



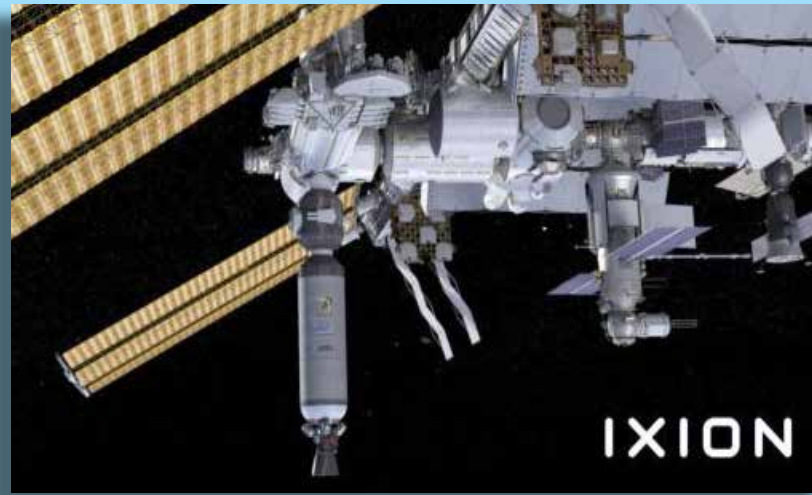
New Chapter Opens for Commercial Space: NanoRacks and NASA Sign NextSTEP Contract for Commercial Habitat Concept Study

By Jeffrey Manber, CEO NanoRacks September 2017

This week marks an important milestone for NanoRacks. NanoRacks and NASA have signed the contract for Ixion, a commercial habitat concept study first announced last summer. The contract will focus on re-purposing spent launch vehicle upper stages. NanoRacks is working with United Launch Alliance (ULA) to provide launch services and Space Systems Loral who will provide robotic outfitting capabilities.

Funded by the NASA NextSTEP-2 award, the Ixion concept is the only one of the NASA-funded programs that focuses on re-purposing spent launch vehicle upper stages.

For us, at NanoRacks, the signing of the agreement marks a broader milestone: the public start of our commitment to bring about cost-efficient, commercial space stations via re-purposing in-space hardware, and we can't wait to bring you along for the ride into the future.



Every step NanoRacks takes on the International Space Station (ISS) is preparing us for building on our vision of the future – a world where launches are plentiful, the in-space destination is king – and commercial habitats and space stations populate our solar system with customers from every sector of our society.

Starting with plug-and-play research modules, we've mastered how to operate science labs in micro-gravity and leverage the astronaut expertise on-board, while also building up robotics programs for

Continued on page 5



Steve Jurczyk, NASA Associates Administrator for Space Technology and Andrew Rush viewing a robotics demonstration

First-Ever 3D Printing in a Space-like Environment Demonstrated

By Bryan Culbert Moffett Field, Calif., 1st August 2017

Under its Tipping Point contract with NASA, Made In Space, Inc. (MIS) recently manufactured the first-ever extended 3D-printed objects in a space-like environment, a significant milestone on the path to manufacturing systems and satellites in space. In a thermal vacuum chamber (TVAC) at NASA Ames Research Center's Engineering Evaluation Laboratory (EEL), MIS's Extended Structure Additive Manufacturing Machine (ESAMM) successfully operated within the vacuum and temperature environment of space. In its facilities, MIS quickly built on this success, using ESAMM hardware to manufacture a beam structure measuring over 30 meters in length. The ability to manufacture complex, large-scale structures in space is a critical enabler of next-generation, space-optimized satellite design and deployment.

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As part of its in-space manufacturing and assembly technology, Archinaut, ESAMM is used to manufacture space-optimized structures. Archinaut combines robotic assembly with ESAMM to produce bigger, more complex structures than exist in space today. Because this technology manufactures in space, it enables the optimization of structures and spacecraft for the space environment instead of the launch environment.

“These successful demonstrations mean that on-demand, adaptable manufacturing of complex structures in space has been significantly de-risked,” said Andrew Rush, MIS President & CEO. “This expands the design space. We hope that mission planners can now more confidently design missions around in-space manufacturing and assembly, optimizing satellites for their operational environment, not just launch.”



