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**Antrix Corporation Limited (ANTRIX)**

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Bangalore 560231 Karnataka  
**Tel** : 91-80-2217 8302  
**Email** : mail@antrix.gov.in  
**Website** : www.antrix.gov.in



**Confederation of Indian Industry (CII)**

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**Fax** : 91-124-4014057 / 80  
**Email** : rachna.jindal@cii.in  
**Website** : www.india-space.in, www.cii.in



**Indian Space Research Organisation (ISRO)**

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**NewSpace India Limited**

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**Email** : contact-nsil@isro.gov.in  
**Website** : www.nsilindia.co.in



— INTERNATIONAL CONFERENCE & EXHIBITION ON —

# SPACE

**BUILDING NEWSPACE IN INDIA**

## **International Conference & Exhibition on Space 2021**

Global Space economy which is valued at US\$385 Billion in 2020 is expected to grow to US\$428 Billion by 2028, as per the findings by renowned consulting firm “Euro Consult”. This growth is enabled by growing demand for space-based services, lowering of costs, miniaturization and access to technology, liberal funding and enabling regulations around the world.

India, currently with share of 2% in global space business, holds great promise as a destination for increased Space commerce and also as a manufacturing hub. India’s advances in space programmes and simplicity in operations driven by ISRO have been highly appreciated the world over.

The formation of new regulatory body- Indian National Space Promotion and Authorisation Centre (IN-SPACe) by the Government last year to promote Hon’ble PM ‘self-reliant India’ mission, is yet another endeavour to accelerate the advancements in space activities, and spur the growth of Indian private companies, improve space industry revenues and India’s share in the global space market.

Taking the vision of the government of enhancing Indian private sector participation, Confederation of Indian Industry (CII), in association with the Indian Space Research Organization (ISRO), the Antrix Corporation Limited (ANTRIX) and NewSpace India Limited (NSIL) is organising the 2<sup>nd</sup> edition of International Space Conference and Exhibition scheduled from 13 September – 4 October 2021 over Virtual platform. The theme of the conference is ‘Building NewSpace in India’.

### **Objectives:**

1. Facilitate and strengthen Indian industry who wish to venture into various space products and services.
2. Provide an ideal platform for Indian industry and entrepreneurs to build technology partnerships with Indian Space agency, industry to cater to Indian demand and global market.
3. Highlight the initiatives taken by Indian government and Space agency to encourage & engage Indian Industry in space sector and showcasing opportunities for Indian industry.



## **Antrix Corporation Limited**

Antrix Corporation Limited is one of the “Mini-Ratna” public sector undertaking under Department of Space owned by Government of India. Incorporated in September 1992 as a commercial arm of Indian Space Research Organization (ISRO); Antrix was awarded the “Miniratna” status by the Government of India in 2008.

Antrix functions as the Marketing arm of Indian Space Research Organization (ISRO) for promotion and commercial exploitation of space products, technical consultancy services and transfer of technologies developed by ISRO. Antrix is a one-stop-shop for any of the space products, ranging from supply of hardware and software, simple subsystems to a complex spacecraft developed by ISRO’s technical centres, for varied applications covering communications, earth observation, planetary scientific missions; space related service including remote sensing data series, transponder lease service; Launch services through the operational launch vehicles; and Mission support services.

**VISION OF ANTRIX** - To emerge as a globally significant marketing company on space systems, fully utilizing the strength of Indian Space Research Organization (ISRO) and other Indian entities in the field of space.

**MISSION OF ANTRIX** - To enhance & generate commercial spin-offs from ISRO’s programme in the global space markets & establish a commercially viable space industry in India.

With a turnover of around INR 2000 crore during FY 2015-16; Antrix team is mainly into core marketing,. The technical functions are outsourced from ISRO and industry depending on the contracts won by Antrix.

With the versatility of products and services being marketed, Antrix caters to a prestigious clientele including some of the leading space companies across the globe – EADS Astrium, Intelsat, Avanti Group, WorldSpace, World Sat, DLR, KARI, Eutelsat, OHB Systems and several other Space Institutions in Europe, Middle East and South East Asian countries.



## Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, with over 9000 members from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 300,000 enterprises from 294 national and regional sectoral industry bodies.

For more than 125 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, livelihoods, diversity management, skill development, empowerment of women, and sustainable development, to name a few.

As India marches towards its 75<sup>th</sup> year of Independence in 2022, CII, with the Theme for 2021-22 as **Building India for a New World: Competitiveness, Growth, Sustainability, Technology**, rededicates itself to meeting the aspirations of citizens for a morally, economically and technologically advanced country in partnership with the Government, Industry and all stakeholders.

With 62 offices, including 10 Centres of Excellence, in India, and 8 overseas offices in Australia, Egypt, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with 394 counterpart organizations in 133 countries, CII serves as a reference point for Indian industry and the international business community.

