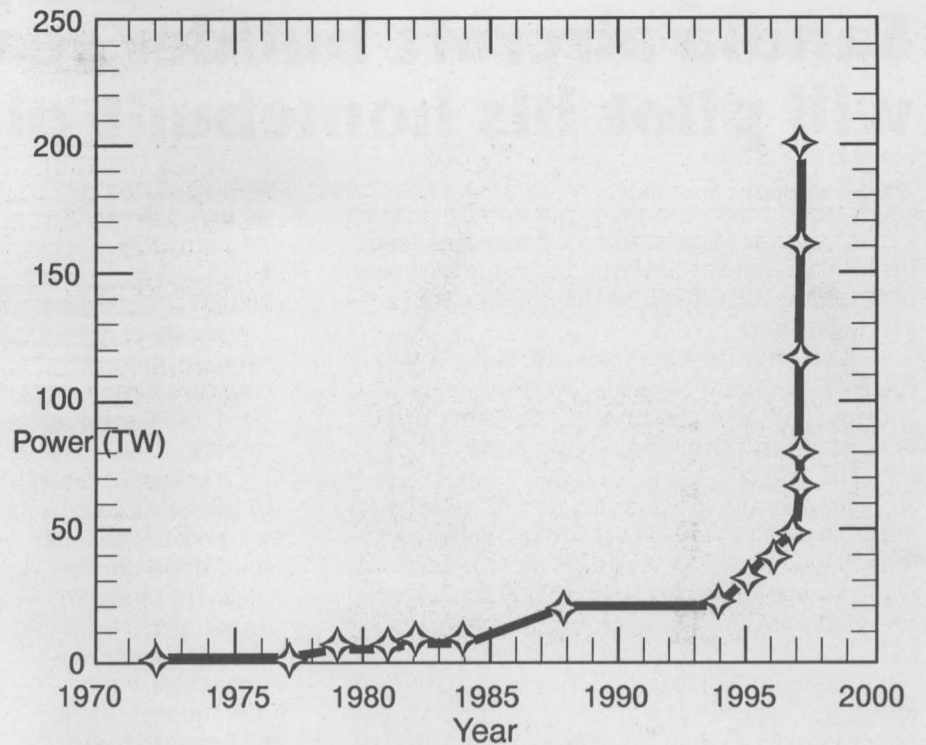
"The best part," says Don Cook, Director of Pulsed Power Sciences Center 9500, "is that if fusion can be made to work in a very cost-effective way, there will not be future wars over oil in the Persian Gulf or anywhere else, and the injury to the environment caused by civilization will be reduced. Fond hopes, but these were, and are, some of the dreams of fusion scientists and engineers."

## Sandia gains on high-yield fusion

Sandia's inertial confinement approach uses massive bursts of electricity to superheat a miniature oven, called a hohlraum, that is about the size of a sugar cube.

Numerical figures on Z's achievement are necessarily approximate because a change in any factor influences the others. But it could be said that Z now produces approximately 20 percent of the energy, 40 percent of the power, and 33 to 50 percent of the temperature to achieve high-yield fusion — a state in which much more energy is created than used. Of particular importance is temperature, because the pressure that drives the basic reaction increases as the fourth power of the temperature.

While temperature is the hardest quantity for the Z accelerator to increase, "By optimizing the configuration of the hohlraum further, we believe we can increase its temperature still more," Don says. "If all goes well with these tests on Z over the next several months — and so far, we have exceeded all milestones — we will submit a formal request, first to design and then to build the



**Z ACCELERATOR'S MARK** — After many years of modest increases, Sandia researchers during the first half of 1997 engineered a sharp upward rise in the power output of the Z (formerly PBFA-Z) accelerator. The advance corresponds to introduction of a new configuration of a cylindrical array of wires that becomes an imploding plasma. The Z accelerator is the latest in a succession of X-ray-generating Sandia devices, most recently the Saturn.

next-generation X-1 accelerator. We anticipate DOE's approval to begin conceptual design when we achieve 1.7 million degrees."

The next-generation machine's energy, power, and temperature outputs would be sufficient to create the fusion energy required to start the reaction in the accelerator.

"In X-rays, this new machine would yield 1,000 terawatts of power, 16 megajoules of energy, 2 million to 3 million degrees Centigrade, and cost about \$300 million," Don says.

One eventual use of the Z technique may be for a rocket propulsion system, says Sandia researcher Rick Spielman (9573). "Z generates tremendous pulsed thrusts from a portion of the machine an inch high." Every time one drive pellet is burnt up, another would be dropped into place and lit.

Says Don, of achieving enough fusion to power an electricity-generating plant by inertial confinement methods, "The greatest challenge is getting one pellet to ignite one time."

Eventually, says Don, a fusion power plant would be designed to withstand the repetitive stresses, "much like an auto engine, where the fuel goes in, gets burned, the exhaust comes out, then you do it all over again."

Cautions Gerry: "First you have to make fire. Then you design a locomotive."

## Welcome

New Mexico — Marilyn Gruebel (6472)

Illinois — Rolf Carlson (6513)

Texas — John Moser (2664)

## Retiree deaths

Jesus Lopez (84).....	3644	.....	May 1
Martin Rechner (88).....	7651	.....	May 1
Clarence Young, Jr. (76).....	1581	.....	May 1
John Southwick (77).....	2551	.....	May 4
Richard Sager (2473).....	2473	.....	May 5
Frank Chavez (71).....	7412	.....	May 6

(Continued from preceding page)

the Senate later this year, because the final text will provide language that allows a fallback position: testing can be resumed as a matter of "supreme national interest" if something goes wrong with the stockpile that cannot be resolved by science-based stockpile stewardship.

• If he had to bet, Paul said, he would bet that Lockheed Martin will see its contract to manage Sandia renewed for another five years. Why? Under Lockheed Martin management, Sandia has earned its best scores ever on DOE evaluations. The current contract runs out in October 1998.

## Why the breakneck breakthrough pace?

The first breakthrough on the Z machine came when Sandia scientists realized that a nearly discarded forty-year-old technique — the passage of a huge electric current through a wire cage the size of a thimble — could produce dramatically more power in the form of X-rays if scientists greatly increased the number of thimble-wires — from 30 to 300 — through which the current passes.

Within limits, the more wires available, the more uniform the magnetic field. The field evenly collapses at tremendous speed as the wires vaporize and become plasma. Atoms caught within the collapsing field speed up and then are braked suddenly to a stop — nowhere to go — as the uniformly shrinking magnetic field reaches a diameter about the thickness of a mechanical pencil lead. The sudden stoppage generates heat, much like the tires of a fast-moving car get hot when suddenly braked. While tire heat is generated at frequencies in the infrared range, the much faster deceleration of plasma in the shrinking magnetic field produces heat at higher radiation frequencies — as it happens, in the X-ray range.

While tweaking input energies and wire arrays could boost output even further than

1.5 million degrees, the present arrangement is not certain to achieve fusion temperatures, says Don Cook (9500).

But by putting a very thin-walled gold cylinder inside the wire cage, Don anticipates heat of approximately 1.7 million degrees, because of the heating effects of the imploding magnetic field and plasma striking the three-microns-thick walls of the cylinder. Says Don, "The temperature goes up as the radiation container size decreases."