Structures produced in the EEL TVAC facility were made from PEI/PC, a polymer alloy well-suited to space applications. As part of this NASA-backed effort, MIS manufactured a structural segment of a space-optimized boom out of PEI/PC on its Additive Manufacturing Facility aboard the International Space Station (ISS). Taken together, these tests demonstrate ESAMM’s high state of technological readiness. In the lab and on ISS, MIS is continuing to advance the state of the art with ongoing robotic assembly development and improvements to space-capable manufacturing technologies. “Satellites incorporating in-space manufacturing and assembly will inherently be more capable and provide more value to operators and users,” said Rush. “We’re proud to be making this vision a reality and grateful for NASA’s support.”



Singularity University Announces SU Ventures for Impact Entrepreneurs Who Use Exponential Technologies for Good

By Anna Roubos, Mountain View, California 27th September 2017

In Partnership with Impact Investors, SU Ventures is Designed to Encourage More Social Entrepreneurship by Providing Long-Term Direction and Support

Singularity University (SU), a global community with a mission to educate, inspire, and empower leaders to apply exponential technologies to address humanity's grand challenges, today announced SU Ventures, a new program designed for the unique and more long-term needs of impact-focused startups. In order for these startups to become high-growth, sustainable businesses, they need early and ongoing funding, rapid and iterative customer testing to inform product development, as well as connections to a global network of domain experts and potential partners.

The emphasis on sustained engagement is critical. These entrepreneurs are tackling humanity's greatest challenges surrounding water, food, disaster resilience, climate, health, and education, to name a few, by using rapidly evolving, exponential technologies such as artificial intelligence, virtual reality, digital biology, and nanotechnology. The difficulty of their missions is of a different order of magnitude to the traditional entrepreneurial effort, which is often focused on bringing the next generation of existing solutions to market. Rather, these social impact creators are striving to solve big problems that could favorably impact a billion people within ten years with their moonshot initiatives.

"SU Ventures is the first and only program developed to encourage more, successful impact entrepreneurs to solve humanity's challenges," said Monique Giggy, Managing Director of SU Ventures. "SU has the global network of corporates, development organizations, and experts to open doors to early customers and partnerships. We also have an arsenal of boot camps, sprints, retreats, labs, summits, and other tools to ensure these startups deliver impactful breakthroughs. We go well beyond traditional accelerators and incubators to give them an 'all-you-can-engage' format for the lifetime of the startup."

"We believe Singularity University has one of the few well-positioned startup programs with solid management to execute the operations and help companies reach their goals," said Paul Mahal, CEO of Stanford Ventures, LLC.

SU Ventures Tools for Social Entrepreneurs Bringing Abundance to the World

Capital: SU provides boot-camps focused on teaching founders how to raise and leverage the various types of capital they need to create growth, scale, and sustainability. SU teaches them how to raise and blend sources of early seed capital from government grants and philanthropy, to angels, VCs, and social impact investors.

Customers: SU helps startups design field-trial pilots to test their innovations and get real-world feedback. Being able to set clear metrics and get fast, iterative feedback accelerates the startup's product development life-cycle and time to market. SU brings others from its global network to ensure these trials are successful, including corporations, other startups, and development organizations in its Impact Partners program.

Connections: SU has a community that is 200,000-strong across all regions of the world. The community includes impact investors; corporations; industry, market, and technology domain experts; government agencies and NGOs; foundations; SU Country Partners and Chapter representatives; and SU alumni and faculty. From this community network, SU Ventures curates mentors to help participants address specific challenges, scale their impact, and understand product market fit. SU also curates unique Boards of Ad-

visors with relevant domain experience to support founders on their journey.

To learn more about what the second Incubator class participating in SU Ventures is doing to solve global grand challenges for climate and the environment, go to the SU press release also distributed today entitled, Social Entrepreneurs Showcase 15 Innovations for Global Good to Impact Investors at Third Singularity University Ventures Demo Faire.