## Confederation of Indian Industry

The Mantosh Sondhi Centre

23, Institutional Area, Lodi Road, New Delhi – 110 003 (India)

T: 91 11 45771000 / 24629994-7 • F: 91 11 24626149 • E: [info@cii.in](mailto:info@cii.in) • W: [www.cii.in](http://www.cii.in)

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Reach us via our Membership Helpline: 00-91-124-4592966 / 00-91-99104 46244

CII Helpline Toll Free Number: 1800-103-1244





## **Indian Space Research Organisation (ISRO)**

Indian Space Research Organisation (ISRO) is the national space agency under the Department of Space, Govt of India.

The objective of ISRO is to develop space technology and its application to various national tasks. Accordingly, Indian Space Research Organisation (ISRO) has successfully operationalized the large constellation of communication satellites called Indian National Satellite System (INSAT) in the Asia pacific region with approx. 288 transponders in orbit. And, India has plans to augment the present capacity as well.

ISRO has the largest constellation of earth observation satellites, namely, Resourcesat and Cartosat series of satellites, the latter having better than one meter resolution. Resourcesat data is being used for a variety of applications such as crop yield estimation, drinking water missions, waste land development, forest cover mapping and a host of other applications benefiting the common man.

India has developed two work horse launch vehicles namely the Polar Satellite Launch Vehicle (PSLV) and Geo-synchronous Satellite Launch Vehicle (GSLV).

The major establishments of ISRO/DOS are Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram; ISRO Satellite Centre (ISAC), Bangalore; Satish Dhawan Space Centre (SDSC), SHAR; Liquid Propulsion Systems Centre (LPSC), Bangalore; ISRO propulsion Complex (IPRC), Mahandragiri; Space Applications Centre (SAC), Ahmedabad; National Remote Sensing Centre (NRSC), Hyderabad; ISRO Inertial Systems Unit (IISU), Thiruvananthapuram; Development and Educational Communication Unit (DECU), Ahmedabad; ISRO Telemetry, Tracking and Command Network (ISTRAC); Master Control Facility (MCF), Hassan & Bhopal; Laboratory for Electro Optics Systems (LEOS), Bangalore; Regional Remote Sensing Service Centres (RRSSCs); Physical Research Laboratory (PRL), National Atmospheric Research Laboratory (NARL), North Eastern-Space Applications Centre (NE-SAC) and Semi-Conductor Laboratory (SCL) and Antrix Corporation Limited.



## **NewSpace India Limited (NSIL)**

NewSpace India is a Central Public Sector Enterprise under Department of Space, incorporated on 6 March 2019, with a vision to “Excel in providing space related products and services emanating from Indian Space Programme to global customers and to further spur the growth of Indian Industry in undertaking technologically challenging space related activities”.

The basic objectives of NSIL are to enable Indian Industries to scale up high-technology manufacturing base for space programme through technology transfer mechanisms, catering to emerging global commercial small satellite launch service market, satellite services for various domestic and international application needs and enabling space technology spin-offs for betterment of mankind through industry interface.

NSIL is at the cusp of transformational growth and set to play a key role in space sector. Towards this, Government has enhanced its mandate which includes wide range of activities starting from building and launching satellites, operating and providing services to the Indian and Global Customers. NSIL has an important role to play in enabling Indian Industries with the necessary Technology Know-how from ISRO and emerge as a Manufacturing Hub for ‘Satellites and Launch Vehicles System Production’ at the global level.

NSIL is located at Bengaluru within ISRO Headquarters Campus. Currently, into the third year of operation, NSIL has already created a market for itself in the Indian and Global arena for Launch and Space based services.

URL: <https://www.nsilindia.co.in>





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# AIRBUS DEFENCE AND SPACE NETHERLANDS B.V.

Mendelweg 30  
2333 CS Leiden  
The Netherlands

**Website** : [www.airbusDS.nl](http://www.airbusDS.nl)

**Product Details:** The portfolio of Airbus DS NL includes Solar Arrays, Launcher Structures, Optical EO Instruments, Mechanical-thermal Products, EGSE and Satellite Intelligence Services.

**Company Profile:** Airbus is a global leader in aeronautics, space and related services. In addition to its comprehensive range of passenger airliners, helicopters and mission aircraft, Airbus is Europe's number one space enterprise and the world's second largest space business. Airbus Defence and Space Netherlands B.V. (Airbus DS NL), which is subsidiary of the space division of Airbus, is supplier of high-tech products and services for the international aerospace industry. Since its founding in 1968, the company has contributed to a broad range of noteworthy space programs and has built up broad expertise in developing space technology and services in areas such as Earth observation, Satellite navigation, Robotics, Climate research, Optical communications and Science.

The Leiden-based site of Airbus Defence and Space has state-of-the-art facilities to design, assemble, test and deliver its technology, and employs over 300 experienced professionals. Airbus DS NL aims to be the reliable partner that contributes to the success of our clients' missions in a solution-driven and targeted manner.

