

ConsortiumConnection

PARTICIPANTS IN THIS ISSUE

- iDEA Hub
- Parkin Research
- RMV
- NASA AFRC
- Monarch
- San Diego REDC
- Ventura County
- I-Corps
- NAVAIR

TECHNOLOGY IN THIS ISSUE

- Autonomy
- Robotics
- MakerSpaces
- Fed Tech Transfer
- Thermal Rockets
- Aerospace and Defense Business
- STEM
- Interoperability
- CubeSats and ESD



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6th Annual Technology Symposium

Startup Week, San Diego, CA

The Technology Symposium is an annual event co-sponsored by the iDEA Hub members and the High Tech Consortium that focuses on "multi-use technologies" which can be utilized by government, military and commercial entities. The goal is to bring together a diverse group of researchers, technologists, CEOs and venture capital investors to learn about innovations, cutting-edge technologies and to look for potential collaborations and partnerships.

Representatives include university professors, corporate CTOs, military leadership, government and national laboratory scientists and engineers, and officials from local, state and federal governments. Admission is always free to the public.



Welcome from Mr. Gipe, SDREDC



Co-Sponsored by iDEA Hub and CLHTC

This year's Symposium was hosted by the San Diego Regional Economic Development Corporation (SDREDC), and held in conjunction with Startup Week June 13-17, which brings together entrepreneurs to share progress, exchange resources, and celebrate the thriving local innovation community.

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ConsortiumConnection
2016 SUMMER EDITION

CubeSat Protocols for Launch Integrity

Bob Vermillion

RMV Technology Group, Moffett Field, CA

CubeSats using COTS require ESD handling protocols for launch integrity. CubeSats are relatively inexpensive when compared to traditional vehicle size satellites. However, CubeSat spacecraft functionality in surviving a launch for operational integrity in space is questionable, at best.

According to Mark Betancourt, Air & Space Smithsonian, January 2016, "...CubeSat launches have remained steady—118 in 2014, 108 last year—their success rates are still comparatively dismal. One out of every three CubeSats that reach orbit fails to accomplish its mission (one in four is lost in a launch failure)..." However some CubeSat manufacturers have reported up to 50% operational loss in space. During build, are ANSI/ESD S20.20-2014 ESD Protocols being observed to insure best value for the taxpayer? As of 2016, the highest transistor count in a commercially available Intel 22 core Xeon Broadwell-EP is over 7.2 billion transistor equivalency as compared to 2300 transistors in 1971 [1] with the Intel 4004 microprocessor (Table 1).