If that works, "We'll want to do experiments to show we can get symmetry in produced X-ray flux — adequate symmetry to drive a high-yield fusion reaction when scaled up to X-1 levels." Symmetry is important because without it, not all the energy arrives at the same location at the same time, thus diluting the impact.

Successful conclusion of these experiments would mean that every contingency has been examined on the Z machine and found to be working correctly.

At that point, a request to actually build the X-1 machine will be submitted to DOE.

If granted, the Sandia team will move ahead on the road to fusion.

# Sandia aircraft builder realizes lifelong dream; will pilot his homebuilt plane to Oshkosh fly-in

By Bill Murphy

In a couple of days, when Charles Fink lands his RV-6 aircraft at the Wittman Regional Airport in Oshkosh, Wis., it will be the fulfillment of a lifelong dream.

Oshkosh is the Olympics, the Super Bowl, the Final Four, the Oscars — everything grand and superlative — for the select few, that band of brothers and sisters who build and fly their own aircraft.

The annual Experimental Aircraft Association (EAA) Fly-In Convention at Oshkosh (July 30-Aug. 5) is a big deal — it attracts more than 800,000 aviation enthusiasts, 12,000 airplanes, and media coverage from around the world — and Charles this year will be a part of it.

Charles, an engineer in Environmental Monitoring and Reporting Dept. 7575, built his Van's Aircraft model RV-6 in his garage over a period of about six years. Although he has already put about 100 hours of flying time on the plane, his flight to Oshkosh for the annual EAA wing-ding represents an exclamation point, an affirmation, that he did it.

As is so often the case with lifelong pas-



CHARLES FINK in his homebuilt RV-6 airplane.

sions, Charles was bitten early by the flying bug. As a boy, he built model airplanes, followed the exploits of test pilot Chuck Yeager, and dreamed of darting, soaring, and looping among the clouds.

"Actually, when I was a young teenager," Charles says, "I tried to talk my dad into building an airplane, but I just couldn't convince him that we could really do it. He thought it would be too big a job and cost too much."

## Flying at last

Although Charles grew up, his dreams didn't grow old. After a stint in the military, which included a tour as a helicopter avionics technician in Vietnam, he settled in Albuquerque, where his wife Kristy and daughter Tammy were living with her parents while he was in Vietnam. He had barely unpacked when he began taking flying lessons at Coronado Airport. He soloed after eight hours and earned his license after about six months of almost total immersion in lessons and study.

And how did it feel to finally fly? "It was everything I expected it to be," Charles says. But how did it feel? "I don't know; that's hard to say," he says.

Having a pilot's license was wonderful, exhilarating, Charles says. Even in early-1970s dollars,

though, flying was an expensive hobby.

"And in 1974," Charles says, "when I started at UNM [the University of New Mexico] and our daughter Bonnie was born, money got real tight."

He kept his hand in the flying game with occasional one-hour hops, but the dream of flying unhampered by monetary concerns smoldered within him. Indeed, when he began to see the light at the end of the college tunnel, he went out and bought a truckload of aluminum — enough to build a little 18-foot wingspan, single-seat, VW-powered plane whose blueprints he had found in *Popular Mechanics*. (This was in the mid-70s, years before he built the RV-6.)



THUMBS UP — Charles Fink (7575) gives the thumbs up sign as he prepares to take off in the Van's Aircraft model RV-6 he built over a period of about six years. Charles, who has built two airplanes over the past two decades, likes the high-performance characteristics of the single-engine, twin-seat plane. It has a top speed of nearly 200 mph and a cruising range of more than 700 miles. (Photos by Randy Montoya)

"I bought the aluminum without telling my wife. I just hauled it into the garage one day and told her I was going to build an airplane. She said, 'Yeah, right.'"

Not long after graduating from UNM with a civil engineering degree, Charles landed a job

at Pantex. He moved his family and his precious garage full of aluminum with him to Amarillo. It was there that he completed the plane, which represented an investment of maybe 1,200 hours and \$2,000.

"This was a very, very small airplane," Charles says. "The VW engine was really cheap compared to conventional aircraft engines. There were lots of them around and parts were easy to get. It was an extremely inexpensive way to get into the air."

While he was building the little craft in his garage, he became very popular with the neighborhood kids.

"Once it started looking like an airplane, they were always coming around begging me for rides," he says. His response was that the little plane had only one seat, and he intended to be sitting in it whenever it left the ground.

## Maiden flight in his own plane

The first homebuilt plane Charles ever flew was this wee thing he had built from *Popular Mechanics* plans, so he didn't know quite what to expect.

"I liked it," he says of the maiden flight. "It flew pretty well, but the controls were a lot more sensitive than a factory plane's. Also, and this was the main thing, I really liked the fact that I

owned it; since it was mine, about all I had to pay for was fuel."

After a lot of flying, a move back to Albuquerque for a new job at Sandia, and a lot more flying, Charles had a misadventure, one that several years after the fact is still not easy for him to discuss — he, ahem, crashed his little plane at Coronado Airport. The throttle cable broke on him during an approach to the runway, dumping him down hard on the mesa. The little go-kart-class landing gear couldn't take the jolt, and the whole plane collapsed around him.

"I made both newspapers [the *Journal* and the *Tribune*] and all three TV channels. That's no way to get your 15 minutes of fame, believe me. But I wasn't hurt."

The worst part of the episode, he says, is that his wife first learned of the accident when a newspaper reporter called to ask her about her husband's piloting ability.

"She didn't know if I was hurt, or dead, or what. That was pretty awkward," he says.

## Moving up in the (aircraft) world

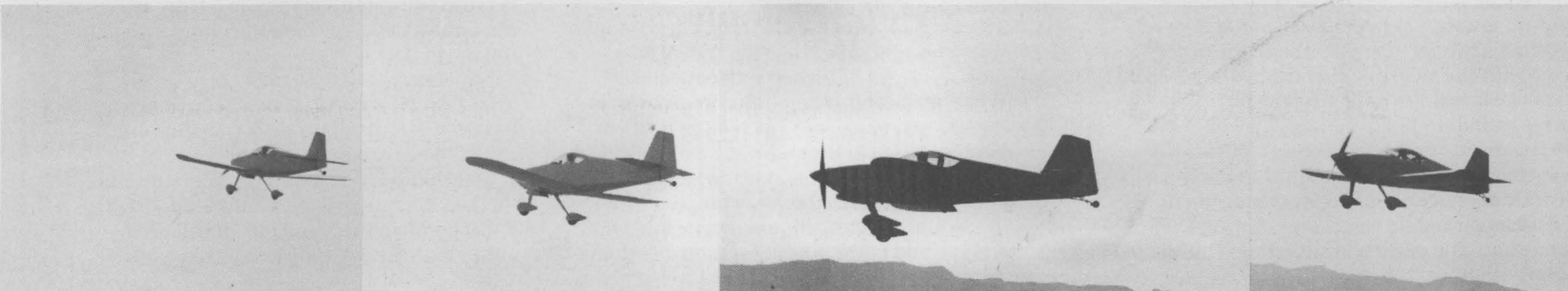
Even before the accident, though, Charles had decided it was time to build a more sophisticated plane. After lots of research, he settled on the RV-6, a kit plane sold by Van's Aircraft, a well-regarded outfit based in Oregon. A much more substantial plane than his VW-powered job, the RV-6 carries two passengers and their luggage, and has a cruising speed of 170 mph, a top speed of almost 200 mph, and a range of more than 700 miles.