ABOUT SINGULARITY UNIVERSITY

Singularity University (SU) is a global learning and innovation community using exponential technologies to tackle the world's biggest challenges and build an abundant future for all. SU's collaborative platform empowers individuals and organizations across the globe to learn, connect, and innovate breakthrough solutions using accelerating technologies like artificial intelligence, robotics, and digital biology. A certified benefit corporation headquartered at NASA Research Park in Silicon Valley, SU was founded in 2008 by renowned innovators Ray Kurzweil and Dr. Peter H. Diamandis with program funding from leading organizations including Google, Deloitte, and UNICEF. To learn more, visit SU.org, join us on Facebook, follow us on Twitter @SingularityU, and download the SingularityU Hub mobile app.

Center Director, Eugene Tu, Announces Carol Carroll as NASA Ames Deputy Center Director

Moffett Field, CA 6th August 2017

MESSAGE FROM EUGENE L. TU, CENTER DIRECTOR

It is with great pleasure that I announce the selection of Ms. Carol Carroll as the NASA Ames Deputy Center Director, effective Sunday, August 6, 2017. I am very excited to have Carol join me as we lead and support the Center and Agency into the future.

Carol has a unique blend of technical, project/program management and mission support experience—having worked in many NASA Ames and HQ organizations. Carol worked on the Unitary Wind Tunnel as a safety engineer, delivered TPS flight hardware for Mars missions and X-Planes as a systems engineer, developed and executed in-space propulsion programs as a program executive, initiated the transformation of the SOFIA Program as the program manager, revitalized the Space Biology Program and the Space Biology Division and greatly expanded the work at Ames for the International Space Station as the Deputy Director for Science. Most recently, as Director of the Ames Human Capital and Education Directorate, Carol developed and im-



plemented a new strategic workforce plan and hiring process that is benefiting the entire center.

Carol was appointed to the Senior Executive Service in September 2009. Prior to joining NASA in 1994, she had 11 years of experience in the aerospace industry, and she designed and developed missile launch systems for the Department of Defense. Carol received a bachelor of science in mechanical engi-

neering from Virginia Tech and completed the Senior Executive Fellows program at the Harvard University Kennedy School of Government.

With Dr. Thomas Edwards' retirement from NASA on July 31, 2017, I want to thank him for his more than 34 years of service to our Center and Agency. Throughout this time—and my entire career at NASA—Tom has been a great mentor, colleague, collaborator and friend, and I look forward to hearing about his future endeavors. We will have an opportunity to thank Tom personally in late August and wish him well for the future (more details

coming soon).

As we end this chapter in Ames leadership, we turn to a new chapter in moving our Center forward. Please join me in thanking Tom for his service and welcoming Carol to her new position as the Ames Deputy Center Director.

Eugene L. Tu
Center Director

RMV Tech Group Will Train ONE NASA Program Managers – CubeSats, PCB Troubleshooting & More

Moffett Field, California September 2017

Since 2014, RMV Technology Group, LLC, a NASA Industry Partner, has trained the ONE NASA ESD Program Managers over a 5-day period in support of NASA Programs and Projects. In 2016, a one-day 'mock' audit of a Contract Manufacturer demonstrated to the NASA engineers the significance of Instrument Driven Assessments in an assembly operation.

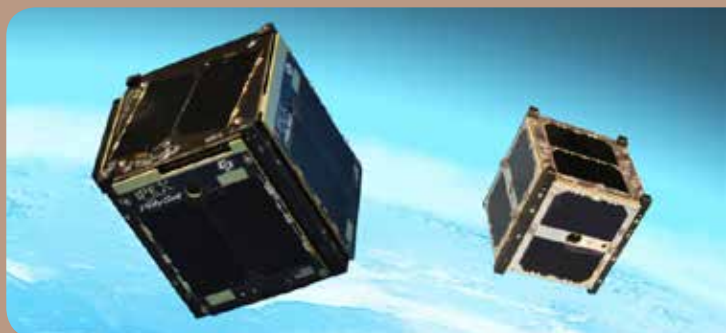
On March 26-30, 2018, NASA Ames Code R (Engineering) will host the 5-Day Event which will take place in Building 152. For part of the session, RMV will provide a one-day "Hands On" Instrument and Incoming Inspection Training in Building 19, where



RMV Technology Group is headquartered. Attendees will receive the RMV ESD Aerospace Engineer Certification upon examination and attendance for the NASA Electrostatics course.

