Hide and seek

Sandia engineer helps design a way to expose suicide bombers before they walk into a crowd

By Nancy Salem

On the chilling list of terrorist tactics, suicide bombing is at the top. Between 1981 and the end of 2015, an estimated 5,000 such attacks occurred in more than 40 countries, killing about 50,000 people. The global rate grew from three a year in the 1980s to one a month in the 1990s to one a week from 2001 to 2003 to one a day from 2003 to 2015.

Terrorism experts say suicide bombings are pervasive because they generate publicity and require little expertise, resources, or planning. They instill fear and breed distrust in the public, a goal of groups determined to spread terror. Perhaps most importantly, suicide bombings are almost impossible to prevent.

"The suicide bomber can walk into a crowded place unnoticed and inflict a horrifying amount of death and destruction," says Albuquerque businessman Bobby Roberson. "It's very hard to stop. There's no technology to deal with it."

Until now, Roberson says, his company, RJ Technologies, is working with a group of small businesses to develop a way to prevent suicide attacks by detecting concealed bombs before they go off. After a frustrating start, the group decided it needed more technical help and turned to the New Mexico Small Business Assistance (NMSBA) program, which pairs entrepreneurs with scientists and engineers at Sandia and Los Alamos national laboratories.

Turning things around

RJ found a partner in Sandia sensor expert JR Russell (6514) who, during the past two years, has helped bring the company's Concealed Bomb Detector, or CBD-1000, close to commercialization.

"JR has been all over it and really turned things around for our company," Roberson says. "He is let

(Continued on page 4)



WEARING A MOCK SUICIDE VEST, Albuquerque businessman Bobby Roberson stands in front of his company's CBD-1000 bomb detector, being adjusted by Sandia scientist JR Russell. JR worked with RJ Technologies to iron out technical issues and bring the suicide bomb detector close to commercialization.
(Photo by Randy Montoya)

Exceptional service in the national interest

Sandia LabNews

Volume 68, No. 4

February 19, 2016

Managed by Sandia Corporation for the National Nuclear Security Administration

National Labs Day at Howard University

On Feb. 4, Sandia led the coordination of National Labs Day, a career fair at Howard University featuring 15 national labs, DOE, and NNSA. The event was designed to introduce STEM students to career opportunities at the national laboratories. Story and photos on page 12.



Speaker Norm Augustine laments low US value given education, research

Former LM CEO describes need for increased funding in critical areas

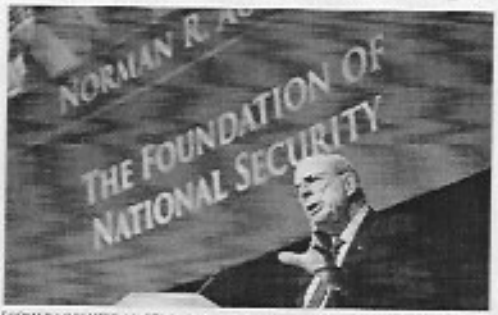
By Neal Singer

Peppering his sobering remarks with wry humor, apt quotes, and sometimes surprising statistics in a speech at Sandia, retired Lockheed Martin chairman and CEO Norm Augustine delivered an analysis of America's declining state of readiness to compete educationally, economically and, eventually perhaps, technologically in the international arena.

The solutions he proposed were increased funding for research and education, and a social adjustment that would value academics over athletics.

In terms of funding, he said, "Once when I advocated for more funding for research, [a colleague on a panel] warned me that the country has a serious budget problem. I told him that when I was a young engineer, I worked with a lot of airplanes too heavy to fly in the design stage, but none ever flew by taking out the engine."

Among his comments regarding education, he said, "Teachers should be the heroes but you get what you celebrate. The highest paid employee [at some universities] is the football coach. What message does that send?"



FORMER LOCKHEED MARTIN CEO Norm Augustine addresses Sandians as part of the Labs' National Security Speakers Series. (Photo by Randy Montoya)

$20,000 a pitch

He reported calculating that top baseball pitchers get $20,000 for every stroke they throw.

"A pessimist," he said, "is an optimist who sees the facts."

He quoted a statement from Bill Gates: "When I see our high schools and compare them with what I see when traveling abroad, I'm terrified for our nation."