"It used to be if you had 30 or 40 of your kits out there flying, it was considered a very successful design. Van's has more than 1,500 RV models flying, which is pretty amazing, but it's an amazing little plane."

Charles spent almost six years building the RV-6. Even though the kit provided all the airframe parts — many of them already pre-cut and shaped — it took him 2,500 hours of actual hands-on time to finish it, twice as many hours as it took to build his first little flyer.

"It's just a lot more complicated airplane," he says. "But that's why I wanted to build it."

By the time he had completed the plane, Charles had invested perhaps \$25,000 in the project. That includes \$10,000 for the kit,



# History repeats itself in new book about Sandia's past

By John German

For Sandians who recall what the heat from an atmospheric nuclear blast felt like, who visited the Salton Sea before it was a water sports mecca, or who know why a radar developed in the 1970s was named after a brand of eye drops, history repeats itself . . . in a new book about Sandia's history to be distributed next week.

Titled *Sandia National Laboratories: A History of Exceptional Service in the National Interest*, the book covers Sandia's origins as Z-division in 1945 — then a part of Los Alamos Laboratory located on Sandia Base near Albuquerque — through 1996 when Lockheed Martin became Sandia's management and operating contractor. (The book's color cover art appears at right in black and white.)

The book was authored by former corporate historian Leland Johnson and edited by current corporate historian Carl Mora, research historian Rebecca Ullrich (both 15102), and John Taylor (5336). History archives coordinator Myra O'Conna (15102) was photo editor, and Jan Gaunce of Creative Arts Dept. 12615 designed the book.

The result is a well indexed, richly illustrated history written for a general audience. "It's not an academic treatise," Carl says. "It's not heavily technical. It should serve as a good reference work for employees and spur veterans to reminisce a little."

"Sixty percent of Sandia's workforce has worked here less than 10 years," adds Rebecca.



**SKILLFUL CRAFTING** — This 1961 photo of Ron Snidow (ret.), then supervisor of the Scientific Glass Blowing Department, appears as part of a sidebar about Sandia's "shops," where precisely crafted prototype weapons components have been created out of metal, glass, and other materials for decades.

(Continued from preceding page)

another \$10,000 for a used-but-almost-new Lycoming 150 hp engine, and \$5,000 for instruments and special tools. That sounds like a lot of money, but it's less than a quarter the cost of a new Cessna two-seater, with far, far better performance, says Charles. And besides, he built it; it's truly his plane.

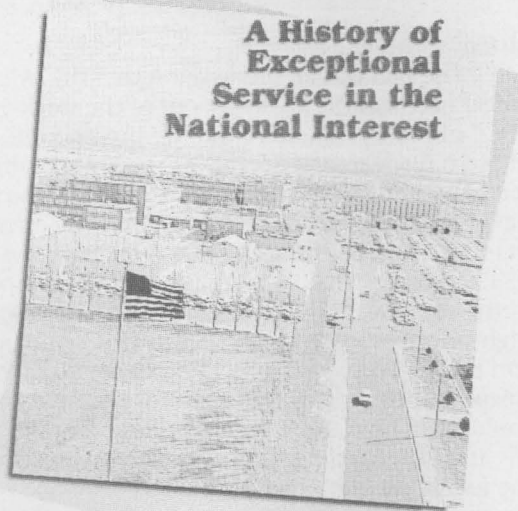
There's an important message there: Charles wanted to *build* the plane. He offers this advice for would-be aircraft makers:

"Don't even think about starting to build a plane just because you like to fly. Building a plane is a huge, expensive, time-consuming job. Don't get started unless you really like the *process* of building the plane. Otherwise, I can guarantee you



A riving hobby

 Sandia National Laboratories



"The book may give younger employees a sense of why things are done the way they're done at Sandia."

## The occult art of weaponeering

One of Z-division's first missions, the book says, was to formalize "the occult art of atomic weaponeering and prepare a set of how-to-do-it manuals." It discusses the disagreement among Manhattan Project leaders about whether to locate Z-division in Pasadena, Calif., or in Albuquerque. Z-division became a separate laboratory in 1949.

The book's staple is interesting anecdotes, touching nearly every project, test, and significant decision made as Sandia transformed itself from an offshoot of the Manhattan Project to the premier national R&D laboratory it is today.

Example: Did you know that air pollution from Los Angeles was one reason Sandia's field test group relocated from the Salton Sea in California to Yucca Flats (later Tonopah Test Range) in Nevada in 1954? The encroaching smog had begun to interfere with range optical equipment, according to a sidebar on Sandia's test ranges.

Stories about people help paint the bigger picture. "Donald Cotter . . . began his career at Sandia cleaning aircraft tail-warning radars for use as fuzes on early nuclear bombs," the book says. "They were shipped from Air Force depots with sand in the boxes, and it was Cotter's job to remove the sand and refurbish them. 'We used four of them in [each] bomb,' he recalled, 'because they were fairly unreliable.'"

"The book focuses primarily on Sandia's technical work, with weapons work obviously at the core," says Rebecca. Administrative and support activities are acknowledged in a series of sidebars, ranging from the United Way campaign to the classification office, she says.

you'll never finish it. You'll just end up with a lot of heartbreak and an empty pocketbook."

## A commitment rewarded

For Charles, though, building and flying the RV-6 represents a life fully lived, a passion pursued, a commitment rewarded. When he lands this week at Wittman Regional Field in Oshkosh in his turquoise-and-tan, Zia-symbol plane, he will be announcing his arrival on a field of dreams occupied by only a few. As he comes in from the south and west, thousands of would-be flyers lining the runways will crane their necks, looking up, up, up, imagining themselves in his cockpit, dreaming they are at the controls.

Charles, focused on his approach, watching his glidepath, scanning his instruments, will barely notice the crowds. He will have joined that exclusive club of men and women who have slipped the surly bonds of earth astride machines they have shaped with their own skilled hands.

"There are lots of stories about great things being done in a very short time, about doing it right, about people being proud of what they accomplished, and about the Cold War's sense of urgency," says Carl. "Sandians have always had a sense that what they were doing for the nation was almost heroic, yet they kept a low profile."

## Making history

Leland Johnson began writing the book in January 1994, relying on corporate archives, an extensive oral history collection, and almost 50 years of the *Lab News*. When he departed two years later, he left a draft.

"Leland did a tremendous job of pulling together information from a variety of sources," says Carl.

The book's editors then set out on a tedious fact-checking, indexing, illustrating, and editing mission with the help of a History Advisory Panel of almost two dozen longtime Sandians (see "History Advisory Panel members" below) and more than 150 subject-matter experts, a process that made the book "much more solid," says Carl.

More than 3,000 copies of the book were pre-ordered by individual Sandians and retirees prior to its printing; those copies will be distributed this week. Department, center, and division offices should receive copies, as well.

Although extra copies were ordered, very few of the original 5,000 print run remain unclaimed, Carl says. If there is sufficient interest to warrant a reorder, more copies might be printed, but probably at an increased cost, he adds.

