Making the crime scene blink

NIJ funds development of affordable evidence detector

By John German

Placing the "perp" at the scene of the crime can be difficult for police because some evidence can be hard to find — fingerprints, semen, urine, and other organic substances.

Now researchers in Instrumentation Engineering and Technology Dept. 2665 are developing an evidence-detection system that would — with the aid of a flashing lamp and a pair of modified 3-D video game goggles — make organic substances appear to blink, allowing police investigators to locate potential evidence more quickly and in a lighted room if necessary. The National Institute of Justice has provided $393,000 for the project.

"This system would give us the ability to see things we haven't been able to see more quickly and in ambient light."

The researchers hope to begin testing a prototype of the system in 12 months and have it available for licensing and manufacture in 18 months. The Albuquerque Police Department's crime lab has agreed to help test a prototype system at actual crime scenes.

"If it works, this system would give us the ability to see things we haven't been able to see more quickly and in ambient light," says APD Criminalistics Director Ann Talbot.

An important feature of the system is its affordability, says Dave Sandison (2665), lead researcher for the project.

"We don't want to develop something that the FBI would have two of and nobody else could afford," he says. "It should be accessible to police departments everywhere."

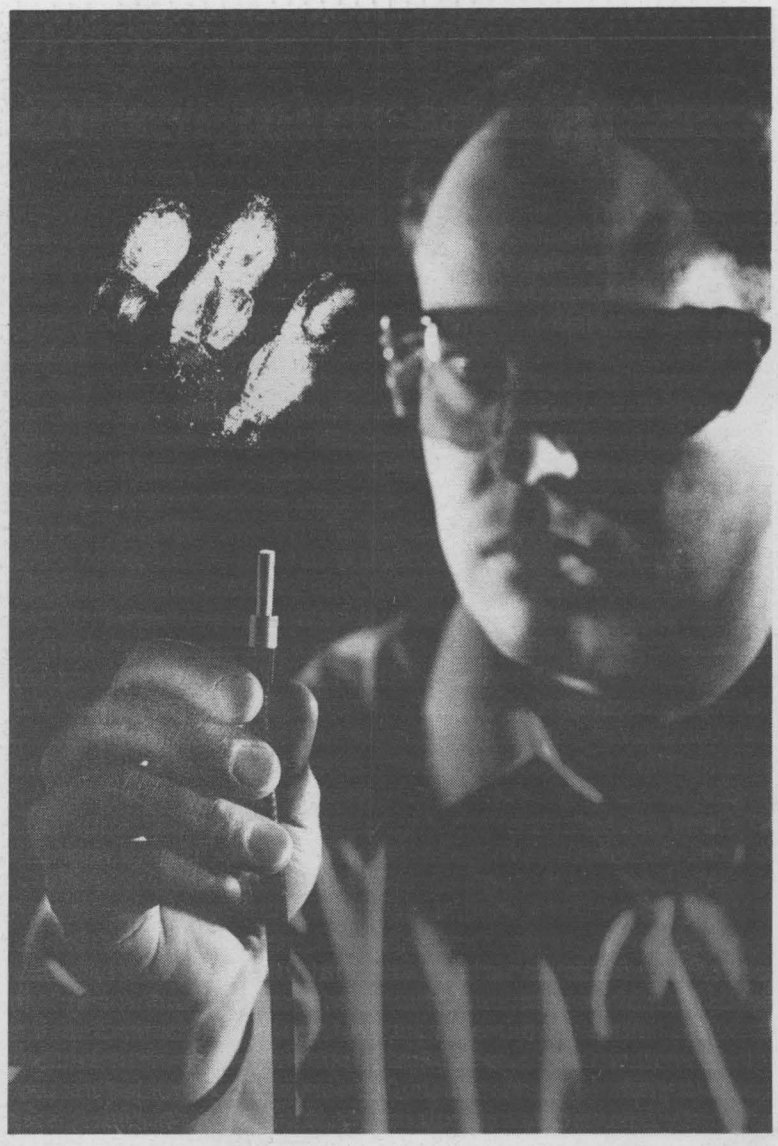
Less thinking when it's blinking

To locate certain organic evidence, fingerprints for example, police typically rely on optical aids such as special powders, lamps giving off various wavelengths of light, and yellow-tinted goggles that increase the evidence's visibility. Even with these aids, investigators typically must conduct their crime-scene investigations at night or in a darkened room. It can take hours to scour every inch of a crime scene.

Most fingerprints that are discovered are found on smooth surfaces such as glass windows or furniture, says Talbot. Latent fingerprints on walls and other textured surfaces are nearly impossible to find, and some kinds of evidence, such as semen or urine, don't show themselves even with optical aids.

Sometimes fluorescent dyes are used in situations where they won't contaminate other evidence, but rarely and as a

(Continued on page 5)



FLUORESCING FINGERPRINTS — Dave Sandison lights up a set of fingerprints with a lamp that is part of an evidence-detection system under development at Sandia for the National Institute of Justice. (Photo by Randy Montoya)

Sandia LabNews

Vol. 49, No. 20 October 10, 1997

Sandia National Laboratories

Super-sensitive coating improves detection of dangerous molecules

Porous gel could increase sensors' sensitivities 500-fold

By Neal Singer

A coating that allows miniature sensors to detect dangerous, even lethal, air- or water-borne molecules much more quickly has been created in a joint project of Sandia and the University of New Mexico.

The achievement was reported in the Sept. 25 issue of *Nature*. Sandia has applied for a patent on behalf of itself and UNM.

The film-like coating — less than one micron thick — barely increases the size of the sensor. But the material's extreme porosity increases the sensor's surface area, and therefore its sensitivity, by a factor of about 500, says Sandia principal investigator Jeff Brinker (1831).

"Imagine tasting something sour, and then 500 times more so," says Jeff.

The film's sensitivity will help combat terrorism, could lead to smaller yet more accurate sensors for environmental monitoring, and could benefit oil and pharmaceutical companies, which use molecular separations to produce grades of gasoline and a variety of drugs, says Jeff.

Funding was received through DOE's Basic Energy Sciences program and the UNM/National Science Foundation Center for Microengineered Materials.

The extremely high surface area of the film can be modified to detect chemical weapons like Sarin, used in a terrorist attack in the Tokyo subway. Under laboratory conditions, the film applied to a sensor detected 200 parts per billion of a Sarin simulant. A human being can survive approximately 50 minutes at those concentrations, says Jeff.

How does it do that?

The material, honeycombed by tiny tunnels of precise size, acts as a membrane to separate molecules of differing dimensions.

The film functions similarly to zeolites —

(Continued on page 5)

Cassini mission ready; Sandia helped assess nuclear power source risks

By Bill Murphy

When the Cassini spacecraft is launched next week from Kennedy Space Center for its seven-year flight to Saturn, it will lift off in the wake of a vitriolic public debate about the safety of using nuclear fuel as a source of energy for space missions.

And risk-analysis tools and methodologies developed at Sandia have played a key role in resolving the scientific issue in favor of a "go" for launch.

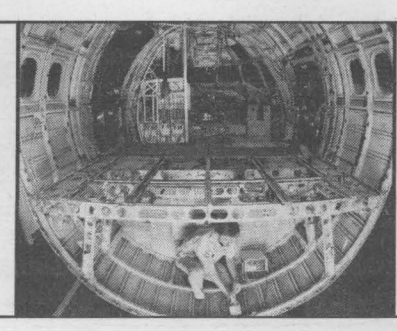
Cassini is a multinational effort; seventeen countries are directly involved. The mission is being coordinated by NASA's Jet Propulsion Laboratory, which has designed and managed almost all of NASA's major interplanetary missions.

Elaborate flight trajectory

After launch aboard a Lockheed Martin Titan IV rocket, the 12,000-pound Cassini will follow an elaborate flight trajectory that uses gravity boosts from the Earth, Venus, and Jupiter to speed it on its way.

Beginning in 2004, when it enters Saturn orbit, Cassini will spend four years studying the planet at close range. The Cassini is also a "mother ship"; it carries with it the Huygens instrument probe, designed to parachute through the thick atmosphere of Titan, Saturn's largest moon. The Cassini/Huygens mission is expected to return a

(Continued on page 4)



This & That

Help pick next dialogue topics – Executive VP John Crawford hosts the next round of employee dialogue sessions Nov. 17, 18, and 20, and he wants to know what you most want to hear about. He'll spend most of the time discussing topics and answering questions that employees submit ahead of time. Please submit your questions and suggested topics to John's office, or indirectly and anonymously through me if you prefer; see details and dialogue-session schedule below. We'll announce John's major topics in the Nov. 7 issue.

* * *

U rating could have been even better – It sure feels good to start out the new fiscal year after receiving another great performance review rating for the last one. Through hard work and dedication, I managed to bag myself another "U" rating this year, which I'm pretty sure stands for *unusually* fine work. (Someone tried to tell me the U stands for unsatisfactory, but I just can't buy that.) Although I'm quite proud of my U, I may have received an even better rating of U-plus if I hadn't bragged on my performance management form that I get more work done in five hours a day than most people do in eight or nine. My management took that to mean that I work only five hours a day.

* * *

Fine new flick – Sandia's new 10-minute overview videotape gets my two-thumbs-up rating. It's a great way to introduce Sandia to visitors and to prospective employees and customers. Titled "Solutions from Science for a Changing World," the overview is produced by and available from Video Services Dept. 12610. To order copies (case number needed), call 844-7167. VHS copies are available for $15 (quantity discounts available if you buy 25 or more at the same time). Sandia/New Mexico employees can see the tape next week on the internal TV network; watch the *Sandia Daily News* for times.

* * *

Crafty or just plain dishonest? – Direct mail marketers will do about anything today to get you to open their junk mail. The most blatant attempt I've seen lately is from Publishers Clearing House. One side of the envelope had all of the following printed in big, bold, capital letters: EXPRESS CLASS, RUSH PRIORITY, URGENT, AND CONFIDENTIAL DOCUMENTS ENCLOSED. I was almost tempted to actually open it but the telltale type on the other side saved me the trouble: Bulk Rate U.S. Postage Paid. I'd worry that I lost my chance at the $3 million prize if it weren't for this great Sandia job security.

* * *

New name needed? – Free advice for my friends (maybe *former* friends after this) who manage Sandia's Internal Web: I think the "Old Teasers" page that contains recently outdated icons from the Internal Web home page needs a new name. "Old Teasers" reminds me too much of a bar I used to frequent. "Overaged Icons" sounds much better.

– Larry Perrine (845-8511, MS 0167, lgperri@sandia.gov)

Employees invited to suggest topics and questions for November dialogue sessions

Sandia Executive VP John Crawford invites Sandians to suggest topics they want to hear discussed at the next round of employee dialogue sessions in mid November.

Suggested topics and questions can be e-mailed to John's executive secretary Edna Luther at emluthe@sandia.gov or mailed to her at MS 0102.

Anonymous suggestions are welcome. If you prefer to submit suggestions anonymously via e-mail, send them to Larry Perrine (12640) at lgperri@sandia.gov; he will remove your name and forward your suggestion(s) to John's office.

John's main topics will be announced in the Nov. 7 *Lab News*; please submit suggestions by no later than Tuesday, Oct. 28, to allow John time to determine his main topics and for the *Lab News* to meet its copy deadline. Although John may not be able to cover every topic/question submitted in the one hour allotted for each session, he will cover those issues that are of the greatest interest Labs-wide.

The dialogue schedule:

- Monday, Nov. 17, 1:30-2:30 and 3-4 p.m., Sandia/New Mexico's Technology Transfer Center (Bldg. 825)
- Tuesday, Nov. 18, 9-10 a.m., Sandia Vista Building, 2301 Buena Vista SE in Albuquerque
- Thursday, Nov. 20, 1:30-2:30 and 3-4 p.m., Sandia/California's Bldg. 904 Auditorium

Sandia LabNews

Sandia National Laboratories

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LOCKHEED MARTIN

Welcome

New Mexico — Walter Beyeler (6416), Paul Brophy (1521), Richard Corderman (2334), Steven Dron (9323), Henry Duong (6406), Steven Hafner (5100), Ann Kirk-Schweitzer (7525), George Longmire (4212), Raymond Parks (6543)

Illinois — Richard Lehoucq (9222)

Yonas speech describes emerging threats to US

Gerry Yonas, VP of Systems, Science, and Technology Div. 9000, mapped an uneasy vision of the future of US security, as well as the role Sandia will play in securing it, in a talk to the Alaska World Affairs Council in Anchorage, Alaska, on Sept. 5.

"There was a period a few years ago when we [at Sandia] seriously shifted much of our attention toward issues of economic rather than military security, but now we have decided that the world is not yet ready for us to ignore a future of uncertain but still dangerous threats," he said.

While the speech, "Emerging Threats: International Terrorism and Security Issues," did not ignore nuclear threats, it placed them as only one of a number of security concerns with which Sandians might deal.

Fissioning nations

Yonas told the *Lab News* he chose to give the speech to the eclectic audience of Alaskan oil executives and international developers (many of whom had developed business links with Russia, particularly in oil exploration) to see what the reaction of those furthest from Washington and closest to international business relations would be.

"I was afraid they would think I was a right-wing wacko. Instead, the general reaction seemed to be, 'Why are you soft-pedalling this threat? Get this message out.' "

"I was afraid they would think I was a right-wing wacko," says Gerry. "Instead, the general reaction seemed to be, 'Why are you soft-pedalling this threat? Get this message out.' "

Describing the international political situation, he said, "Instead of fusing, as they did during the Cold War, nation-states . . . are fissioning. And many of the emerging new nation states aren't happy about who is living next door. . . ."

He said that space-based information-intensive military systems and a proliferation of nuclear, biological, and chemical weapons "may increase the military advantage of a first strike from one regional power to another. This emerging environment of unpredictability offers unprecedented opportunities for terrorists. A complex fabric of financing from organized crime, technology provided by smugglers, and hatred for the United States as the unifying threads provides a tapestry of danger that has not been previously imagined."

Access to weapons of destruction

Talking of threats from organized international crime, terrorists schisming along religious fault lines, and rogue states, he said, "What if any of these bad actors not only happened to get away with their schemes, but also had access to biological or chemical weapons? That possibility is becoming more real every day."

About the ability of the United States to detect the production and stockpiling of such weapons, he said, "I wonder if you realize that we had been watching Iraq very closely before they invaded Kuwait, but we had no clue as to their real capabilities until the UN inspectors arrived on the scene after the war."

