The Global Trade Driver
(An International Forum on Industry and Education)

Explore The Space
(Promoting STEM Education & Space Exploration awareness in Schools & Colleges across Geographies)

CHANGE LEADERS

February 2024

Tim Dyer,
Executive Director, Fralock, USA

Space Exploration unites the planet.

Space Exploration requires hardware designs that are reliable and long lasting.

Ion engines in Space Craft, Micro Satellites, Direct Imaging Systems for Photo Lithography, Advanced Inspection Equipment, 3d printing of high entropy alloys, Semi conductor innovations are some of the path-breaking recent developments in the space industry.

"Change Leaders", is a series of interviews by The Global Trade Driver and Explore The Space withleaders in business, academia and government, whose actions and ideas have a positive and big impact in their field of work. Please give your valuable

Tim Dyer, is the Executive Director, Fralock, Calfornia, USA. 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.

FRALOCK®
Leading the Way in Advanced Materials Solutions

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) Laminar material designs made via layer based additive manufacturing processes also offer higher temperature and light weight performance.

3) What is the contribution / role of Fralock group to the Space / Aerospace Industry?

Fralock provides flexible circuits and connectors for commercial and military satellites. Flexible circuits can be up to 2 meters long. They have developed non adhesive bonding methods to eliminate circuit outgassing in space. In addition, the ceramics division offers many products in the space and aerospace market: Aluminum Nitride ceramic temperature control devices for space and electrical ceramics for naval projectile systems, Zerodur lightweight optics for mirrors used in space telescopes, and aluminum oxide ceramics for sensors and electrical packaging

b) What do you have to offer for the Indian market and what kind of products are you seeking from the Indian market?

Fralock can offer lightweight high thermal conductivity Aluminum Nitride ceramics and high density alumina ceramics for severe environment, and or high voltage, electrical applications. Fralock can also metallize both alumina and aluminum nitride ceramics to enable metal to ceramic assemblies. Aluminum nitride composite heaters can heat a rates upon to 300C per second, and would be idea for chemical sublimation based braking systems like the ones envisioned for Mars landings.

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) 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 are long life and compact devices. They are assisted by highly efficient solar-electric cell arrays to power the engines.

"Explore The Space" promotes STEM Education through curiosity in Space Exploration among Kids

Explore The Space (ETS) is an International NGO based in Chennai and promoting awareness on Space Sciences and Technology through various outreach programmes - Quiz, Seminars, Science workshops, Webinars, Study tours, etc. , - among school and college students.

Objectives:
1. Awareness on Space Education / Industry opportunities.
2. Industry - Institution partnerships
3. International collaborations in Space exploration - are the three main objectives of Explore The Space.

D.V. Venkatagiri
CEO
Explore The Space

5) 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 engieering/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 of by enabling faster build and test learning cycles.

6) 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, boarders, 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.

International Space Station

Glimpses of The Global Trade Driver & Explore The Space

Prof. V. Sumitrra Devi, CAO, ETS presents STEM & Space poster to Mr. Prakasha Rao P.J.V.K.S., Outstanding Scientist & Director - Space Infrastructure Programme Office, ISRO (Retd.) at the ETS - Albert Einstein STEM & Space Science Lab, Chennai on 20.10.2023

Mr. D. V. Venkatagiri, CEO, ETS welcoming Mr. S. Somanath, Chairman, ISRO at the ETS stall at Bengaluru Space Expo - September 2022

ETS was conferred the title "ISRO - Registered Space Tutor" by Mr. N. Sudheer Kumar, Director, CBPO, Dr. A.S. Kiran Kumar, Former Chairman & Mr. Shanthanu Bhatawdekar, Scientific Secretary ISRO at ISRO Headquarters, Bengaluru – August 2022

Explore The Space participating at Space Tech Expo, Long Beach, California, USA in May 2022

"Joy of Science", a fun-filled workshop, RKM Hr. Sec. School (South), Chennai - February 2019

Subhajit Maity, Accountable Manager, Thakur Institute of Aviation Technology, Mumbai with Jaydeep Mukherjee, PhD., NASA Scientist, Florida, USA - December 2023

"Explore The Space" is an educational NGO, registered in NITI Aayog, Government of India and works 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.

Explore The Space & The Global Trade Driver

595, Alagirisamy Salai, K K Nagar, Chennai 600 078 | Phone: 044-9790973789

Emails: info@explorespace360.com; info@tgtd.biz

Websites: www.explorespace360.com; www.tgtd.biz