# ALPHA DESIGN TECHNOLOGIES PVT LTD

No.09, Service Road, Hal II Stage, Indiranagar  
Bangalore 560008, Karnataka, India

**Website :** [www.adtl.co.in](http://www.adtl.co.in)

**Product Details:** ADTL's Product Spectrum includes the following:-

## Space Segment

- a. Satellite Assembly, Integration and testing (AIT)- IRNSS, GSAT 30, RISAT
- b. Selected for bidding for PSLV Launchers.
- c. ADTL capabilities in manufacturing and supplying PSLV/GSLV rocket parts and assemblies to VSSC by Alpha Tocol, Bangalore
- d. Manufacture and supply of PSLV and GSLV critical machined parts and Assemblies to VSSC by fully owned subsidiary of ADTL, M/s Kortas Industries, Trivandrum

## Ground Segment

- a. Satellite Based Ground Communication Systems:
  - (i) Seven Earth Stations and 350 VSATs for North Eastern States
  - (ii) Earth Station and 700+ VSATs for State Police and Central Para Military Forces
  - (iii) Earth Stations and VSATS for SAARC Countries
  - (iv) Telemedicine Network of 110+ Nodes
  - (v) Andaman & Nicobar Network of 37 Nodes
  - (vi) Army UN Mission Network connecting Sudan, Congo and Lebanon to Army HQ
- b. Indigenous Flyaway VSATs for C and Ku band

## Satellite based Navigation equipment

- a. Two Way MSS Terminal for Fishermen emergency communications
- b. NavIC receivers with GSM transmitter for Vehicle Tracking Applications
- c. NavIC messaging Receivers for Fishermen
- d. Distress Alert Transmitter (DAT)-2G

## Defence and Aerospace Segment

- a. Image Intensifier & Thermal Imaging based Opto Electronic Systems
- b. RF & Microwave Systems
- c. Electronic Warfare Systems

- d. Military Communication Systems
- e. Simulator Systems
- f. Aero Structures for Military aircraft

**Company Profile:** Alpha Design Technologies Pvt. Ltd (ADTL) is one of the fastest growing Defence Electronics & Avionics Design and Manufacturing Organisation in the Private Sector in India. The Company has been incorporated under the Companies Act 1956 on 02-07-2003. ADTL has its Corporate Office in Bangalore and its production facilities at Bangalore and at Hyderabad. ADTL also has its branches at various places including New Delhi, Trivandrum, Chennai, Ahmedabad and Guwahati.

Over the years, ADTL has developed its expertise in Research & Development, manufacturing, Quality Assurance, evaluation and system integration for various defence products such as Optronics & LRF Based Products, Laser Aiming Systems, Thermal Imagers & Fire Control Systems, Navigation, Tactical Communication, Image Conversion, Data & Image Fusion, Radar and C4ISR Systems, EW, Simulators, Microwave Components & RF Units, Satellite Communication and Satellite Assembly, integration & Testing for Indian and International markets.

The Company has invested adequately in Plant, Machinery & facilities, including test equipment and R&D and plans to invest in critical R&D and infrastructure every year for the next 10 years. Adequate strides have been made in diverse technology areas to identify areas of potential growth. The company has been accorded R&D Recognition from DSIR. The Company is also BS EN ISO 9001:2015; EN9100:2018 (technically equivalent to AS9001 Rev D Certification). The Company also possesses CMMI-DEV Level 3 Certificate for Software Development.

The company consists of more than 1200 personnel with more than 700 young engineers, 400 skilled tradesmen / staff and 40 senior executives who have decades of experience in a variety of systems ranging from Microwave components, Thermal Imager based Fire Control Systems, Night Vision Devices, Radars, Tactical Communications, Command and Control Systems, Electronic Warfare systems, Avionics, Airframe for SU-30 fighter aircrafts, and Navigation equipment and Operational software. Specialization extends also to areas such as Research & Development, Production, Assembly, Testing & Integration, Field trials in desert/high altitude/ship/airborne platforms, Environmental, EMI-EMC, Maintainability evaluation, Integration of products/systems with equipment already existing and/or from other OEMs, Up gradation of weapon and Communication systems, Warranty and after sales support, Feedback to OEMs on defects/corrective action to be taken and Obsolescence management. Alpha has special expertise in Offset manufacture and establishment of Simulation & MRO Aviation facilities.



# ANTRIX CORPORATION LIMITED (ACL)

Antariksh Bhavan Campus  
Near New BEL Road  
Bengaluru 560 094  
Karnataka, India

**Website :** [www.antrix.co.in](http://www.antrix.co.in)

**Product Details:** Antrix is engaged in providing Space products and services to international customers worldwide. With fully equipped state-of-the-art facilities, Antrix provides end-to-end solution for many of the space products, ranging from supply of hardware and software including simple subsystems to a complex spacecraft, for varied applications covering communications, earth observation and scientific missions; space related services including remote sensing data service, Transponder lease service; Launch services through the operational launch vehicles (PSLV and GSLV); Mission support services; and a host of consultancy and training services.

**Company Profile:** Antrix Corporation Limited (ACL), incorporated on 28 September 1992 (under the Companies Act, 1956) is an ISO 9001:2015 certified and a wholly owned Government of India Company, under the administrative control of Department of Space (DOS). In the year 2008, the company was awarded 'MINIRATNA CATEGORY-I' status.

