

Aerospace Scientists Forge New Path For Tin Whisker Research

by Heather Golden

October 31, 2016

Aerospace scientists have been studying the issue of tin whiskers for decades. The current group of Aerospace scientists researching tin whiskers was the first to present an entirely new way to analyze and characterize them.

Tin whiskers are hair-like crystalline structures that sometimes grow from tin-finished surfaces. They can grow to be several millimeters in length, long enough to short-circuit electronic systems by bridging the circuit elements, and thus causing system failures. They are a phenomenon that was first noted in the 1940s and '50s, and the precise mechanism for their formation is still unknown, although there are several working theories on the subject.

“The study of tin whiskers is especially vital when concerning space instruments because of the potential to cause system failures while in space, making timely repair impossible,” said Mark Peterson, one of five Aerospace scientists responsible for this new line of research.

Peterson, along with Scott Sitzman, Brendan Foran, Maribeth Mason, and Miles Brodie, all from the Microelectronics Technology Department, Electronics and Photonics Lab, started with one of the origin theories — that tin whiskers sprout in response to compressive stress in the tin plating.

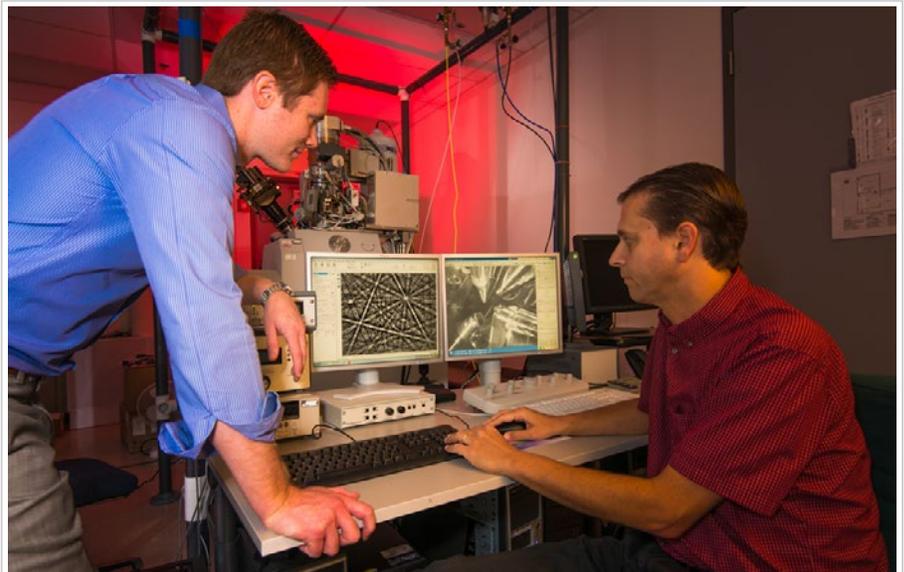
“Even though whiskers have been around since the '40s, some of the fundamental formation and growth mechanisms are still not understood,” Peterson said. “Once we understand those mechanisms, then we can find ways to prevent whisker formation.”

“Most metals are made of aggregates of individual crystals called grains. We know that the tin grains in the plating are under stress,” said Sitzman. A whisker is a single grain growing out of the plating, and its growth acts as a stress relief mechanism. “We want to analyze the root of the whisker to better understand how and where it grows. We especially want to study its deformation characteristics for comparison to neighboring grains in the plating.”

“The question was, ‘So how do we access the whisker root and study the grains around it without introducing damage and artifacts?’ There are a lot of challenges to doing this. A lot of the work was overcoming those challenges,” he added.

They employed the use of Transmission Kikuchi Diffraction (TKD), which is an electron backscatter diffraction-derived technique that uses a scanning electron microscope.