Among the weapons the US then learned Iraq possessed were nerve agents, chemical warheads, and biological agents including anthrax and botulism toxins.

Many of the biological agents need only a garage to be created, not a heavily armed nation-state, Gerry said. A Japanese group not only created but used one such agent, Sarin, in that nation's subway in the mid-1990s.

Another area of danger: "Conversion of

(Continued on next page)

Remote sensing with unclassified satellite images

Sandian blends logic, official accounts, and hard evidence to detect proliferation activities

By Nancy Garcia

Vipin Gupta (8112) was surprised how much he could determine from unclassified satellite photos when, as a postdoctoral fellow, he decided to determine their utility in verifying the Comprehensive Test Ban Treaty.

Working at Lawrence Livermore National Laboratory with Frank Pabian, he investigated allegations made in December 1995 that India was preparing for a nuclear test. He and Pabian used satellite images commercially available from the US, Russia, France, and Canada. They used the "hard evidence" of the images to filter out accounts of the allegations in media and from other sources, and the responses from various officials and local residents, which ranged from denials to confirmations.

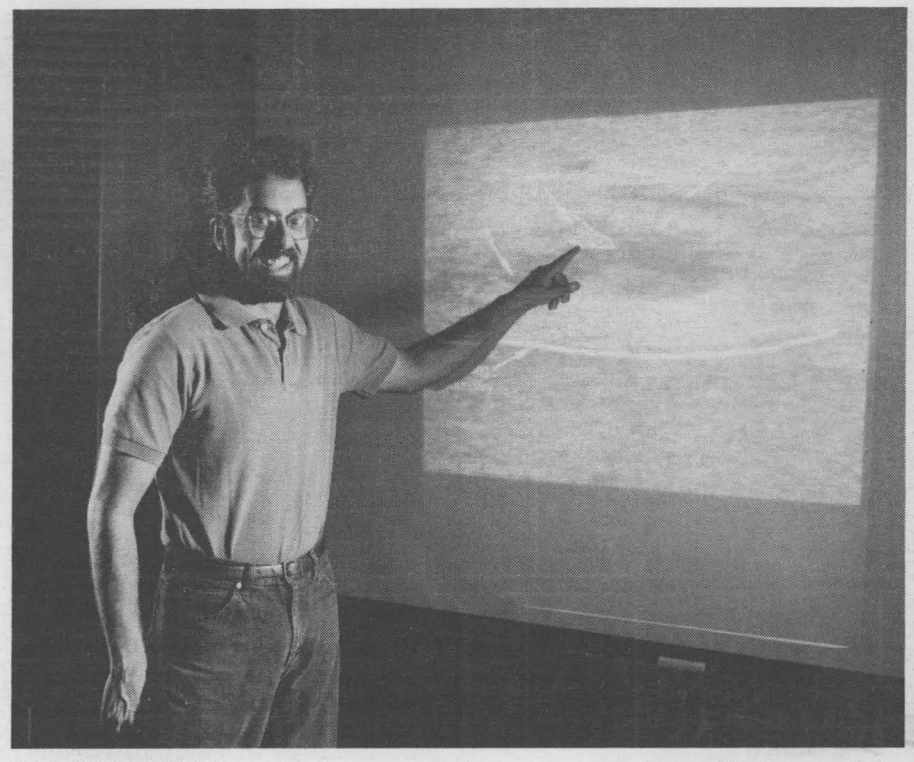
The pair gathered evidence into sets and used a logic tool called a Venn diagram to group the sets into overlapping circles that show relationships between them. This turned out to be a "very effective" tool that hadn't been used in remote-sensing analysis, Vipin says.

The analysis concluded that activity in the Rajasthan Desert could be consistent with planned Prithvi missile field testing, or nuclear test preparations, or a combination of both. The researchers also found the exact location of India's first nuclear test in 1974. Beside the subsidence crater, they discovered a military range near the Khetolai village.

Sifting through clues

Interpreting the images required a certain amount of common sense and deduction, he says. For instance, the pair found clues that the land around the area of the alleged nuclear test preparations had been taken out of farm production because it was converted to military activities. A rural village was concluded to be abandoned because the dwellings have dark spaces where roofs should be. The village also lacks adjoining animal pens. A nearby village that is known to be still occupied shows white intact roofs instead, and rectangular animal pens alongside.

"It really took time to sift through the information," Vipin says. "It was complicated, very challenging from a technical standpoint. I couldn't stop thinking about it; it was a blast."



SEEING IS BELIEVING — Vipin Gupta displays a commercial satellite image of the crater caused by India's 1974 nuclear test. He used allegations of preparations of another test near this site to evaluate the usefulness of commercial satellite imagery to verify comprehensive test ban compliance.

Submitted as an invited paper for the September international symposium on "Global Security & Global Competitiveness: Open Source Solutions," their work has received one of 10 "Golden Candle" awards for making the most of open sources outside traditional intelligence applications. The president of Open Source Solutions, Robert Steele, called the researchers "pioneers" in demonstrating the value of commercial imagery and remote sensing capabilities for proliferation-control purposes.

The paper was published in the January-February issue of *Science and Global Security*. It has been posted on Sandia's External Web since February (http://www.ca.sandia.gov/casite/gupta/index.html) and has been accessed more than 25,000 times, Vipin says, adding, "It's gotten rave reviews."

Affordable satellites

Commercial satellite imaging is moving from a Cold War domain of a few satellites with limited capabilities to an anticipated 30 or so satellites by the end of the decade. The trend is fostered by better and more affordable technology, which makes satellites cost perhaps hundreds of millions of dollars rather than a few billion. Also, the US encouraged private companies to build, operate, and deploy satellites with passage of the Land Remote Sensing Policy Act in 1992, Vipin says.

"Before that," he says, "the images were only spy satellite stuff."

Starting with graduate work in applied physics at the Remote Sensing Center of the Imperial College of London, he began using commercial images in part because of the convenience of not needing a security clearance. The quality of satellite images is improving to the point that resolutions of 1 - 4 meters are expected to be available electronically within 72 hours of acquisition, which should enhance the ability to distinguish between different types of unconventional military activity.

Though he said he's always been "respectfully surprised at how much information we could extract from this under-utilized resource," it was Pabian who advocated its value in verifying the test ban treaty. Pabian is now an Iraq inspector for the International Atomic Energy Agency. Vipin joined Sandia in May 1996.

'Tactics to filter out noise'

Vipin thinks their work has been well-received in part because they point out both the promise and hazards of interpreting satellite imagery for nuclear test monitoring, spelling out what he calls "tactics to filter out noise," such as the Venn diagram approach. He hopes that applying this analysis to the 1995 allegations could serve as an example of how commercial satellite images can resolve treaty compliance disputes before any nuclear testing occurs.

In addition to presenting this work in a half-dozen conferences, Vipin also often makes presentations to delegations of visitors at Sandia's Cooperative Monitoring Center in Albuquerque, where his thesis work on detection of nuclear testing in China is on display.

Sandia CaliforniaNews

(Continued from preceding page)

civilian technology to military uses could give advanced military capabilities to some of the worst-governed nation-states in the world."

As for the reaction of the US, "Our national defense policy has not adequately adjusted to this emerging threat. Defense R&D investments are still dominated by conventional military requirements based on Cold War threat scenarios."

Part of our weakness, as well as our strength, Gerry said, is that "Our nation's collective personality is one of optimism, prosperity, and self-confidence, and it is this public personality that drives national policy. If we are really honest with ourselves, we have been very lucky. . . . What I wonder now is if our optimism will serve us well during an extended period when we as a nation, to a large extent, believe we have nothing to really fear?"

Roles for Sandia

In addition to preparing defenses against nuclear, biological, and chemical attacks, he said it is Sandia's role to "continue to challenge and focus our best minds to anticipate and provide the means for protection of our safety and security" in protecting the United States against:

• "Crime, drug trafficking, and lawlessness [which] may continue to spread from within our own inner cities, often aided by international criminal and terrorist groups. . . . Information technology advantages these groups over nation states by increasing their communications while they remain hidden from physical view."

• an " 'electronic Pearl Harbor' " from "malicious assaults" on the US computer systems network.

• attacks on our utility infrastructures, which "terrorist or nation-states can attack . . . causing widespread damage."

• attacks against our transportation system.

He also warned of a possible loss of civil liberties: "As terrorism and crime grow in America, the victims list will expand well beyond those directly affected by terrorist acts. All of us may experience loss of our freedoms driven by an increasingly dominant internal security force required to deal with widespread crime and both state and nonstate terrorism."

"All of us may experience loss of our freedoms driven by an increasingly dominant internal security force."

He concluded with a darkly optimistic vision: "We are obliged to the American taxpayer to prepare for a world where there are many people increasingly unhappy with America — the rich nation, the perceived disrupter of their order, and the purveyor of unwelcome change to their culture and values — and we need to let it be known to these people they will not succeed and they need not even try."

Those interested in reading the entire speech will find it on Sandia's External Web at http://www.sandia.gov/9000/alaska.htm.

—Neal Singer

Take Note

Retiring and not seen in *Lab News* pictures: Arlyce "Archie" Stannish (10244), 31 years; Franklin Ezell (6524), 30 years.

Cassini mission

(Continued from page 1)

bonanza of some 300,000 color images of Saturn, its rings, and its other satellites, as well as reams of data from a suite of science instruments.

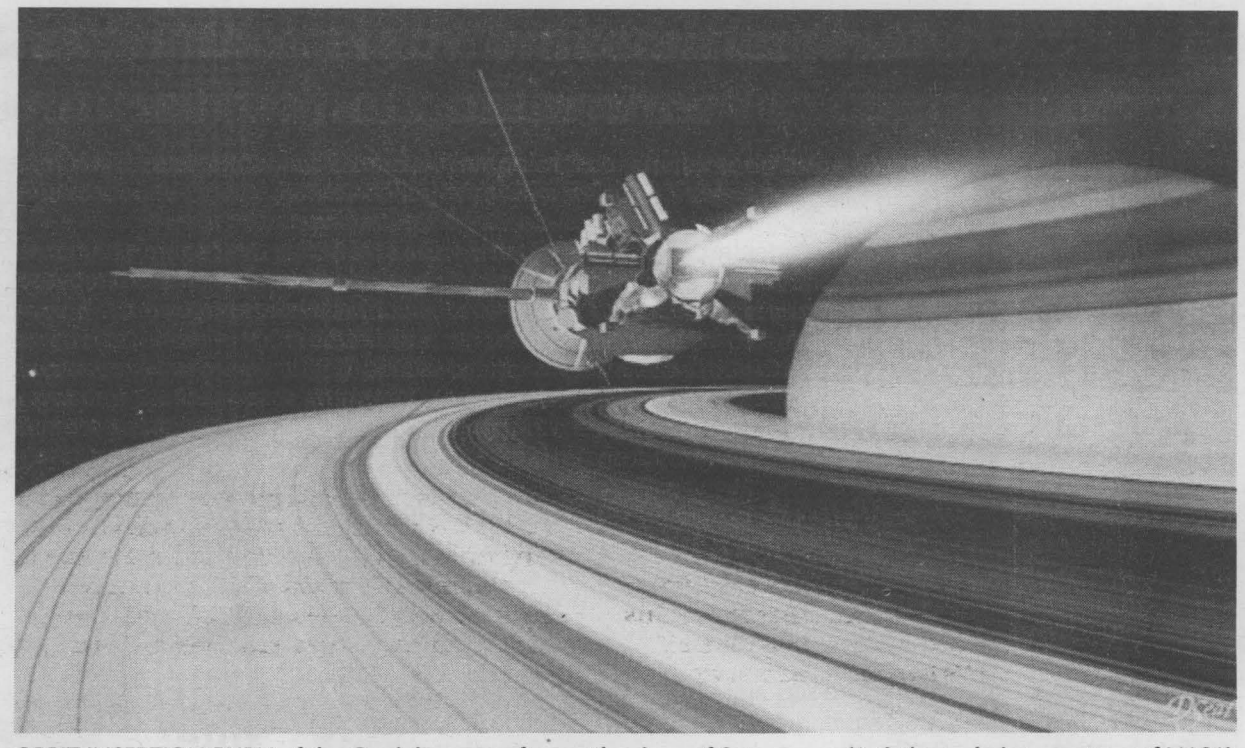
The ambitious science objectives of Cassini have been almost lost in the highly public flap over the use of a plutonium power source for the spacecraft systems. Cassini, like many previous US spacecraft, uses RTGs — radioisotope thermoelectric generators — to produce some 800 usable watts of electricity for the spacecraft's communications, navigation, and science instruments.

Sandia risk-analysis code used

Cassini mission planners have used sophisticated risk-analysis tools to determine that the use of RTGs poses a vanishingly small risk to the health of any human being on the planet. Among the tools used are the Fireball Integrated Code Package, developed at Sandia by Dean Dobranich (9113), Dana Powers (6404), and Fred Harper (5514). The code's purpose is to determine what might happen to Cassini's (or any other spacecraft's) plutonium-based RTGs in the event of an explosion and ensuing fireball during launch.

"The objective here," says the executive summary for the code package, "is to determine how the fireball environment modifies the size distribution of all plutonium-bearing particles."

The extremely flexible code package enabled Cassini mission planners to look at various launch-abort scenarios and determine quickly how those scenarios would affect the distribution of plutonium. Bruce Boughton (5514) developed the models for the actual atmospheric dispersion of plutonium.



ORBIT INSERTION BURN of the Cassini spacecraft near the rings of Saturn. (Artist's rendering courtesy of NASA)

In another area, Greg Wyss (6412) developed new mathematical methods to more effectively calculate the variability and uncertainty factors that are a part of any meaningful probabilistic risk assessment. Specifically, Greg's methods were applied by Cassini mission planners in refining their risk model for various launch-abort and earth fly-by mission failure modes.

According to Sandia Cassini project leader Vince Dandini (6412), Greg's mathematical methodology and the fireball code represents a great leap forward for probabilistic risk assessment launch accident analysis.

Before deciding to use RTGs, JPL looked at and discarded a number of alternative energy sources. Batteries, fuel cells, and solar panels were all considered, but none was deemed feasible for the mission. At the current state of the art, only RTGs, which convert heat from the decay of plutonium directly to electricity, combine the mission-essential qualities of relatively low mass, simplicity (and thus, reliability), and long life. And JPL has great confidence in RTGs; they have been used in such legendary NASA successes as Apollo, Viking, Voyager, Galileo, and others.

JPL has great confidence in RTGs; they have been used in the Apollo, Viking, Voyager, Galileo, and other missions.