The new book is not a continuation of Necah Furman's more academic book, *Sandia National Laboratories: The Postwar Decade* (University of New Mexico Press, 1990), covering the first ten years of Sandia's history. Such a continuation is underway, however, to cover the following 20 years of Sandia's history (1956-1974). In addition, histories are in the works on three other topics: the Waste Isolation Pilot Plant, Sandia/California, and Area 2.

(The "MURINE radar," by the way, is the whimsical name of a missile-warning radar that was tested on the "Redeye" missile in the early 1970s.)

## History Advisory Panel members

Max Newsom (ret.), chair	Glen Otey (ret.)
Ruth David (2)	Herb Pitts (4900)
Virgil Dugan (4500)	Nancy Pruett (5951)
Tom Edrington (12301)	Don Rigali (2400)
Nigel Hey (12600)	Rob Rinne (8104)
John Hogan (14707)	James Schirber (ret.)
Glen Kepler (ret.)	Tom Sellers (5300)
Paul Longmire (2106)	Joe Stiegler (ret.)
Dick Lynch (6100)	John Taylor (5336)
Jim Ney (5100)	Wendell Weart (6000)
Bill Nickell (12300)	Jim Wright (2200)

## Local chapter of aircraft group welcomes new members

Charles Fink isn't the only Sandian who has built or is building his own plane. In fact, the membership roster of the New Mexico chapter of the Experimental Aircraft Association includes a number of current or retired Sandians.

Although many EAA members are involved in building projects of one kind or another, Charles says the association welcomes all aviation buffs with open arms.

"All you need is an interest in aviation," Charles says. "We have people at our meetings who haven't even started working on their pilot's license yet, much yet thought about building their own airplane."

The Albuquerque chapter of the EAA meets every third Tuesday at 7:30 p.m. at the District 9 Fire Station, 501 Bear Canyon NE (near Osuna and Edith).

# Sandia has refashioned a rugged laydown bomb into the powerful earth-penetrating B61-11

## Test drops of B61-11 penetrator weapon continue

*Editor's note: The following article appeared in the June 9 Aviation Week and Space Technology. We thought it of special interest to Sandians and obtained permission to print it in the Lab News. See the June 6 Lab News (p. 9) for a photo of a B-2 bomber dropping a B61-11 test unit at Sandia's Tonopah Test Range.*

William B. Scott  
Aviation Week & Space Technology

The Air Force plans to test-drop two inert B61-11 earth-penetrating bombs from a B-2 this week [week of June 9] as part of a series aimed at defining the repackaged nuclear weapon's aeroballistic dispersion patterns. Another two drops from a B-52 are scheduled for July.

Designed by Sandia National Laboratories to replace the aging B53 "laydown" weapon, the lower-yield B61-11 detonates 3 to 6 meters below the surface, creating a massive shock wave capable of destroying high-value underground targets "hundreds of meters in [lateral] dimension and hundreds of meters deep," said Donald L. McCoy [Manager of Special Studies Dept. 2014], Sandia's B61-11 program manager. Although much smaller than the B53, the new-version B61 will produce the same destructive ground shock, but without the collateral damage of a surface blast.

The latest version of the B61 is not a new weapon, just a repackaged B61-7, which — like the B53 — is a rugged laydown bomb already in the U.S.' nuclear stockpile, according to Sandia officials (*AW&ST*, April 7, p. 38). The B61-7 was designed to be dropped about 50 ft. above the ground by an aircraft flying at Mach 1.2. Because it had to survive a high-speed impact with concrete, the -7's nuclear warhead or "physics package" was well-protected. Consequently, converting the weapon into an earth-penetrator required no changes to the critical explosive section.

### B53 was huge, aging

Contrary to claims by antinuclear activists, the B61-11 was not developed to counter proliferating underground complexes in the Middle East following the Gulf War, according to Pentagon and Sandia officials. Sandia first advocated replacing the B53 with a modified B61-7 in 1987, although it took another eight years to get approval for the project. "But that was the purpose — strictly to replace the B53," Sandia's

McCoy affirmed.

"The B53 was an old weapon that the [Air Force] had been trying to get out of the stockpile," primarily because it did not incorporate modern nuclear safety features, McCoy explained. It also was huge, weighing about 9,000 lb. and having a 50-in. dia. The B-52 was the only aircraft in today's USAF inventory that could carry the B53. However, the B53 "was a special-use weapon — the only weapon that could hold a very few high-priority targets at risk. [Strategic Command] and the Air Force were unwilling to get rid of that weapon until there was something available that could [still] hold those targets at risk," he said.

In 1987, Sandia engineers started evaluating the feasibility of modifying the B61-7 for an earth-penetration role. Their intent was to find more efficient ways to couple a weapon's energy into a ground shock wave than was possible from an air or surface burst. Computer models determined how the B53's energy was converted to a specific ground shock capable of destroying deeply buried targets such as command and control complexes.

### Produces underground shock wave

Based on historical data from underground nuclear tests, "we knew how deep we had to go to get the same coupling for the yield we had available. That end of the problem we understood pretty well," McCoy said. The smaller-yield B61-7 could produce the necessary shock wave, but only if detonated underground.

A series of 1987 drop tests from helicopters at Sandia's Tonopah, Nev., test range demonstrated the B61-7's ability to survive soil and concrete penetration. By putting the same nuclear and electronics packages into a steel case, "we made a limited penetrator out of the B61. And it is limited; it is not designed for massive rocks. It's primarily a dirt penetrator. We can handle a foot of concrete, [but] two feet hasn't been investigated," he said. Rather than develop a weapon to penetrate deep rock and underground concrete structures, "we just drive a shock wave through them."

That capability was sufficient to meet Strategic Command requirements, though.

Conversion of a limited number of laydown B61-7s to the -11 penetrator version is being accomplished as a USAF field modification, using Sandia-developed kits. The first were delivered in

*(Continued on next page)*

## Hagengruber: B61-11 a modification, not a new weapon

In a recent extensive television interview regarding Sandia's nuclear weapons work and stockpile stewardship mission, Roger Hagengruber, VP for National Security Programs, talked in detail about the Labs' development of the B61-11. In his comments, Roger made clear that the B61-11 is not a new weapon but, as the name suggests, a modification of an existing weapons design.

"The physics package itself is identical, and most of the nonnuclear parts are the same [as in the B61]," Roger told the interviewer.

Roger explained the scope of the modifications to the B61 and the exhaustive testing required to certify the modified bomb's safety, functionality, and reliability.

"We replaced the parachute [of the B61] with a flared cone, which changes the appearance of the weapon somewhat in the rear, where the fins existed before to allow the bomb to spin in a certain way. Now there is a cone in that region.

"We also sharpened the nose tip and strengthened the centercase section. All of this is intended to allow the aircraft to deliver the bomb and allow the bomb to orient itself at a steep enough angle that it will enter the ground and proceed a short distance without broaching. Normally, if the bomb hits at a shallow angle it will either skip or it could go into the ground and then turn and broach — that is, come out of the ground. The intention with the modification is to actually allow it to fully impact. . . . So it is what is called a shallow penetrator munition."

The radiation from the B61-11 blast, Roger said, is largely contained within the ground, as are the blast effects. As such, he explained, a bomb with a smaller yield can hold at risk a hardened target that previously had to be targeted by the aging B53.