“It is a technique that can analyze crystalline materials in many different ways,” Sitzman explained. “We used this technique to look at these crystals in detail at high resolution, how they were oriented, how they deformed as a response to the stress, and mapped that out on a micro-nano scale. The technique is new enough that it has not been applied in this way to the tin whisker issue yet.”



Mark Peterson, left, and Scott Sitzman view an image of tin whisker diffraction patterns transmitted to them from a scanning electron microscope. (Photo: Eric Hamburg)

The technique works by pointing an electron beam at a crystal to create diffraction patterns. In this case, a small slice of the sample containing a whisker root and some surrounding grains was first thinned down to 100 nanometers or less, allowing much of the beam to pass through it. The resulting patterns were then analyzed.

“Using this technique, we can study crystallographic structure and orientation,” Sitzman said. “The size, shape, and orientation of grains all have an influence on the properties of materials, such as strength, resistance to cracking, and electrical properties. We are particularly interested in how the grains are deformed internally. Aerospace has world-class facilities and staff, and using some of the other available techniques here, we can look at the material in different ways and corroborate this work.”

“The predictive power that would come with understanding the fundamental mechanisms of whisker growth would be invaluable,” Peterson added.

Peterson said scientists at Sandia National Laboratories, the originator of the whisker formation theory the Aerospace team was working within, are interested in a future collaborative research effort along this line of exploration.

“We are not working in a vacuum, but building on previous work,” Sitzman said. “It is a comprehensive effort.”

Vaeros Picks ‘Service Line’ VPrize Winners

by **Kimberly Locke**
October 25, 2016

Employees from throughout the corporation and Vaeros, a division of Aerospace, recently gathered at the Service Line Workshop to reimagine existing Aerospace capabilities from a Vaeros customer perspective.

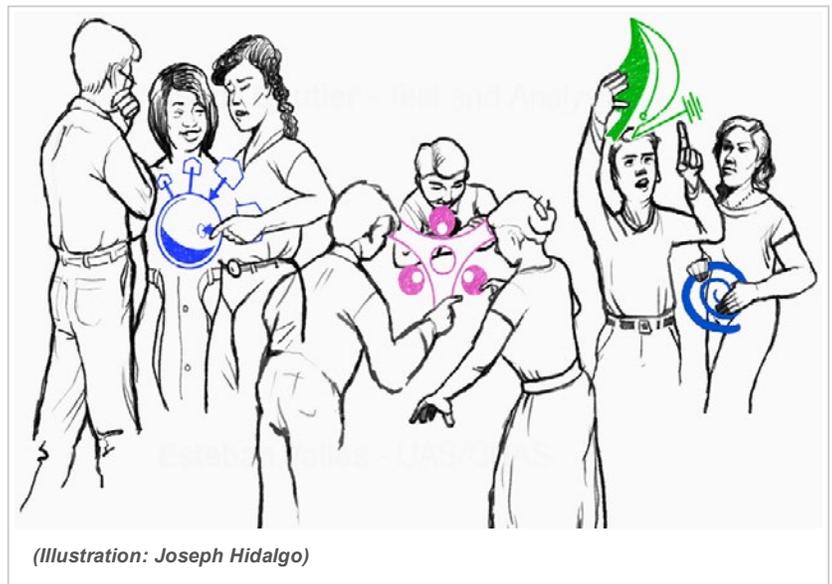
Participants were then given the challenge to work on combining capabilities that would help meet current and emerging customer demands with the end goal of funding four pilot projects for VPrizes, which will be awarded go-to-market investment in FY17.

Ed Swallow, vice president, Vaeros Operations, kicked off the workshop with a briefing titled, “Vaeros Myth Busters,” followed by an introduction about service lines. “Service lines are more of a capability push, not a requirements pull, and describe our capabilities not in terms of telling people ‘this is what we do, take it or leave it,’ but by combining things we do in an effective manner to let our customers know how we can solve their toughest challenges and address their largest issues,” he explained.