The three RTGs used in Cassini were designed by Los Alamos National Laboratory. Safety, specifically the containment of plutonium in the event of an accident, was integral in the design. Over the years, Sandia has conducted safety tests on RTGs, putting them through all kinds of high-stress, high-impact scenarios.

The 72 pounds of plutonium in the Cassini RTGs is in the form of a ceramic, plutonium dioxide. In consistency, the material is much like the material in a coffee cup or dinner plate. This material is further protected by heat shields specifically designed to withstand the extreme temperatures of possible launch accidents and reentry from earth orbit. In the unlikely, but possible, event of a launch failure, the ceramic is designed to break up into large chunks, rather than into tiny airborne particles. The amount of plutonium that could potentially be breathed — and therefore pose a health risk — is extremely small.

A cosmic collision one year later: Its legacy of meteorites still being sought

After a year of detective work involving scores of eyewitness reports from across New Mexico and Texas, a group of scientists has concluded that the Earth collided with a swarm of cosmic debris on the night of Oct. 3-4, 1996.

The most widely reported fireballs were ones over eastern New Mexico and the Texas panhandle, and another near Bakersfield, Calif., exactly 104 minutes later. The relationship among the times, locations, and trajectories of the meteors seemed too unlikely to be mere coincidence and had initially led some of the scientists to believe that a single object skimmed through the atmosphere and re-entered after one orbit (*Lab News*, Oct. 25, 1996).

After careful analysis of a videotape taken from El Paso, Texas, together with eyewitness reports, Mark Boslough of Sandia (9232) and Peter Brown of the University of Western Ontario found that the first meteor entered at too steep of an angle to skip off the atmosphere. They are now convinced that the two fireballs observed over New Mexico/Texas and over California were two different objects.

They also determined the most likely location in the Texas panhandle where meteorites might have fallen, and John Wasson (University of California, Los Angeles) has reissued a reward for a sample.

Brown and Mark believe that any meteorites reaching the ground in the Southwest would most likely be found south of Amarillo, near the towns of Hereford and Canyon, where they were carried by winds to the east of the visible trajectory. The most likely place for small meteorites to have landed would be in an oblong area about 10 miles east-southeast of Hereford, but any larger meteorites would be in a strip that stretches as far as 10 miles east of Canyon.

This part of the Texas panhandle is well known for its abundance of meteorite finds because it is flat, with little vegetation and few natural rocks on the surface. The best-known meteorite area is southwest of Plainview, where more than 900 meteorites were recovered after a fall in 1903. They were still being found as late as 1949.

Over the past year, two groups of scientists from Los Alamos National Laboratory and the National Oceanic and Atmospheric Administration have also reported low-frequency sound data showing that the Earth's atmosphere was hit by at least 60 objects within several hours of the two that were originally reported, two of which were also observed by Defense Department satellites.

Most of the infrasound-producing meteors occurred during daylight hours and were not seen by witnesses, but the large number of collisions taking place that night helps explain why two bright ones with such similar trajectories would be seen so closely spaced in time. Although the scientists eliminated their hypothesis of a single object bouncing off the atmosphere and re-entering it later, they are still very interested in the events of one year ago because it means the Earth collided with a cluster of objects, perhaps pieces of a broken asteroid.

A sample of one of these meteorites would help scientists determine what kind of asteroid spawned the fragments and better understand how they break apart and explode in the atmosphere, Mark says.

Prof. John Wasson is seeking such samples and is offering a reward of $2,000 for the first confirmed sample as large as 4 ounces. He urges persons living within the calculated fall area to look in their yards and fields, on their roofs, and (if safely accessible) in their gutters for small stones, probably black with a fresh matte texture. Samples should be sent to Prof. Wasson at the Institute of Geophysics, UCLA, Los Angeles, CA 90095, or to Dr. Adrian Brearley, Institute of Meteoritics, University of New Mexico, Albuquerque, NM 87131. Each sample will be acknowledged, but those that are not meteorites will not be returned unless a return self-addressed envelope is provided.

Employee deaths

Alexander Filuk of Ion Beam Generation Physics Dept. 9533 died in a motorcycle accident Sept. 30.

He was 35 years old.

Alexander was a senior member of technical staff and had been at Sandia since 1991.

He is survived by his wife Jean and his parents Dmitry and Marie Filuk.

* * *

Keith Reimholz of Reapplication Operations Team 10267-1 died Oct. 1.

He was 43 years old.

Keith was an assembler and had been at Sandia since 1983.

He is survived by his mother Doris Jackson, brother Scott Reimholz, and sister Cheryl Reimholz.

Sympathy

To Frank Figueroa (10000) on the death of his father-in-law, Frank Sanislo, in Chicago, Sept. 16.

Fingerprints

(Continued from page 1)

last resort.

"If you use chemicals, you typically have to spray down the entire room," Talbot says.

A lot of potential evidence can go unnoticed, she says.

Sandia's proposed evidence-detection technique relies on the fact that all types of organic substances give off weak fluorescent emissions, normally invisible to the naked eye because other, much brighter sources of light interfere. The proposed system takes advantage of the periodic dissonance between two signals at slightly different frequencies — an effect called heterodyning — as well as the human eye's natural affinity to anything that moves or blinks.

"Former Sandia postdoc and originator of this project Todd French used to like to say 'There's less thinking when it's blinking,' " says Dave.

On, off, on, off, on, off

In a nutshell, the system's lamp is modulated at a specific frequency, say 100 times per second, which is to say it flashes at a rate too fast for the human eye to detect. The glasses, modified from a 3-D video game, shutter open and closed at a slightly different frequency, say 102 times per second, which essentially turns the user's eyes on and off at a rate also too fast to be detected by the human eye. To the wearer, the lenses appear transparent.

Every so often, about twice a second, the glasses shutter open at the exact moment the lamp is "on," which for a split second drowns out most background light whose wavelengths are different than that of the lamp. With the background light masked, the net effect is that the fluorescing materials appear to flash brightly at a rate that is distinctly noticeable to the human eye.

From behind the shuttered glasses, the crime-scene investigator would see the room lighted normally, but any organic substances would flash a few times per second when illuminated by the system's lamp.

It's like the combined sound two jetliner engines make, every once in a while humming in harmony and alternatingly reverberating in discord. The engines hum when the acoustic wavelengths match up. They clash when they don't.

The researchers may also test the system using a low-light video camcorder that is more sensitive to the fluorescence than the human eye, Dave says.

The APD crime lab tests are intended to help work out any bugs in the technique, define what kinds of evidence it can help find, and determine whether the system will be practical as a law enforcement tool.

"Who knows, we may turn the system on and see thousands of fingerprints," Talbot says. "If we see too much, we won't be able to sort out the real evidence.

"But if it works with some discretion and it's portable, it would be useful to us on a fairly frequent basis. . . . The beauty of this approach is that it doesn't contaminate other evidence."

It may be particularly useful at sexual assault crime scenes for identifying semen, which fluoresces much more brightly than the oils from fingertips. And it may help identify fresh fingerprints, which presumably fluoresce more brightly than organic substances that have been there for awhile and that may not be pertinent to the investigation.

Idea grew from weapons security

A similar system is being used by a private company for detecting cancerous lesions in tissue samples. And Molecular Technologies Inc. (run by Ned Godshall, a Sandia researcher on entrepreneurial leave-of-absence) has applied fluorescence to the problem of DNA sequencing. (A joint Los Alamos National Laboratory/Molecular Technologies DNA sequencing project won a 1997 R&D 100 Award.)

The heterodyning technique originates from an early 1990s Sandia project to detect weakly fluorescing paints on the surfaces of nuclear material storage containers. The eye-invisible, hard-to-replicate paints were applied to the containers' outside surfaces and used to verify that the containers weren't opened without authorization.

The evidence-detection project is being conducted jointly by Surety Components and Instrumentation Center 2600 and Security Systems and Technology Center 5800.

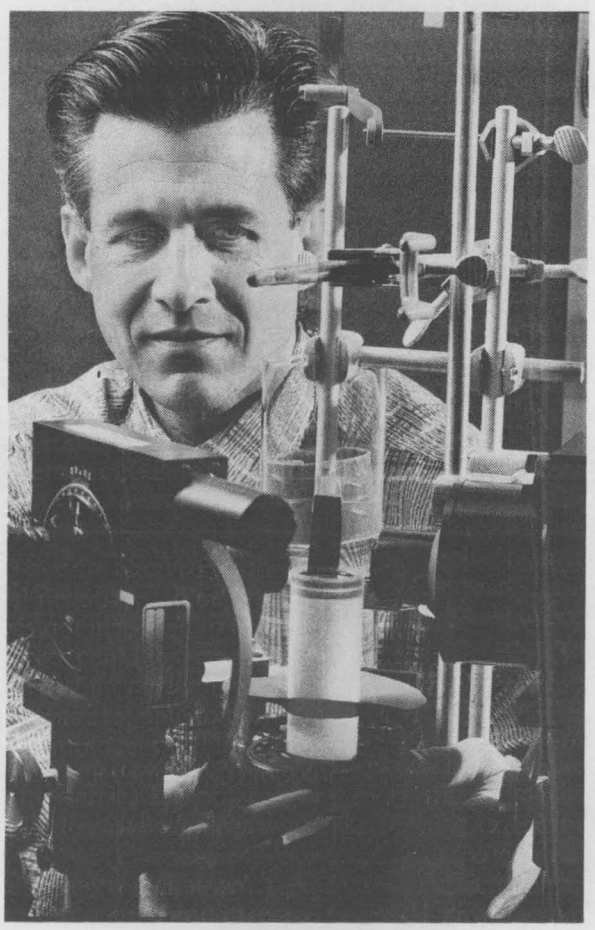
Sensor coating

(Continued from page 1)

porous crystalline pebbles used by the oil industry to separate out molecules of different sizes. Honeycombed by tiny tunnels, zeolites filter out molecules too big to pass through them, trap mid-sized ones, and allow passage of smaller ones.

Unlike some zeolites, the Sandia coating — a lightweight gel — must be created artificially. However, because the gel's molecules self-arrange themselves into a kind of molecular rug, no machinery of assemblage is necessary. Also, while a zeolite's pores never exceed a dimension of 13 angstroms, the pore sizes of the Sandia coating are controllable by scientists and can be made as large as 100 angstroms to accommodate a variety of molecules.

While such artificial coatings long have been desired, scientists could not produce an interior network of tiny tunnels that allowed large numbers of molecules to enter the surface and exit the base of the film, rather than be halted at dead ends. Another problem — not solved until development of the coating — was making it seamless, so that molecules intended for inspection could not evade the sieve by flowing through cracks in it.



EYE ON HIS WORK — Sandia scientist Jeff Brinker observes characteristics of a gel that helped lead to development of a super-sensitive coating. The coating increases sensor sensitivity approximately 500 times without a perceptible increase in sensor size.

Better than stitching

In the Sandia method, the gel is made seamless by continually removing a substrate from a liquid bath. The gel — a nanocomposite — forms seamlessly as water and alcohol evaporate.

Earlier methods, which allowed the gel to dry on sections of substrates, formed fractured borders that made the gel useless as a sieve.

Seen by transmission electron microscope, the coating's molecular structure resembles a grandma's endless knitted blanket with never a stitch missed.

The continuous formation of a kind of cubic arrangement of molecules guarantees that a sizable number of pores accessible at the film's surface will pass completely through it.

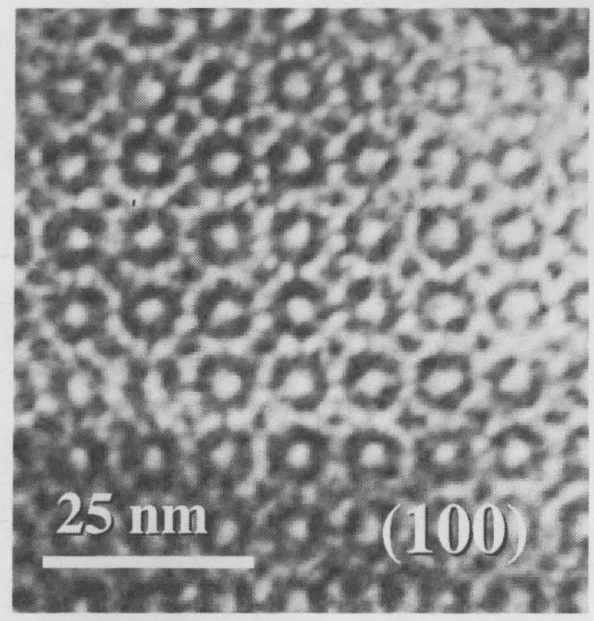
"Everything depends on the initial surfactant [surface-acting molecular] concentration we choose," says Jeff.

Circling the wagons

The materials of the gel self-assemble due to the two-sided organic surfactant molecules.

One side is hydrophobic (hates water) and the other hydrophilic (loves it). In a solution of water and silica, small groups of organic molecules perform tiny versions of circling the wagon trains, arranging their water-loving ends to face outward in wheel-like shapes. The circles form an ordered array. The water-phobic ends remain within the circles, somewhat like spokes and hub. Silica in solution, attracted by the circular rims, surrounds them like tires encircling wheels. After this self-assembly process, the organics are removed by heating (pyrolysis), leaving an inorganic silica fossil with a periodic arrangement of pores where the organics used to be.

The work is a collaboration between Jeff, Celeste Drewien (1822), Mark Anderson (formerly at Sandia, now at 3M), UNM students Yungfeng Lu and Rahul Ganguli, and Professors Bruce Dunn and Jeff Zink at the University of California at Los Angeles.



GRANDMA'S KNITTING? — No, it's a transmission electron microscope's image of the square, periodic arrangement of pores achieved in Sandia's new less-than-a-micron-thin coating. According to principal investigator Jeff Brinker, such coatings increase the porosity and, as a result, the sensitivity of minisensors, and can aid in separating and catalyzing materials.

Feedback

Q: A recent Feedback indicated that both exempt and nonexempt employees could not take vacation in one-hour increments. Represented employees (who are also, by definition, nonexempt) can take vacation in one-hour increments as they do not get the "freebie" of being able to take up to two hours off and not count it.

A: The April 1997 Feedback indicated that employers could not allow one- or two-hour absences for exempt employees. In order to be fair but yet follow the Fair Labor Standards Act, Sandia decided to apply a half-day (4- or 4-½-hour) vacation allowance to exempt and nonexempt employees. You are correct in stating that represented employees are allowed to take vacation in one-hour increments. They are allowed to do so because this is a [union] negotiated item. The April 1997 Feedback was not intended to indicate that represented employees could take vacation only in half-day increments but rather to explain that the half-day option was available to both exempt and nonexempt employees.