With the recent updating of NASA ESD documents, RMV will discuss Class A to D Protocols for CubeSats including R&D or Unrated Areas where ESD protection is required. Other areas to be covered will include Risk Classification of Payload Projects, Instrument Driven Assessments, Handling of Extremely Sensitive Devices and damage that can occur upon removal from a bag.

The NASA Program Manager Course has been specifically designed for Aerospace & Defense and has been continually updated every two years as Electrostatics continues to be a major factor for successful pro-



grams and projects within NASA. This NASA ONE ESD Training is open to all NASA Program Managers as a priority. Limited seats are available for NSC personnel, Joint Audit Planning Committee (JAPC) members and NASA primes.

If interested in attending this class, please contact Gene Monroe, NASA POC for ESD, NASA Langley Research Center, Hampton, Virginia. Call Gene direct at 757-864-6156 or email gene.s.monroe@nasa.gov.

For more information, please contact Bob Vermillion at bob@esdrmv.com or call Renee Mitchell (650) 964-4792. RMV is a Service Disabled Veteran Owned (SDVOSB) High Technology engineering firm. Please visit the website www.esdaerospacetraining.org for more information on professional engineering services, training and ESD test & evaluation.

From NanoRacks and NASA, continued from page 1

increased automation and efficiency. We've stimulated the growth of the satellite deployment market as the leading provider for CubeSat services in low-Earth orbit, with one of the world's most diverse customer bases. We're learning how to operate in the extreme space environment, while limiting space debris, with our External Platform.

Our team, the "Ixion Initiative Team" is a new addition to NASA's NextSTEP effort, and will begin by conducting a comprehensive feasibility study evaluating the conversion of rocket upper stages into habitats. This innovative approach offers a pathway that is more affordable and involves less risk than fabricating modules on the ground and subsequently launching them into orbit.

Additionally, the Ixion Initiative Team proposes demonstrating this revolutionary, low-cost concept via the conversion of a Centaur

rocket upper stage, which can be attached to the ISS. After the converted Centaur upper stage is attached to the ISS, our team will leverage the habitat as a proving ground for a variety of private sector activities leading to a new era in commercial low-Earth orbit utilization.

NASA has made it clear that the International Space Station will be the last U.S. government-funded space station in low-Earth orbit – and all of us at NanoRacks believe we are well positioned to be one of the commercial leaders as NASA focuses on taking America into deep space.

Let the designing begin.



CMU-SV Students and Faculty Mentor Teens in Hackathon

By Emily Durham & Catherine Fang, Cupertino, California 24th June 2017

This summer, students and faculty from CMU-SV collaborated with the Cupertino Library on their third annual Teen Hackathon, CU Hacks 3.

This summer, students and faculty from Carnegie Mellon University Silicon Valley (CMU-SV) collaborated with the Santa Clara County Library District (SCCLD) and Cupertino Library on the third annual Teen Hackathon (CU Hacks 3) in the Cupertino community. Students and faculty from CMU-SV worked closely with the library and acted as

mentors for the local teens, who were invited to attend the free event held on Saturday, June 24, 2017.

solve with the development of minimal viable products. We form groups and create prototypes very rapidly to test in the market—all in a few weeks. In the hackathon, the students gathered their ideas in a short time-line, and they created prototypes to present on stage within a day. It was something challenging for them, and we were glad to facilitate their process with our experiences.”

Ten CMU-SV students from the Integrated Innovation Institute, the Department

of Electrical and Computer Engineering, and the Information Networking Institute, as well as CMU-SV faculty Gladys Mercier and Catherine Fang, acted as mentors during the competition. CMU-SV Professor Catherine Fang coordinated with the event organizers, Cupertino Library’s Matt Lorenzo and Roslyn Donald, to define the mentor role. CMU-SV students used the skills they acquired at Carnegie Mellon by providing guidance to the teens on such topics as project idea brainstorming, team collaboration, quick research skills, debugging, and formality on final pitch.

beginner teams and 11 intermediate/advanced teams. The students’ applications, aka “hacks,” could include phone apps, websites, robots, and other innovative ideas that could contribute to bettering the community. The winning team created an image recognition app that, when given a photograph of a plastic or glass bottle, a container, or another object, would tell the user whether that item is recyclable or not.