At the time of incorporation, the Authorized share capital of ACL was INR 5 crores and the paid up share capital was INR 1 crore. Presently, the Authorized share capital of ACL is INR 100 Crores and the paid-up share capital is INR 6.80 Crores.

## Organizational Structure

ACL, in accordance with its original mandate, has remained lean, close-knit and professional, with techno-managerial and functional personnel mainly drawn from ISRO. The Chairman-cum-Managing Director and Director (Finance) who are whole time Directors, carry out the day-to-day management of ACL. Currently ACL consists of business segments and Administrative divisions like purchase, finance, administration, legal, secretariat and CSR led by business managers and officers respectively.

## Major Achievements

- Introduced ISRO's products and services in the global market;
- Marketed Satellite Launch services using PSLV for the first time;

- Enabled DTH services in India for the first time in 2003;
- Along with ISRO, created history by launching 104 satellites in a single PSLV mission in 2017. Antrix successfully marketed & contracted 101 customer satellites for this mission;
- Launched ~328 foreign customer satellites using PSLV;
- Earned FE to the tune of approximately INR 1718.32 crores over the last 10 years;
- Earned revenue of the order of INR 16688.36 crores over the last 10 years;
- Brought the importance of deregulation in the space sector through articles, reports & presentations;
- Partnering CII, organised and conducted Asia's biggest exclusive Space Exposition "Bangalore Space Expo" since 2006;
- Brought the taxation issue of PSLV Launch services to the attention of Finance Ministry, to declare Launch services as export of service. This enabled PSLV to remain competitive in a changing market.

### **Future Vision**

Currently, ACL is in the process of revamping its business, and is looking at new opportunities majorly in defence – space domain.

## AQST CANADA INC

300 Joseph Carrier  
Vaudreuil Dorion /J7V 5V5/ Quebec /Canada

**Website :** <https://www.aqst-space.ca/>

### Product Details:

- GEO/MEO/LEO Satellites
- SDR/ Digital /Optical payloads
- Spacecraft manufacturing
- Electric Space Propulsion Systems
- LUNAR/ MARS Rovers/LANDER
- R&D
- Engineering Services
- Testing and Qualification
- Spacecraft integration
- EO/SAR VHR AI-ML remotes sensing satellites
- In Orbit Services ( BIU, In orbit life extension, de-orbit)

**Company Profile:** AQST Canada Inc. with a global team of expert engineers and scientists, with more than 25 years of experience each; provides the most advanced and reliable technologies for Space Solutions to offer the clients vertically integrated holistic solutions to reduce costs and complexity; increase reliability and resiliency; mitigate risks and failures; and improve orbital operational capabilities

AQST is based upon the vision of technology and innovation. AQST is providing unique solutions to the industry and customers with our technological solutions such as plasma propulsion, on board processing and Optical (laser) communication. We are developing Quantum communication and AI On-board high-power computer and processor for our next generation solutions. These on-board computers and AI solutions can be integrated in advance manufacturing, robotics and aerospace.

# ASIA SATELLITE TELECOMMUNICATIONS CO. LTD. (ASIASAT)

15 Dai Kwai Street  
Tai Po Industrial Estate, N.T., Hong Kong

**Website :** [www.asiasat.com](http://www.asiasat.com)

**Product Details:** AsiaSat Fleet AsiaSat's core fleet of five commercial satellites, including AsiaSat 5, AsiaSat 6, AsiaSat 7, AsiaSat 8 and AsiaSat 9, serves both the broadcast and telecommunications industries at four prime orbital locations of 100.5°E, 105.5°E, 120°E and 122°E. AsiaSat's satellites provide region-wide C-band coverage over the Asia-Pacific and high-powered Ku-band fixed and steerable beams serving South Asia, East Asia, South East Asia, Australasia, Middle East and major sea routes across the Arabian Sea, Indian Ocean, Malacca Straits and the Indonesian archipelagic waters.

## Video Services

AsiaSat provides cost efficient end-to-end media solutions that meet customers' distribution requirements. Through its best-in-class satellites, fibre connectivity, distribution platforms with premium video neighbourhood of 550+ channels, broadcasters and programmers enjoy rapid access to 850+ million households and 490K hotel guest rooms across the Asia-Pacific. AsiaSat's video service offerings include traditional content distribution to headends, telcos, DTH, DTT platforms to new IP-based, hybrid OTT service, as well as broadcast-grade live streaming service for global audience.

## Data Services

AsiaSat's end-to-end, fully integrated data connectivity solutions support wide-ranging services including VSAT-based networks for corporate, businesses and governments, backhauling for fixed and mobile networks, broadband connectivity for consumers in the rural and remote area, as well as mobility service for maritime and aero sectors. Highly scalable and flexible solutions encompass high-powered satellite capacity, terrestrial links, dedicated hub and teleport infrastructure, professional engineering support in network design and deployment, along with compact and easy-to-install satellite terminals.