— Larry Clevenger, MD (3300)

Q: How will flextime be treated with the new vacation policy?

A: The flextime policy has not changed because of the new vacation accrual and carryover policy. For further flextime policy information, please refer to Sandia Laboratories Policy 4120, "Overtime, Flextime, and Extended Workweeks."

— Larry Clevenger, M.D. (3300)

Robotics Expo finds Congress, business want a major US intelligent-machines industry

By Chris Miller

NASA's Sojourner robot, which Sandia helped deliver to the Martian surface this past summer, is akin to the Wright Brothers' first airplane when viewed in the context of where the robotics and intelligent-machines industry is headed, says the space agency's chief technical officer.

"We're really in the embryonic stage of using robotics for exploration beyond Earth orbit," said Sam Venneri in his outline of NASA's vision for robotics during a panel discussion at the Congressional Expo on Intelligent Machines last week on Capitol Hill. "We look at intelligent machines and robotics as an integral part of our future."

Sponsored jointly by Sandia, DOE, and the Robotics and Intelligent Machines Cooperative Council (RIMCC), the Sept. 30 Expo was held at the request of the Manufacturing Task Forces of the US House and Senate to inform Congress about the developing intelligent-machines industry and its importance to the nation's competitiveness. The Expo included two panel discussions, several lunch speakers, an evening reception hosted by Lockheed Martin Corp., and robotics and intelligent machines demonstrations throughout the day.

Expo attracts scores of lawmakers

Situated in the Cannon House Office Building across the street from the US Capitol, the event attracted scores of congresspeople and their staffs, other government agency representatives, industry people, and Washington-area media.

"I think the Expo certainly exceeded everyone's expectations," said Labs Director and President C. Paul Robinson. "This is the second major event Sandia has brought to Washington, and we are seeing the effectiveness of bringing the mountain to Mohammed."

This past June at the Capital Hilton, Sandia presented a daylong event, "Revolution in Engineering," to demonstrate how Sandia is using high-performance computing to revolutionize the engineering process.

Venneri's comments about intelligent machines were echoed by Vic Reis, Assistant Secretary of Energy for Defense Programs. Reis said intelligent machines will play an increasingly vital role in stockpile stewardship.

"The role of intelligent machines in nuclear-weapon life-cycle engineering will be indispensable to the success of the program," he said. "Intelligent machines can and will provide weapon dismantlement, component storage and retrieval, management of hazardous materials, as well as flexible manufacturing or small-lot production of vital weapons components."

The Expo not only generated a lot of interest among congresspeople and their staffs, it also appeared to produce significant support for a national initiative to create a new intelligent-machines industry.

"The United States must not lose this opportunity," said Rep. Bob Franks of New Jersey during a panel discussion. "We must take steps now to assure a leadership position in the new broad-based intelligent-machines industry."

Added Rep. Marty Meehan of Massachusetts, "We on the manufacturing task forces will continue to work with you hand in hand."

Sen. Pete Domenici of New Mexico spoke at the beginning of the day's events. He said the federal government must lend its support to the creation of a strong robotics and intelligent-machines industry. He said Sandia's Robotic Manufacturing Science and Engineering Laboratory (RMSEL) is a logical location for a national testbed where government, industry, and academia can work together on research and development to commercialize new robotics and intelligent-machines products.

Industry will change world, says Domenici

Domenici said the robotics industry is poised to quickly rival the enormous and ever-expanding telecommunications industry.

"If you want to change the workplace for the better, if you want to increase productivity, if you want to create better jobs, if you want to create more goods and services for more people, then put robotics right up there with telecommunications as something that will change the world for the better," he said.

Domenici said the idea that robotics will take away jobs is a misconception. The US and Japan, the two nations that produce the most robots and intelligent machines, also have among the world's lowest unemployment rates and strongest economies, he said.

Japan currently leads the world in the production of robotic machines. The US, however, leads in key technologies that create intelligent machines when integrated — computers and software, sensors, controls, and precision machines.

Brian Carlisle, CEO and President of ADEPT Technologies, concurred that many new high-skilled, high-paying jobs will be created through the expansion of such an industry. He said intelligent machines will have a particularly strong impact on manufacturing, which makes up 17 percent of the nation's gross national product, health care (15 percent of GNP), and defense (5 percent of GNP). He said they will also help the food industry, and even provide care for the infirm and disabled.

"We have a strong technical base for intelligent machines — the US leads the world in computing, software, and modeling," Carlisle said. "We need to integrate those with sensors and precision mechanisms that can sense their environment, reason, and act on it."

Carlisle said the government can aid by funding research and development, passing legislation that enables collaboration among researchers, and establishing testbeds where collaborators can "prove out high-risk applications."

Brian Turner, President of the Work and Technology Institute, praised the involvement of labor in the early stages of the national initiative. "This is the first such technology initiative that has explicitly included labor in its structure," he said.

NASA's Venneri predicted that 10 years from now for its robotics and intelligent machines the space agency will be contracting with a US company that currently does not exist. He said intelligent machines will do things humans can't do, reduce risks, and potentially reduce the cost of space exploration.

"We're looking for fast-track ideas that will provide the vision we need," Venneri said. "We are interested in pushing the envelope to create the technology we require."

Bingaman proposes follow-up meeting

During a noon address, Sen. Jeff Bingaman of New Mexico said the US must "move forward aggressively to seize the future of the robotics and intelligent-machines industry."

Bingaman recommended that RIMCC should organize a follow-up meeting involving the top leadership of DOE, NASA, DoD, and National Institute of Standards and Technology (NIST). The goal would be to persuade those agencies to work out a high-level memorandum of understanding among themselves so that the experts in each agency have the "mandate and the high-level direction needed to get to work on the national robotics and intelligent machines initiative as quickly as possible," he said.

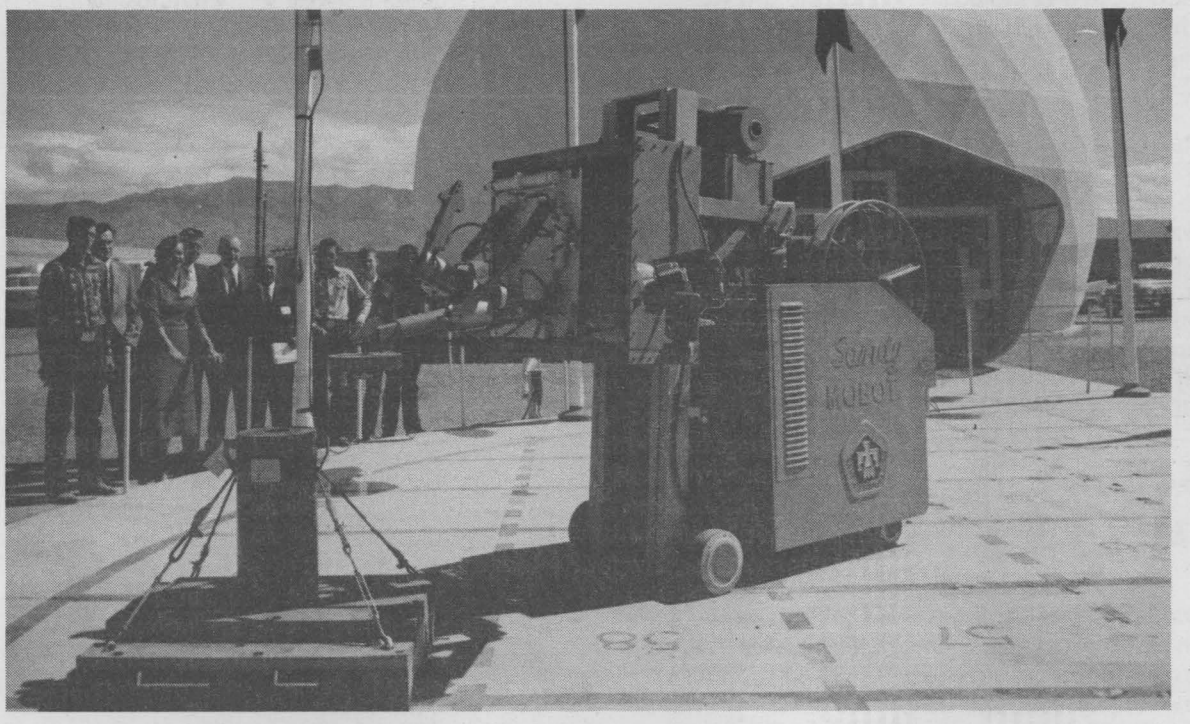
Pat Eicker, Director of Intelligent Systems and Robotics Center 9600, said it's becoming increasingly clear the message he has helped spread over the past year as president of RIMCC is beginning to take hold. Pat organized the National Needs Workshop on Robotics last October in Albuquerque. The 60 robotics experts issued a white paper calling for a national initiative to create a strong robotics and intelligent-machines industry.

"We need to keep pushing to get these agencies together," Pat said. "Our next step must be the creation of a roadmap to keep things moving in the right direction. It will be up to Sandia to push that effort, and that's something we will begin immediately."

Joseph Engelberger, Chairman and CEO of HelpMate Robotics, Inc., and considered the "father of robotics" because of his pioneering work, emphasized collaboration.

If the US does not act quickly, he warned, Japan could become the world leader in intelligent machines by integrating technologies developed in the US.

"I'm not a Japan basher," Engelberger said. "I say bully for the Japanese and shame on us. We have the capability in both technology and people."



YOU'VE COME A LONG WAY, SANDY — Sandia's first foray into robotics, Sandy Mobot, was featured at the 1959 New Mexico State Fair along with the geodesic dome (background) that is now located northeast of the Sandia/New Mexico Cafeteria. Labs engineers designed the remote-controlled mobile robot in 1958 to work in radioactive environments at the new Sandia Engineering Reactor Facility (SERF), one of the Labs' first nuclear research reactors. After Sandy Mobot, it was several years before Sandia initiated its major robotics research program. Today "intelligent machines" are being used to perform tasks as wide ranging as planetary exploration, weapon dismantlement, environmental cleanup, manufacturing, and, still, remote handling of radioactive materials. SERF began operation in 1962 and was dismantled in 1969 when the still-operational Annular Core Research Reactor was commissioned. (Photo courtesy of Corporate History Archives)

Ruth David, CIA's 'Q,' talks technology trends among spies

Editor's Note: In conjunction with the 50th anniversary of the CIA on Sept. 18, the Christian Science Monitor *published this feature about Sandian Ruth David, on temporary assignment as deputy director of the CIA for science and technology. We thought Sandia employees would enjoy it, and the* Monitor *gave us permission to reprint it. Ruth was Director of Sandia's Advanced Information Technologies Center at the time of her CIA appointment in 1995.*

By Faye Bowers
Staff writer of The Christian Science Monitor

Ruth David has her dream job. She is the CIA's equivalent to "Q" in the James Bond adventures — the techie who conceals Stinger missiles behind the headlights in Bond's BMW or designs a pen that can morph into a Class 4 grenade.

"I actually used to watch all the James Bond movies and think what a fun job that would be," she says. "It has to be every techie's ideal job."


RUTH DAVID

The demure Dr. David is the CIA's deputy director for science and technology. She is in charge of developing everything from sophisticated eavesdropping satellites to the fancy gadgets and disguises that "Q" offers 007 at the onset of a new assignment.

Her directorate — one of four within the CIA — has become the largest. Its high-tech wizardry allows the US to peer from space into other countries or intercept their radio and telephone communications. It also uses most of the intelligence community's estimated $28 billion annual budget.

On the eve of the spy agency's 50th anniversary, David talked with the *Monitor* about the changes and challenges in the agency's uses of technology. Of course, she has to protect "sources and methods" and declines to say much about the latest gizmos.

And the CIA's "Q" doesn't fit the Ian Flemming portrait. Youthful and quick to laugh, she looks more like a trenchcoat's femme fatale in her brown silk suit than a lab coat techie. The Kansas native holds undergraduate and two advanced degrees in electrical engineering. And she's served in several high-level positions — mainly in advanced information systems — at Sandia National Laboratories in Albuquerque, N.M.

David is parlaying that experience into meeting one of the biggest challenges she sees at the CIA — the speed at which technology is developing and the way that is driving change within the agency — especially in terms of creating partnerships with private business. Post-Cold War budget constraints and a shift from government-driven technological advances to industry-led are forcing the agency to develop new strategies. The key word for her these days is "leverage." "When we started in the intelligence business, the government was very much in the forefront of driving state of the art," she says. "Industry is very much in the forefront [today]."

"I actually used to watch all the James Bond movies and think what a fun job that would be."

That means the agency needs a constant technology infusion, and it requires "us to have our tentacles in the commercial marketplace everywhere," David says.

She says that in the early days at the agency, they could build a capability, and it would be used for a decade or two. Today, she says, "we're lucky if we get a year or two."

She cites the agency's first real technological breakthrough — the U-2 spy plane — as one example. Originally developed to fly over the Soviet Union to spy on its military prowess, the U-2 — publicly humiliated when the Soviets shot down and captured pilot Frances Gary Powers in 1960 and heralded when it detected the Soviet build-up of missiles in Cuba in 1962 — was used for 20 years to take photographs from 80,000 feet.

Spy planes have largely been replaced by satellites, which can instantly transmit digital imagery into the cockpits of warplanes and war rooms anywhere. From 150 miles up, they reportedly can see details as minute as different musical instruments carried by a parading Chinese military band.

In addition to satellite technology, David's department deals with the whole area of information technology, which she says touches every phase of their business — from designing methods of collection, to processing, analysis, and to dissemination of their reports to their clients — mainly the president and Congress.

A huge challenge to the agency, she says, is dealing with the exploding information environment out there. This is an area where she's found that they can successfully leverage capabilities from the private sector.

For example, the agency has collected information from open media sources for its full 50 years. The steadily increasing challenge they face is the glut of information available — especially on the Internet, where a key word search might elicit 500,000 responses.

The agency has found that it can take advantage of commercial news services available on the Internet that create specific profiles with key word searches and distinctive context. The agency takes those capabilities and builds on them — devising new search methods for character-based foreign languages, like Asian and Arabic, for example.

"We are increasingly focused on using collaborative technologies, " David says.

"Our philosophy is if we can buy it, we buy it."