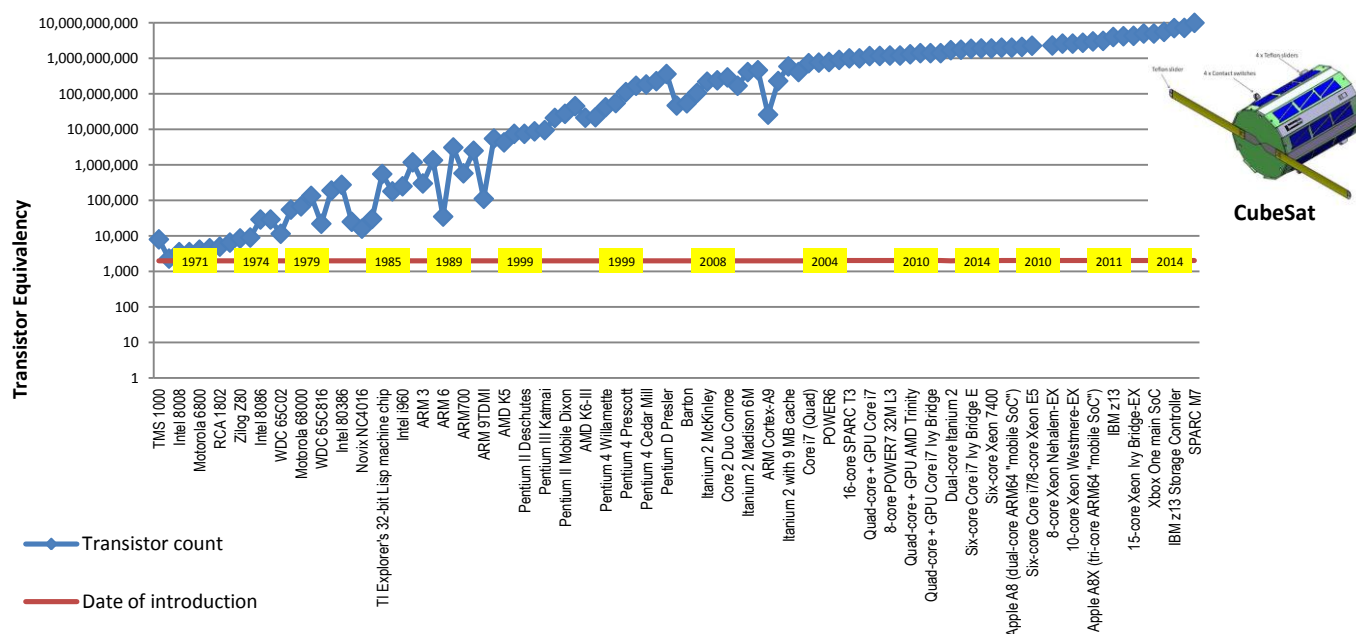


Illustration A: Tu-Pod in Space

Photo courtesy of Amin Djamshidpour, Teton Aerospace

Table 1

Moore's Law: Microprocessor Densification from 1971 to 2015



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SPOTLIGHT : Q's Lab

So what exactly is Q's Lab?

It is a place to DO things. We are a hybrid MakerSpace, where you can Make, Create, Hack, Learn and more.

MakerSpaces are collaborative environments where everyone contributes to the whole and everyone benefits from the whole. **MakerSpace** is a community where you can share your DIY process, search for inspiration, and connect with fellow makers.



Q's Lab have partnered with Monarch Inc. (www.monarchmakers.com) in Ridgecrest to be able to use their developmental and production space. This will provide access to their cool toys, including their Fortus 400 3D printer, CNC cutter/router, 5 Axis Mil, electronics workstations, computers (for modeling), workbenches, drill press, band saw, chop saw and much more.



We are just getting started and need you, your ideas, and support. The more members we get the more cool stuff we can do.

We have a huge wish list of tools and equipment, and are working our way down that list, including more 3-D Printers, CNC, Electronics, Wood Working, Metal Working, Fabrication, Robotics...what do you need to finish, or start, you project...lets make it happen together.

Hosted by:



For more information go to:

<https://www.facebook.com/groups/Qs.Lab.Ridgecrest/>

and

<http://www.monarchmakers.com/>

NSF I-Corps Program

The primary goal of NSF I-Corps is to foster entrepreneurship that will lead to the commercialization of technology that has been supported previously by NSF-funded research.

❑ The approach to entrepreneurship uses techniques developed to validate each commercial opportunity in a recognized, effective way: customer and business model development

❑ The vehicle for commercialization activities will most often be start-ups founded by the I-Corps participants; successful I-Corps projects will be prepared for business formation

❑ The I-Corps programs feed the NSF Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs

❑ NSF will work with the private sector to bring additional resources to the table (in the form of partnerships and finance), when warranted

There are three distinct components of I-Corps: Teams, Nodes and Sites.

1. The [I-Corps Teams](#) are composed of the principal investigator(s) (PI), an entrepreneurial lead (EL), and a mentor.
2. The [I-Corps Nodes](#) serve as hubs for education, infrastructure and research that engage academic scientists and engineers in innovation; they also deliver the I-Corps Curriculum to I-Corps Teams.
3. The [I-Corps Sites](#) are academic institutions that catalyze the engagement of multiple, local teams in technology transition and strengthen local innovation.

NSF recognizes that transitioning technology out of an academic laboratory requires skill sets and knowledge that differ from those required for research, and those skills and expertise are much more common in a start-up environment than an academic one.

NSF has long supported the development of human capital, and I-Corps will help develop entrepreneurial knowledge and skills in an important new cadre of scientists and engineers.