His Feb. 11 talk, titled "The Foundation of National Security," was part of Sandia's National Security Speakers Series. It was presented in Steve Schiff Auditorium and videolinked to Sandia/California and to Sandia's Washington, D.C., facility.

Augustine, a man with a resume that VP 3000 Rob Leland described in his introduction as "enough for any three men," has had a wide view of American life. Among his many achievements and honors, he's been under secretary of the Army, chairman of the Council of the National Academy of Engineering and the American Red Cross, and president of the American Institute of Aeronautics and Astronautics and the Boy Scouts of America. He's taught at Princeton and served for 16 years on the Presidential Council of Science and Technology. He has been presented the National Medal of Technology by the

(Continued on page 4)



Sandia marks Engineers Week:

'Synergy between science and engineering'

By Dr. 3000 VP and Chief Technology Officer Rob Leland Pages 6-7

DISCOVER ENGINEERS WEEK FEBRUARY 21-27, 2016

Contest: "Let's build a paper roller coaster" 2
John Hopkins Applied Physics Lab CEO Jeres Gill on "Engineering at the Edge of Knowledge" 5
Complete this sentence: "You know you're an engineer when ..." 5

Inside . . .

Sandia in 3-D teams take on first design challenge 3
Making energy storage cheaper, more portable 8
Finding more powerful semiconductor materials? 9
Eastern Cherokees explore IT and partnership at Sandia 10
Altrean American community leaders visit Labs 12

That's that

I read an article a few years back – I think it was about a presentation by a popular business guru – that goes something like this: A traveling music teacher visits a kindergarten class to introduce the kids to some basic music concepts. Before beginning her lesson, she asks the kids how many of them can sing. Every single child laughs and raises his or her hand. What kind of silly question is that?! Everybody can sing!

Excellent, the teacher says, and proceeds to lead the kids through medleys and rounds and ballads and even some pop tunes. The kids all boisterously join in.

Five years go by. The teacher finds herself back at the same school, but this time with a lesson plan for 4th-graders. She realizes this is the same group of kids she'd taught as kindergartners. Oh, good, she thinks, these kids were fun. Before beginning her lesson, though, she asks the question again: How many of you can sing? Two kids out of the 22 in the classroom tentatively raise their hands.

With National Engineers Week coming up, I was reminded of that story. Just change a few words and make it a story about engineers. How many kids out there "learn" sometime between kindergarten and 4th grade, that they could never be engineers, "learn" that they're no good at math, "learn" that kids like themselves can never succeed? Too many, I'll wager. Sandia's trying to do something about that.

Sandia's Community Involvement team and our various outreach and networking groups are doing great things in the schools, working with committed teachers and involved parents to help kids learn the right lessons about themselves, their options, and the opportunities open to them.

So this year during Engineers Week, let's celebrate not only the engineers of today, but the engineers of tomorrow, too. The ones who learned early on – maybe with some help from Sandians – that they can be whatever they want to be. And just for the heck of it, let us warble in the shower and not give a hoot if we're on key. Who ever said we can't sing?!

* * *

Speaking of Engineers Week, I hope you get a chance to read Dir. 1000 VP and Sandia Chief Technology Officer Rob Leland's fascinating essay beginning on page 6 that explores what he calls a "virtuous cycle," the synergy between science and engineering and what that means for Sandia. Here's a little sneak preview:

> *Engineering deeply rooted in science is a common theme permeating much of Sandia's work. The intentional cross-pollination between scientific disciplines and the practical application of the resulting insight to challenging engineering problems is one of Sandia's great strengths and underpins our value propositions to sponsors and customers alike. Perhaps less appreciated are the cases in which our engineering skills enable a new frontier in scientific discovery. On the occasion of Engineers Week, I'd like to share a few of these stories, and thereby offer the perspective that there is actually a virtuous cycle, a deep synergy, between science and engineering that often enables our most exceptional results.*

Again, be sure read the whole essay beginning on page 6.

* * *

A colleague just came back from a personal trip to Antarctica – yeah, I'm jealous – and she says it was just as amazing and incredible as you imagine it would be. In the course of her travels, she noted something that also struck me on a trip in December to visit our son in New Zealand: Being that the Southern Hemisphere's SUMMER is our winter, when you cross the equator and keep going south in December or January, the daylight lingers longer and longer into the evening.