David says they also leverage available technology on the operations side — creating gadgets for agents in the field — when they can. But this is an area she can't discuss in detail, particularly because "there is probably still some part of the world in which a gadget is still useful."

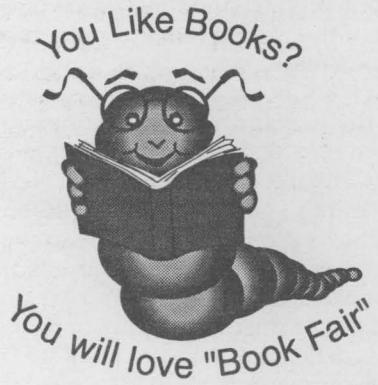
Ditto for disguises. "We actually don't retire disguises," she says. "One of the challenges we face is that the state of technology is so variable in different parts of the world that we retire very few capabilities. I think we can be very naive in assuming that the rest of the world looks like the US in terms of technical ability. Trust me, it doesn't!"

But she will — with some hearty laughs — compare what they do to the movies. "We actually share technology," she says. "There are techniques used in the movies that are very relevant."

While David won't directly confirm it, former agents say the CIA does use rubber masks like the one worn by actor Tom Cruise to make him look like his boss, Christopher Walken, in the recent spy movie, "Mission Impossible."

Last month, CIA agents managed to sneak a North Korean defector out of Egypt. "The government flew him out of Cairo under an assumed name with false documents," says a former CIA case officer. "They obviously had to disguise him somehow."

ECP/United Way Kick Off Event



Reading's Fun BOOK FAIR

- ✓ Purchase high quality books at discount prices
- ✓ You will be supporting your community
- ✓ Pay with Visa, MC, Discover, check (or postdated checks)
- ✓ They make great gifts — 40% to 70% off publisher's prices

Book Fair schedule

Monday, Oct. 20	Tuesday, Oct. 21	Wednesday, Oct. 22	Thursday, Oct. 23
7:30 a.m.-5 p.m. Bldg. 800 lobby	7:30 a.m.-5 p.m. Bldg. 800 lobby	7:30 a.m.-5 p.m. Bldg. 800 lobby	7:30 a.m.-5 p.m. Bldg. 800 lobby
7:30 a.m.-5 p.m. TTC (Bldg. 825) lobby	7:30 a.m.-5 p.m. TTC (Bldg. 825) lobby	11 a.m.-1 p.m. Cafeteria (Bldg. 861) conference room	11 a.m.-1 p.m. Cafeteria (Bldg. 861) conference room

Book fair returns to kick off 1997 ECP/United Way campaign

The Reading's Fun Book Fair returns to Sandia Oct. 20-23 to kick off the 1997 Employee Contribution Plan/United Way (ECP/UW) campaign, which raises funds for United Way of Central New Mexico and health and human service organizations anywhere in the world.

Last year at the 1996 ECP/UW kickoff book fair, more than 1,500 Sandia employees purchased approximately $60,000 worth of books offered at discounts of up to 70 percent by Reading's Fun Ltd. A percentage of the profits from the sale were donated in the form of books to United Way agencies to help in their literacy programs — one book donated for every 10 sold.

All books were hardbound, high-quality new or recent editions stamped with the words "This book donated by the employees of Sandia National Laboratories." Approximately 600 books were delivered to United Way of Central New Mexico agencies in March 1997.

The 1997 ECP/UW campaign calendar of events: Executive Management Campaign (Small Staff), Sept. 22-30; Management Leadership Campaign (directors, managers, team supervisors, and union leaders), Oct. 6-17; Kickoff Event for General Campaign (Book Fair), Oct. 20-23; and General Campaign, Oct. 27-Nov. 7.

Passion for technology can outweigh lack of business experience, says start-up Sandia entrepreneur

By Bill Murphy

Tim Cooley has a message for all would-be, maybe, and thinking-about-it Sandia entrepreneurs: dive in. The water may not be warm, exactly, but it is exhilarating.

Tim (Security Technology Dept. 5838), up to his hips in the intricacies of forging a new company (see "Labs' spin-off high tech company incorporated," on next page) was project manager of a team that spent several years developing and refining an innovative 3-D, laser-based video range-imaging system for a DOE customer.

A couple of years ago, DOE decided the technology, a device that integrates aspects of radar and video capabilities for use in security applications, should be commercialized. Completion of the project brought its funding to a close. There would be no more funding to refine the technology and extend its capabilities into new applications.

After spending several years of his life shepherding the technology from a concept to a working prototype, Tim wasn't about to let a little snag like funding stop the momentum he and his team had generated. In addition, the large number of outside applications for the technology strongly pointed to consideration of opportunities in the commercial world. If the technology was destined for the marketplace, Tim decided he'd start a company, get a license, and bring the technology to the market himself.

Enter Tim Cooley, entrepreneur.

Tim originally entered the entrepreneurial arena by working with Leland Traylor (4231) in what was then called the New Ventures Initiative and is now — under Jesus Martinez (4221) — the New Ventures Program (NVP). The program was launched to help move technologies from the Labs to the marketplace and to help Sandians learn the ins and outs of the business world. Tim also worked right from the start with Technology Ventures Corporation (TVC), established in 1993 by Lockheed Martin to provide assistance to aspiring laboratories entrepreneurs, with a special focus on helping new start-ups find investment capital.

"My technology transfer experience has probably taken longer than people would expect," says Tim, "but I was somewhat sidetracked because I was waiting on an active kidney transplant list. I had a transplant last year."

His medical situation, to say the least, preoccupied Tim for some months, but it didn't distract him from his focus; he believed in the technology he and his team had sweated over for a thousand days — and nights — in a little wind-rattled trailer out at the dusty video range site. He believed in this technology and was determined to get it to the marketplace.

It wasn't easy, though, making the transition from Labs employee to entrepreneur.

"It's a very ambiguous, difficult transition for a Sandia engineer to bridge the gulf to the private sector of business, to commercialize a technology," he says. "You almost, for all practical purposes, need an MBA [master's of business administration]. Sandia's New Venturtes Program folks and TVC work hard to coach you through the process. Actually, by the time you go through this process, you almost get an MBA by experience."

BEST-LAID PLANS — Tim Cooley, center, TVC President Sherman McCorkle, left, and TVC project manager George Friberg, right, discuss business strategies. Looking on is Jesus Martinez of Sandia's New Ventures Program Dept. 4221. TVC is working with Tim to secure risk capital investment in his start-up business, Creative Vision Technologies, Inc.

No simple thing

Starting a business based on a Labs technology is no simple thing: It takes a lot of time and energy, and the process is not initially understood by prospective Sandia entrepreneurs, Tim says.

"It's very daunting to think about making that transition, but there are many engineers here at Sandia who could do the same thing, who would do the same thing if they thought they could succeed. I think they're hesitant simply because it seems like an ambiguous process and they do not know about the resources that are available."

Unknown, but not unknowable, aspiring Sandia business people, Tim fervently believes, can learn the ropes, compete, and succeed in an entrepreneurial role. Many Sandia entrepreneurial start-ups have already left the Labs and are successfully operating in the Albuquerque area.

In pursuing the commercial route, Tim concedes, Labs engineers often find themselves up against far bigger players interested in licensing Sandia technologies.

Under current licensing policy, guided by DOE's "fairness of opportunity" doctrine, Sandia entrepreneurs find it difficult (verging on impossible) to get an exclusive license to a technology. The guiding principle of "fairness of opportunity" is that if a technology was developed with taxpayer money, then anyone who meets certain criteria ought to be able to license it.

From Tim's perspective, the problem of fairness of opportunity is that to secure investment for your company, you need a strong intellectual property position. Unless you have that, you are considered "high-risk" in the eyes of venture capitalists. Without an exclusive license — even for a small niche of a larger market — you may not get sufficient funding. If you proceed without the cover provided by an exclusive license, you may be just breaking the market for someone else to overtake you and put you out of business.

"In a nutshell, that's the problem," says Tim, who adds that he would like to see the fairness of opportunity policy changed to make it easier for Labs-based entrepreneurs to secure exclusive licenses. To Tim's way of thinking, changing licensing rules would ultimately lead to increased and greater commercialization success of taxpayer-funded research and development by Sandia

(Continued on next page)

Labs entrepreneurs can transform New Mexico economy

During his 18 years of experience in the line at Sandia, Tim Cooley has become strongly convinced of the caliber of Sandia's technical competence. He believes "without a doubt" that Labs' scientists and engineers are capable of producing marketplace-viable technologies at a clip that will sustain the spin-off of 30 or more new high-technology companies per year.

"Think of the transforming effect that would have on the New Mexico economy," he says. "Think of what it would mean for New Mexico if you had 30-plus high-tech companies coming out of Sandia every year, not to mention the companies coming out of Los Alamos. When coupled with the necessary capital, this area would soon rival Silicon Valley in terms of quality and innovation of technology that would be available."

Tim says he would like to see the Labs become more proactive in serving as an "incubator" of high-tech companies, which he sees as a mission every bit as significant for the nation's security as its weapons work. "Despite the availability of technologies for licensing, it is still a long process for the Sandia entrepreneur, and once a high technology company is spun out of the Labs, it remains vulnerable for some time.

"If only we would incubate and care for these infant high-tech companies when they're most vulnerable, we would substantially alter the future of New Mexico and this country. Sandia and Los Alamos entrepreneurs are the single largest source of high technology companies for New Mexico. We're in a global economy, and the prosperity of our people and country is dependent on our rate of innovation and commercialization. We need the best technology, and we need it commercialized by American companies.

"In the 21st century, technology will be the ultimate currency," Tim argues.

"Sandia and Los Alamos," he says, "have the ability to play the unique role of creating that currency for our citizens by incubating entrepreneurs out of the Labs. Believe me, they [Labs-based entrepreneurs] will be successful if they are given the chance and supported in their new role."

TVC workshop aims sights at aspiring entrepreneurs

Technology Ventures Corporation (TVC), in preparation for its 1998 Equity Capital Symposium, will hold an entrepreneur's workshop on Oct. 16 for technology-based companies seeking equity funding and for Sandians who are considering starting their own companies based on Labs technologies. The workshop will be held at the Albuquerque Marriott, Thursday, Oct. 16, from 8:30-11 a.m.

The New Mexico Equity Capital Symposium is an annual forum for investors nationwide to review technology-based investment opportunities in New Mexico. At the Symposium, 12 to 15 entrepreneurs give presentations with the goal of gaining funding for their ventures. The Oct. 16 workshop is the first of several events TVC provides to support entrepreneurs with technology-based companies and assist them in preparing for the Symposium's investor forum.

A nonprofit organization established in 1993 by Lockheed Martin, TVC serves as a bridge between the public and private sectors for the commercialization of technologies developed at the national laboratories and regional research universities.

The symposium has been presented by TVC since 1994 as part of its mission to contribute to economic development in New Mexico's technology sector. Companies requesting consideration as TVC client companies and presenters at the May 1998 Symposium may submit a business plan. At the workshop, TVC staff will outline what they look for in a business plan and offer guidance on how to become a presenter. TVC will also review what resources and advisors are available to assist aspiring TVC clients. Symposium presenters will be selected in January. TVC will work closely with each presenter providing necessary assistance in preparation of funding proposals for investors attending the Symposium.

Federal Aviation Administration names Sandia, eight universities to pilot new 'Center of Excellence' for airworthiness assurance

By John German

The Federal Aviation Administration has selected Sandia and eight universities to pilot its new Airworthiness Assurance "Center of Excellence," a research and development partnership intended to bring government, university, and airline-industry R&D resources to bear on improved commercial aircraft safety.

The Center focuses on six areas the FAA has identified as critical to its aircraft safety mission: aircraft maintenance, inspection and repair techniques, crashworthiness, propulsion and fuel system safety technologies, landing gear safety, and advanced materials development.

The nine-member Center of Excellence crew includes Iowa State, Ohio State, Arizona State, Wichita State, University of Maryland, University of Dayton, Northwestern, UCLA, and Sandia. Each organization will provide a member to the Center of Excellence board of directors. Sandia's representative is Dick Perry of Airworthiness Assurance Dept. 9752.

Iowa State's Bill Shurtleff, who retired from Sandia Sept. 26 as Dept. 9752 Manager, will serve as the Center's director.

New mission areas

Sandia's responsibilities will be carried out through its Airworthiness Assurance Nondestructive Inspection Validation Center (AANC), located near the Albuquerque International Sunport. The AANC was created at Sandia in 1991.

Center of Excellence activities likely will go beyond the AANC's traditional realm of developing and validating technologies for the nondestructive structural inspection and repair of commercial aircraft, says Dick.

Sandia's role will include independently evaluating research projects for potential usefulness, providing samples of aircraft structural defects in support of Center research, assisting the FAA with effectiveness and reliability assessments for new technologies, and transferring technologies from Center laboratories to the aviation industry.

"Sandia's operations will remain pretty much the same, with a few additional program areas," he says. "We'll be receiving our usual AANC program funds directly from the FAA as well as some funding through the Center of Excellence for independent technical validation work.

"There also is the potential to apply AANC expertise and technologies to aircraft propulsion and to rotary-wing aircraft, helicopters, and military aircraft," he adds.

The Center will be financed through a 50-50 cost-sharing arrangement between the FAA and the academic institutions, which have received pledges from various airline industry partners. To ensure the Center's long-term viability, the FAA intends to provide a minimum of $500,000 per year for the first three years, with $713,000 in start-up funding for FY98. The Center of Excellence will strive to become self-sufficient in 10 years, relying on the support of private industry, university research grants, and other private and government funding sources.

