William H. Swanson
Chairman and CEO
Raytheon Company

Excerpts of remarks prepared for delivery to:
The Economic Club of Phoenix
Phoenix, Arizona
December 7, 2006

Thank you, Barbara (Barrett), for those kind words. Barbara is a Board member of Raytheon and a key member of the Raytheon team. I really appreciate her advice and counsel -- as I'm sure your organization does. She is a special person.

It is a pleasure to be here. Raytheon is proud of its presence in Arizona. We have approximately 11,000 employees in the state -- and we did over $450 million in business with Arizona suppliers in the past 12 months. Louise Francesconi, President of our Raytheon Missile Systems, headquartered in Tucson, is here with us today. She is a terrific leader -- we and Arizona are lucky to have her. She is here with several members of her team, along with other Raytheon team members.

We are also pleased that there are two students here today who will join our prestigious Supply Chain Leadership Development Program this spring after they receive their MBAs from ASU's Carey School.

I'd like to spend our time together today discussing the importance of science and math education to our nation -- to the technical talent pipeline of the United States.

I will be wearing two hats -- one as the leader of a technology company that has a big stake in keeping that pipeline full; and the other as co-chair of the Business-Higher Education Forum's initiative on "Securing America's Leadership in Science, Technology, Engineering and Mathematics" -- "STEM" for short.

We all can see that technology is transforming our country and our world -- creating opportunities, driving growth in regions like the Phoenix area, and opening up new ways to connect with each other.

Some of us can get emotionally attached to the technology. I know I am. I am dependent on my BlackBerry® device. I admit it. I can't imagine being without it. I like answering my own e-mail. I don't see it as a burden. It enables me to connect directly with all 80,000 teammates -- no filters -- at all levels of the company.

I feel confident saying that technology is transforming every industry and organization represented in this room, including education. It is also embedded in the vision of my company: "To be the most admired defense and aerospace systems supplier through world-class people and technology."

Raytheon through the years has pioneered some great technology:

- Figuring out how to mass produce magnetrons, the heart of radar;
- Discovering microwave cooking;
- And perfecting the world's first operating laser.

In our industry today, "world-class technology" means having the capability to:

- Intercept ballistic missile warheads in space;
- Provide sophisticated air traffic management systems -- when you get on a plane, we track you across the U.S. and over two-thirds of the world's airspace;
- It is the capability to develop a Perimeter Intrusion Detection System to safeguard airports in the New York-New Jersey region;
- And to enable advanced electronic highway toll collection in Florida and other places.

It means providing our men and women in uniform with a level of situational awareness that was once unimaginable -- so that they can assess, respond, adjust, synchronize and integrate their activities faster and more comprehensively than ever before.

The security and prosperity of this city, this state, and this country depend on engineers and scientists to continue to work their wonders in an increasingly competitive world. But where will the new generations of engineers and scientists come from to give shape to America's future? This question is being asked by many these days in business, government and academia -- myself included.

The Business-Higher Education Forum has set a goal of doubling the number of U.S. citizens who are STEM graduates with bachelor's, master's and doctoral degrees by 2015. The most recent data available suggest that to achieve this goal, we will need to graduate some 500,000 STEM students by 2015.

Our thinking is that if we act today -- we can anticipate the challenges over the horizon.

How many folks in this room are Baby Boomers? Let's use the Census Bureau definition -- those born between 1946 and 1964. Could you raise your hands? We Boomers are one of the big challenges. The current Boomer generation of engineers and scientists is moving ever closer toward retirement. This is something we need to address. The fact is: we Boomers are hardly babies any more. The Census Bureau projects that 7,918 Boomers are turning 60 years old each day this year. And just to rub it in, the Bureau reminds us that this amounts to 330 people an hour.

No wonder, then, that the Task Force on the Future of Innovation -- citing the Rand Corporation -- reported that "nearly one-third of the civilian scientific and technical workforce in the Department of Defense (DOD) is currently eligible to retire."

But when we look into the pipeline for future generations of engineers and scientists, we find that in 2005, only 30 percent of eighth-graders scored proficient or better in math on the National Assessment of Educational Progress by the National Center for Education Statistics.

Only 37 percent of eighth- and ninth-graders who took ACT's EXPLORE program in 2005-2006 met the benchmark for college readiness in math. That's according to a presentation by Cynthia Schmeiser of the ACT testing service to the National Symposium on Middle School Education.

And according to international studies on the subject, U.S. eighth-grade students rank 15th in math achievement. But by the time they graduate high school, they score near the bottom of all industrialized nations.

If we are to improve these results, we need to strengthen our students' math and science skills well before they enter high school. It is in middle school -- the 4th to 8th grade -- that math and science education is so crucial.

At Raytheon, given our engineering heritage, we decided to try to better understand the attitudes of middle schoolers toward math.

Raytheon commissioned a survey of 11- to 13-year-olds and found that most (84%) would rather do one of the following than their math homework: clean their room, eat their vegetables, go to the dentist or take out the garbage. Nevertheless, and this is very important, the vast majority of the students surveyed, 94 percent, recognize that doing well in math is important. This says that we have an opportunity to do some good here -- by improving student attitudes toward math in the critical middle school years.