Back in the days of sailing ships, the transition was no big deal; you'd adapt to the difference in daylight bit by bit. But in the age of jet travel, where you can get halfway around the world in 12 hours, the change between winter sunsets at 5 p.m. in New Mexico and SUMMER sunsets in Wellington at 9:30 p.m. are jarring. The physical effect is not unlike jet lag: your body seems to "expect" it to get dark at a certain hour and when it doesn't you vaguely feel there's something wrong. My wife and I even came up with a term for the effect: We call it "light lag" and have gotten some good laughs at the idea of selling homeopathic "remedies" for this previously unidentified affliction. Our concoction would be a proprietary blend of dark and light chocolate. Might not really help light lag, but we'd probably sell a ton anyhow. Medicinal chocolate is the next big thing, you know.

See you next time.

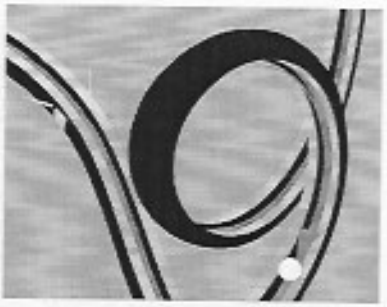
– *Bill Murphy (MS 1668, 505-845-0845, wtmurph@sandia.gov)*

DISCOVER ENGINEERS WEEK

FEBRUARY 21-27, 2016

THRILL RIDE

Sandians, students celebrate engineering with roller coasters made of paper



Ninth-grade students from Tech Leadership High School and members of ANGLE (Advancing the Next Generation of Leadership Excellence) at Sandia will team up to build roller coasters out of paper during this year's National Engineers Week.

The engineering challenge, open to spectators, will take place from 12:15-2:30 p.m. Wednesday, Feb. 24, at Tech Leadership High School. The charter high school, which opened last August, is in the Sandia Science & Technology Park at 10500 Research Road SE.

Each team will build a paper roller coaster and send a marble along its course.

Teams will have 45 minutes to build their creation from cardstock, tape, and a marble. Judging will be based on such things as the roller coaster's directional changes, use of spirals and loops, and the time it takes the marble to go through the course.

Staff from Explora children's museum and science center will facilitate the competition.

Sandia marks 65th anniversary of Engineers Week
- Activities, events on page 5
- Essay: Synergy of science and engineering on pages 6-7

LabNews

Sandia National Laboratories

http://www.sandia.gov/LabNews

Albuquerque, New Mexico 87185-0165
Livermore, California 94550-0969
Tonopah, Nevada • Nevada National Security Site
Waihelle, Texas • Carlsbad, New Mexico • Washington, D.C.

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corp., for the U.S. Department of Energy's National Nuclear Security Administration.

Bill Murphy, Editor 505/845-0845
Randy Montoya, Photographer 505/844-5605
Patti Koning, California site contact 925/294-4911
Michael Langan, Production 505/844-2297

Contributors: Michelle Fleming (Adv. Midpoint photos, 844-8303), Neal Singer (845-7078), Stephanie Holinka (284-9277), Rannie Hurst (844-2809), Heather Clark (844-1511), Sue Holmes (844-6362), Nancy Salem (844-2298), Valerie Larkin (284-7078), Lindsey Kibler (844-7903), Tom Dobbins (844-2282), Rebecca Strack (844-7772), Joelle Hayen (844-6259), Michael Padilla (925-294-2447), Valerie Smith, manager (844-6367)

Classified ads 505/844-4902

Published on alternate Fridays by Internal & Digital Communications Dept. 3651, MS 1168



IN KEEPING WITH TRADITION, members of the Sandia Emergency Response Team pushed a nearly 13-ton truck — dubbed Squad — through Gate 1, signaling the start of its service. This is the third squad Sandia has received since 2002, the most recent being Squad 2 in November 2013. The tradition of pushing a new truck into service stems from the days when fire departments used hand-drawn and horse-drawn steam engines. Horses were unable to receive the equipment and align the steam connections on the engines, leaving the firefighters to back the gear in after the calls. Although Sandia does not have shafts instead of firehouses), the ERT continues a similar tradition. According to ERT Team Lead Ricky Romero (6736-1), the tradition goes, "If you push the truck in the first time, it will always bring you back home safely." (Photo By Randy Montoya)

Let the competition begin!