Over a period of six months, each NSF Innovation Corps (I-Corps) Team will methodically identify and address knowledge gaps to ascertain the technology disposition: What resources will be needed? What are the current solutions? What value will this innovation add? The formal hypothesis-validation approach will answer questions along the following seven lines:

1. Value proposition of the proposed product or service--what customer needs are we satisfying?
2. Customer/user use-case and pain point--what are the customer's problems (their pains), and why and how much do they matter?
3. Demand creation--what activities are needed to help customers learn about the product and to create a desire in them to buy it?
4. Channel development--through what channels do our customers want to be reached, and how does the product get from the company to the customer?
5. Revenue model--what strategy will the company use to generate cash from each customer segment?
6. Partnership strategy--who are the key partners and suppliers needed to make the business model work (e.g., strategic alliances between non-competitors)?
7. Resource requirement--what are the most important assets required (human, intellectual, financial and/or physical) to make the business model work?

I-Corps Team projects will culminate with participants possessing a clear understanding of what is necessary to achieve an economic impact with a particular innovation. For those projects that are feasible, I-Corps Teams will be ready to transfer the activity to the for-profit sector and pursue support for translational research from, for example, strategic partners, investors, and NSF programs for small businesses.

For more information please go to:

https://www.nsf.gov/news/special_reports/i-corps/index.jsp

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6th Annual High Tech Symposium

For **Startup Week** we're putting all our efforts into bringing together the community to showcase exciting local innovation, share resources and knowledge, and strengthen connections. It is the region's premier catalyst for innovation, creativity, and entrepreneurialism.

With over 125 events, 50 speakers, 10 parallel tracks, dozens of demonstrations, educational panels, and revelry in the heart of downtown San Diego, **Startup Week** showcases leading tech innovations. Attendees included thousands of San Diego's brightest entrepreneurs, developers, designers, top-tier investors, strategic advisors, community leaders and civic supporters, students and talent — all of whom contribute to San Diego's thriving startup ecosystem.



Photo: Multiple exhibits included RMV, KYOCERA, NAWCWD China Lake and NASA Armstrong FRC



Photo: Robotics Panel with speakers from UC San Diego, 5d Robotics and Qualcomm

This year's **Symposium Key Note** address was given by Mr. Patrick Stoliker, Deputy Center Director at NASA Armstrong FRC, who spoke about the past, present and future of autonomous systems.

Panel discussions ranged from unmanned and autonomous systems to innovative aerospace technologies and advanced robotics. The theme of "Be the Next Tony Stark" featured experts on how to partner with federal labs to obtain technology licenses and technology transfer. In depth discussions followed on patent license agreements and cooperative research agreements (CRADAs).



Photo: Participating members included AMP SoCal

The Symposium concluded with remarks from Dr. Prescott, the CTO of the National Security Technology Accelerator in Washington, DC and Dr. Russell, the CTO of SSC-Pacific in San Diego. They both commented on the various models and progress being made to enable high tech start-ups to partner with government labs to accelerate both development and delivery of future facing technologies.

For more info: www.ideaihub.org

New Participants in the China Lake High Tech Consortium

The Consortium is a unique partnership of government, industry, academia, non-profits and equity investors working collaboratively to address technology requirements for both the military and commercial marketplace. Utilizing the vast array of talents in the Consortium solutions are sought for issues surrounding technology transfer, commercialization of capabilities, non-traditional acquisition for the warfighter, multi-use product development, education, training and local economic growth.

The China Lake High Tech Consortium is pleased to announce that with the addition of the new members listed below the number of individual

participants now exceeds 600, representing interests from over 100 organizations in 18 different States and the District of Columbia. The Consortium focuses on Entrepreneurship and Technology Innovation. Some ongoing technology focus areas include:

- Energy security
- Unmanned aerial systems
- Unmanned ground and undersea systems
- Energetics
- Combustion engineering
- Nanotechnology
- Biosciences
- Green and clean technology
- Cyber security

Technology Collaboration Center Houston, TX

The TCC concept arose after a series of high level meetings, focusing on how the community can more fully exploit the technological capabilities in the greater Houston region. A shared interest among our communities is in the development of more efficient interdisciplinary approaches to real world problems, with the goal of bringing those solutions into practice and to the market.