Capabilities are not to be confused with skills, according to Swallow. “The distinction is that a skill is something one or two people have that we can offer to a customer,” he added. “A capability is something that has five or more people we can offer to support a customer, backed by tools, technology, and standardized processes. Service lines are then made up of one or more capabilities that are bundled into offerings that solve specific types of customer problems or address broad categories of customer needs,” said Swallow.

The workshop included briefings by Andre Doumitt, systems director, Vaeros Development, who discussed how and why aggregating capabilities supports the go-to-market effort, and Elizabeth Horton, senior project leader, Intellectual Property Programs, who shared news and opportunities in intellectual property.

Following the briefings, participants broke into six technology groups with five to 12 members, each loosely formed around similar or related capabilities. Each group member was asked to review their proposed service offering and then they worked on merging capabilities in preparation for a service line outbrief and pitch later that afternoon. Each group facilitator briefed their service lines, were then scored by the audience, followed by a systems architecting perspective given by Mark Maier, Aerospace fellow, Electronics and Sensors Division, Engineering and Technology Group.



(Illustration: Joseph Hidalgo)



Andre Doumitt addresses the Service Line Workshop.
(Photo: Eric Hamburg)

After the scores were totaled, the four VPrize winners were determined. The winners, their service lines of business, and subcategories of business are:

- **Jenny Gautier**, Test and Analysis (Space Technology Test and Evaluation)
- **Craig Lindsay**, Space Situational Awareness and Space Traffic Management (Orbital Debris, Space Traffic Management, Space Asset Protection, and Space Weather/Near-Earth Objects)
- **Anthony Salvaggio**, Acquisition Management (Department of Homeland Security (DHS), Department of Commerce, and National Institutes of Health Information Technology Acquisition and Assessment Center)
- **Esteban Valles**, Unmanned Aircraft Systems (UAS) and Counter Unmanned Aircraft Systems (CUAS) (DHS, FBI, other agencies, and UAS Working Group Outreach Program)

Lindsay, a VPrize winner, views his service line with great optimism.

“This new service line will open up an entirely new line of business both domestically and internationally,” he explained. “In addition, this work will enhance our current support to the DOD and other traditional customers by building additional skills and depth in areas of interest to them.”

Some of the service lines, such as UAS and CUAS, were cultivated under a Corporate Strategic Initiative Project (CSIP) to build Aerospace capabilities and services. “Under the CSIP, we did market research with potential customers and end-users to identify our focus on protecting against threats from drones,” said Dr. Randy Villahermosa, principal director, Research and Development Office, Technology and Laboratory Operations.

From there, he said, the effort was transitioned to the Aerospace Technical Investment Program (ATIP), where research and development teams were formed to develop technologies and methods for detecting and neutralizing rogue drones. “Those efforts successfully culminated in our first, revenue-generating task with the DHS to address CUAS,” Villahermosa said. “That work validated our strategy and the work we did under ATIP to bring it to fruition. We’ve now entered the third phase of this effort by letting Vaeros further refine and package our CUAV capabilities into a service line that will be readily available to our customers.”

In addition to the four VPrize winners, two seedling projects were selected for further exploration as business ideas. The seedling winners are Susan Vogel for Data Analytics and Joe Betser for Software Analysis and Evaluation.

“We are looking forward to kicking off these FY17 service line programs and working together across Aerospace to enhance our customer business base and bring more capabilities to market. We are also looking forward to doing this workshop again next year to follow up on our FY17 thrust and help develop and package the services current and future customers will need,” Doumitt added.