"We had to recertify all of our parts to survive the g-environments, that is, the accelerations and shocks the bomb will be exposed to in this mode as opposed to being laid down on the surface or dropped on a parachute in the air."

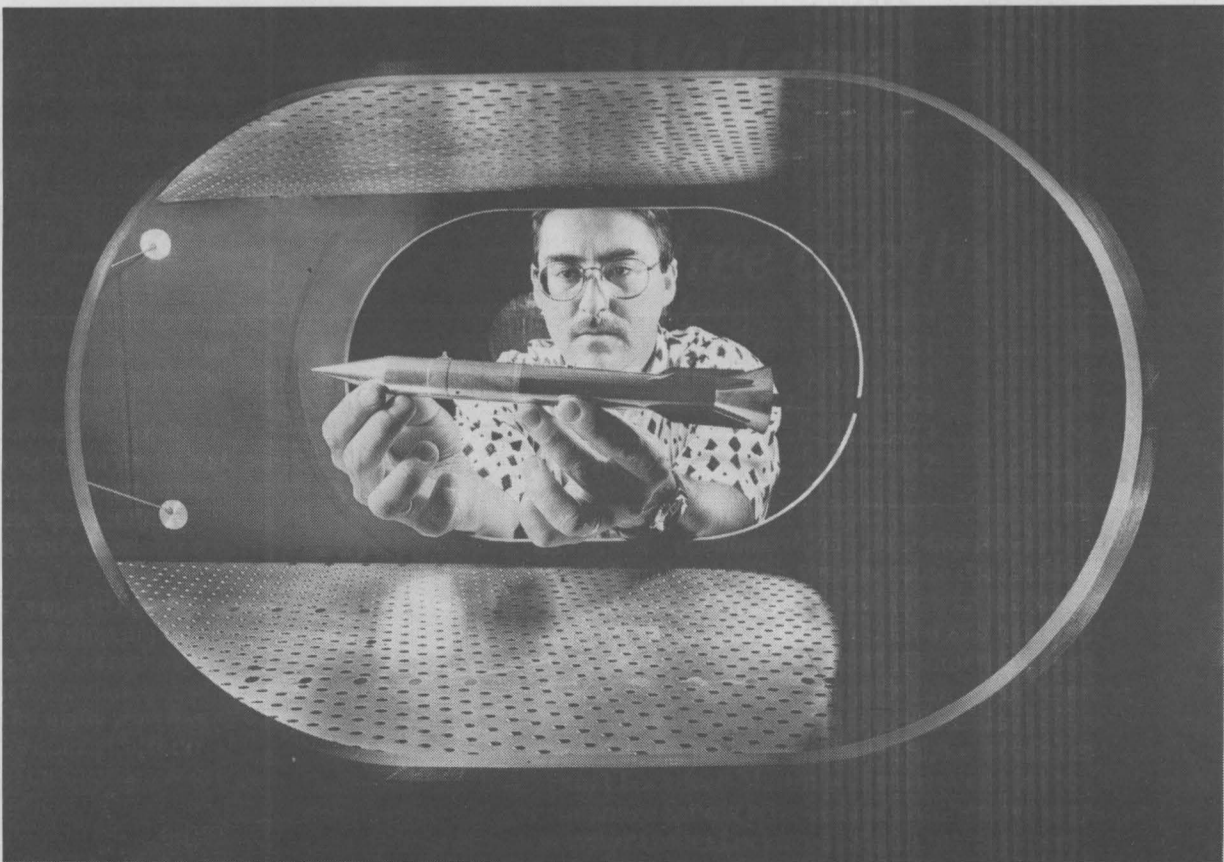
Roger emphasized that Sandia does not and never has had the latitude to initiate weapons programs on its own. New weapons projects and weapon modifications, he said, are carried out to meet explicit military needs. Such projects, he said, are initiated by USSTRATCOM (Strategic Command), and go through an escalating round of approvals up through and including ultimate approval by the White House and Congress.

"In the case of the B61-11, the original requirement was brought forward from STRATCOM; it was supported in the Nuclear Weapons Council; was supported by the two secretaries [defense and energy] in conjunction with the agreement and concurrence of both the White House and Congress. Otherwise we could not have done it; it requires all those people to agree to it.

"We [Sandia] were certainly in no position to become the principal advocate for the B61-11. When we were asked whether we could do this weapon and do it on a relatively short time scale, we were actually quite enthusiastic for several reasons.

"First of all, it helps our people to have system-like things to do, but I think most importantly, we wanted to get the B-53 out of the stockpile, and it is very important to have an alternative. Everybody here for many years has wanted to see a change [away from reliance on the B-53, which elsewhere in the interview Roger had described as obsolete, without many of the surety features common in modern weapons], so we're very pleased with the program."

— Bill Murphy



WIND TUNNEL TESTS — Ken Chavez (9115) adjusts a 7.5 percent scale model of the B61-11 for a wind tunnel test. The B61-11 is a modification of an existing weapon design. (Photo by Randy Montoya)



# New Mediation Cadre can help resolve conflicts

## 20 trained Sandia volunteers available to mediate workplace disputes

By Bruce Hawkinson

As in most other organizations, life at Sandia is dominated by what seems to be an ever-increasing rate of change. Downsizing, reengineering, decreased direct and indirect funding, increased individual responsibility and accountability, doing more work with fewer people — any of these can lead to stress, frustration, and interpersonal conflict.

Enter Sandia/New Mexico's new Mediation Cadre, 20 trained volunteers in peer mediation. Made up entirely of Sandians, with classifications ranging from ASAs through directors, the cadre has the full support of Sandia's management and legal department. Cadre members are on-call to coach, mentor, and solve basic disputes in the workplace (more about these services at the ombuds site on the Internal Web under Organizations/11 - Corporate Ombuds).

Isn't that what Sandia's ombuds do? "Yes," says newest Ombuds Don Noack (himself an example of technician-turned-professional ombud). "But the new Mediation Cadre is a major step toward Sandia's vision of a self-mediating workplace. By being able to turn the simpler conflicts over to members of the cadre, the ombuds are able to concentrate on the complex, multiparty conflicts."

All members of the Mediation Cadre have at least 40 hours of basic mediation training, and several of them have, on their own time, advanced their skills well beyond that de facto training standard. They adhere to standards similar to those of Sandia's corporate ombuds for maintaining confidentiality and the anonymity of the mediating parties.

What kinds of workplace conflict issues can be handled by the cadre members? Says senior Ombuds Wendell Jones, "Some really tough budget negotiations have to go on these days as

(Continued from preceding page)

December. A parachute is removed and a new tail section — called a "drag flare" — added to increase drag, ensuring the weapon attains proper velocities and impact angles.

The final 1,210-lb. B61-11 configuration has a 0.4-in.-thick steel nose cone, includes approximately 250 pounds of ballast for center of gravity control, is 145 inches long, and has the same carriage-lug positions as the -7. It is 4.5 inches longer and 445 pounds heavier than the standard B61-7. A 13.3-in. body and 22.5-in. "fin box" -dia. enable the -11 to be carried on a B-2 or B-1 rotary launcher.

