

CHANGE LEADERS - DRIVING ENTREPRENEURSHIP



**Tim Dyer, Managing Director,
Elcon Precision Inc., San Jose, USA**

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- **Space Exploration unites the planet.**
- **Space Exploration requires hardware designs that are reliable and long lasting.**
- **Commercial Ion engines for Space Craft, Micro Satellites, Digital X-Ray Inspection Equipment, 3D printing of specialty alloys, and modern power efficient semiconductor devices are recent breakthrough developments advancing the space industry.**

“Change Leaders”, is a series of interviews by The Global Trade Driver with leaders in business, academia and government, whose actions and ideas have a positive and big impact in their field of work. Please give your valuable feedback to info@tgtd.biz

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Tim Dyer, is the Managing Director of the Material Science firm , Elcon Precision in San Jose, USA. Elcon specializes in photochemical machining, metallization of ceramics and brazed assembly services. A Materials Scientist and senior executive with 25+ years experience working as a process engineer, ceramist, senior engineering director, VP Operations, CTO and President for start-up to medium sized public and private companies, Tim knows what he is doing and where he is heading to. With a Bachelors and Masters in Materials Science and Engineering, from University of California, Davis, creating and making products at nexus of energy, fabrication technologies, and materials science is the special feature of the distinguished career of Tim.

D.V. Venkatagiri, CEO, The Global Trade Driver & Explore The Space, interviews Tim Dyer on the recent innovations in the Space Industry and about Space Education. Readers have a rich feast of Space Technology updates in this interview.

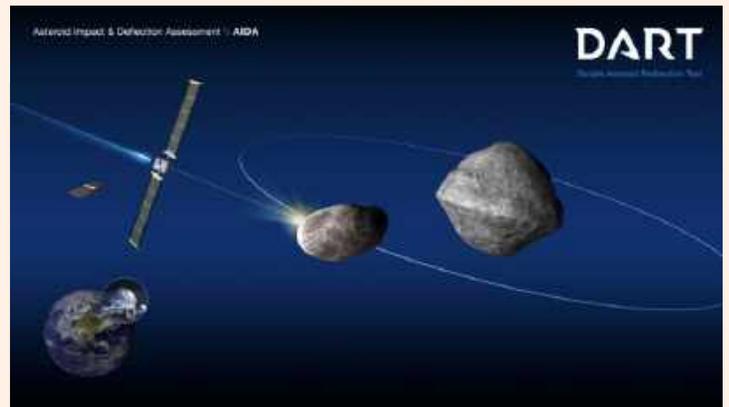
1) What are the major technology breakthroughs / advancements that you have seen in your Company / Business in the last 5-10 years.

a) Ion engines in space craft and micro satellites have created opportunities. b) New and advanced non-contact inspection equipment is less costly and has enabled us to improve quality. Systems like optical CMMs and digital X-Ray systems. c) SPC Software has improved and is easier to use, also enabling us to determine risks and process stability. d) Direct imaging systems for photolithography enable us to make small high purity refractory metal (Tungsten, Molybdenum) components for joining and brazing hermetic assemblies.

2) Metals comprise the largest part of Rockets / Launch Vehicles. Is there enough and quick innovation taking place to discover lighter (lesser in weight) and stronger metals.

a) 3-D printing of both high entropy alloys (HEA) and difficult to manufacture composite aluminum alloys will help reduce weight. b) Metal-ceramic composites also offer promise as lightweight materials with better properties >500C. c) Lamina material designs made via layer based additive manufacturing processes also offer higher temperature and light

weight performance.



DART Mission
Image Courtesy: NASA Website

3) "Elcon Precision is the only supplier in the world qualified to assemble commercial ion engines for deep space missions " --- Can you please give a little more detail on this.

a) In 2004 Elcon started work with NASA to help them construct a long range, second generation, ion engine for deep space flight. The new engine had significantly more thrust and longer service life than version. This first metal to ceramic precision assembly project lasted until about 2008, when they successfully tested the engine. b) Then in 2017, we were approached by a large aerospace manufacturer to construct a commercial ion engine using the assembly technology we had demonstrated to NASA in 2004-2008.

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NASA was the end customer for the engine. Our technology was building the metal to ceramic assembly of the main components of the NEXT-C ion engine, the discharge cathode array (DCA) and neutralizer cathode array (NCA). NEXT-C is the first commercial deep space Ion engine to be constructed and will be flight tested in 2022. We are providing parts for the NEXT-C engine used for the NASA DART mission launching in 2022.