And, while the initial focus on planning for the collaboration center was on building more partnerships within the Space, Medicine and Energy communities in the Houston area, the mission of the TCC was expanded to provide support for any technology and industry, involving organizations from any location.

In 2014, a steering committee held a series of meetings to develop a proposal for launching a new Technology Collaboration Center in Houston. An interim Board of Directors was formed in December, with commitments from founding partners to launch the new center in January, 2015. The TCC began operations as an independent 501(c)(3) nonprofit organization on April 1, 2015.



In 2015, the TCC launched two programs - a TCC Events series and the Collaboration Concierge Service. The Events program was a successor to the JSC Connect series of 5 events held in 2013 by the Houston Technology Center, Gulf Coast RCIC, Texas Emerging Technology Fund and NASA Johnson Space Center. Last year, the TCC held two events on Water Quality and Knowledge Management and was a supporting organization in other events, including SpaceCom.

Through the TCC's Collaboration Concierge Service program, the TCC finds potential partners and helps organizations form new collaboration partnerships, solving difficult problems and bringing those solutions to the market. In August, the Collaboration Concierge Service was launched, with the first Requests from NASA.

For more information go to:
<http://www.tcc-houston.org/about.html>

Parkin Research

San Francisco, CA

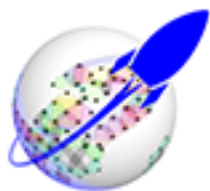
New company combines artificial intelligence with 21st century rocket science to make space access 30x cheaper.

The high cost of launching people and satellites into orbit has been holding back activities in space since the 1960s. Science, exploration and commerce have all been stunted, but a new company stands ready to fix that. Parkin Research opened for business in San Francisco and it bears the name of its founder, Dr. Kevin Parkin, the inventor of the Microwave Thermal Rocket, a low-cost rocket powered by microwaves directed from the ground. "New commercial space ideas literally can't get off the ground, but Microwave Thermal Rockets can slash the cost of launching satellites or people into space by 10 to 100 times," said Parkin.

Parkin invented and patented the Microwave Thermal Rocket over a decade ago as a graduate student at Caltech, and he has been honing the idea ever since. It is not just a paper rocket – Parkin has worked with the Air Force, NASA and recently DARPA to experiment with the technology. "Directed energy rocketry is where conventional rocketry was in the 1930s, there are a handful of pioneers worldwide and the significance of their work is only just beginning to be realized", said Parkin. "The development effort is worth it because the U.S. Government currently spends \$160 million dollars per week on space launch; agencies can get so much more capability for that money."

The most game-changing technology of all may turn out to be the software that designs the rocket, the Engineering Inference Engine. Artificial intelligence software traditionally uses inference engines for tasks like recognizing objects or diagnosing medical conditions, but Parkin is the first to use them to design rockets. "The Engineering Inference Engine empowers a single designer or a small design team to wield more complex engineering solutions than ever before. It's quite magical to watch it deduce its way through a 20,000 variable rocket design problem," said Parkin.

"I wrote the Engineering Inference Engine to solve the complex engineering problem of designing Microwave Thermal Rockets without the massive cost of a room full of rocket scientists. Our research challenge now is to mature the Engineering Inference Engine into a tool that other engineers can use to design aircraft, satellites or even interstellar missions."



PARKIN RESEARCH

Find out more about Parkin Research from the website <http://parkinresearch.com>

NEXT ISSUE

Have an article, announcement, or press release you'd like to see in the next issue of Consortium Connection?

Contact us at:

bill.hogan@clhtc.com

FACTOID

Did you know that:

There exists an Innovation Hub specifically for Defense, Energy and Aerospace devoted to accelerating economic development?

