



# WHARTON AEROSPACE & DEFENSE REPORT

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## **Innovation in Aerospace and Defense: From 'Skunk Works' to Convoy Trainers, Innovative Minds Tend to Think Alike**

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Frank J. Cappuccio has spent his entire career on the front lines of innovation. As executive vice president and general manager of advanced development programs and strategic planning at Lockheed Martin Aeronautics, he oversees the company's "Skunk Works" -- the official alias for Lockheed's advanced development programs, responsible for many famous aircraft designs. "I was one of the original team members at Skunk Works," Cappuccio noted during the 2008 Wharton Aerospace Conference in February. "Everyone said that you couldn't make an invisible airplane. I spent 10 years of my life working on that, and my wife never knew whom I worked for. We made an invisible airplane."

At the conference, Cappuccio discussed strategies for creative thinking and problem solving with other aerospace and defense industry experts on a panel titled, "Innovation in Aerospace and Defense." Moderated by Jon Barney, a consultant in the airlines, aerospace and defense practice at Russell Reynolds Associates, the panel included Don Ariel, founder and chief strategic officer of Raydon Corp. in Daytona, Fla.; Matthew Bromberg, vice president and general manager of global materials solutions at Pratt & Whitney; and Eugene Gholz, associate professor at the LBJ School of Public Affairs at the University of Texas at Austin.

While the panelists acknowledged that aerospace and defense are in many ways two different worlds, they indicated that the practices which foster innovation tend to apply across the board. Primary among those: embracing risk.

### **Innovation in Black and White**

Although "Skunk Works" is a registered trademark with Lockheed Martin, the term has become a popular label for teams within organizations that work on specialized or top-secret projects with a high level of autonomy. At Lockheed, Cappuccio said, Skunk Works' historic productivity has been fueled by passionate people who are not afraid to take risks and a "can-do" culture that generates ideas quickly. The key to encouraging both, he emphasized, is to embrace the concept of successful failure. "As long as you are doing everything that you know how to do, it's okay to fail," he said. "Get back on that horse and try again. What's important is to learn from the failure. Failure is something that comes with pushing the envelope. If you're not putting your people in a position to fail, you're doing them an injustice."

Cappuccio added that managers who encourage a high level of innovation must also protect their greatest assets: their people. "Accepting risk is an important part of the equation," he said. "You cannot give individuals impossible jobs and have them worried about being laid off. Somebody has to provide balance. If I ask somebody to do something that has never been done and it crashes three times, I'll say I screwed up. If you want an innovative company, protect the people who are going to work hard to take risks." That security will yield the kind of flexibility that is a hallmark of an innovative culture, he said.

Another key to innovation within organizations is choosing the right leaders, those "who know the right things to do, but also how to do them right," Cappuccio said.

### **'Possibility Thinking'**

Assembling the optimal innovation team was a critical task a few years back for Pratt & Whitney's Bromberg. Previously vice president of strategy and development at P&W,

Bromberg was charged in 2006 with leading the company's new global material solutions business as its vice president and general manager. This was more than a new title: Bromberg had the challenge of taking a world leader in the design, manufacture and service of aircraft engines, space propulsion systems and industrial gas turbines into an entirely new business segment.

"I had to have a hand-picked team of eight players pulled out of leadership roles from around the company," noted Bromberg. "And they had to be protected so if this didn't work, we would parachute them back into the eight positions they had before they left. We needed a leadership culture that supported creative thinking."

For Bromberg and his team, that has meant wrapping their brains around "possibility thinking," a concept that has come to define the group's working culture. Said Bromberg: "When you're sitting in a meeting and somebody is pushing back on you, you say, 'Consider the possibility.' It's very powerful. It stops the nay saying, it stops the objection and you start focusing not on why you can't do it, but on how you can get it done."

According to Bromberg, several other practices fuel innovation in this environment:

- Being data-rich with high integrity. "Put it all on the table," said Bromberg. "Show where you have data and show where you have assumptions. Be true to yourself. We were looking at a strategic opportunity [with global material solutions]; there were knowns and unknowns. We weren't trying to paint a rosy picture that this was going to be an easy path forward."
- Working to resolve challenges. "Many times, when I was considering this project or any other project, I would start with reasons not to do it," Bromberg explained. "Why not to go forward with this acquisition or why not to go forward with this strategic venture? Embrace the challenges."
- Being strong on internal communications. "What you don't want in a large organization is for the workforce to hear something for the first time in the press," Bromberg noted. "We did thousands of meetings to get an initial buy-in from the organization. We continue to educate about where we are and the problems we're having in front of the entire organization so they can talk about it."
- Focusing on team growth and development. "We're growing the team ahead of the demand. I always tell them that it's like working a case study every day. They have an opportunity to do something that they have never done before."
- Sharing that vision every single day. "I'll get 10 minutes, 30 minutes or an hour if I'm lucky to talk to a group of people," said Bromberg. "You really have to tell them your vision through a story so that when you walk away, they've got it. Creating that vision and perpetuating it through the organization is now my job."

