Orbiter
August – September 2019

Aerospace Employees Put Their Asteroid Deflecting Skills to the Test

by **Conor Shine**
September 27, 2019

With an asteroid hurtling toward Earth, a team of employees at The Aerospace Corporation huddled around computer monitors in an attempt to devise a strategy to knock it off course.

With the clock ticking down, the team found the right combination of launches and trajectory to deflect the asteroid and save the state of Hawaii from catastrophe.

Except, there was no asteroid. Instead, the employees were taking part in a friendly competition against their colleagues using an Aerospace-designed tool for modeling deflection missions.

The lunch-hour “Help Save the Earth” event, hosted Thursday by the D8 Site Council, featured four teams of four people each working to save their assigned city. Dozens more gathered in the cafeteria to cheer them on while snacking on pizza and cookies.

“It’s One Aerospace. It’s meant to bring everyone together. We had different teams from different divisions with people collaborating,” said Linda Yocum, senior business manager in the Engineering and Technology Group and member of the D8 Site Council. “It was a great turnout and I think everyone enjoyed themselves.”

The competition was built around a software application Aerospace designed in collaboration NASA’s Jet Propulsion Laboratory. The project grew out of international planetary defense conferences organized by Aerospace and a need for tools to help decision makers understand the range of possible responses should an asteroid threaten Earth.

“The purpose of the tool besides education is to tell decision makers what is possible and what is not possible for a variety of timelines for hypothetical asteroids,” said Dr. Nahum Melamed, project leader in the Vehicle Systems Division who helped emcee the event. “It also makes the point that finding asteroids early and having systems on the pad early enough to launch when we need them will avert crisis.”

The scenario played out Thursday saw Aerospace employees attempting to design a mission using high-speed kinetic impact, where spacecraft are launched on a collision course with the asteroid. The spacecraft hitting the asteroid imparts momentum, shifting its course slightly.

With enough spacecraft and enough time, the technique can create a suitable miss distance to save the Earth.

The teams had limited time to devise a solution to deflect the approaching asteroid.

Employees were grouped into teams of four and assigned a city to protect.

To keep things interesting, the Aerospace teams were faced with an increasing difficulty level, as the time to deflect the asteroid shrunk from 30 years down to one year and the asteroid's properties changed. This limited the margin for error and forced teams to get creative with how they used their limited launch vehicles.

Ryan Hill, a member of the winning team charged with protecting Honolulu, said his group worked collaboratively to zero in on the right combination of trajectories, launch windows and launch vehicles in order to save the city.

"It feels good. I was hesitant coming in because I didn't have much experience with orbital mechanics. It was an easy to learn app and a good learning experience," said Hill a technical staff member in the Mechanical Systems Department. "It was a new experience getting to work with people outside of my group and getting to see new sides of Aerospace and what we do."

Outpacing the Threat with an Agile Defense Space Enterprise

September 24, 2019

The United States' adversaries are working intensely to undermine our leadership in national security space, as President and CEO Steve Isakowitz explained at the September 19 all-hands — it is not enough to meet the challenges these adversaries pose, but to anticipate and confront them with greater speed, innovation, and resiliency.

Aerospace has shared its vision for getting ahead of adversaries, referred to as Project Thor, in a new publication, *Outpacing the Threat With an Agile Defense Space Enterprise*. The paper explains Thor's four recommendations for creating an agile architecture for defense space acquisition and production:

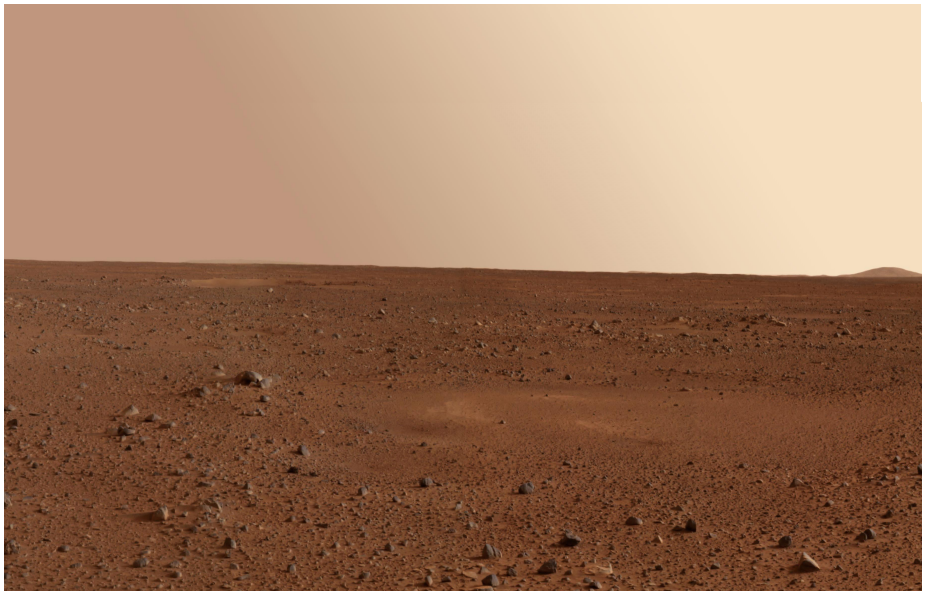
> Realigning space acquisition for agility and resilience through increased production, a modular and open architecture and contracting approach, and greater competition, a concept referred to as Continuous Production Agility (CPA).
> Using modern systems engineering to create a single, agile space enterprise.
> Accelerating advancement with meaningful prototyping and stronger partnerships.
> Streamlining decision making for requirements, resources, and acquisition.

These concepts were Aerospace's response to a 2018 challenge from the Deputy Secretary of Defense to provide an actionable plan to outpace the threat and project lethality that aligns with the National Defense Strategy.

Aerospace will also soon publish a paper that expands on the CPA concept. And as a next step in furthering Project Thor's impact, Aerospace is looking for employee ideas that build on Thor's recommendations — a call for papers will soon be announced, giving you an opportunity to provide new ideas on the future of defense space architectures.

A Powerful New Laser for Studying the Solar System

September 09, 2019



The surface of Mars. (Photo: NASA)

Nearly 140 million miles away on Mars, NASA's Curiosity rover is searching for life and measuring the age and makeup of the Red Planet. The fourth rover to explore our planetary neighbor uses laser spectrometry to analyze the elements found on the surface by firing a laser at a sample and studying the gas released from impact.

Laser and electronics experts in the Photonics Technology Department and xLab/Electrical and Software Engineering Department at The Aerospace Corporation are establishing and maturing new laser technology to enable candidate instruments to be sent to the moon and planets in the solar system and determine their age from an elemental analysis of collected surface samples.

This Aerospace technology is paving the way for instruments such as the Chemistry Data Experiment (CDEX) instrument. This device would be about the size of a cube 40 inches on a side and would contain nine lasers, a mass spectrometer, and mechanisms for gathering and processing surface samples. The instrument's in situ measurements will address fundamental questions of inner solar system impact processes and geochronology, and potentially support the search for evidence of biological activity or environmental capability to support life. CDEX is expected to be more accurate than dating methods currently in use.

CDEX uses a dating method that goes by the acronym LARIMS – Laser Ablation Resonant Ionization Mass Spectrometry.

"The instrument has an ablation laser, two specialized lasers each for preparing strontium, rubidium, and lead; and two ionization lasers," explained William Lotshaw, director of the Photonics Technology Department in the Electronics and Photonics Laboratory.

Read more here.

Students Strut Their Science

September 03, 2019

On a warm day at the end of August, interns from the Physical Sciences Laboratories (PSL) showed off some of their hot projects during a poster session in A6.

A crowd of employees enjoyed engaging presentations on work that spanned a variety of subject areas.

Sean Jergensen, for example, wants to ensure that space missions do not bring Earth-based biological contaminants to locations being searched for new life. His project involved confirming the presence of microorganisms on space materials and figuring out how to remove them. And you thought it was hard to remember to throw out your piece of fruit before boarding an international plane flight.