## Occasional Use (OU)

AsiaSat offers prime OU platforms with exceptional, customised and cost effective distribution of live sports, news, entertainment and special events in HD and UHD

formats. With full range of C-band and Ku-band capacity and supported by its 24/7 Customer Network Centre, the dedicated AsiaSat OU team offers the highest service quality and reliability for recurring, scheduled fixed time, live events, breaking news or emergency communications usage across AsiaSat's ubiquitous coverage, whether it's for point-to-point or point-to-multipoint transmission.

### **Teleport Services**

AsiaSat's world-class earth station located at Tai Po Industrial Estate, New Territories, Hong Kong, is the home of its teleport facility, Network Operations Centre and 24x7 Customer Network Centre. The facility consists of 19 C, Ku and Ka-band antennas and an antenna farm of more than 50 TVROs, for performing Telemetry, Tracking and Control (TT&C) activities of AsiaSat's satellite fleet, and supporting a wide range of value-added services to video and data customers, including signal downlink, turnaround and uplink, fibre connectivity, transmission platforms and related service. AsiaSat was named the Global Top 20 at WTA's 2020 Top Teleport Operators ranking.

### **Hosting Services**

AsiaSat offers hosting services for clients from its state-of-the-art teleport facility in Hong Kong with highly reliable, secure and cost effective service that can accommodate over 200 racks. It can leverage on AsiaSat's satellite and ground facilities to deliver fully integrated, service-oriented solutions to meet customers' expectation and high standard of quality and information security. AsiaSat was awarded ISO/IEC 27001: 2013 Information Security Management System certification for its hosting service.

### **AsiaSat 5G Bandpass Filters**

AsiaSat offers a comprehensive series of high performance 5G interference rejection bandpass filters, designed to meet the spectrum requirements of various markets. A total of 11 different models are available, including the BPF-3700S and 3700T models that are most suited for the Indian market, and the BPF-4230 model which has add-on features to suppress radar signals generated by altimeters built on aircraft. These filters have been extensively installed in customers' antenna sites across South Asia, South East Asia, Greater China, Australasia and the Middle East, and are proven to be effective in preserving the quality of satellite transmission, even with 5G base stations operating within close proximity.

### **SAILAS Maritime Solution**

SAILAS is a key component of AsiaSat's complete, end-to-end solution to support the digital transformation of the Asia-Pacific maritime sector. SAILAS is tailored to



address the exact requirements of the maritime vertical and all of its sub-verticals. Its service is available in high reliability and availability over a wide area from the Middle East, South Asia to South East Asia; passing through major shipping routes across the Arabian Sea, Indian Ocean, Malacca Strait and the Indonesian archipelagic waters, powered by AsiaSat's wholly-owned satellite fleet and ground infrastructure. SAILAS also includes a wide range of value-added services such as package options with a compact and easy-to-install maritime antenna, FTA TV.

**Company Profile:** Asia Satellite Telecommunications Company Limited (AsiaSat), Asia's premier satellite solutions provider, offers reliable satellite connectivity, media and data solutions to customers in the broadcast and telecom sectors through its core fleet of five in-orbit satellites – AsiaSat 5, AsiaSat 6, AsiaSat 7, AsiaSat 8 and AsiaSat 9, and teleport infrastructure.

At four prime orbital locations of 100.5°E, 105.5°E, 120°E and 122°E, AsiaSat's satellites provide region-wide C-band coverage over the Asia-Pacific and high-powered Ku-band fixed and steerable beams serving East Asia, South Asia, South East Asia, Australasia and Middle East regions, as well as Ka-band payload for regional coverage.

AsiaSat was formed in 1988 in Hong Kong as Asia's first privately owned regional satellite operator. Since the launch of its first satellite, AsiaSat 1, in 1990, AsiaSat has been at the forefront of Asian satellite television. Today, AsiaSat operates Asia's most popular satellite TV distribution platforms for premier content from South Asia, East Asia, Europe, Middle East and global TV networks, offering access to over 850 million TV households in the Asia-Pacific. AsiaSat also provides network and data connectivity services across the region.

Through its Tai Po Earth Station in Hong Kong and worldwide service partners, AsiaSat offers integrated, end-to-end transmission solutions including signal downlink, turnaround and uplink; fibre connectivity; MCPC platforms; signal encryption; playout and broadcast facilities; IP-based, hybrid OTT service; live streaming; hosting services; disaster recovery facilities; and maritime equipment and solutions.

Over the past 30 years, AsiaSat has been expanding its fleet capacity and teleport facilities, diversifying space and ground solutions, and growing partnership to meet changing clients' needs. Through its best-in-class satellite fleet and ground infrastructure, AsiaSat offers Asia's most comprehensive C-, Ku- and Ka-band capacity and transmission solutions for serving DTH, video broadcast, VSAT and data connectivity, and mobility services for the maritime and aero sectors in the region.

AsiaSat helps bridge the digital divide, aiming to be the foremost satellite solutions provider and an instinctive partner of choice in the Asia-Pacific.