### Physics package unchanged

"The inside of this steel-nose version looks exactly like the inside of the aluminum-case laydown [B61-7] weapon," McCoy said. "We didn't want to mess with the physics and electronics package. It's a big, big program to change that part."

Since Pentagon approval of B61-11 development in August 1995, the -7 weapon was repackaged and test-flown on the B-2, B-1B, and F-16. Eighteen straight-and-level deliveries have been made from a "few thousand feet" and at speeds up to Mach 0.8. Drops of inert weapons fitted with high-fidelity mockups of the physics and electronics packages were made at Tonopah and in Alaska "to prove components certified for a laydown weapon also would suffice for a penetration weapon," McCoy said.

Operational aircraft that will carry the B61-11, and its speed/altitude delivery parameters, are classified. However, the bomb must be released at specific conditions to ensure the correct impact angle and velocity, or it will not penetrate properly. "This one will skip," McCoy said. "If you get it too shallow, it'll go in and come back out."

Six remaining test drops are scheduled — four this summer for aeroballistic dispersion data, and two next March in Alaska. Most tests have used aircraft from Edwards AFB, Calif.

the funding for projects shrinks. Mediation done by cadre members could really add value in these situations."

While there are actually very few issues the cadre members cannot handle, the Ombuds Office is still the appropriate place to go if the organizational independence of the mediator is important to the issue at hand.

The services of the cadre are currently limited to the Albuquerque and Carlsbad sites. In Livermore, mediation services are provided by Ombuds Geri Albright, who can be reached at 294-2065. Additional resources will be considered as the need arises.

### A new approach to conflict resolution

"I joined the Mediation Cadre because it has the promise of leading the way into a new approach to conflict resolution at Sandia," says Gila Yaniv (12820). "If handled well, conflicts can result in better solutions and improved teamwork. The mediation process has the potential of minimizing antagonism and of bringing about greater harmony in the workplace." Gila adds that the mediation process uses communication to resolve conflicts.

"I volunteered for the Mediation Cadre because I felt that the mediation process is a good way to settle disputes in an empowered work-

place," says Denise Bleakly (6682). "The mediation process appeals to me because it is a way to bring people together to work toward a 'win-win' solution in a structured, less-combative environment. I have already received benefits from being part of the cadre by using my mediation skills in everyday work situations with my peers and my work team."

Adds Denise, "I think as Sandia uses mediation as an alternative conflict resolution process, our teams will be stronger and work better together, which benefits our customers."

### How do I utilize the Mediation Cadre?

To contact a member of the Mediation Cadre, or to simply get answers to your questions, either call the Ombuds Office at 844-9763 or visit the Mediation Cadre's Web page at <http://www-irn.sandia.gov/organization/div1/org11/cadrelist.html> (there is also a link to this site from the ombuds home page).

At this location, you will find the name, organization number, and phone number of each cadre member. In some instances, it may be beneficial to select a mediator who is familiar with your organization; in others, someone from an entirely different division may be preferred. In either case, Sandia's cadre members are available now to help in the resolution of workplace disputes.

## One-to-One Sandia Volunteer Mentorship Fair scheduled for Aug. 28 at Coronado Club

The One-to-One Sandia Volunteer Mentorship Fair is scheduled for Thursday, Aug. 28, 11:30 a.m.-1 p.m. at the outdoor pavilion of the Coronado Club. The fair is being held to recruit volunteer mentors to serve at-risk youth in the Albuquerque area. The all-American theme of the fair is related to the President's Summit for America's Future initiative.

"Community enhancement is a corporate goal, and Sandia has pledged to provide 100 mentors to help at-risk youth as a commitment to the President's Summit," says Sandia Volunteer Program Administrator Redd Eakin (12650).

The Sandia Volunteers Program in Community Involvement and Issues Management Dept. 12650 is coordinating this event and has invited 24 nonprofit agencies serving (including Big Brothers/Big Sisters, Martineztown House of Neighborly Service, and the Albuquerque City Government Foster Grandparents

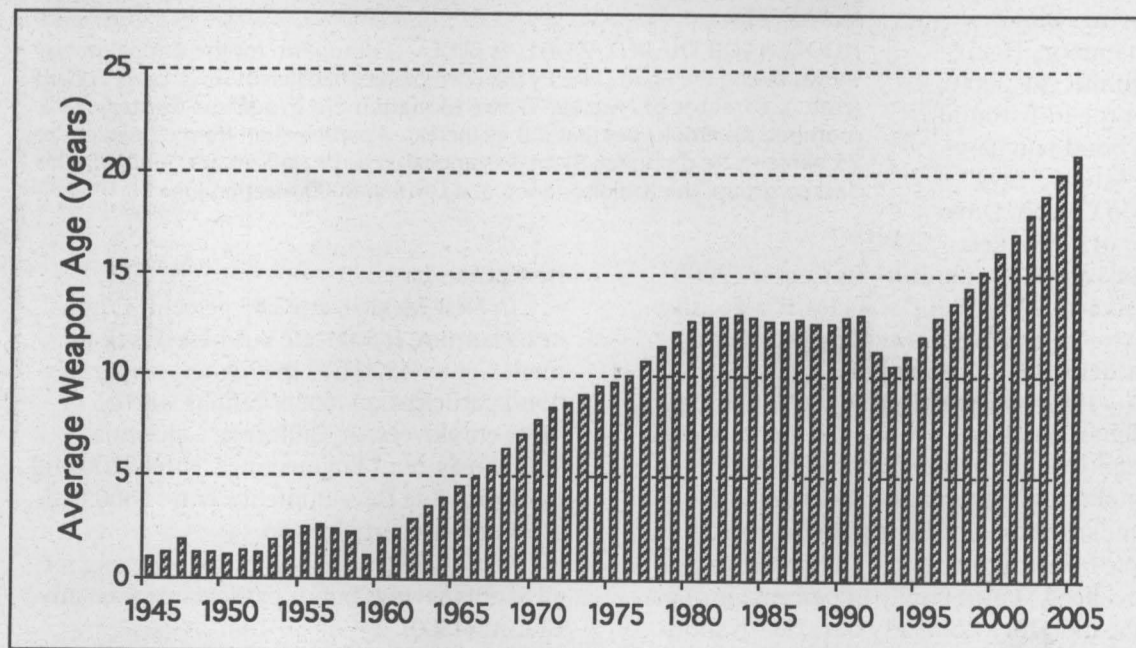
Program) to provide information about mentorship opportunities for Sandia employees, retirees, and family members in the Albuquerque area.

Fair features:

- Lunch for a dollar; includes hot dogs, lemonade, watermelon, and apple pie.
- Mountainside Jug Band (with Sandia retiree Harriet Goodness)
- Information booths provided by Albuquerque nonprofit agencies serving youth
- Comments by EVP John Crawford and a mentored youth
- Door prize drawing (requires advance purchase of a meal ticket on sale Aug. 16-27, 11 a.m.-1 p.m., Coronado Club lobby; meal tickets are not required to attend the fair.)

For more information, contact Redd at 284-5209 or Scott Suzuki at 284-5206.