4) If you are to be asked the three most important things / developments that have happened in the Space / Aerospace Industry, in the recent past, what will they be a

“These are difficult times for scientific education. General science education seems focused on medical and computer engineering/software skills & it is less focused on materials science, mechanical engineering, and chemical engineering. These hard sciences are key skills needed to support space flight hardware development.”

a) Semiconductor industry innovations: High speed, large memory, Lithium ion batteries, and compact computers augment human capabilities to control and manage a space flight vehicle. b) Development of advanced digital imaging sensor technology for data capture; photos, proximity detection, radiation mapping, heat mapping and RF/microwave distance measurements. These are critical to guidance systems and gathering scientific data. c) Ion engines for micro satellites and long-range space flight. Ion engines are long life and compact devices. They are assisted by highly efficient solar-electric cell arrays to power the engines.

5) What are the steps that the Aerospace Supplier Industry is taking to manage the disruptions (both in production and in demand) caused by the global pandemic Covid-19?

a) Adopt and hold to WHO, US Federal, California State, and Santa Clara County Local COVID-19

guidelines for essential suppliers. b) Solicit key customers for essential supplier status letters, so to keep operational. c) Establish a PPP loan just in case of a COVID-19 shutdown (keep paying employees who are sick and/or sent home). Keep cash around (>3 full payroll cycles). d) Work with other companies of similar size to share best practices for COVID-19 hygiene and response plans. e) Pay attention to supply chain, materials suppliers, and send essential business letters if necessary. f) Talk to key suppliers frequently to determine delivery risks. Report COVID-19 issues immediately to customers in case of an event.

As the President of a Company that is actively involved with the Space Industry, what is your opinion on Science Education or more specifically Space Education in USA today.

a) Science education is suffering from anti-science politicization in the USA. These are difficult times for scientific education. b) General science education seems focused on medical and computer engineering/software skills, less focused on materials science, mechanical engineering, and chemical engineering. These hard sciences are key skills needed to support space flight hardware development. c) There should be some aspect of manufacturing engineering/process engineering taught to all engineers seeking to work in the space products sector. The product demands are high, and components should be designed for manufacturability (DFM) from the beginning. This extra challenge pays off by enabling faster build and test learning cycles.

7) Your piece of advice for the young Engineers and Science Graduates who want to join the Space Industry.

a) The concept of Space exploration unites the planet. Everyone is curious and interested in learning more about our world and the universe that surrounds it. This passion crosses cultures, borders, and oceans. Please seek others who share your passion and collaborate. b) Accept that failures are normal and part of the learning process. In the end, space exploration requires hardware designs that are reliable and long lasting. Technical advancements are difficult to develop and come because of many experiments. Any experiment that teaches you something is a successful one.

8. "With Indian space sector opening for private sector in a big way....what is your opinion on the increasing US Investments / interests in the Space Sector in India and what do you think India needs to do to attract more US Investments in its Space Sector?"

"As for industrial collaboration, we presently

work with CUMI out of Chennai for ceramics and like them as a supplier. In general, we find it difficult to work with many of the suppliers in India due to payment complications and long product lead times. In addition, we find that communication issues can delay addressing quality problems if they arise. We do get occasional and exciting requests from Indian space related start-up companies. We have difficulty learning about the requesting companies since we do not understand the culture of technology development there; need help. In general, Elcon is careful working with startups and limit that work to only a few companies at a time.

Currently, we work with two US Based materials startups, with one in the Space sector. In addition, many of our customers require US origin, DFARS materials, for their manufactured products. This limits the use of Indian suppliers for some contracts, but not all. Even some of our medical companies enforce those rules. We would like the opportunity to work with more suppliers in India in the future."

Glimpses of The Global Trade Driver & Explore The Space



Raman - Armstrong Lecture Series on Space - Edition 1 -
Dr. Jayadeep Mukherjee, Director NASA FSGC along with Dr. G. Gopinath,
Registrar, Bharathidasan University, Tiruchirappali - December 2018



Certificate Course on Introduction to Space Technology
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PSCMR College, Vijayawada, August 2019

"Explore The Space" is an educational venture and an NGO working to promote awareness on Space Sciences and Technology among Schools and Colleges through seminars, quiz programmes, study tours and research. ETS connects Institutions and Industry through its programmes.

Established in 2010, The Global Trade Driver (TGTD), is a niche facilitator of Businesses connecting Indian Companies within the domestic market and International Markets, particularly USA through Business Delegations, B2B meetings, Strategic Consultancy, Advocacy and other programmes.

The Global Trade Driver & Explore The Space

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