Go to:

www.idealhub.org

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- SD REDC
- DOD Research
- Monarch
- NAWCWD



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Reese Industries, LLC

Scottsdale, AZ

Reese Industries LLC is a value-added, EDWOSB independent distributor. So what does this mean and let's break it down. We're value added because we custom kit together material which is otherwise only sold separately and individually. Our company goes out to all the manufacturers on the breakdown of the parts list and then purchases bulk from all the manufacturers listed then we assemble in house to create the parent NSN/ NATO # which our end user prefers us to do.

Secondly we are EDWSOB—Don't worry it stands for: Economically Disadvantaged Women Owned Small Business— Thirdly we are independent distributors meaning our hands are not tied to any one particular manufacturer, allowing us to really find and offer the best lowest possible price and lead-time both. Normally you can find one or the other but it's much more difficult to have a company who can do both at the same time.

We provide products and support to procurement agencies with in commercial businesses, government contractors, system integrators, as well as U.S. military branches and state to federal government agencies in sourcing of small and large parts, equipment, tools and accessories (including marine spares and aviation equipment), fire & safety products, testing and measurement equipment, electrical components(board level), and repair kits, from a broad range of manufacturers and authorized OEMS.

Differentiator Partnerships are a Part of Our Quality Assurance



Our pricing and lead times are always competitive and because we are a smaller business, communication is typically direct and efficient. We recognize customer support to be among the most crucial aspects of any service related company, which is why we work so very hard to keep ours rock solid. We are an ISO compliant company and also offer value added services like: one stop sourcing of a variety of products, small assembly and kitting. We specialize in connectors, switches, sensors, communications and IT related equipment.



Figure 1: Shipment bound for USSOCOM

Additionally, carry a wide arrangement of nuts, bolts, and hardware suitable for installation of the prior products. Our customer base consists of many large communications groups, all branches of the US military, aircraft and shipbuilding companies and state, federal and government procurement offices.

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Continued from Page 2

CubeSats using COTS require ESD handling protocols for launch integrity

As a consequence, speed kills with microprocessor densification so one cannot overlook ESD procedures. In fact, the author has reviewed CubeSat design specifications that incorporate ESD sensitive devices but do not include any ESD procedures.

JPL has taken cleanliness and ESD control for their interplanetary CubeSats to a different level in the redesign of a dedicated 1250 square foot room (modern day Moore's Law type High Bay) from an existing program. This cannot be said of other governmental, university and commercial CubeSat manufacturers that appear to have overlooked ESD procedures by building units from a desktop to non-flight hardware work surfaces without implementation of static control safeguards.

CubeSat construction has been observed on charge generating Plexiglas or Lexan platforms that could facilitate field induced model (FIM) discharges. The incorporation of an ANSI/ESD S4.1 approved work surface (see Figure 1) is required to safeguard today's circuit cards from Class 0A devices (<125 volts) to Class 1A (250 to <500 volts) for ESD sensitive devices.

Adherence to static control protocols in compliance with ANSI/ESD S20.20-2014 requirements is not optional when building CubeSats. ANSI/ESD S20.20 applies during test, inspection, transport and handling of electronic parts, assemblies and equipment susceptible to ESD damage greater than or equal to 100 volts HBM, 200 volts CDM, and 35 volts on isolated conductors [3]. The DoD and NASA have adopted ANSI/ESD S20.20 along with the prime contracting community.

The argument that S20.20 does not apply to devices rated above 125 volts (Class 0A devices) is unfounded. To dispel one myth, some COTS are Class 0A; the same classification can also apply to ESD sensitive EEE parts for GOTS from DOD authorized distributors.