— Janet Carpenter



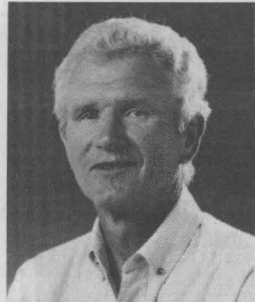
**AGING STOCKPILE** — This graphic shows that the average age of weapons in the US nuclear stockpile will be the highest in history beginning some time next year. The stockpile will average more than 15 years old by 2000 and about 20 years old by 2005 if new weapon systems are not produced. Sandia has critical stewardship responsibilities for the US nuclear arsenal, with particular emphasis on surety — defined as the safety, security, use control, and reliability of the stockpile. For an overview of Sandia's stockpile responsibilities, see the National Security page (<http://www.sandia.gov/NS.htm>) on Sandia's External Web.

# Mileposts

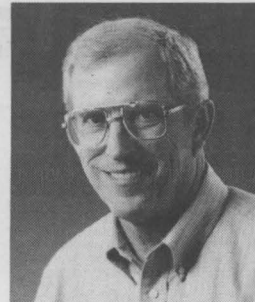
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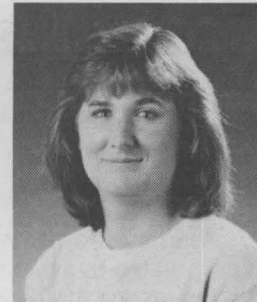
Daniel Dominguez Jr.  
15 8515



David Shirey  
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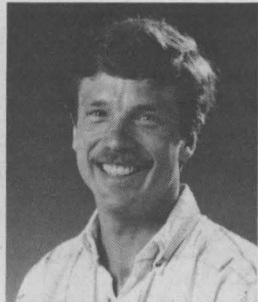
Kenneth Kimball  
35 2671



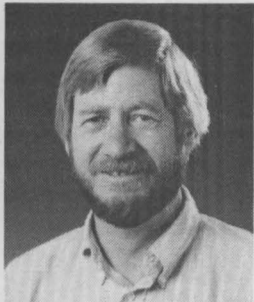
Karen Shanklin  
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John Norwalk  
15 7926



William Kolb  
15 6215



David Haaland  
25 1823



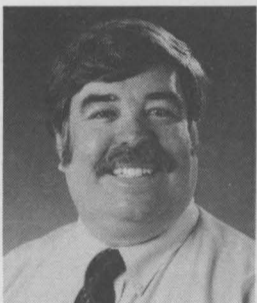
James Trentham  
30 2665



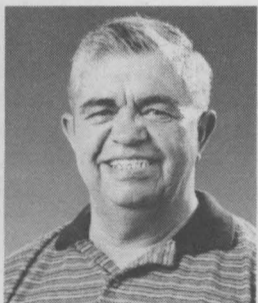
"Andy" Andrzejewski  
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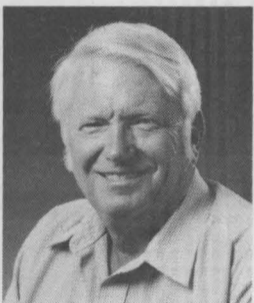
John Stichman  
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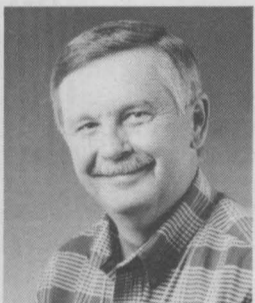
Steven Yearout  
15 5717



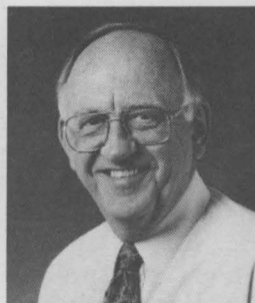
Paul Martinez  
40 7433



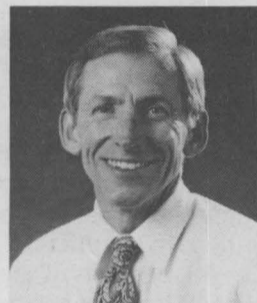
Lewis Bartel  
30 6116



Francis Sieradzki  
30 1231



Warren Siemens  
20 4200



Leland Byers  
30 4914

## US Savings Bond 1997 campaign delivers upturn in bond purchases

Despite fewer employees, savings bond participation is up at Sandia. Last year, 71 percent of Sandians purchased US Savings Bonds. This year, 72 percent of employees participated. Since this time last year, \$2,970,462 worth of bonds have been purchased.

"We'd like to thank this year's Savings Bond champion, Heinz Schmitt (VP 2000), for the turnaround in bond purchases at Sandia," says Don Carson, Director of Public Relations and Communications Center 12600. "His active leadership was clearly a decisive factor in turning around the decline in participation in recent years."

"I think I can still safely say we're the highest purchaser of bonds in the state per employee for a company of 5,000 or more employees," says Juanita Sanchez (12650), Sandia's Labs-wide Savings Bond coordinator. "We're one of the top 11 companies in the Lockheed Martin family in percentage of participation for a company our size." Nationwide, Lockheed Martin is second after Johnson & Johnson.

"Sandia has consistently received the US Treasury Department's Savings Bond Honor Roll Award," says Juanita. "I feel very proud of the continued support for the bond program



**HOORAH FOR THE RED, WHITE, & BLUE** — Enthusiasm for the campaign was shown during the Bond Drive by many employees in different ways. Les Shephard (right), Director of Nuclear Waste Management Programs Center 6800, promised his employees that if they increased participation from 62 percent to 75 percent, he'd sing for them. Les appeared as Uncle Sam and sang with his backup group, the Radioisotopes, at a Division 6000 meeting June 18.

here at Sandia."

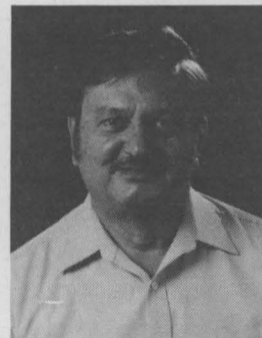
In New Mexico, at 92.85 percent, Corporate Planning & Strategic Business Development Center 4500 had the highest savings bond participation rate of centers with 25 or more employees. In California, California Weapon Systems Engineering Center 2200 and California Site Development Center 8800 tied at 85 percent participation.

Winner of the dinner-for-two drawing for all Sandia savings bonds participants was Amy Faucett (4500).

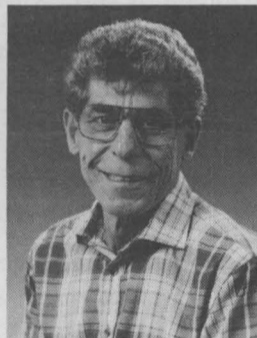
Although the US Savings Bond Drive is over, the program is available all year. Anyone can sign up at any time. Contact the Sandia Payroll Department to sign up for direct purchase of bonds through payroll deduction.

— Janet Carpenter

## Recent Retirees



George Williamson 27  
2151



Nicholas Martinez 22  
7613



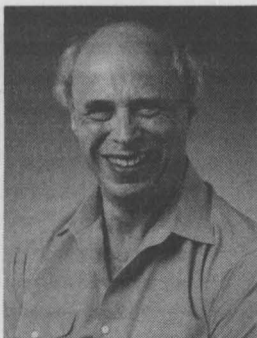
Robert Vaughan 32  
7613



Jesse Allen 37  
6543



Jim Freese 36  
1523



David Emin 27  
1153

## Recent Patents

Douglas Adkins (9113), Phillip Kahle (2338), Bruce Kelly (1846), and Suzanne Stanton (2103): Control of Power to an Inductively Heated Part.  
Richard Brow (1833): Sealing Glasses for Titanium and Titanium Alloys.