Sandia in 3-D teams take on first design challenge

By Jana Cuiper

If you can imagine it, you can print it. 3-D printing technology is accessible to everyone. No special skills or degrees required.

This message resonated with members of the workforce who enthusiastically gathered for the Sandia in 3-D (S3D) kick-off, held simultaneously in California and New Mexico on Jan. 12.

"Everyone can see the possibilities for this technology and learn how to use it," says Bonnie Arthun (8343). She spent several months working with Mike Hardwick (8240), deputy director for advanced weapons systems, and a team of 30 committee members to create the S3D design challenge.

With an ambitious set of objectives, S3D aims to increase awareness of 3-D printing technology, while providing a fun, creative, and friendly competition that is open to all. Working together in this informal setting creates an opportunity for future collaboration and cross-mission area synergy, all while demonstrating Sandia's ability to create revolutionary design solutions using 3-D printing.

Three design challenges

Participants can choose among three design challenges: a musical instrument capable of playing as many notes as possible, a piece of Sandia memorabilia that represents multiple mission aspects, or improvements to an existing product.

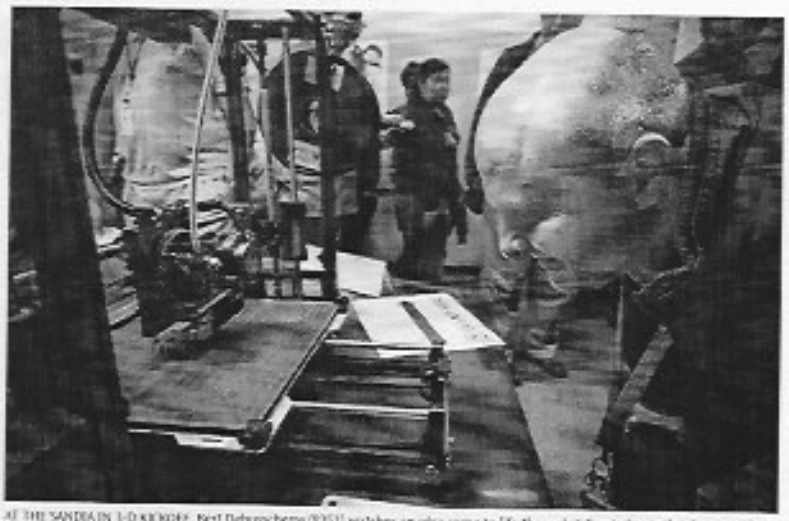
More than 300 attendees in New Mexico and California received a warm welcome from Mark Smith (1801), deputy director of additive manufacturing. He opened the event with an overview of Sandia's 20 plus years of pioneering development and commercialization of additive manufacturing (AM) technology, also known as 3-D printing.

"You can do things with additive manufacturing you can do no other way," Mark says. "This technology has the advantage of design freedom at lower cost, with reduced waste, energy, and risk, and it has broad applicability throughout the laboratories."

For example, the W80-4 systems engineering team is committed to using 3-D printing in its product development.

"3-D printing has the potential to be used for everything from low-risk tooling to higher-risk critical components that fly with the warhead," says Mike Hardwick (8240). "The progress we make in engineering design and materials science will determine how extensively this technology is incorporated into the weapons program."

Mike says he hopes the design challenge will inspire creativity, innovation, and learning that contribute to Sandia's collective ability to move forward with this technology. "One way to accelerate our AM work is to engage bright and inquisitive minds and draw upon their expertise and passion," he says.



AT THE SANDIA IN 3-D KICKOFF, Bert Debusschere (8351) watches an idea come to life through 3-D printing technology. Sandia in 3-D is a friendly design competition meant to spark interest in 3-D printing and encourage diverse learning.

Bringing together diverse planning committee

Diversity and inclusion are at the core of the 3-D Challenge, so Bonnie, as committee leader, knew the planning team needed to reflect that. She branched out beyond her network of technical colleagues to recruit people who might not typically participate in planning an event like this.