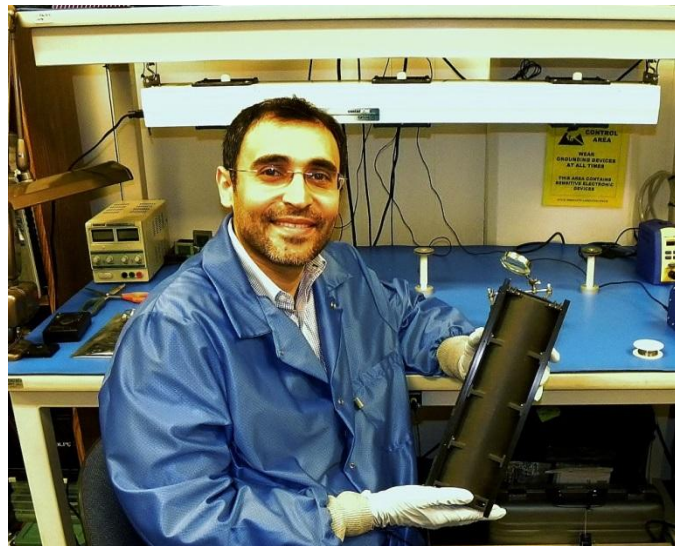


Figure 1

*Photo courtesy of Amin Djamshidpour
Co-Founder, Teton Aerospace*

This subject alone will require a separate white paper. To be in conformance with ANSI/ESD S20.20-2014 when tailoring outside the limits, one must have technical justification in order to downgrade practices or waiver requirements.

Product qualification of ESD materials must conform to ANSI/ESD S20.20-2014 using traceable technical data, in-house testing or by an independent lab using instrumentation as called out in the ANSI/ESD Standards or Standard Test Methods. For in-house qualification, the on-site qualifier must conduct testing of ESD materials at the stated relative humidity (RH) and temperature levels. If the RH and temperature levels are not achievable, then said evaluator must qualify ESD materials at worst case conditions that could be experienced in a 12-month period, for example, the Santa Ana Wind conditions at Edwards Air Force Base.

For Aerospace & defense, it is not uncommon to build and assemble products in Class 1A (250 to <500 volts) ESD protected areas (EPA). Other organizations will designate micro-EPAs to Class 0A or 0B compliance. A Class 0A ESD work surface is illustrated in Figure 2.

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CubeSats using COTS

Table 2 ANSI/ESDA/JEDEC JS-001-2014

Classification	Voltage Range (V)
0A	< 125
0B	125 to < 250
1A	250 to < 500
1B	500 to < 1000
1C	1000 to < 2000
2	2000 to < 4000
3A	4000 to < 8000
3B	≥ 8000

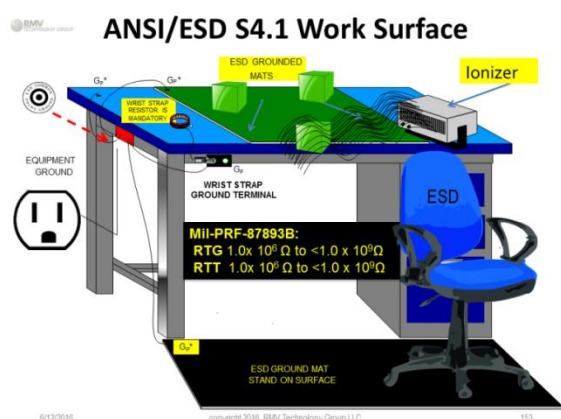


Figure 2 – RMV Laboratory at NASA Ames Research Park

In Figure 2, an ANSI/ESD S4.1 work station is certified (calibrated) annually with periodic verification taking place as outlined in an organization's ESD Procedures.

A calibration label is affixed to the work surface, ionizers, flooring mat, static control chair, soldering iron, wrist strap monitor and proximity voltage sensing antennas. Hard data is recorded - not simply stating "pass" or "fail."



Figure 3

As illustrated in this series of photographs (Figures 3-5), the operator, engineer or scientist gowns up and tests the ANSI/ESD S1.1 grounded wrist strap. The wrist strap is connected to ground and cleanroom nitrile gloves are utilized

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EYE ON IT

What do YOU know about MakerSpaces?

Entrepreneurs and Inventors have a place to go to share both ideas and tools, including software and hardware.