While this collaboration with the Cupertino Library allowed CMU-SV to spread its resources to the teenagers and to the local community as a whole, the university and its students also gained much from the experience.

“It’s a two-way thing. On one hand, we share with the teens our experiences on building applications in a team context by managing codes in repositories like Github, and tips and tricks to debug issues,” explains Aw. “On the other hand, from the mentor side, you kind of feel young again. You can feel the energy in the room—the teens learned really fast, and it’s amazing that at their young age they were able to prove their ability to leverage new technologies, like Google Cloud Vision API and Firebase, to create new applications. It is a nice reminder that regardless of age, anyone can be creative, hack, and create something of value.”

Through this event, local community also gained a better understanding of the programs offered at the CMU-SV campus. One community member said, “It’s amazing that such a great educational resource is so accessible and close to us. It’s a big plus to our community.”

“The teens really learned a lot from all of the outstanding CMU mentors,” says Matt Lorenzo, the host of the hackathon. “It was a wonderful collaborative effort, and in the end, the teens created some really awesome projects that went towards helping the Cupertino community. It would not have been possible without the help of the entire CMU mentor team. This event will keep getting better and better year after year.”



mentors for the local teens, who were invited to attend the free event held on Saturday, June 24, 2017.

The goal of the hackathon, which had the theme of “Smart City,” was to encourage local teens (age 14-18) to code prototype applications that would help the Cupertino community become a better place to live—all while giving the students hands-on knowledge in computer science and software engineering.

“I see parallels in the hackathon with what we do in school,” says hackathon mentor Elaine Aw, a master’s student studying Software Management at CMU-SV. “For example, in our classes, we identify real-world problems to

of Electrical and Computer Engineering, and the Information Networking Institute, as well as CMU-SV faculty Gladys Mercier and Catherine Fang, acted as mentors during the competition. CMU-SV Professor Catherine Fang coordinated with the event organizers, Cupertino Library’s Matt Lorenzo and Roslyn Donald, to define the mentor role. CMU-SV students used the skills they acquired at Carnegie Mellon by providing guidance to the teens on such topics as project idea brainstorming, team collaboration, quick research skills, debugging, and formality on final pitch.

Around 100 students participated in the competition, and students were divided into 15 teams of six to seven members, with participants separated into four B]

MOON EXPRESS AND NANORACKS TEAM TO SUPPORT COMMERCIAL MISSIONS BEYOND EARTH ORBIT

Columbia, Maryland 10th October 2017

NanoRacks Alliance with Moon Express will Provide Sales & Technical Support for Science and Commercial Payloads to the Moon and Beyond

COLUMBIA, MARYLAND (October 10, 2017) – Moon Express and NanoRacks, leaders in commercial access to space, announced an alliance today supporting science and commercial payloads flying on Moon Express missions to the Moon and beyond. The announcement was made at the annual meeting of the Lunar Exploration Analysis Group (LEAG) meeting at the Universities Space Research Institute headquarters in Columbia, Maryland.

Moon Express has introduced a family of robotic exploration vehicles designed to collapse the cost of access to the Moon and other deep space destinations, with flights to the Moon beginning in 2018. Under the agreement, NanoRacks will provide global payload and mission sales, marketing, management and technical support to Moon Express commercial, academic and government customers and expedition partners.

“We are thrilled to partner with Moon Express to grow the commercial market and provide world-class customer service on the Moon and beyond,” says NanoRacks founder and CEO Jeffrey Manber. “Our customers are excited about commercial lunar opportunities.”

“The primary goal of our alliance with NanoRacks is to ensure a great customer experience,” said Moon Express Founder & CEO, Bob Richards. “Our companies share a culture of customer focus, and together we will be able to provide end to end support from payload concept to mission operations.”