# Sandia News Briefs

## Industrial Electronics Handbook features work of Sandia contributors

CRC Press has just published the *Industrial Electronics Handbook* that includes articles by several Sandians. Otis Solomon (1542) was the editor for the chapter on "Measurement System Architecture" that included articles by Bill Boyer (9321), David Ryerson (2664), Richard Pettit (1542), and Pat Walter, Ray Reed, and Samuel Stearns (all retired). The 1,700-page publication covers a wide range of topics on industrial electronics, with special emphasis on practical applications of the technologies discussed. The handbook includes sections written by Sandians on "Measurement System Architecture," "Microsensors," "Evolution of Factory Communication," "Virtual Reality," and "Fuzzy Numbers: The Application of Fuzzy Algebra to Safety and Risk Analysis." Additional Sandia authors include Antonio Ricco (1315), Nadine Miner (9621), Carmen Pancerella (8920), Timothy Strayer (8910), and Arlin Cooper (ret.).

## Sandians pen lead article in Embedded Systems Programming magazine

The cover article of the June issue of *Embedded Systems Programming*, "Co-simulating Software and Hardware in Embedded Systems," was written by Sandians Phil Dreike (2314) and Jim McCoy (2612). The article is an outgrowth of work the two did in a Laboratory-Directed Research and Development (LDRD) project on virtual prototyping of microprocessor software and hardware in 1995-96. Co-simulating software and hardware means to verify and test the operating software of an electronic system with an embedded microprocessor on a software model of the electronic hardware, rather than on an actual hardware prototype. The article describes some of the potential pitfalls of co-simulation, and reviews the methods used by four commercial applications. It also describes the authors' experience in the LDRD project developing the Embedded Microprocessor Modeling Environment (EMME), a prototype tool for software-hardware co-simulation.

## Video Services Department wins international awards

Video Services Dept. 12610 won two awards at the International Television Association's Video Festival. The competition, now in its 29th year, honors excellence in corporate video productions from around the world. "The Hundred Year Impact," produced for Mark Boslough of Computational Physics & Mechanics Dept. 9232, won a Silver award. "Autumn 1996," produced for John Crawford's November Employee Dialogue Session, won a Bronze award for videography.

## Retiree Jim Voytko named a Fellow of the AESF

Jim Voytko, who retired from Sandia in April 1996, was named a Fellow of the American Electroplaters and Surface Finishers Society (AESF) at the society's annual international conference in Detroit in June. AESF, of which Jim is a past president, is an international technical-educational society that advances the science of surface finishing to benefit industry and society. The award was granted "In recognition of his contributions to the advancement of science and technology to surface finishing and for leadership in the dissemination of this knowledge." Before he retired, Jim worked in the Technology Transfer and Commercialization organization on assignment at DOE in Washington and at the Pinellas Plant in Florida. He currently works with Concurrent Technologies Corp. in Largo, Fla.

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

## Coronado Club

Thursdays and Fridays all month — Summer swim nights. A la carte buffet. Pool open until 9 p.m.

Aug. 3 — 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.

Aug. 7, 14, 21, 28 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

Aug. 8 — "Western Night" dinner/dance. \$6.95 all-you-can-eat buffet (\$7.95 for guests), 6-9 p.m. Music by Isleta Poor Boys, 7-11 p.m.

Aug. 15 — Kids bingo. Buffet, 5-8 p.m., cartoons, 5-7 p.m., bingo at 7 p.m.

Aug. 17 — 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.

Tram tickets — Round-trip Sandia Peak tram tickets available at the Coronado Club office; \$6 each.

Movie tickets — UA and General Cinema movie tickets available at a discount price of \$5 each. At the C-Club office.

## ! Take Note

Retiring and not seen in *Lab News* pictures: Shizuka "Toni" Lowe (7845), 16 years; Eloisa Maldonado (4415), 16 years; Pat Hitchcock (14306), 13 years; William Millard (9115), 32 years; Jim Martin (7000), 34 years; Jean Sherlin (9761), 12 years.

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The National Federation of the Blind of New Mexico and Albuquerque public television station KNME-TV Channel 5 have announced the availability of a new descriptive video service for the visually handicapped. Certain KNME programs, such as the American Experience, Masterpiece Theatre, Mr. Rogers' Neighborhood, Mystery, Nova, Nature, Scientific American Frontiers, and the New Explorers are now available with descriptive video provided by Descriptive Video Service (DVS). DVS is a national service that makes PBS television programs, Hollywood movies on video, and other visual media accessible to people who are blind or visually handicapped. DVS provides narrated descriptions of visual elements such as actions, settings, body language, and graphics without interfering with the audio or dialogue of a program or movie. If you know someone who is visually handicapped, tell them about this new service. To receive DVS, viewers must have a stereo TV or a stereo VCR that includes the Second Audio Program (SAP) feature, standard on most newer stereo televisions and videocassette recorders. Call KNME at 277-2121 for more information.

## Attention, owners of AT&T savings plan fund options: The clock is ticking on closing out balances

Sandia Corporation Savings Plan participants who still have balances in the AT&T Shares Fund or spin-off balances in the Lucent or NCR Shares Fund options need to transfer their balances out of these funds before June 1, 1998, or the balances will be reinvested in Sandia's Interest Income Fund.

If you are a participant with a balance in one or more of these funds, you're not alone, says Rebecca Spires (10310), savings plans project manager. Some 3,500 participants



have yet to transfer their balances. The deadline for elimination of the AT&T Shares Fund was established in 1993 when the Sandia Corporation Savings Plans were created in anticipation of the change in management and operating contractors. Now, less than 11 months from this five-year deadline, more than \$117 million remains invested in the three funds.

These participants will be sent reminders of the upcoming deadline.

## National Atomic Museum model show marks debut of classic American aircraft stamp series

Models of the 20 aircraft featured in the new Classic American Aircraft US postal stamp series — 18 of which figure in Albuquerque's aviation history — were displayed at the National Atomic Museum July 26. The stamps were issued July 19 at the US Air and Trade Show in Dayton, Ohio.

The models included such landmark craft as the Curtiss Model B, the first aircraft to fly in New Mexico, at the 1912 state fair; the JN-4 Jenny, used by Gen. John J. Pershing to scout for Pancho Villa in 1914; the Ford TriMotor, which provided transcontinental passenger service through Albuquerque beginning in July 1929; and the World War II-era B-17 Flying Fortress bomber.

The museum-hosted ceremony commemorating issuance of the stamp series included a walking tour to the exterior of Albuquerque's original 1929 airport terminal building, now part of the Sandia Area Federal Credit Union, across Wyoming Boulevard from the museum.

The one-day model display was on loan from the Albuquerque Aviation Department's "Cavalcade of Wings" collection, which is a permanent display at the Albuquerque International Sunport terminal building. The Albuquerque Scale Modelers Club displayed models of other aircraft relevant to Albuquerque's aviation history.



SOME OF THE CLASSIC AIRCRAFT STAMPS issued July 19. (Stamps not actual size.)