# ASTROGATE LABS

#216/2, 2<sup>nd</sup> Floor, Samruddi  
10th Cross, F Block, Sahakarnagar  
Bengaluru 560092 Karnataka, India

**Website :** <http://astrogatelabs.com>

## **Product Details:** Smallsat Optical Downlink Terminal

One of the industry's smallest (0.8U) optical communication terminal providing upto 1Gbps downlink. It can be readily integrated on any nano/ small satellite platforms ideal for low earth orbit satellites for earth observation, high data volume scientific missions.

### Key Features/ Specifications

- Fully integrated laser comm solution
- Downlink Wavelength: 1550nm
- Downlink speeds: upto 1Gbps raw data rate
- Acquisition & Pointing: ground beacon acquisition within 6°, integrated fine tracking system, tolerates 1.2° in satellite bus pointing error
- 32 GB on module data buffering
- Dimensions: Cubesat compatible 95x95x80mm
- Addons: Full comm solution - integrated UHF, S-band for low data rate TT&C
- ITAR free
- Flight heritage in 2021

**Company Details:** Astrogate Labs is a space-technology startup based in Bengaluru, building core technologies in laser communication terminals and networks for small-satellites. Astrogate Labs aims to simplify, reduce cost of communication, and enable satellites send more data to ground. The company has developed one of the industry's smallest optical communication terminal targeted for nano/ small-satellite use. Astrogate is also collaborating with Momentus for the in-orbit demonstration of its smallsat optical communication terminal in 2021.

Astrogate Labs has also been recognized on various platforms including:

- Awarded DST grant for technology development

Recipient of India Innovation Growth Program 2.0 2019 (tripartite initiative of the Department of Science and Technology (DST), Lockheed Martin and Tata Trusts)

- Elevate 2019 Winner, Government of Karnataka
- Only Asian space-tech startup to be selected for Australia Venture Catalyst Space Program
- Only space-tech startup from India in the Indo-US STARTUP Delegation, 2019  
The start-up has long term plans to support the growing satellite downlink needs with a network of optical ground stations and in-space relays using the technologies developed in-house

# AUSTRALIAN CONSULATE-GENERAL CHENNAI ON BEHALF OF THE AUSTRALIAN SPACE AGENCY

Lot Fourteen, McEwin Building. North Terrace  
Adelaide 5000, South Australia, Australia

**Website :** <https://www.industry.gov.au/strategies-for-the-future/australian-space-agency>

**Product Details:** Australian Governed department lead for Australia's civil space industry.

**Company Profile:** The Australian Government established the Australian Space Agency (the Agency) as an ongoing entity on 1 July 2018 to effect long-term transformation and growth of Australia's space industry.

The Agency is working to transform and grow a globally respected Australian space industry to lift the broader economy, and inspire and improve the lives of Australians.

Space offers huge economic and job opportunities, with new technologies also improving life here on Earth. Inspiring the next generation to take up STEM activities, grow career pathways and collaborate across industry, government and academia fuels our goal to triple the size of Australia's space industry to \$12 billion dollars and create up to 20,000 new Australian jobs by 2030.

The Agency is the front door for Australia's international engagement on civil space and operates as the national priority setting mechanism for the civil space sector. The Agency ensures that Australia's civil space activities contribute to productivity and employment across the Australian economy, secure new knowledge and capability, and inspire all Australians.

The Agency is responsible for whole-of-government coordination of civil space matters and is the primary source of advice to the Australian Government on civil space policy. Under this broad mandate, the Agency has six primary responsibilities:

- Providing national policy and strategic advice on civil space sector
- Coordinating Australia's domestic civil space sector activities.
- Supporting the growth of Australia's space industry and the use of space across the broader economy.

- Leading international civil space engagement.
- Administering space activities legislation and delivering on our international obligations.
- Inspiring the Australian community and the next generation of space entrepreneurs

To help grow the economy, the Agency will focus on areas of advantage for Australia including:

- Communication technologies and ground stations
- Space situational awareness
- Earth Observations
- Position, Navigation and Timing (e.g. GPS)
- Remote asset management
- R&D and leapfrog technologies
- Future areas like space medicine and space service



# AUTOMATION SYSTEM ENGINEERS PVT LTD.

“Automation house” #4, Sardar Patel Nagar,  
wNavrangpura, behind Hotel Dev Corporate,  
Ahmedabad 380009 Gujarat

**Website :** [www.asepl.in](http://www.asepl.in)

**Product Details:** Electrical and Electronic Test and Measurement

**Company Profile:** ASEPL specializes in the design and development of custom automated test, control and acquisition solutions for R&D, design validation and product testing. We act as a bridge between technology and application, by bringing up-to date high quality technological products/solutions to our customer.

We have been supplying electrical and electronic Test and Measurement equipment's to industries, educational institutes, research and development organizations, civil aviation and military organizations. Our customers are scientists, researchers and engineers in the electronics industry involved with advance materials research, semiconductor device development & fabrication and production of end products and devices.

## **Mission**

Be a one-stop supplier for high quality electronic test and measurement instruments (hardware and software).

## **Vision**

To become an industry leader in Test, Measurement, Automation and Instrumentation & Control by providing innovative, high quality product/solutions.