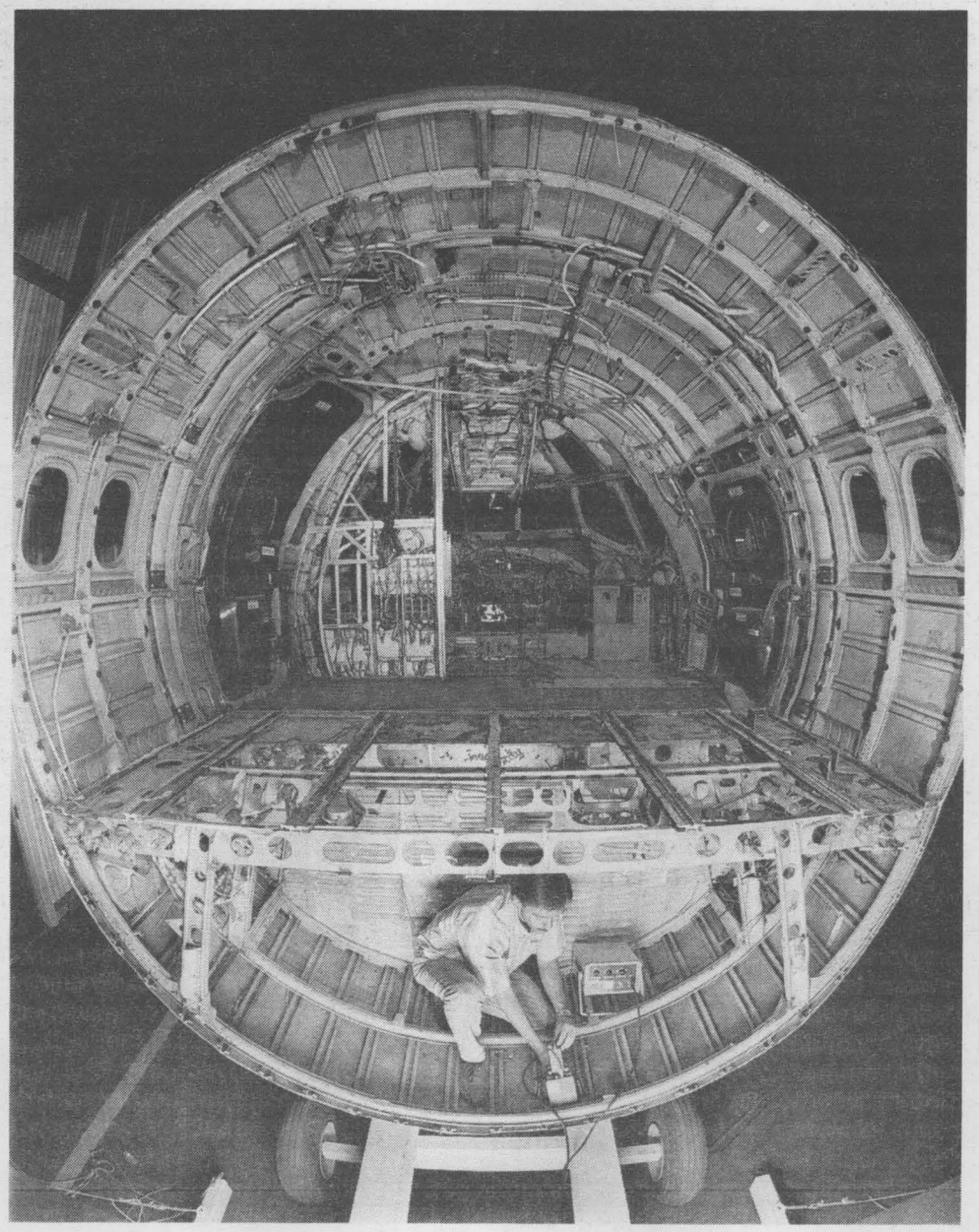
A unique contracting mechanism also affords the FAA the flexibility to award the Center up to $100 million in direct funding for specific engineering development and rapid prototyping projects.

Advancing aircraft safety

The FAA oversees several other Centers of Excellence contributing to improvements in runway and tarmac surfaces, improved operations research (including air traffic control), and safer aircraft structures. Since 1992, when the first FAA Center of Excellence was established, the FAA and its industry partners have invested more than $13 million in aviation research and development.

Centers of Excellence are established through a competitive process. To be selected, an institution must demonstrate an ability to undertake technological R&D activities, serve regional needs for improved air transportation, make research resources available, provide leadership in solving air transportation issues, and disseminate research results.

"In this Center of Excellence, some of the leading minds in academia, industry, and government will advance aviation technology into the 21st century and beyond," said FAA Administrator Jane Garvey in announcing the new Center last week.



DOWN BELOW — Mike Valley (9752) inspects fuselage skin from the cargo hold of a dismantled DC-9 at the Sandia/FAA Airworthiness Assurance Nondestructive Inspection Validation Center (AANC). The AANC develops new nondestructive inspection techniques for commercial aircraft. The FAA has selected the AANC and eight universities to lead its new Airworthiness Assurance Center of Excellence. (Photo by Randy Montoya)

(Continued from preceding page)

entrepreneurs.

Under the current commercialization practices, "you have Sandia entrepreneurs and you have the existing business world," Tim says. "Sandia entrepreneurs are generally inexperienced at business. They have the disadvantage of not having a company infrastructure. They do not have marketing resources. They do not, most of all, have financial resources. They do have the advantage of understanding their technology better."

On the other hand, he says, private companies that apply for a license typically have the advantage of a wealth of practical business experience. They have the advantage of an existing corporate infrastructure that the start-up Sandia entrepreneur has to build from the ground up. In the private sector, established businesses have marketing resources. They have distribution channels. They already have customers. They are a known business entity with sources of capital.

Tim makes it sound as if the deck is formidably stacked against Sandia entrepreneurs. But Sandians have an ace in the hole.

"I would say the difference is passion," Tim says, "and this is always overlooked and never can be quantified. The Sandia entrepreneur often has years of experience in his or her field. He is the one who has developed the technology, who persisted against all obstacles and was successful. He understands the technology and its limitations and capabilities.

"Most of all, the Sandia entrepreneur has that special vision of its role in the future commercial world as a new product. All of this happened primarily because of his or her passion for the technology — a passion that many times goes beyond the call of duty. When this passion is coupled with sufficient investment capital and a good business plan, a strongly motivated and significant business enterprise is forged.

"If I were to bet my money on who would succeed at commercializing a technology, I would go with the small Sandia entrepreneurial firm. Why? You see, as a Sandia entrepreneur you face many challenges and your risk is substantial. To start a business takes lots of time and money. You even risk your job. However, the Entrepreneurial Separation for Technology Transfer as a leave of absence provides a door to return to the Labs.

"All things considered, the experience of starting your own high technology company is the ultimate high-growth experience, and taking a new company to an Initial Public Offering (IPO) can be very financially rewarding as well."

Labs' spin-off high tech company incorporated

In July, Creative Vision Technologies was formally incorporated to commercialize the recent breakthroughs in high performance 3-D image acquisition.

Tim Cooley, the founder and President of CVT, was project leader in this field for DOE's Office of Safeguards and Security (OSS) over the last several years and sees opportunities beyond the original DOE security application the technology was developed for. A few of these applications include machine/industrial vision, robotics, and 3-D visualization.

A joint venture with Laser Ablation Systems, Inc., also of New Mexico, sprang out of the Equity Capital Symposium last May to incorporate CVT's 3D vision technology to provide imaging and guidance for the laser paint stripping system being developed by Laser Ablation Systems for commercial aircraft.

Sandia National Laboratories

President & Laboratories Director
C. Paul Robinson 1

Executive Vice President & Deputy Director
John Crawford 2

- VP 15000 Senior Advisor — Paul Stanford
  - 15100 Contracts — David Goldheim
- VP 11000 General Counsel & Corporate Secretary — Bob Kestenbaum
- 12100 Executive Staff — Ron Detry
- 12300 Surety Assessment — Bill Nickell
- 12600 Public Relations & Communications — Don Carson
- 12700 Ethics — Charles Tapp
- 12800 Audit — Bill Hollis

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  - 2100 New Mexico Weapon Systems Engineering — Ron Andreas
  - 2200 California Weapons Systems Engineering — Jim Wright
  - 2300 Electronic Subsystems — David Williams
  - 2400 Aerospace Systems Development — Don Rigali
  - 2500 Exploratory Military Systems — Carolyne Hart
  - 2600 Surety Components & Instrumentation — John Stichman
- **VP 5000 National Security Programs — Roger Hagengruber**
  - 5100 National Security Sector Planning & Operations — Jim Ney
  - 5300 International Security Programs Coordination — Tom Sellers
  - 5400 Strategic Studies and Operational Analysis — Steve Rottler
  - 5700 Monitoring Systems & Technology — James Kelsey
  - 5800 Security Systems & Technology — Dennis Miyoshi
  - 5900 Systems Assessment & Research — Dave Nokes
- **VP 14000 Defense Programs Products & Services — Gary Beeler**
  - 14100 Production Integration — Gary Beeler, Actg.
  - 14300 Production Management — Lew Butler
  - 14400 Production Operations — Lenny Martinez
  - 14700 Military Liaison & Knowledge Preservation — Carol Yarnall
- **VP 1000 Physical Sciences & Components — Bob Eagan**
  - 1100 Physical & Chemical Sciences — Tom Picraux
  - 1200 Electronic Components — Ray Bair
  - 1300 Microelectronics & Photonics — Al Romig
  - 1400 Manufacturing Technologies — Jim Searcy
  - 1500 Energy Components Technology & Metrology — Bill Alzheimer
  - 1800 Materials & Process Sciences — Dan Arvizu
- **VP 3000 Human Resources — Charles Emery**
  - 3300 Benefits & Medical Services — Larry Clevenger
  - 3500 Human Resources Customer Service — Don Blanton
  - 3600 Diversity Leadership & Education Outreach — Miguel Robles
- **VP 6000 Energy, Environment, & Information Technology — Joan Woodard**
  - 6100 Geoscience & Environment — Dick Lynch
  - 6200 Energy & Critical Infrastructure — Sam Varnado
  - 6300 Systems Development & Engineering — Dori Ellis
  - 6400 Nuclear Energy Technology — Nestor Ortiz
  - 6500 Information System Engineering — Jim Rice
  - 6800 Nuclear Waste Management — Les Shephard
- **VP 7000 Laboratories Services — Lynn Jones**
  - 7400 Safeguards & Security — Frank Gallegos
  - 7500 Environment, Safety, & Health — Tom Blejwas
  - 7800 Operations & Engineering — Ed Graham
  - 7900 Facilities Management — Neil Hartwigsen
- **VP 8000 California Laboratory — Tom Hunter**
  - 8100 Exploratory Systems & Development Center — Mim John
  - 8200 Integrated Manufacturing Systems — Al West
  - 8300 Combustion & Physical Sciences Center — Bill McLean
  - 8400 National Security & Environmental Technologies — Rick Wayne
  - 8500 Human Resources & Site Operations — Pat Smith
  - 8700 Materials & Engineering Sciences — Mike Dyer
  - 8800 California Site Development — Paul Brewer
  - 8900 Distributed Information Systems — Dona Crawford
- **VP 9000 Systems, Science, & Technology — Gerry Yonas**
  - 9100 Engineering Sciences — Paul Hommert
  - 9200 Computation, Computers, & Math — Bill Camp
  - 9300 Applied Physics, Engineering, & Testing — Jim Powell
  - 9500 Pulsed Power Sciences — Don Cook
  - 9600 Intelligent Systems & Robotics — Pat Eicker
  - 9700 Design Evaluation & Test Technology — Kathleen McCaughey
  - 9800 Systems Analysis & Simulation — Joe Polito
- **VP 4000 Laboratory Development — Dan Hartley**
  - 4020 Reengineering & Performance Improvement — Dan Hartley, Actg.
  - 4030 Corporate Business Development — David Goldheim
  - 4200 Technology Partnerships & Commercialization — Warren Siemens
  - 4500 Corporate Planning & Strategic Business Development — Virgil Dugan
    - 4500 — Larry Bertholf
  - 4010 Chief Information Officer — Mike Eaton
  - 4400 Information Services — Melissa Murphy
  - 4600 Information Processes — Jack Jones
  - 4800 Information Systems Development — Paul Merillat, Actg.
  - 4900 Computing and Communication Systems — Herb Pitts
- **VP 10000 Business Management & CFO — Frank Figueroa**
  - 10200 Procurement — David Palmer
  - 10300 Financial Systems & Pension Funds — Ralph Bonner
  - 10500 Controller — Richard Shepardson
  - 10700 Supplier Relations Center — Leo Miranda

October 1997

It has been 18 months since we last published the Sandia organization chart. This new version includes a number of changes, some as recent as last week.

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

FOUR TIRES, Firestone FR 680's blackwalls, rated for 65K miles, 215/70R15, used 25,500 miles, $100. Diprima, 275-3479.

AUTUMN WOOD SOFA W/SLEEPER, loveseat, chair, oak, w/gray-& rust-colored cushions, $500 OBO. Sena, 873-1665.

TWIN-SIZE MATTRESS & BOX SPRING, $55 OBO; twin comforter, sham, $75; plaid cream/blue sofa, matching chair, w/otterman, $550/all. Campanozzi, 291-8677.

RIMS & TIRES, Ford Ranger stock, 15" x 8", 5 on 4.5 center, also fits Jeep, tires 31" x 10.5", $150. Duncan, 271-2718.

COLOR TV, Sharp, 13-in., not cable-ready, $70. Apodaca, 892-2435.

IBM APTIVA M71, 133MHz Pentium, mid-tower, 1.6GB HD, 16MB RAM, CD ROM, full MWave sound/voice/communication pkg., Win95, programs; $750. Everts, 822-1767.

REFRIGERATOR, 24 cu. ft., $600; washer, $125; dryer, $125; patio loungers, $35; exercise bike, $75; patio table & chairs, $150; microwave & cabinet, $135. Hall 298-6856.

BUNKBED, new, $250; entertainment center, $70; mountain bike, $90; oak dining table, 6 chairs, $450. Baca, 271-2962.

AUSTRALIAN OPOSSUM FUR JACKET, medium size, beautiful, $250. Powell, 877-4939, ask for Carroll, leave message.

HEALTHRIDER EXERCISER, $300. Smith, 865-7261.

METAL STORAGE SHED, 8-1/2'L x 9-1/2W x 6'H, no base, fair condition, help dismantle, you haul free. Swift, 821-5909.

MACINTOSH PPC 7200/90, 8/500/4X, OS8, $900; Macintosh SE20, $100; Kurta, 12 x 12 drawing pad, w/o pen, $100 OBO. Cohn, 275-8080.

CORDLESS TELEPHONE AND DIGITAL ANSWERING MACHINE, AT&T Model 5635, $30; Harmon Kardon amplifier (PM640) & Tuner (TU610), $75/both. Selleck, 232-4127.

NORDICTRACK, all-American version, w/performance scanner, hardly used, $125. Lucero, 255-9649.

EXERCYCLE, Tunturi Ergometer original, excellent condition, $150. McConnell, 883-6073.

PONY, beautiful brown & white pinto, perfect for kids, well trained, w/saddle or harness, $1,500. Reynolds, 281-9431.

NORDICTRACK PRO, w/speed monitor, excellent condition, best offer. Dosanjh, 293-4527.