Our thinking is that if we can get them excited about math in middle school, they will be more likely to graduate with STEM degrees later on -- and replenish the technology sector. Or better yet, they will be prepared for other professions. But we need to get involved today -- because there is a long lead time in the pipeline from improving the situation in middle school and graduating engineers and scientists ready to enter the workforce.

While discussion continues about proper class size and teaching tools, corporate America is taking action -- from IBM's Academic Initiative, to the GE Foundation's College Bound program, to Intel's Education Initiative, to ExxonMobil's outreach efforts.

Let me tell you a little about our focus at Raytheon on middle schoolers. Our program is called MathMovesU. It had its first birthday last month. It is built around showing students that math can be fun -- and that it is used in many exciting careers. We try to reach out to the students on their own terms, and through their preferred medium, the Internet. Our Web-based initiative offers prizes for solving math problems linked to celebrities like BMX biker Dave Mirra, gold medal speed-skater Apolo Ohno, and Mia Hamm in soccer, just to mention a few.

So far, so good: in the last year, our mathmovesu.com website -- with its weekly math challenges and incentive-based recognition factor -- has had more than a quarter of a million visitors; 450 middle schoolers have each won $1,000 scholarships; $1,000 has also been given to their local schools or local chapters of MATHCOUNTS, an organization that focuses on math improvement and competition; and a total of $165,000 has been awarded to the teachers who create lesson plans making math more enjoyable and to their schools.

These are hopeful metrics. But beyond the metrics is the energy being generated in the schools. I felt it for myself when I visited an inner-city school, the Tobin School in Boston, last March with Willie McGinest of the NFL. He was a surprise celebrity math teacher for the day.

The school's regular math teacher, Lynne Jones, had earned the celebrity visit by winning one of our MathMovesU essay contests. The excitement in that school was electric. I can't tell you how great it felt to be "high-fived" by the students.

Willie McGinest was a big hit. And he gave the students something to think about. He showed them a connection between the Pythagorean theorem, angle of pursuit, and chasing down a ball carrier.

Simplified, it boiled down to this: The assumption was that Willie was 20 yards away and parallel to the opposing tight end, who had just caught the ball. Assuming Willie is faster than the tight end and has correctly estimated the angle of pursuit, how many yards will Willie have to run along the hypotenuse of the right triangle to catch the tight end 15 yards straight down the field? Now we use the Pythagorean theorem for right angle triangles, which we all remember from geometry class is $A^2 + B^2 = C^2$ where C is the hypotenuse.

In this example: A is 20 yards, or the distance between Willie and the tight end when the tight end first catches the ball; B is 15 yards downfield, or where the tight end will be when Willie will have to catch up with him -- taking into account that Willie is faster and selects the proper angle of pursuit; and C is the distance Willie will have to run along the hypotenuse of the right triangle to intercept the ball carrier.

The answer is: A^2 = 20 by 20 or 400 square yards; B^2 = 15 by 15 or 225 square yards; and C^2 = the sum of 400 and 225, or 625 square yards. Therefore, C = the square root of 625 -- or 25 yards -- and that is the distance that Willie needs to cover. So Willie will need to run 25 yards to tackle the ball carrier. No sweat, huh?

Maybe one of those students in the Tobin School will go on to do great things with math partly because of Willie's visit.

It's possible. And I have proof of the possibility.

Milton Friedman is the proof. When he passed away, the *New York Times* did a beautiful article about his life. It described the factors that contributed to his becoming one of greatest economists of the 20th century -- and the winner of a Nobel Prize in Economic Science.

According to the *Times*, Milton Friedman credited his success to what he called "accidents" in his life. And, one of those "accidents" occurred in high school when his geometry teacher showed him the connection between Keats's poem, 'Ode to a Grecian Urn,' and -- get this! -- the Pythagorean theorem. This connection allowed him, the *Times* explained, "to see mathematical beauty."

Here are two stories about making math exciting -- both involving the same theorem -- one using poetry, the other using football.

Maybe one of the students who was in the Tobin School that day will -- in her acceptance speech for the Nobel Prize -- recall the moment when an NFL player made math beautiful for her.

That is the hope and the wish I leave you with today. Please help our students see the beauty in math and science. Please remember that the teachers are on the front lines in this struggle. They are the "heart" of education. And please be engaged in the great educational opportunity and necessity before us.

You have wonderful role models right here in Arizona: ASU President Michael Crow, who is an Academic Member of the Business-Higher Education Forum; Lee McPheters, a Professor of Economics and Senior Associate Dean of the Carey School, who spoke about globalization and economic resources at our BHEF meeting last winter; and Arizona Governor Janet Napolitano, who is chair of the National Governors Association and co-chair of its "Innovation America" Task Force.

The governor really nailed it when she said of "Innovation America":

"The goal of my Chair's initiative is to educate our students to be innovators, and to carry that spirit of innovation through their university experience and into the workforce.

“Math and science education,” she said, “teaches true problem solving skills that, in turn, will increase our nation’s capacity for innovation in virtually every field.”

I agree: this is the challenge. This is the reward. And if we work together, this will be the reality.

Most of all, I join you in celebrating the students and faculty in this room today – who are helping to secure the future of our country for many many years to come. Thank you. ■