Isakowitz and Goodman Discuss Four Strategic Imperatives

by **Matthew Kivel**
October 13, 2016

On Thursday, Oct. 13, Aerospace President and CEO Steve Isakowitz and incoming Executive Vice President Dr. Wayne Goodman delivered a 35-minute presentation to Aerospace employees from the Titan meeting center in El Segundo. In their remarks, they assessed the current state of the corporation, reported on Isakowitz’s experiences during his first months as president, and outlined four new strategic imperatives for the company as it evolves to meet the challenges of a rapidly changing industry:

1. Shaping the future
2. Growth
3. Innovation
4. Velocity

Speaking from a stage set simply with two elevated chairs and a table, Isakowitz and Goodman utilized a PowerPoint presentation and a healthy dose of levity to deliver a message that served as a broad introduction to the leadership vision of

the new president and CEO, who assumed the role upon the retirement of Dr. Wanda Austin on Oct. 1.

Early in the presentation, Isakowitz relayed an anecdote about a humorous incident that occurred at the Pentagon where a security staffer mistook his Aerospace lapel pin for the logo of the famed Marvel Comics superhero team The Avengers. He went on to make a parallel between the larger-than-life capabilities of The Avengers and the real-life, but no less remarkable, capabilities of the Aerospace staff.

Isakowitz praised former Aerospace leaders including Dr. Wanda Austin and Dr. William Ballhaus, while emphasizing the need for the corporation to evolve and further enhance its capabilities in order to serve an industry that is transforming as the result of security threats, new technology, and increased competition in the commercial sector. Yet he also made it abundantly clear that Aerospace must never lose the “recipe of success” that enabled the unprecedented string of successful launches the corporation has supported in recent years.

He and Goodman went on to outline and define the company’s four new strategic imperatives. To shape the future, Isakowitz indicated that Aerospace must anticipate its customers’ needs and take on projects at the very earliest phases of planning and development. Goodman added that shaping the future is “built into Aerospace’s DNA,” and he used the corporation’s work on the Global Positioning System as a case in point.

In order to promote growth, Isakowitz stated that the corporation must continue to build its commercial business while Goodman added that by expanding its reach, the corporation can best provide its “shareholders,” the American people, with the cutting-edge technology and solutions they will need in the years ahead.

When speaking about innovation, Isakowitz explained that the “little i” of innovation, the direct work Aerospace performs for its customers, is already being accomplished at a high level. He sees more room for improvement in the “big I” of innovation, or, the more ambitious, far-reaching concepts that are reshaping and redefining the space industry, including new technological developments and increased access to space, both internationally and commercially.

Finally, he discussed velocity and noted that the scientific definition of velocity, which plots the speed and direction of an object, is instructive in terms of providing a lens with which to view productivity. The idea being that it is best to accomplish work quickly and with a direct purpose than to lose relevance as a result of shortsightedness and inefficiency.

As Goodman and Isakowitz traded discussion points, they commonly emphasized the need for the corporation to embrace a culture that is more agile and to adopt a diversified approach to business that provides safeguards for potential budgetary and commercial uncertainty.

Near the end of the presentation, Isakowitz invoked the words of legendary business consultant Peter Drucker, by stating “the best way to predict the future, is to create it,” and he encouraged Aerospace employees to prioritize innovation and to strive for improvement, not always perfection, in the work that they do beyond the realm of mission assurance support. He went on to announce plans to streamline the corporate hiring and performance evaluation processes and finished by soliciting Aerospace employees to share their perspectives via an online survey.



Isakowitz and Goodman spoke about the direction of the company, including four strategic imperatives going forward. (Photo: Walt Sturrock)

New COI Plants Seeds of After-Hours Innovation

by **Heather Golden**
October 25, 2016

Aerospace has a new community of interest modeled after a technology startup, dedicated to the side hustle, and looking for people with a passion for developing technology after hours.

The Aerospace Seed Technology (SeedTECH) COI embraces the unique combination of state-of-the-art resources, and a community of inquisitive engineers and scientists. Through the COI, members can use Aerospace resources after hours to pursue passion projects that may or may not have a connection to the space industry. Resources can include, but are not limited to, equipment and in-house experts.

It is an informal and collaborative network that values the “innovative, maverick heart of the company,” said Terence Yeoh, a member of the COI’s advisory board.