Moon Express is partnered with NASA under the Lunar CATALYST Program, developing new lander technologies supporting a U.S. return to the lunar surface, and in 2016 became the first company in history to receive U.S. government authorization for a commercial mission beyond Earth orbit and to the Moon.

NanoRacks operates on the International Space (ISS) Station via a Space Act Agreement with NASA’s U.S. National Labs. In 2017 the Company announced permission from NASA to own and operate the first-ever commercial Airlock on the ISS to increase commercial opportunities in low-Earth orbit. Additionally, NanoRacks, along with Space Systems Loral and ULA are working under the NASA NextSTEP program to look at re-use of upper stages of launch vehicles for commercial space stations. NanoRacks has launched over 580 payloads to the space station to date, including almost 200 satellites deployed from ISS.

Both Moon Express and NanoRacks are privately funded commercial space ventures seeking to lower the cost of access to space to create new opportunities for science, research, exploration and commercial missions in and beyond Earth orbit.

For more information: nanoracks.com / moonexpress.com



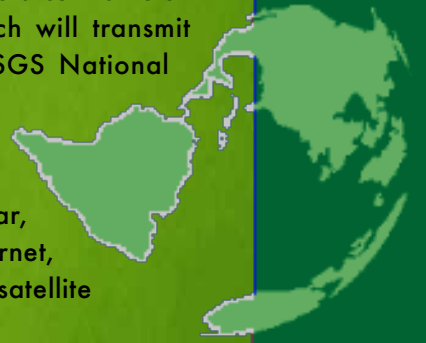
Real-Time Hydrologic Data Using Low-Power Wide-Area Network (LP-WAN) Technology

The problem and the opportunity: Transmitting real-time hydrologic data typically involves sensors hardwired together to a satellite or cellular modem. The problem is that sensors located too far to be wired in need their own telemetry equipment or those data have to be downloaded manually. In many areas, there are multiple

stream gages and sensors that each have their own telemetry equipment even if they are relatively close. Newer technology may enable sensors to be wirelessly linked together at a lower cost per sensor than conventional methods. In collaboration with Carnegie Mellon University (CMU), USGS is co-developing hardware and software

which will wirelessly link multiple sensors to a single access point for telemetry. The research is enabled by the emergence of Low-Power Wide-Area networking (LP-WAN) technology, which can allow for low-power, two-way communication up to 15 km in rural areas. This type of technology may be used to link nearby sensors to an existing real-time sites (for example, a USGS stream gage), cellular modem, or household internet connection. USGS will field-test this technology on at least one demonstration site using water-level loggers which are commonly used for hydrologic monitoring.

Overall Goal or MVP (minimum viable product): LPWAN-based hardware and software to enable communication SDI-12-based sensors to a central telemetry point which will transmit data to the USGS National Water Inventory System (NWIS) database via cellular, broadband internet, and/or GOES satellite telemetry.



Dubai Expo 2020 Turns to NanoRacks to Capture Wonders of Space Exploration

Washington, DC 15th June 2017

NanoRacks is thrilled to be working with the creative team behind the Dubai Expo 2020 on sharing the importance of space exploration in alignment with the Expo's overarching theme: Connecting Minds, Creating the Future.

"Space exploration is our future, and NanoRacks is beyond excited to be

representing the commercial space industry with Dubai Expo 2020," says NanoRacks Director of Marketing Abby Dicks. "We are democratizing access to space and making the greatest unknown obtainable to anyone with the passion to explore. The World Fair is such a unique platform to share what we work towards every day, and we look forward to growing our presence in Dubai through Expo 2020 and beyond."

To date, NanoRacks has launched over 550 satellites and research experiments from over 30 countries around the world, and has facilitated the first-ever space access for Lithuania, Peru, and Vietnam.



Thank you to the Wild Media team and the Dubai Expo 2020 for this opportunity. To learn more about the technology driving the themes of Dubai Expo 2020, please visit <http://www.expo2020dubai.ae/themes>.



AirMap and Kespry Take Commercial Drone Operations to New Heights

9th November 2017

AirMap and Kespry announce an exciting new partnership that brings AirMap airspace intelligence to the Kespry platform for commercial drone operations.