"We needed the perspective of those who know about and understand 3-D printing and those who are not familiar with it," Bonnie says. "Someone may feel they cannot contribute because they don't have that background, but those are exactly the people we wanted to have on the committee."

A key aim is to encourage people to step outside their comfort zone in creating their challenge teams and designs. Teams that combine technical and non-technical members will be awarded extra points for diversity.

"So many people here have never seen this," says planning committee member Jim Brennan (8625). "It's great to see how excited they are to participate. There is no barrier to entry so you don't have to be afraid to try it."

Kevin Connelly (8343), also on the committee, talked with an attendee at the open house who reported being artistic but with no design background. "That's perfect!" he says. "The goal is to get people from different backgrounds to interact over their ideas."

Incorporating diversity

As part of their design submission, the teams will define how they incorporated diversity. Among the 36 teams registered, most are mixed gender and include an age range from high school interns to undergrad researchers, to engineers and professionals with up to 20 years of lab experience. Some teams combine administrative and mission support professionals with mechanical and materials science technologists.

"Diversity often shows up in unexpected ways," says Bonnie. "People are surprised to discover just how diverse they are once they take the time to get to know one another and build relationships. We see this as a catalyst for people from all different areas and backgrounds to link up and make connections."

Teams can win prizes in addition to bragging rights. The organizing committee is planning special 3-D printed awards for the winning teams, as well as commemorative 3-D printed coins for each participant. An event to announce the winners and showcase all of the entries is planned for early April.

A second design challenge kicks off in April as well, and a third challenge is slated for July. Current teams may continue to work together and new teams will be welcomed at the beginning of each session. The planning committee is considering new challenge projects and accepting suggestions on the S3D wiki.

"We will continue to emphasize creativity as well as technical results in our future challenges," Bonnie says. "Some of the challenges may build on earlier challenge ideas, and teams will be encouraged to demonstrate diversity and inclusion."

A range of training options is available for participants to learn the needed design software and printing skills, and SEI hours are available for this. 3-D printing labs have been set up in New Mexico and California for teams to print their own designs.

Contact Bonnie Arthun at 925-294-4707 or visit the S3D wiki to stay informed about S3D events and plans for the upcoming challenges.

SandiaCaliforniaNews

3-D Challenge comes to New Mexico, too



NEW DESIGN SPACE — Shelby Hansen and Jake DeFord, both 2016 interns at the New Mexico kickoff to see how their work at Sandia's Explosive Components Facility might benefit from 3-D printing. Twenty-four New Mexico teams are participating in the challenge. "We're hoping to spark creativity in applying this technology. It opens a whole new design space," says Deidre Hirschfeld, manager of coatings and additive manufacturing (8132). (Photo by Randy Montoya)

Bomb detector

(Continued from page 1)

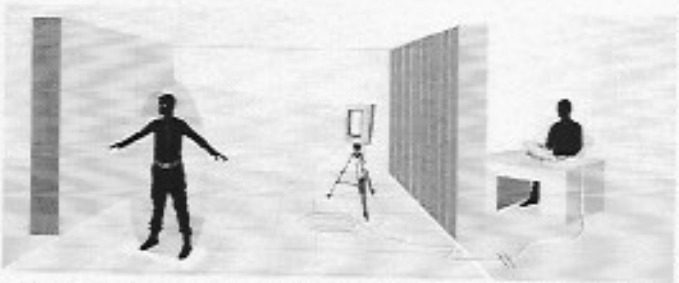
rific. He brings in sharp people from Sandia. I love working with those guys."

JR, a 35-year veteran of the Labs, says his role largely has been to develop metrics to quantify the performance of the technology. He zeroed in on the device's accuracy by analyzing false positives and pushed to redevelop software so it would more reliably detect a bomb threat. "After getting to know Robby and the team I got more and more interested in the problem," says JR, who enlisted a couple other Sandia engineers, Matt Erdtman and Michael Boatton (both 6514), in the project. "The technical part of me took over. Engineers want to validate the model and we needed to validate the performance of Robby's system. We threw out a lot of the existing technology and made proposals to Robby, and they went with it. Early versions were a good start, but not where the technology needed to be."