Curious?
See Article on Page 3

PARTICIPANTS In the News

Find more CLHTC participant news including a real-time news feed at www.CLHTC.com

Entrepreneur ?
Got a great idea but don't know who to talk to. Check this out:
www.ideaihub.org

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CubeSats using COTS

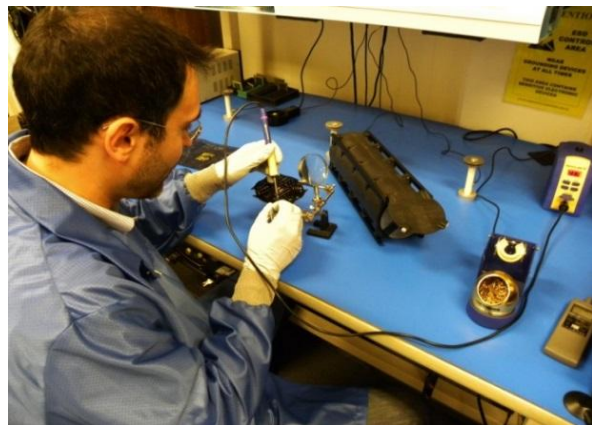


Figure 4

after turning on the ionizer. In this case, an ESD Type III static shielding bag is then opened, housing a CubeSat (Tu-POD) circuit card. Upon completion of work, the static ESD sensitive device (circuit card) is placed into an approved static shielding bag (Figure 5).

When manufacturers handle Class 0A items, i.e. <125 volt HBM, the following additional mitigation techniques should be adopted:

1. Maintain relative humidity (RH) greater than 40%RH with temperature and RH monitored in the EPA [4]
2. Use groundable ESD garments (overalls) with elastic wrist cuffs
3. Use Steady State DC Ionization with an offset voltage of <+/-35 volts
4. Use a dual cord audio jack wrist strap when seated
5. ESD Chairs
6. Qualify all ESD Protective Packaging before utilization on an ESD work surface
7. Remove all non-process insulators from the work area

The second part of this article will address "Validation Methods for Qualification of CubeSats for ESD Safe Operational Integrity in Space [TM]" and will be featured in the next issue of the *Consortium Connection*.

Special thanks to Amin Djamshidpour, Co-Founder Teton Aerospace, amin@tetonsys.com



Figure 5

Bob Vermillion, CPP, Fellow, is a Certified ESD & Product Safety Engineer-iNARTE with subject matter expertise in the mitigation of Triboelectrification for a Mars surface and in troubleshooting robotics, systems and materials for the aerospace & defense, hand held devices, wearables, medical device, pharmaceutical, automotive and semiconductor sectors. Bob Vermillion can be reached at bob@esdrmv.com or 650-964-4792.

References:

1. ANSI/ESD S20.20-2014, For the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices), ESD Association Standard, 31 July 2014.
2. ANSI/ESDA/JEDEC JS-001-2014, For Electrostatic Discharge Sensitivity Testing Human Body Model (HBM) Component Level, ESD Association Standard, Aug 28, 2014.
3. ANSI/ESDA/JEDEC JS-002-2014, For Electrostatic Discharge Sensitivity Testing Charged Device Model (CDM) Device Level, ESD Association Standard, 7 April 2015.
4. NASA STD 8739.6; 6.1 TEMPERATURE AND RELATIVE HUMIDITY (RH)
5. MDA LESSONS LEARNED ADVISORY, MDA-LL-2016-0018 February 2016, Keith Peterson, Ph.D.
6. Illustration A; Tu-Pod in Space Courtesy of Amin Djamshidpour, Co-Founder Teton Aerospace

To learn more: www.esdaerospacetraining.org and www.esdrmv.com

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Reese Industries, LLC

Our goal with every customer is to not only become approved but preferred supplier to them for both specific and selective general spares. Reese is confident we can help to improve your company's procurement process and work with you to meet your company's overall quotas and mandated goals.

We can ship JIT or on schedule (up to 2 years out) or as needed to ensure inventory is always available once a purchase order / contract is placed. All our products come with full OEM/ mfg. trace and include our company CofC with each and every shipment regardless of size or dollar value.



Figure 2: Reese Industries kitting capability

Along with the above products Reese is an Authorized Dealer for RATIONAL and Rational Technology Ovens. If you have not seen the technology live, it's a must!