Enterprise customers in mining, construction, insurance, and other industries count on Kespry's autonomous drone and flight planning and data analytics platform to gather aerial data and translate it into actionable business insights. The Kespry drone can take off, gather high-resolution aerial data, avoid obstacles, and land without the help of a human pilot, allowing industry customers to conduct drone operations at scale with ease.

Now, anyone with a Kespry drone will have instant and integrated access to AirMap airspace intelligence when they plan their flights, ensuring that each mission can be flown more safely, more efficiently, and in compliance with relevant airspace conditions and requirements.



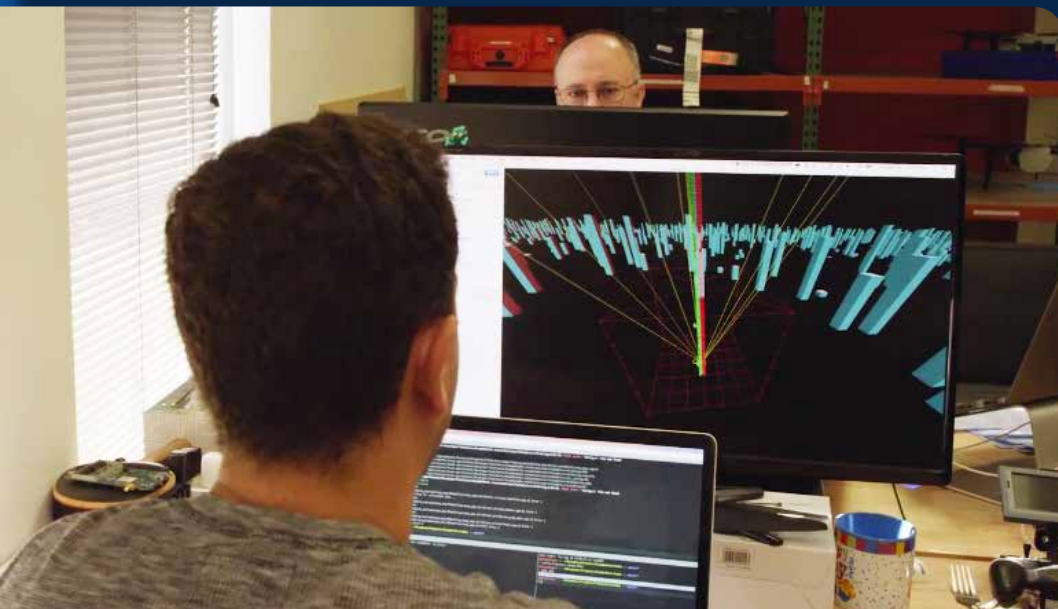
During the flight planning process, the Kespry app automatically surfaces AirMap airspace advisories, wind, and weather tailored to the unique parameters of each flight, including the drone operator's pilot certification. Preflight checks are easier than ever before, auto-filling this information in each mission plan to help operators move more quickly from field, to flight, to finish. Airspace rules, temporary flight restrictions, and the locations of schools, prisons, hospitals, power plants, and more

can be viewed with just a tap.

The result: a richer, more streamlined experience that makes situational awareness and flight planning effortless for Kespry customers.

Kespry is also the first in the drone industry to integrate airspace intelligence from AirMap's contextual airspace offering, which tailors rules and conditions to the exact specifications of each mission, including operator certification, flight location, and speed, height, and weight requirements. Users of AirMap's web and mobile apps will already be familiar with some of our new contextual airspace features, which will be released to the entire AirMap community via an API in 2018.

To get started with a Kespry drone and explore the AirMap integration, visit www.kespry.com.



DRONES IN THE MATRIX

CMU-SV researchers are training drones through real-time deep learning in the same way that Neo downloads knowledge in the Matrix.

In the 1999 film *The Matrix*, a young hacker named Neo learns that the world as he knows it is a virtual simulation—and with this realization comes the ability to use this virtual world to his advantage. In one scene, Neo, who has no combat training whatsoever, downloads an extensive knowledge of martial arts into his brain, making him a Kung Fu master in mere seconds.