### **Innovation, Military Style**

In commercial aerospace, managers are charged with finding customers who will buy their inventions and ultimately pay for innovators' upfront investments. The model of innovation in the defense world looks quite different, stressed Gholz, who is coauthor of the book, *Buying Military Transformation: Technological Innovation and the Defense Industry*. "If you're going to be a successful defense company, you have to have a very different core competency than if you're going to be innovative in the commercial world," Gholz said. "If you think you're going to run military innovation like innovation in a commercial business, you're going to go bankrupt."

Gholz noted that in defense companies, the customer drives innovation. Whether it's Congress, the armed services or combatant commanders, these customers are "constantly churning with ideas because they're figuring out how to fight better. That leads them to a set of general requirements" that require innovative solutions.

The defense industry is not faced with the prospect of paying up front for R&D and then having to make that money back on the product, Gholz added. "[The customer] paid for the R&D up front, they're going to pay you for the product and they're going to inspect you with a microscope to make sure you don't make too much money on both the R&D and the product," he said. That money comes from a political process, not from someone calculating return on investment or from a venture capitalist. The public also plays a role by supporting the government's commitment to military innovation, he noted. "The political process is about combining war expertise and what we need to beat the enemy with the lobbying expertise of the defense industry to explain to Congress and voters why national security is important."

By recognizing these critical defense-world differences, companies will arrive at what Gholz describes as "the core competency" of military innovation. "The core competency is managing the relationship with the only customer you've got, understanding the needs of the customer, being able to talk in war-fighter jargon and understanding operational concepts, not just understanding technology," he explained. "The reason we hire former military officers is because they're part of our understanding of how to talk, how to figure out the vision of the military and how to explain it to Congress and get the money."

### **'Elevator Objections'**

Raydon Corp. intimately understands the core competency to which Gholz refers. The Daytona Beach, Florida-based firm, which produces simulation training products and solutions, is the top provider of convoy trainers to the United States Armed Services -- a technology that has become increasingly valuable in a wartime plagued by improvised explosive device (or "IED") attacks.

According to founder and CSO Ariel, problem solving has driven innovation in his organization. "We've tried to focus on the idea that the market is a demand market," Ariel said. "It's not about requirement documents generated by people over eight or nine years.... If the market becomes a consumer of [what is] good now, it actually evolves more rapidly than if you try to put a plan together to have something even better two years from now. What you gain is use knowledge. The war fighters will tell you immediately what's good about it and what's not good about it. If you hand them a four-inch-thick document and say, 'Is this good?' they're not going to be able to give you the kind of critical feedback that you need to rapidly innovate around their demand."

Taking that one step further, Ariel added that the defense industry's ultimate customer, the war fighter, could only benefit from more rapid adoption of technologies. Rather than make decisions on their behalf, the government should instead study the decisions these fighters are making in the spirit of "market research," he said.

Unlike the Lockheeds of the world, however, small companies like Raydon don't necessarily have the luxury of costly failures. "As a small company, I'm far more interested in bounding innovation," said Ariel. "Anybody who has worked with engineers anytime in their life can tell you that you can get innovated into bankruptcy rather quickly. How do you bound them, focus them and keep innovation controlled around major objectives?"

Innovation often involves a degree of daring, and as a small company in an industry dominated by the government's rules on technology acquisition, Raydon has embraced a certain amount of risk for the sake of innovation, Ariel noted. "We took some risk with our convoy trainers. We built a fleet of trainers at risk and took it out to defense sites and let them use them. As a result, they started using their own budget and renting them from us."

Big-company innovators may not always be able to respond so nimbly to factors which threaten to derail their ideas. Bromberg, for one, has been faced with skepticism and resistance within Pratt & Whitney, and has formulated a sound defense strategy. "There's an elevator objection to everything," he said. "When we started [our] initiative, there were objections about configuration management, risk management, you name it. You really have to understand what's behind these objections. Every time we've done that, we've found that their concerns are not substantial. Take those objections and embrace them."

Sometimes, innovation means you may not have all the answers, Cappuccio added. "You have to be comfortable with uncertainty."