The next generation
SelfCookingCenter®

RATIONAL

5 Senses



RATIONAL is the essential cooking equipment of the future but available now. This system always prepares your food exactly the way you want it. Self Cooking Center® 5 Senses. Together with food scientists, physicists, and engineers, we have brought food quality, efficiency, and cooking intelligence to a new standard.



Figure 3: Toughbooks bound for US Navy and USCG vessels

To the Groups who count on our services, to a personal thanks from a long way away. We help to support the warfighter in any shape condition or way that we can including drives for packages for our troops, Habitat for Humanity, and donations to all our local and state police departments. The greatest impact you can make on some is when its genuine, unexpected, and from the heart.

Let Reese Industries LLC help to guide your company in the direction of advancement.

For more information go to:
www.reeseindustries.com

Ventura County Science Fair and STEM Expo



A great example of encouraging Science, Technology, Engineering and Math (STEM) is Ventura County Office of Education (VCOE)'s annual Science Fair and STEM Expo. Where last year 800 students from more than 75 area California schools competed.

Volunteers from the Naval Air Warfare Center Weapons Division (NAWCWD) in Point Mugu and China Lake, CA showed up in force to support that event.



NAWCWD Point Mugu engineers talk with a Ventura County student at a science, technology, engineering and mathematics (STEM) expo. (U.S. Navy photo)

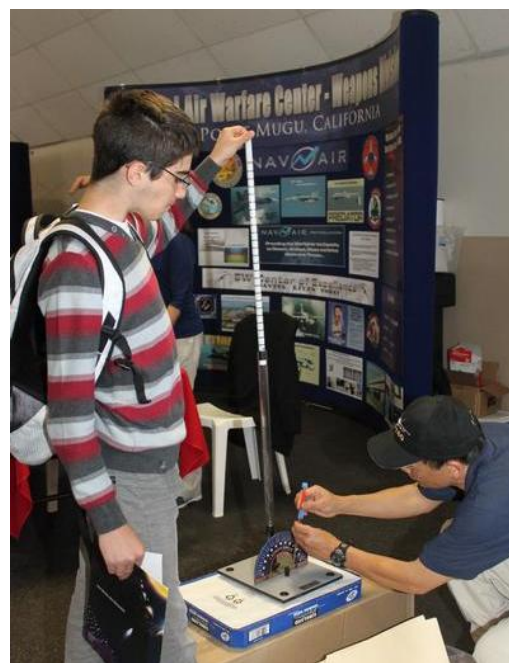
Students from Hueneme High School and other Ventura County schools displayed their award-winning science projects from local school competitions, previously judged by NAWCWD volunteers, for the county-level competition. This round of judging will result in the top students' projects selected for the state competition.

The California State University, Channel Islands (CI) fifth annual science, technology, engineering and mathematics (STEM) exposition was held in conjunction with the science fair.

The STEM expo, that was co-sponsored by CI and VCOE, attracted several local and national science and technology exhibitors who provided materials and demonstrations geared toward the middle and high school student audience.



The STEM Expo gave students a chance to meet NAWCWD employees, private individuals and corporate STEM professionals who shared information about the wide range of STEM careers available to them. This exemplifies the commitment that both the US Navy and VCOE have for STEM.



An engineer at NAWCWD Point Mugu, helps a student prepare to launch a straw "rocket" during the STEM Expo. (U.S. Navy photo)

Attribution: a portion of his article was from excerpted from NAVAIR News Story, 5.3.14 ID # 5579

For more information go to:
<http://www.csuci.edu/>



China Lake High Tech Consortium

The Consortium is a unique partnership of academia, industry, government, non-profits and equity investors working collaboratively to provide creative solutions for the military and commercial marketplace.

ANNOUNCEMENTS

Now Accepting Spotlight articles for the next issue of *Consortium Connection*

Please forward submissions to bill.hogan@CLHTC.com by **September 15, 2016** to be included in the **next** issue.

More information about California's Innovation Hub for Defense, Energy and Aerospace (iDEA Hub) may be found at: www.idealhub.org



To learn more about
CLHTC click below



JOIN the Consortium

For comments or questions
please contact:

bill.hogan@clhtc.com

or visit us at

www.CLHTC.com