“We are looking for people with passion to bring new ideas,” he said. “We can collaborate between communities. Maybe you don’t have the skill to work that equipment. You find someone in the COI who does.”

“It is like an Aerospace Craigslist of resources,” said Donald Yang, another of the COI’s advisory board. “The ideology is that we are working on our own projects, and reaching out to others to collaborate as a team working toward the common good.”

SeedTECH takes advantage of existing avenues for commercialization of intellectual property. Yeoh and Yang emphasized it does not compete with the Research and Program Development Office or Vaeros. Rather, it supports the same mission by elevating seed technology into Vaeros or RPDO areas of interest while also offering employees a chance to pursue projects they may not have had the resources to explore otherwise.

“This is seed funding,” Yang said. “When a product is complete, we ask if the Aerospace Technical Investment Program [managed by RPDO] or Vaeros wants it. If neither wants it, then the product is returned to the inventor to farm it out externally.”

“We have worked closely with the legal team from the beginning, asking how we could do this and go as far as we can with existing policies,” Yeoh said. “We have a generous royalty sharing here. One third goes to that developer, and that’s an incredible policy.”

It is a “huge win” for Aerospace’s growth no matter if the company decides to keep the product or if the inventor licenses it externally for use outside of the space industry, he added.

“We would then have name association with that market, and it enables a foothold in the areas that could be of interest in the future,” he said.

SeedTECH aims to create an environment that nurtures technology development at Aerospace by promoting out-of-the-box thinking and an entrepreneurial mindset, Yeoh said. Everyone in the company has something to offer, whether technical or not, MTS or non-MTS, Yang added.

In order to facilitate this, the COI founders had to find funding for nonexempt employees, and to pay for consumable materials or resources like specific software. They approached Sherrie Zacharius, vice president of Technology and Laboratory Operations, who agreed to provide the seed funding for the COI.

“We are aware of the pitfalls, and we didn’t want to restrict membership because of that,” Yeoh said. “We want to ensure it is open to everyone. We don’t want to constrain anyone from inventing new things, and ensure everyone has an opportunity.”

The funding is not just open to indiscriminate use, however. All proposals go through the advisory board, which looks at it for market viability and need before releasing the necessary funds.

“Someone comes up with an idea, and the advisory board helps shape the idea,” Yang said.

Aside from Yeoh, a member of the Aerospace Patent Committee, and Yang, who has experience with startups and venture capital, the board also includes Aerospace Fellows Steven Beck and Tammy Choy; Innovation Award winner James Nokes; and Frank Wong, who has experience in economic and market analyses.

“The great part that is unique to this COI is we have this advisory board with the experience and access to resources,” Yeoh added. “The board is all volunteer, and dedicated to serving the budding entrepreneur within the company who wants to create something.”

“We are sharing insights, and stirring the pot for creative ideas to grow whatever comes out of it,” Yang added.

“What is unique about Aerospace is that we are genuinely in it for the greater good,” Yeoh said. “This is 10 percent education, 90 percent community, and 33 percent innovation; it is having an idea and sharing it with someone.”

For those wanting to learn more in-depth details on the SeedTECH COI, there will be an encore lunchtime presentation Thursday, Oct. 27 from 11:30 a.m. to 12:30 p.m. PT (12:30 to 1:30 p.m. MT, 1:30 to 2:30 p.m. CT, 2:30 to 3:30 p.m. ET) in A3-1607A, sponsored by the Aerospace Black Caucus. Members of the advisory board will be on hand to answer any questions. More information about SeedTECH is also available [online](#).

Awards and Recognitions, October 2016

by Gail Kellner
October 10, 2016

Aerospace employees frequently earn recognition for their professional accomplishments. This Orbiter feature will acknowledge those honors and awards, including the publication of books. To nominate someone for consideration in this section, send details of the award in a timely fashion to orbiter@aero.org, or contact Gail Kellner at gail.d.kellner@aero.org.