GTO LIGHT COVERS, for '93-'94 Chev. Cavalier, $25. Noriega, 867-8287.

CAMERA: Yashica C, medium format (2-1/4 x 2-1/4), $100; tripod: Bogen 3001, w/3030 pan-tilt head, $115. Conway, 342-2405, leave message.

COMMUNITY GARAGE SALE, Academy North homes, Barstow/Harper NE area, (follow signs), Sat., Oct. 18, 8 a.m.-1 p.m. Torres, 822-8598.

WOOD COOKING STOVE, white, $300. Castillo, 864-1962.

WALL UNIT, honey-oak finish, excellent condition, $150. Kettleborough, 293-4503.

MACINTOSH PERFORMA 6116 CD COMPUTER, 24 MB, 1-meg L2 cache, 14-in. monitor, 700MB HD, $500. Quintana, 275-5842.

MAGNAVOX TV, 25-in., Sanyo 4-head VCR; both excellent, must sell together for $325; piano, Adam Schaaf upright, cherry wood, $500. Hultine, 888-4887.

LASER PRINTER, Epson Action 1500, 300 dpi, 2.5MB RAM, works great, needs new toner cartridge, $125. Atencio, 897-2189.

WALNUT ANTIQUE BEDROOM SET (1940s), double bed, chest, dresser/mirror, night stand, excellent condition, $1,990. Olona, 268-3604.

GAS DRYER, heavy-duty, Kenmore, new condition, almond, $90. Clay, 291-0884.

STEP TWO CLIMBER w/slide, plastic, excellent condition, $225. Marquez, 294-9014.

VGA MONITOR, Dell UltraScan, 15 in. 28-dot pitch, 1024 x 768 max res., excellent condition, $200 OBO. Noble, 271-8631.

GARAGE SALE, computer table, greeting cards & racks, 23.7 cu. ft. refrigerator, TVs, more, Sat. Oct. 11, 9 a.m.-4 p.m. Graham, 293-7302.

CAMPER JACKS, $199 new, asking $75; 2 auto seats: Ranger bench seat; 60/40 Ford seat; make offer; VW fiberglass hood, $30. Miller, 869-6383.

AIR CONDITIONER, $250; 12-spd., w/Campy gear, $200; single/twin jogger strollers; 286 computer/monitor. Swanson, 281-2735.

BABY FURNITURE: crib, $100; crib bedding, $15; swing, $20; infant seat, $10; baby bath, $10; clothes. Heermann, 298-2067.

PIANO, antique, upright, excellent condition, $800 OBO; large car-top carrier (6-ft. long by 3-ft. wide), $75 or $90 w/rack. Lucas, 899-6904.

BED TRACTION UNIT for neck, $20; Royal typewriter, manual, case, $15; solitaire board, 58 ways, $3; corn popper, $5. Smith, 299-7151.

SANDIA PEAK SKI PATROL SKI SWAP, check-in Oct. 31, 11 a.m.-7 p.m., sale Nov. 1, 9 a.m.-4 p.m., Nov. 2, 1-4 p.m., sell old/buy new. Haley, 281-2898.

AMERICAN AIRLINE VOUCHER, must use by 3/5/98, for $293, will sell for $250. Holmes, 292-0898.

SET OF RIMS, 13 x 7, McLiens & Roadsters, chrome w/gold; speakers, amp. Gonzales, 968-2186, pager.

BUCKET SEATS, from '85 Mustang, w/tracks, adjustable head rests, blue/gray cloth worn, no holes, $40/pair. Hanson, 299-6421.

NISSAN PARTS: tires, 4-31/1150; rear window, blue bench seat, dash, carpet, electric wire harness. Chavez, 861-0712.

GUITAR AMP, Peavey, 35-watt, reverb, headphone jack, powerful, versatile, portable, $100. Brown, 823-9155.

REFRIGERATOR, 3-1/2 cu. ft., like new, $75; microwave oven, 1,200-watt, GE, $50; humidifier, 2-1/2 gallon/day, $25. Ney, 332-8702.

APPLE PERFORMA 6200CD COMPUTER, 24MB RAM, 1GB HD, MS Office software, $800; NordicTrack Pro, $350; AerobicRider 2, $75. Savage, 890-4796.

CERAMIC WATER FILTER, for backpacking, Katadyn, removes giardia, other impurities to 0.2 microns, $295 new, asking $75. Koenig, 294-2264.

MITCHELL MANUALS, mechanic bibles, for wiring, vacuum, AC, brakes; both American & foreign makes, $2,500 OBO. Armijo, 254-9387.

FISH TANK, 30 gallons, stand, light hood, air pump, water filter, 40-lbs. natural gravel, plastic plants, $120. Herther, 298-4823.

CHANDELIER, 5-light, 21-in. diameter, antique brass finish, crystal pendants, $30; toddler's metal bed, white, 49 x 25, $8. Bentz, 857-0728.

COMPUTER PRINTER, HP Quiet Jet Plus, dot-matrix, cable, handbook, extra cartridge, paper, $40 OBO. Moss, 298-2643.

THE PRINCETON REVIEW GUIDE TO SAT: book w/2 audio cassettes, top condition, $10. Wagner, 823-9323.

TWO ELECTRIC TWIN BEDS, $300; king-size linen; 27-in. Magnavox TV, $100; entertainment center, $50. Beasley, 298-3398.

BABY FURNITURE: crib, $50; dressing/changing table, $25; portable playpen, $30. Thomas, 822-1923.

FORMAL DINING ROOM SUITE, burled walnut, 8 chairs, 2 leaves, lighted hutch w/beveled glass, $2,900. McGovern, 856-1385.

FORD EEC-IV COMPUTER, code scanner, never used, instruction manual, $20; JVC VCR, w/remote, everything works, $30. Dietz, 797-8735.

TORO LEAF BLOWER/ VAC, electric, heavy-duty model, too heavy for me, $40 OBO. Ryan, 298-8692.

SOLID MAHOGANY BREAKFRONT, Chippendale-style, secretary, $925; Victorian heart chair, $175; Victorian sofa, $900. Anderson, 296-3352.

QUEEN MAHOGANY RICE BED, 4-post canopy; 2 cherry nightstands, upright dresser, long dresser w/mirror, excellent condition, $1,200 firm. Maddox, 298-3815.

THREE-PIECE CHILDREN'S BUNKBED SET, red, bottom bunk folds into couch/full-size bed, entertainment center, w/shelves & drawers, 3-dresser drawer, $300. Chavez, 344-6159.

BABY ITEMS: Play Yard, battery-operated swing/cradle, jumper seat, sling-type carrier, portable high chair, crib bedding, gate, more. Cocain, 281-2282.

GOLF CLUBS, Bertha irons, 3-SW, R-flex graphite, $625 (cost $1,300); Ti drivers, R-flex, Taylor-made 10.5, $205; Callaway 10.0, $300. Feng, 275-6639.

GREEN IGUANA, large male, very friendly, litter-box trained, all accessories, to excellent home only, $100. Wilson, 286-8192.

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 (nrcampa@sandia.gov). Call Nancy at 844-7522 with questions. 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 8½- 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.

SEVENTH GUEST CD ROM, adventure/puzzle game, perfect condition, $15. Peter, 828-9873.

NINTENDO 64 SYSTEM, with 2 controllers, 4 games, good for all ages, like new, $230 OBO. Kottenstette, 450-3430.

CONTEMPORARY OAK DESK, good condition, $125. Ludwigsen, 294-7076.

MULTI-FAMILY GARAGE SALE, 4734 Tierra Encantada NE, Oct. 11-12. Ayers, 888-8922.

NEW BOX CAR SIDING, 1" x 6" tongue & grove, about 60', very reasonable. Zurawski, 884-3862.

TRANSPORTATION

'93 SAAB 9000 CSE, loaded, leather, CD, new tires, still under warranty, below book, $14,900 OBO. Bruff, 232-7608.

'90 NISSAN MAXIMA, great condition, AT, leather interior, previously owned by auto repair shop owner, $8,300 firm. Hunter, 865-5745, ask for Jeff.

'90 CHEV. C1500 TRUCK, Stepside, Silverado, 2WD, 350 V8, extras, immaculate, 44K miles, $10,500. Gamblin, 821-8708.

'87 VW VANAGON, off-road AWD, skiing, camping, 7-passenger, 2.1L, 5-spd., water cooled, 1 owner, excellent condition, $4,995, negotiable. Williams, 296-8094.

'83 HONDA ACCORD, hatchback, AT, 120K miles, new brakes, tires, reliable, same owner since '83, $1,900 OBO. Jacksits, 284-2823.

'96 FORD ESCORT LX, extra clean, 2-dr., 5-spd., 19K miles, sport wheels, white w/gray interior, $9,000. Dow, 268-4322.

'74 SUPER BEETLE, runs well, sunroof, new battery, new brakes, alloy wheels. $2,000 OBO. Martinez, 877-4980.

'67 CORVETTE, marina blue on white, frame-off , 350-hp, 4 spd., $29,900 OBO. Von Loh, 877-4140.

'94 ACURA LEGEND GS, loaded, 30K miles, $27,000 OBO. Martinez, 881-7337, daytime, 856-6275, evenings.

'96 CHRYSLER SEBRING Lxi, loaded, 36K miles, extended warranty, $15,000. Lambert, 281-5798.

'75 FORD F250, 90K miles, extended cab, full camper, manuals, extras, excellent body, runs well, won't pass Albuquerque emissions, $2,250. Kupferman, 265-7224.

'95 TOYOTA T100, 4WD, regular cab, 3.4 V6, AT, AC, AM/FM, bedliner, trans oil cooler, 25K miles, $18,000 OBO. Romero, 864-8730.

'90 CHEV., 4X4, w/t 1,500, 6-cyl., 5-spd., $6,800, make offer. Knight, 839-0948.

'72 CHEVELLE, V8, 4-dr., $2,200. Forrest, 242-8692.

'96 FORD MUSTANG, 20K miles, AT, V6, AC, AM/FM stereo cassette, take over payments plus $1,000. Strauch, 831-4766.

'93 FORD EXPLORER XLT, warranty, original owner, excellent, new tires, best offer, must see. Bullock, 286-1910.

'92 OLDS BRAVADA, 4.3L, 200-hp V6, 62K, all the extras, showroom quality, 1 owner, $14,500. Bassett, 898-1840.

'95 SATURN SC1, 2-dr., champagne gold coupe, 42K miles, 5-spd., AC, AM/FM cassette, sunroof, $10,500. Cline, 286-1108.

'60 FIAT 1100 SEDAN, complete, original, 4-spd. column shift, suicide doors, not running, easy restore, $600 OBO. Roberts, 866-5422.

'97 MAZDA PICKUP, extended cab; '91 Chev. Astro Van; bids through 10/15/97, right to refuse bids, sold as is. SLFCU, 237-7386, ask for Christine.

'93 MERCURY, well maintained, AT, $9,000. Campbell, 888-3135.

'90 PONTIAC SUNBIRD, convertible, white/black, AC, AM/FM cassette, new front tires, must sell, runs great, $4,500 OBO. Otero, 839-4075.

'88 CHEV. CORSICA, PS, PB, AM/FM, low mileage, 1 owner, good condition, AT, 6-cyl., $2,500. Stephenson, 836-4260.

'80 PONTIAC LEMANS WAGON, runs well, looks/sounds good, it must be good, everything works, $1,495. Lenz, 884-4835.

'90 GRAND VOYAGER LE, 3.3L V6, AT, 71K miles, new tires, excellent condition, below book, $6,900. Iman, 856-6500.

'55 CHEV. RACECAR/STREETCAR, narrowed rear-end, center-line wheels, roll-cage, rolling chassis, fiberglass front-end, $2,500. Ortega, 294-6479.

'92 CHEV. LUMINA, 4-dr. sedan, 3.1L V-6, low-mileage, ABS brakes, w/new pads, new tires, PS, AC, cruise, $5,950. Owyoung, 797-4137.

'87 CADILLAC BROUGHAM, 65K well-kept miles, new tires & front windshield, premium sound system, metallic blue, velour upholstery. Noe, 268-6620.

'77 CADILLAC ELDORADO, blue/white, fully loaded, sunroof, good condition, $1,700 OBO. Jackson, 291-0996.

'97 MAZDA PROTEGE LX, 4-spd., AT, AM/FM, AC, cruise, tint, excellent condition, warranty, 10K miles, $9,850. Langwell, 329-0345.

'94 TAURUS GL WAGON, 54K miles, loaded, fully powered, 3.8 V6, dual airbags, ABS brakes, excellent condition, $9,300. Hart, 291-8774.

'87 OLDS FIRENZA, 4 cyl., 4-dr., AT, AC, PS, PB, AM/FM, good condition, $1,500. Dubbs, 299-8350.

'91 FORD EXPLORER XLT, 4x4, AT, V6, all power, blue, $9,500. Padilla, 281-9550.

RECREATIONAL

HOBIE 16 SAILBOAT & TRAILER, $800 or will trade for a mono-hull sailboat of similar value. Jones, 856-1837.

CAMPER, '72 Idaho Caveman, queen bed, propane heater, propane/electric refrigerator, intercom, stereo, very nice, $1,100 OBO. Carroll, 298-2827.

'95 SUZUKI DR 350 MOTORCYCLE, 1,600 miles, excellent condition, $3,000. Dwyer, 271-1328.

'95 BAYLINER 1950 CAPRI, open bow, 4L, 135-hp, I/O, excellent condition, $8,800. Vigil, 271-1328.

ROAD BIKE, 19-in., Tour de France, like new, original $1,000, asking $600. Luther, 822-1187.

'90 SEARAY BOAT, Model 180BR, 19-ft., 175-hp inboard, 310 hours, Hummingbird sounder, Shoreline trailer, $9,000. Yingst, 835-0749.

HONDA FOUR TRAX SX250, 4-wheeler, rear rack, storage cover & manuals, $2,000. French, 856-6126.

'78 AMERICAN CLIPPER D440, 21-ft., 76K miles, fiberglass body, generator, roof AC, records, extras, lots TLC, $7,500. Sublett, 884-4426.

CABOVER CAMPER, 8-ft., stove/oven, ice box, sink, w/jacks, older model, $300. Toya, 898-0491.

DISNEY WORLD ALL-DAY ADMISSION TICKETS, to Magic Kingdom, Epcot & MGM Studios, for 2 people/2days, $150; FP gate for toddler, $10. Walters, 857-9767.