## **Core Values**

Delivering on our promise

Transparency with our customers

Improving & Innovating at every phase

Continuous learning to stay up to date with technology & market

## AWS INDIA (AISPL)

**Website :** [aws.amazon.com](https://aws.amazon.com)

Also to know more about AWS in India Public Sector visit - <https://aws.amazon.com/government-education/worldwide/india/>

**Product Details:** Cloud Service Provider

**Company Profile:** Amazon Web Services (AWS) helps commercial and government customers build satellites, conduct space and launch operations, and reimagine space exploration. Our reliable global infrastructure and unmatched portfolio of cloud services position AWS to equip organizations in the private and public sector to process and transform space collections into data, make that data actionable and accessible to customers around the globe, and redefine how organizations transform the space market segment. With the AWS Cloud, customers are accelerating space missions, removing barriers to innovation on Earth, and inspiring future generations.

For 15 years, Amazon Web Services has been the world's most comprehensive and broadly adopted cloud platform. AWS has been continually expanding its services to support virtually any cloud workload, and it now has more than 200 fully featured services for compute, storage, databases, networking, analytics, machine learning and artificial intelligence (AI), Internet of Things (IoT), mobile, security, hybrid, virtual and augmented reality (VR and AR), media, and application development, deployment, and management from 80 Availability Zones (AZs) within 25 geographic regions, with announced plans for 15 more Availability Zones and five more AWS Regions in Australia, India, Indonesia, Spain, and Switzerland. Millions of customers—including the fastest-growing startups, largest enterprises, and leading government agencies—trust AWS to power their infrastructure, become more agile, and lower costs.

# BELLATRIX AEROSPACE PRIVATE LIMITED

148, 3rd floor, Sampige road, Malleswaram  
Bengaluru 560003, Karnataka

**Website :** <http://www.bellatrixaerospace.com/>

**Product Details:** Bellatrix Aerospace has 5 uniquely positioned products in its offering:

1. Nano Thrusters: Unique miniaturised propulsion systems for nano satellites
2. Hall Thrusters: Efficient Electric Propulsion systems for micro satellites all the way up to heavy satellites
3. Green Monopropellant Thrusters: Green high performance chemical propulsion system for agile manoeuvres in space
4. Microwave Plasma Thrusters: Water powered novel electric propulsion system that offers unmatched life, cost advantage and thrust-to-power ratio, ideal for heavy satellites
5. Pushpak: An orbital transportation vehicle for affordable rideshare on medium and heavy lift launch vehicles to precise orbits

**Company Profile:** Bellatrix Aerospace is a full-suite solution provider of spacecraft propulsion systems based in Bangalore, India offering both chemical and electric propulsion technologies. The company has over a dozen awards and recognitions for its innovation, including two National Awards. The company is currently expanding its business towards being a prime contractor for developing and operating unconventional satellite platforms for highly demanding mission requirements. Bellatrix has supplied innovative electric and chemical propulsion systems to ISRO and DRDO and has setup state of the art infrastructure for development, testing and manufacturing propulsion systems. The company follows globally accepted quality standards, can ship internationally and supply at very short lead times.

# **BHARAT ELECTRONICS LIMITED**

Outer Ring Road, Nagavara,  
Bangalore - 560045, Karnataka, India

## BHARAT FORGE LTD.

Pune Cantonment, Mundhwa  
Pune 411 036, Maharashtra, India

**Website :** [www.bharatforge.com](http://www.bharatforge.com)

**Product Details:** Proof machined forgings for SSLV, PSLV, GSLV, Gaganyaan in material grades 15CDV6(VD), 15CDV6(ESR) & Titanium Alloy (Domes)

**Company Profile:** Bharat Forge is a technology driven global leader in metal forming, having a transcontinental presence across ten manufacturing locations, serving several sectors including automotive, aerospace & defence, power, oil and gas, construction & mining, locomotive and marine. Bharat Forge has the largest repository of metallurgical knowledge in the region and offers full-service supply capability to its geographically dispersed marquee customers from concept to product design, engineering, manufacturing, testing and validation. The world's largest forging company with manufacturing facilities spread across India, Germany, Sweden, France and North America, Bharat Forge manufactures a wide range of high performance, critical & safety components for the automotive & non-automotive sector.

Bharat Forge is the first Indian company to secure NADCAP approval for heat treatment of Titanium alloys. Bharat Forge is AS9100D, DGAQA, Cemilac and Testing Lab ISO-IEC 17025 certified and has over the past few years manufactured critical components for the Aerospace sector.

With innovation at our heart, we continue our endeavor of rising through diversification and high-quality manufacturing that drives change and sustainability.