Screening in public places

The CBD-1000 uses X-band radar to detect metallic and non-metallic explosives. Roberson says it can detect ball bearings, glass, nails, concretes, rocks, and other materials frequently used as shrapnel in suicide vests.

The device is designed to detect bombs that current metal detector technology would miss and is intended for screening areas such as airports, embassies, public and government buildings, border crossings, transportation hubs, and military compounds. It is portable and could also be used at special events where crowds are expected.



RADAR BEAM — The CBD-1000 uses a spread spectrum, stepped, continuous wave radar to bounce a signal off a subject. Software analyzes horizontal and vertical polarized signals to determine the possible presence of a concealed bomb. If the person is not carrying a bomb, the return signal is in the same polarity as when it was transmitted. If it comes back differently, a bomb could be present. (Illustration courtesy of R3 Technologies)

The CBD-1000 is the size of a cereal box, weighs about 33 pounds, and is mounted on a tripod. It is powered by AC or battery and works with proprietary embedded software. "The device uses a spread spectrum, stepped, continuous wave radar to bounce a signal off a subject. The software analyzes both horizontal and vertical polarized signals to determine the presence of a potential threat. If the person is not carrying a threat, the return signal is in the same polarity as when it was transmitted," Roberson says. "A threat will rotate the polarity of the signal, and it comes back differently."

The system sets up in about 15 minutes and an operator, who does not need a working knowledge of radar, can be trained in 30 minutes. The scan takes about 1.3 seconds at 9 feet.

"We're working toward an instantaneous scan so a person can be checked while moving through the beam field. And we hope to extend the range to 100 feet," Roberson says. "We want to take movement out of the equation. People who want to protect their citizens want to detect at a distance, keep the threat away. They want to scan crowds and stop threats before they get too close."

Roberson says algorithms are being finalized that will allow scanning at greater distances while people are moving.

System reached a plateau

The original technology was developed by the Albuquerque company Safe Zone Systems in the early 2000s as a hand-held, radar-based sensor that police could use to scan people moving at a distance who they suspected might be armed. It evolved into a stationary system. "It was after 9/11 and there was a thought that we could change our approach and see if we could detect suicide bombers," Roberson says.

After years of development, the technology just didn't work. "It became apparent that the system was not completely accurate," Roberson says. "It reached a plateau. We could not get it to get better. The hope was always to improve the accuracy."

Roberson's father, homebuilder Coda Roberson, was a shareholder in Safe Zone, and Robby joined the company in 2009. The father and son founded R3 Technologies to further develop and commercialize the technology.

They approached Sandia for help through NMSBA and added partners including Manuel Rangel of APPI Inc. in Las Cruces, the acclaimed radar scientist Don McKenzie of McKenzie Enterprises LLC in Albuquerque, Lawrence Sher of Wind Mountain Research Associates in Albuquerque, and Julie Seton of Indelible Enterprises in Las Cruces.

"When JR came onboard we all took a hard look at what we had, what it did, and how it worked," Roberson says. "JR came at this problem from a different point of view. He wanted to know everything about it. He helped us realize we had to go in a completely different direction. We reverse engineered the hardware and software. I can't stress enough how important JR was. He helped with everything."

JR says the Sandians studied noise surrounding the radar signal and how it impacted true positives and true negatives. They found a way to reduce noise and strengthen the signal, improving accuracy. "If the signal is bigger than the noise, it can scan people as they're walking. They don't have to stop," he says. "These breakthroughs will enable new applications in security of the future and will increase the marketability and desirability in the field of the CBD-1000."

Starting a third NMSBA project

Roberson says the CBD-1000 will cost about $50,000 and that several hundred units have been produced. The device is patented, and the company has received inquiries from Pakistan, Afghanistan, Singapore, Kuwait, Saudi Arabia, and Nigeria, he says.

Roberson hopes to go to market this year. His business group has worked with JR under two NMSBA projects over three years and started a third in January to finalize the product by further improving speed, distance, and accuracy. The group meets weekly. "We all clicked as people," JR says. "We have a common focus and all march in that direction. Everybody brings their technical expertise. These are energized people who are the poster child for a highly effective team. It doesn't feel like work to me. I'm lucky to work with them."