'94 FLEETWOOD CAMPER, excellent condition, sleeps 6, awning, screen room, dual propane tanks, new axle/tires, large storage compartment, $4,500. Farmer, 857-0503.

ROLLING STONES TICKETS, main floor, section B3, row 1 (6) & section B5, row 24, Oct. 30, 7 p.m., $100 ea. (2). Eshelman, 858-0855.

CARIBBEAN CRUISE, I don't have time, but would like to give someone else this great opportunity. Phung, 284-4517, ask for Dan.

'81 MOTORHOME, 35-ft., Foretravel, diesel pusher, fully loaded, high-quality coach, under book value, $28,000 OBO. Nelson, 881-0148.

REAL ESTATE

3-BDR. CONDO, 1-3/4 baths, 2-car garage, fireplace, 1,550 sq. ft., skylites & clerestory windows, front/back court yards, ponds, pool, tennis. $134,900. Hayward, 292-2980.

4-BDR. HOME, 2 baths, large kitchen, 2 fireplaces, 2-car garage, 2,000 sq. ft., 5 minutes to Sandia. Parr, 292-5019.

3-BDR. HOME, 3/4-acre, w/shop, Los Lunas area, lease/option to buy, owner financing available, $85,000. Castillo, 864-1962.

2-BDR. MOBILE HOME, 2 baths, on Pecos river in Hidden Valley, beautiful setup, accessible year round, $84,500. Sayers, 877-8094 or 873-2815.

3-BDR. TOWNHOME, 2-story, 3-baths, w/appliances, fireplace, garage, storage shed, 1,120 sq. ft., east of Indian School & Moon, $103,900. McCoy, 292-9114.

2-BDR. TOWNHOUSE, Burlison & Academy, spacious, newly painted, 2 baths, fireplace, double garage, paved patio, pond, newly carpeted. Haycraft, 898-0631.

3-BDR. MOBILE HOME, '93 Clayton, 16 x 80, skirting, washer/dryer, stove, refrigerator, cooler, $21,000. Dobias, 856-7841.

3-BDR. HOME, 1-3/4 baths, 1,408 sq. ft., 2-car garage, Edgewood, safe subdivision, 1 acre, easy commute, must sell, upgrades, $132,700. Kunerth, 281-6689.

3-BDR. HOME, 1-3/4 baths, 1,530 sq. ft., covered patio, pitched roof, security gates, fenced dog run, San Pedro/Montgomery, $124,000. Culler, 881-8310.

FOUR ACRES, Black Lake, 10 miles from Angel Fire, $28,000. Epperson, 271-9880.

6.24 ACRES, electricity, telephone, community water system, nice trees, near Datil, NM & Cibola National Forest, $18,995. Karkiewicz, 332-9711.

3-BDR. HOME, 2 baths, 2-car garage, kiva, covered patio, secure-enclosed yard, fully landscaped, Eubank/Montgomery, Sandia 15-min. Aguilar, 275-2827.

3-BDR. MOBILE HOME, 16 x 80, '96 Oakwood, 2 baths, all appliances, AC, carport, deck,w/awning, skirting, Four Hills MHP, $34,500. Jaramillo, 292-3295.

WANTED

HOUSEMATE, M/F to share 3-bdr., 2-bath home, Comanche/Juan Tabo area, $300/month w/1/2 utilities. Lane, 323-6791.

INTERESTED MUSICIANS, to form bluegrass band with bluegrass banjo picker. Sturgeon, 281-9035, ask for Kerry.

ROOMMATE, to share 2-bdr. house, on 5 acres in Edgewood, horses/pets ok, $375 and 1/2 utilities. Duncan, 286-2024

OLD SOLID-WOOD DOORS, interior, 30" & 24"W, exterior 36", w/glass lites; used carport, aluminum-lattice patio cover, or greenhouse, can disassemble/haul away. Dubicka, 296-6557.

TEMPORARY EXCHANGE, farm house in Kentucky for home in Albuquerque, through June 1, 1997. Spalding, 606-262-0435, ask for Linda.

HARP (folk or Celtic). Loubriel, 268-1341.

USED JOG STROLLER/BABY JOGGER, weight limit of at least 50 lbs. Longley, 294-1190, ask for Susan.

HOUSEMATE, female, to share 3-bdr./2-bath home, Rio Rancho area, nonsmoker, $300/month, 1/2 utilities. Hedge, 896-7991.

DOUBLE-SIZE BED & MATTRESS, inexpensive. Matlack, 256-7371.

SYSTEM DISK OF OLD WORD PROCESSING SYSTEM, 3-1/2-in., Multimate Advantage, Version 3.60. Altwies, 766-2538 or 254-9352, after 5 p.m.

LOST & FOUND

FOUND: Black belt, narrow, gold buckle, found in parking lot north of Bldg. 800. Campanozzi, 844-7522 or 844-9272.

LOST: Box never delivered, MR#1879207, MO253, Room 13, for Sharon I. Archuletta, contains 3 rolls of Velcro & 11 Zebra pen refills. Archuletta, 284-3961.

'Sandia in Space' premieres at Alamogordo Space Center

RATLER has appeared in a Mrs. USA pageant, participated in a rover "parade" on the Mall in Washington, D.C., and become a regular attendee at US Space Camp in Florida. Now one of the diminutive robotic vehicles is going to become the feature of a new Sandia exhibit at the Space Center in Alamogordo, N.M.

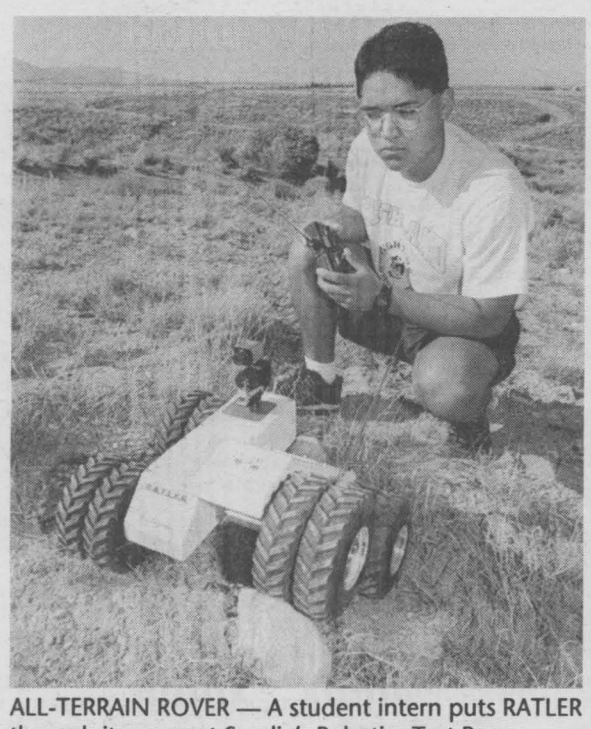
The exhibit, called "Sandia in Space," will be housed in the New Mexico Gallery of the museum. The second-floor gallery features artifacts of the state's rich involvement in space exploration such as astronaut Mike Mullane's space suit and the rocket sled Dr. John Stapp rode to more than 600 mph in 1954 while conducting aeromedical research at nearby Holloman Air Force Base.

Sandia's exhibit includes RATLER (Robotic All-Terrain Lunar Exploration Rover) and a simulated Mars landscape on which museum visitors can drive it.

The exhibit also includes a touch-screen video kiosk, which will play narrated video clips on Sandia's space-related work on satellites, the Mars Pathfinder airbags, comet impact modeling, and the Galileo mission to Jupiter.

"Until I started working on the exhibit I didn't realize how rich Sandia's history is in terms of its involvement in the exploration of space," says Sid Gutierrez, Manager of Airborne Sensors and Integration Dept. 2427 and a member of the Space Center exhibit planning committee. "Essentially, Sandia has been involved since the early years of the 'Space Race,' which started in 1957 with the launch of the Soviet Union's Sputnik satellite."

Aside from rocket research, Sandia's earliest space-related project was the VELA satellite program, a series of satellites launched beginning in 1963 to monitor Soviet compliance with the 1963 Limited Test Ban Treaty. Sandia designed and developed optical instrumentation for VELA, capable of detecting nuclear explosions from space. The VELA satellites were succeeded by Defense Support Program satellites and the current constellation of Global Positioning System satellites, which also have Sandia-designed nuclear-detonation detectors.



ALL-TERRAIN ROVER — A student intern puts RATLER through its paces at Sandia's Robotics Test Range.

The video kiosk traces Sandia's satellite work from VELA to MTI — the Multispectral Thermal Imager — a satellite scheduled for launch in 1999. Sandia has lead responsibility for MTI, which is a research and development satellite that will help develop technology for future treaty monitoring systems.

The exhibit will be unveiled in time for the International Space Hall of Fame's 21st Annual Induction honoring Guion Stewart Bluford Jr., Brig. Gen. Charles Frank Bolden Jr., Claude Nicollier, Lt. Gen. Bernard A. Schriever, and Dr. Walter Charles Williams. Sid Gutierrez, a Sandia manager and 1995 inductee to the Hall of Fame (he is a former astronaut), will say a few words about Sandia's exhibit. Sid also serves on the Space Center Commission, the board overseeing operations at the Space Center.

A number of Sandians helped determine the content of the exhibit: Julie Clausen (12680), David Keese (2412), Doug Nordquist (5799), Brent Sims (2425), and Sid. David Hayward (5516) built RATLER, which was designed by Jim Purvis (5845). The video kiosk was developed by Julie, Bob McInteer, David Sparks, Myra Edaburn (all 12610), and Mona Aragon (12620). — *Julie Clausen*

Coronado Club

Oct. 9, 16, 22, 30 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

Oct. 10 — Kids bingo. Buffet, 5-8 p.m.; cartoons, 5-7 p.m.; bingo, 7 p.m.

Oct. 17 — "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.

Oct. 19 — Sunday brunch buffet, 10 a.m.-2 p.m. Music by Bob Weiler.

Oct. 26 — Halloween Party. Games and treats for kids 6-9 p.m. $1.50 ($2.50 for guests).

Disability Awareness Month activities set

Day of Challenge is Oct. 15

"Are you aware?" That is the theme of Disability Awareness Month, which is being observed at Sandia throughout the month of October. Sandia's Disability Awareness Committee, in cooperation with DOE and Kirtland Air Force Base (KAFB), is conducting several activities to raise awareness about disabilities. If you have any questions, contact Linda Dailleboust at 844-2868, or Sandra Hinton at 845-9911.

Here's a list of Disability Awareness Month activities:

Oct. 15 - Sandia Day of Challenge

Bldg. 822, conference rooms A and B, 7:30 a.m.- noon

The third annual Sandia Day of Challenge will feature refreshments, fun, and challenges designed to provide a perspective on various disabilities. For those who can't make it to Day of Challenge activities, the Disability Awareness Committee will have "awareness kits" available for loan throughout the month for Sandia employees to challenge themselves.

Other October Activities:

Oct. 16 - Wheelchair Basketball

DOE complex, basketball court near snack bar, 11:00 a.m. Sponsored by DOE.

Oct. 16 - "Lunch and Learn"

DOE Training Complex, 11 a.m.-1 p.m. Sponsored by KAFB.

Three panelists will present information about hiring persons with disabilities and about support services that are available for workplace accommodation.

Oct. 21 - "Ability: The Bridge to the Future"

KAFB Officers' Club, 7:30 a.m.-9:30 a.m. Breakfast with guest speaker Ann Thomas, Assistant to the President, UNM; Director of UNM Office of Equal Opportunity; and ADA Coordinator for UNM. Breakfast will be $6.95 (choice of scrambled eggs/sausage or bagel/fruitbread).

Oct. 28 - Herbert Howell, Speaker - *Independent Living Consultant*

DOE Complex, Bldg. 381, ABC Conference Room, 9-10 a.m. Sponsored by DOE.

Sandia News Briefs

Benefits open enrollment Oct. 20-Nov. 9

Health & Work/Benefits Dept. 3343 announces that its annual Open Enrollment period will run from Oct. 20 through Nov. 9. Open enrollment is a time when Sandia employees and retirees may use the automated phone system to choose or change certain benefits. Open enrollment booklets describing the benefits options and a draft Primary Care Physicians' list for the Triple Option Plan (TOP) and Lovelace will be distributed to eligible employees and retirees during the week of Oct. 13. For those electing the TOP plan, a Primary Care Physician selection form (included in the Open Enrollment packet) will need to be filled out and sent to Mutual of Omaha.

1999 scholarship applications available

Scholarship applications are now available for class of 1999 high school graduates. The 1999 competition will be conducted by the National Merit Scholarship Corporation (NMSC), an independent not-for-profit organization devoted exclusively to scholarship activities. To be eligible, children of Lockheed Martin employees, including Sandians, who will complete high school and enter college in 1999 must take the PSAT/NMSQT in the fall of 1997 on the date their school chooses for the administration, either Oct. 14 or 18. All winners will be selected by NMSC from among children of Lockheed Martin employees who meet the competition requirements listed on the application. Deadline for all applications is Jan. 30, 1998. Scholarship applications are available from Benefits Administration Dept. 3344 in Bldg. 832 East, or you may call 844-9272 or 844-2442 to request an application. Leave your name and mail stop number.

Lockheed Martin program matches employee contributions to colleges and universities

The Matching Gift Program for Colleges and Universities will match individual employee contributions to properly accredited colleges and universities (including junior colleges and community colleges). Lockheed Martin will match dollar-for-dollar gifts of $25 or more in multiples of $5 up to a maximum of $10,000 per full-time employee per year. The employee must have at least one year's service at the time the donation is made. All eligible gifts will be matched by the Corporation once a year, in April.

Educational institutions are eligible provided they are (1) accredited by the appropriate regional accrediting organization (see next paragraph) and (2) recognized by the US Internal Revenue Service as an organization to which deductible contributions may be made. Alumni funds or similar fund-raising associations are eligible to receive matching gifts only if they are an integral part of an eligible college or university.

Recognized regional accrediting organizations include Middle States Association of Colleges and Schools, New England Association of Schools and Colleges, North Central Association of Colleges and Schools, Northwest Association of Schools and Colleges, Southern Association of Colleges and Schools, and Western Association of Schools and Colleges.

A brochure that includes more information is available from the Sandia Benefits office in Bldg. 832 East, 9 a.m.-3 p.m., or you may call 844-9272 or 844-2442 and leave your name and mail stop number. Information is also available from the Benefits home page on the Internal Web at http://www.hris.sandia.gov/org/3300/benefits/benhome.html. The completed form must accompany your gift when you send it to the educational institution.