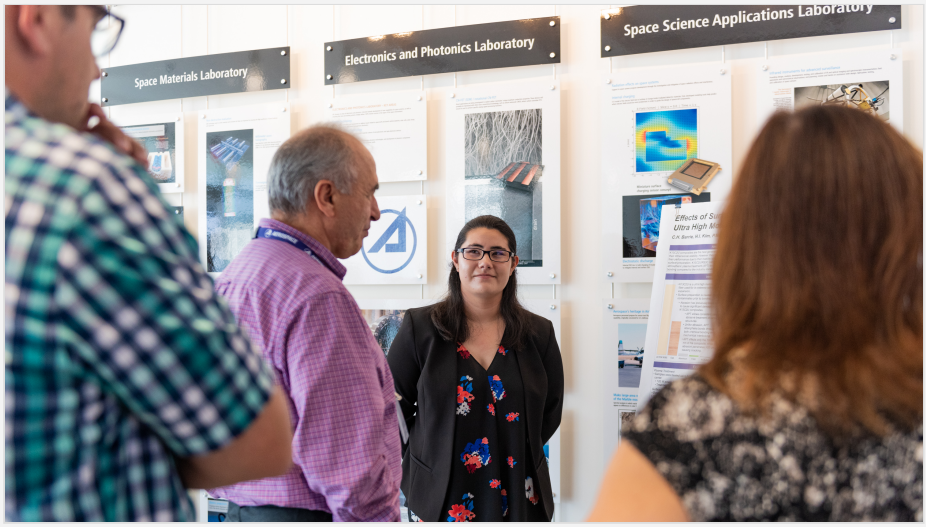
Daniela Marques looked at improving space optics by using carbon-fiber reinforced composite-replicated mirrors instead of traditional mirrors. Reflecting on her work, one might say the quality shines forth.

Gary Li, a recipient of the Matthew Isakowitz Fellowship, spent time this summer assessing how much humidity an ion thruster can take—handy to know if your mission is delayed on a Florida launch pad.

It's time for the students to head back to school, but they've left their mark and we can't wait for them to come back next year.

"These interns made tremendous contributions to our research programs," said PSL General Manager Tim Graves. "It was amazing to see the depth and significance of their work. Through this event, we saw new collaborations and conversations between groups and it will definitely be a future annual event!"

Frank Pan bonds with an interested employee--over a discussion of adhesiveless bonding for satellite applications. (Photo: Jeff Berting)



More bonding takes place around Catherine Barrie's research on surface preparation of composites. (Photo: Jeff Berting)

September 2019 Obituaries

by **Conor Shine**
August 31, 2019

Sincere sympathy is extended to the families of:

Stanley Blumenstein, member of technical staff, hired July 24, 1961, retired May 1, 1992, died Aug. 5, 2019
Ronald Covey, member of technical staff, hired Aug. 15, 1972, retired July 1, 1994, died Aug. 16, 2019
Anthony DiGiacomo, member of technical staff, hired April 9, 1962, retired Oct. 1, 1993, died July 14, 2019
Gerald Herntenstein, member of administrative staff, hired Sept. 24, 1962, retired Nov. 1, 1991, died Aug. 2, 2019
Thomas Hill, member of technical staff, hired April 15, 1964, retired Sept. 1, 1996, died July 22, 2019
Eli Howard, member of technical staff, hired July 20, 1961, retired Nov. 1, 1991, died Aug. 3, 2019
William Huffman, member of technical staff, hired April 10, 1961, retired Nov. 1, 1994, died Oct. 29, 2018
Dorothy Mahaley, member of administrative staff, hired Oct. 17, 1960, retired March 1, 1980, died July 28, 2019
Eunice McGee, member of administrative staff, hired Oct. 27, 1960, retired April 1, 1984, died Aug. 13 2019
James Pierson, member of technical staff, hired March 6, 1961, retired Jan. 1, 1984, died July 23, 2019
Harvey Sigler Jr., member of technical staff, hired July 29, 1965, retired Nov. 1, 1991, died July 17, 2019
Harold Solomon, member of technical staff, hired Jan. 30, 1961, retired May 1, 1993, died Aug. 10, 2019
Fred Voss, member of administrative staff, hired June 13, 1966, retired Jan. 1, 2002, died July 26, 2019
Fletcher Wicker Jr., member of technical staff, hired March 14, 1977, retired Aug. 1, 2013, died Aug. 11, 2019
Earl Wright, member of technical staff, hired June 28, 1983, retired Oct. 1, 1993, died Aug. 16, 2019

To notify Aerospace of a death and have it included in the Orbiter, please contact People Operations at (310) 336-5107.

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