JR says he enjoys helping a small business. "It's good for our community," he says. "Helping someone succeed helps us succeed, too, as a lab. I get to see science through the eyes of business people. And I've learned things that will help me in my work."

JR says R3's missile-bomb detector resonates with Sandia's national security mission. "We want to help our nation protect our people, our assets," he says. "If we can save one life, we can make a difference. The opportunity to make us safer from attacks is one of the obvious things that draw us."

A vital tech transfer tool

The New Mexico Small Business Assistance (NMSBA) program was created in 2000 by the state legislature to bring national laboratory technology and expertise to small businesses in New Mexico, promoting economic development with an emphasis on rural areas.

The program has provided more than 2,300 small businesses in all 33 New Mexico counties with $43.7 million worth of research hours and materials. It has helped create and retain 4,086 New Mexico jobs at an average salary of $38,488, increase small companies' revenues by $300 million, and decrease their operating costs by $85 million. These companies have invested $68.3 million in other New Mexico goods and services and received $77.3 million in new funding and financing.

R3 Technologies was among 364 small businesses in 24 counties that participated during 2015 in NMSBA. In addition to Sandia and Los Alamos, the program contracts with the New Mexico Manufacturing Extension Partnership, University of New Mexico Management of Technology program at the Anderson School of Management, UNM School of Engineering, Arrowhead Center at New Mexico State University, and the New Mexico Tech Department of Management. NMSBA provided $4.7 million worth of assistance to New Mexico small businesses last year. "The project between Sandia and R3 Technologies is a compelling example of how NMSBA is not only helping a New Mexico small business but also helping Sandia's national security mission," says Jackie Kerby Moore, manager of Technology and Economic Development Dept. 1933. "Kudos to JR and his team for helping the company commercialize their technology."

Norm Augustine

(Continued from page 1)

president of the United States, and five times received the Joint Chiefs of Staff Distinguished Public Service award.

He also chaired a prestigious National Academies group that produced the paper, *Rising Above the Gathering Storm*, which advocated more than a decade ago for increased attention to education and research.

Citing Russia's recent experience, he said that "without a strong economy, there could not be a strong defense," because taxes from the economy pay for research that translates into defense.

Among his solutions was to lower corporate taxes — "the highest in the free world" — to encourage corporations to bring to the US profits stored abroad that have already been taxed in their countries of origin.

Going where the high IQs are?

He said one executive had said that if America couldn't get its educational act together, he was going to take his company "where the high IQs are."

Augustine presented a number of statistics that seemed to show that US students are achieving less than they did decades ago, that the number of students getting degrees in science and engineering are far too few, and that US "world class research institutions" like Bell Labs are declining in number. He criticized cutbacks in government funding that have led universities to increase tuition costs for science and engineering students on the grounds that an engineering education costs more. The long-term result of job creation, he said, should restore sanity in tuition.

Draconian increases in tuition

In California, he continued, "Draconian cuts in budgets have led to draconian increases in tuition. There's been a 65 percent increase in tuition in a three-year period."

Now, he said, "Student debt exceeds the debt for credit cards in this country." Student tuition fees have been increased, not only to make up for cutbacks from state government but because federal Pell grants have declined in effectiveness.

Further, "If we sustain present spending directions, in a decade or two we will only be able to pay our entitlements and the national debt. This is the front end of the gathering storm. It's popular to blame China, but does China decide how much to pay our teachers, run our schools, decide how much to invest in research?"

He said that "instead of paying teachers what they deserve, states can lower their educational standards, and most states are doing the latter."

He advocated that the national labs find ways to reach out to the private sector as well as contributing nationally, to better show their worth to the tax-paying public. "We need better bridges between the government and universities and industry," he said.

National Security Speakers Series

The objective of the National Security Speaker Series (NSSS) is to bring senior policy officials and former officials to Sandia to share their thoughts and interact with Sandians on security issues important to the nation. The goal of the series is to increase understanding of the unique role and contribution of the national laboratories to the national security strategy in the post-Cold War environment.

The NSSS provides Sandians an opportunity to meet and interact with distinguished individuals who have had and continue to have such careers that impact the security of the nation.