Mike Spence

Mike Spence, Aerospace retiree and former principal director of the Eastern Range Directorate, was honored with the 2016 National Space Club Florida Committee Lifetime Achievement Award on Sept. 13 in Cape Canaveral.

Each year, the club recognizes individuals for lifelong achievement and contributions to the United States space program while living in Florida. Nominees must have made significant contributions to the space industry through technical achievement, education, or the management of aerospace-related activities as a government, military, commercial, or government contractor employee.

Spence was an officer in the Air Force for 26 years, with posts as commander of the 6555th Aerospace Test Group and the 45th Operations Group. He subsequently worked at The Aerospace Corporation in Cape Canaveral for 16 years.

The Aerospace Corporation Receives ATD BEST Award

The Aerospace Corporation placed 12th in the Association for Talent Development's BEST 2016 Awards. Al Hoheb, principal engineer, The Aerospace Institute, accepted the award on the corporation's behalf at a reception on Oct. 5.

The BEST Awards recognize organizations that demonstrate enterprise-wide success as a result of using talent development as a strategic business tool to get results.

Thirty-six awards were given overall, and there were over 150 entries from 18 countries.

October 2016 Obituaries

by Elaine Young
October 01, 2016

Sincere sympathy is extended to the families of:

Hugh Carmichael, member of technical staff, hired Jan. 22, 1965, retired Jan. 1, 1990, died Aug. 20, 2016.

Dennis Ferm, member of technical staff, hired July 7, 1997, retired Dec. 2014, died April 25, 2016.

Edwin Garcia, member of technical staff, hired June 2, 1975, retired Dec. 1, 1990, died Aug. 26, 2016.

Charles Gross, member of administration staff, hired Jan. 31, 1983, retired Oct. 1, 2013, died, Sept. 17, 2016.

James Pearson, member of technical staff, hired Feb. 28, 1983, retired Oct. 1, 2007, died Sept. 2, 2016.

Sherman Cohen, member of technical staff, hired Oct. 1, 1977, retired Dec. 1, 1994, died Sept. 17, 2016.

To notify Aerospace of a death and have it included in the Orbiter, please contact Cynthia Johnson in Human Resources at 310-336-5806.

October 2016 Anniversaries

by Elaine Young
October 05, 2016

35 Years

Engineering and Technology Group

Jeffrey Childs, Jerris Johnson

Systems Planning, Engineering, and Quality

Gail Johnson-Roth

30 Years

Engineering and Technology Group

John Coggi

Operations and Support Group

Craig Robertson

Space Systems Group

Robert Unverzagt

25 Years

Engineering and Technology Group

Mark Vogel

Space Systems Group

Geoffrey Harris

20 Years

Engineering and Technology Group

Eric Frasco, Joseph Han

15 Years

Engineering and Technology Group

Ari Majamaki

National Systems Group

Rita Farmer

Operations and Support Group

Daniel Menzie, Elvira Wolk

Space Systems Group

Andrew Rowland, Jason Anderson

10 Years

Engineering and Technology Group

Cynthia Dobbs, David Rock, Lael Woods, Robert Santoro, Steven Bielat

National Systems Group

Deborah Bullett

Operations and Support Group

Gail Kellner, James Peterson Jr.

Space Systems Group

Paul Zacks

Systems Planning, Engineering, and Quality

Allen Victor, Jonathan French

Vaeros

Marc Wigdor

5 Years

Engineering and Technology Group

Seema Sud

Enterprise Information Services

Carlos Colon Burgos, Robert Dalin

National Systems Group

Joseph Altebrando, Mark Jelonek

Operations and Support Group

Eleanor Jones, Jennifer Shannon, John Lampasona, Jose Robles

Space Systems Group

Bogdan Marcovici, Todd Falkenstein

Vaeros

Uma Bruegman, Peggy Hwu

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