“What we’re doing is just like the *Matrix*,” says Bob Iannucci, distinguished service professor of ECE at CMU-SV. “We’re hooking into the visual cortex and downloading information that would typically take much longer to learn in a very short amount of time. Only, we’re teaching drones.”

Imagine you want your drone to track a particular car. To teach the drone which car to track, you can apply machine vision and deep learning techniques which work by aggregating large amounts of photo data to help the drone identify an object in a variety of situations. These algorithms take a significant wealth of data to train, however, and these substantial training sets are hard to obtain.

So what if you don’t have a lot of data, but you still need to tell the drone what it’s looking for, in real-time, using only the data it can collect from its surroundings?

Carnegie Mellon University
College of Engineering

Iannucci and his team, consisting of ECE researchers Ervin Teng, Joao Diogo de Menezes Falcao, and Cef Ramirez, are working on a number of projects to train drones through real-time deep learning. The first, called SMILE, uses a camera mounted on the drone to take pictures of the drone’s current surroundings and send those images back to an operator on the ground. If you want the drone to track down a particular red convertible, for instance, some of the images it sends

“This technology is broadly applicable. Not only can it track individual cars or people, but it can be used for.. inspection of industrial sites or pipelines.”

Bob Iannucci, Distinguished Service Professor, ECE,
Carnegie Mellon University Silicon Valley



back will contain the desired car, and some will not. Using a computer interface, the operator lets the drone know whether or not the object it's looking for is in the image. After just a few minutes, the drone can identify the desired object in the images with enough accuracy to track it across distances.

This technology is broadly applicable. Not only can it track individual cars or people, but it can be used for... inspection of industrial sites or pipelines. Bob Iannucci, Distinguished Service Professor, ECE, Carnegie Mellon University Silicon Valley.

Just like Neo, however, drone operators don't always have the luxury of practicing in the real world. Due to lack of time or lack of available data, training a drone to identify an object in space or navigate an environment in the real world can be challenging. It's this difficulty that led the team to develop the Virtual Image Processing Environment for Research, or VIPER.

"Using a video game engine, we're able to create a photo-realistic, virtual training environment, identical to the real-world environment the drone will be encountering," says Iannucci. "By training a virtual drone to identify the desired

object in the virtual world, then uploading that data to the real drone in the real world, the real drone will 'remember' everything the virtual drone learned."

Because the training simulations are done in the virtual world, operators can run them much faster than real-time. In the future, by networking multiple computers running multiple simulations together, the time reductions are potentially limitless. And now, certain more dangerous tasks—such as navigating

collapsed buildings or complicated industrial sites—can be done virtually, so that operators don't have to worry about

expensive drones crashing before they're properly prepared.

"This technology is broadly applicable," Iannucci says. "Not only can it track individual cars or people, but it can be used for many other things, such as inspection of industrial sites or pipelines. It may not teach them Kung Fu, but the variety of tasks that VIPER has the potential to teach drones to perform is virtually limitless."



Crowd-sourced Geodesy for Earthquake Hazard and Process Studies (CMU and USGS)

The problem and the opportunity: CMU and USGS propose to explore the utility of crowd-sourced cell phone GPS data for earthquake hazard and process studies. Their pilot work suggests that large numbers of less accurate cell-phone GPS displacements could yield earthquake parameters (M_w , geometry, slip distribution) similar to those derived from less dense, more expensive continuous GPS network data (see Figures). Their collaboration will explore not only earthquake geodesy, but also the computational and networking aspects of making such a monitoring system operationally feasible. CMU and USGS expect that this approach could have significant impacts not only in great earthquake scenarios such as large Cascadia subduction zone events, but also in regions with large population centers and less dense GPS coverage such as the Bay Area's southern Hayward fault.

Overall Goal or MVP (minimum viable product): To produce real-time finite fault slip models based on offsets estimated from cell phone GPS locations.

**Carnegie
Mellon
University**

USGS
science for a changing world



NASA Research Park wishes Kathleen Burton & Courtney Lopez farewell and best wishes!



NASA Research Park congratulates Geffory Lee on his retirement!

THE
NRP POST

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