# BRADFORD SPACE

New York – USA, Heerle – The Netherlands  
Solna – Sweden, Luxembourg

**Website** : [www.bradford-space.com](http://www.bradford-space.com)

## **Product Details:**

- Space Logistics Services
- Propulsion Subsystems & Components
- Number 1 non-toxic propulsion solutions
- Comet Water based Propulsion Systems
- Pressure Transducers
- Reaction Wheels
- Sun Sensors
- Thermal Control Systems
- Avionics electronics

**Company Profile:** Bradford Space is the most capable space company you've probably never heard of. We are a high-tech developer and manufacturer that has been innovating the space industry for over three decades. Bradford has over 35 years' experience developing and manufacturing state-of-the-art in-orbit systems and components. Today, this US-owned company with headquarters in New York City and operations in the Netherlands, Sweden, Luxembourg, and Seattle builds high performance spacecraft propulsion systems, avionics, attitude orbit control systems, microgravity workspaces, and provides Logistics Services for missions beyond LEO.

Bradford is a world-leader in non-toxic propellant systems and technology ranging from cold gas, water, ADN (Ammonium DiNitrimide), and electric propulsion. Bradford is a leading subsystem supplier to aerospace primes, space agencies and venture-backed space companies around the world with over 2000 products in space.

Commercial customers who have used Bradford products include Airbus, Astranis, Astroscale, Blue Canyon Technologies, HawkEye 360, LeoStella / Black Sky Global, Millennium Space, Moog, OHB, Planet, QinetiQ Space, Sierra Nevada Corp, SSL, Teledyne Brown Engineering, Thales Alenia Space, VACCO, and York Space Systems.

Bradford is also proud of the space agencies it has worked with over many years, in particular ESA, NASA, the Netherlands Space Office, the Swedish National Space Agency and the Luxembourg Space Agency.

## CELESTIA STS

Huygensstraat 44  
2201 DK Noordwijk  
The Netherlands

**Website :** [www.celestia-sts.com](http://www.celestia-sts.com)

**Product Details:** Celestia Satellite Test & Simulation BV (C-STs) provides ground-based solutions in the domains of satellite simulation, testing, communication, and data processing.

**Company Profile:** Celestia STS has more than 30 years of experience in the space industry. More than 300 EGSEs and TT&C modems were delivered to Space Agencies, Large System Integrators, and specialised flight-equipment manufacturers around the World. Celestia EGSE solutions have been used in more than 80% of all European Space Agency Missions.

Celestia STS testing equipment is available in standard functionality or configured to meet specific customer needs. Typically equipment is used either in clean room AIT environments or in ground stations.

C-STs has a strong customer base, having delivered many systems to a variety of leading companies and institutions within the space industry including the European Space Agency (ESA), Airbus Defence and Space (ADS), Thales Alenia Space (TAS), OHB System (OHB), Surrey Satellite Technology Ltd. (SSTL) and many others.

# CENTUM ELECTRONICS LIMITED

No. 44, KHB Industrial Area, Yelahanka New Town  
Bangalore 560 106, Karnataka, India

**Website :** [www.centumindia.com](http://www.centumindia.com)

**Product Details:** Satellite Payloads, Launch Vehicle Subsystems, Embedded On-Board Computers, Control Systems, Power Electronics, RF/Microwave, Sensor Electronics etc.

**Company Profile:** Centum Electronics Ltd is a leading Electronics company head quartered in Bengaluru offering design, development & manufacturing of customized system/subsystem solutions for high reliability applications. Established in 1994, Centum has rapidly grown into a diversified company operating in Defence, Aerospace, Space, Industrial, Medical and Telecom industries. Centum has acquired Adetel group of France, who are embedded system experts catering to defence, aerospace, industrial, energy, medical & transportation sectors. With exports contributing to 90% of the annual turnover and customers that include the most reputed international and domestic organizations, Centum has demonstrated its ability to combine product reliability, performance and competitive pricing with a strong customer-focused approach. Centum has also established a strong global presence with design, engineering & sales offices in the USA, Canada, UK, Australia and France. Centum group's 2300 employees (with 630 designers) have contributed to the company's revenues of 150 million \$.

The company is comprised of Three operational business units – Design & Engineering services, Strategic Electronic Products & Electronic Manufacturing Services.

Centum Adetel group is a design and engineering firm specialized in the design and production of critical electronic systems for power electronics, control systems and energy storage applications in the railway, aeronautics, defense/security, medical industries. Apart from main design center in France, it has other design centers at USA, Canada & Germany to support its worldwide customers.

Centum's Strategic Electronic Products division, designs and develops customized electronic systems and modules for Defence, Aerospace and Space applications.

Over one hundred design engineers specialized in analog, digital, RF, Power and mechanical domains work together in multidisciplinary teams to realize complex products. These include guidance systems for Missiles, High Power RF Amplifiers

and Transmitters for radars, ELINT system for Electronic warfare, Power subsystems and electro-optic sensors, digital systems for satellites & aircrafts, communication modules for military radios, Proximity Fuzes for artillery guns, Bombs and many more.

The quality systems at Centum are certified for international standards, besides customer-specific line and product certifications. Centum is certified by CEMILAC for its design capabilities and is recognized by DST-GOI as an approved R&D house.

Centum was awarded the first prize for Quality, Business excellence and R&D at the ELCINA awards. It also won the IEI Industry excellence award & was appreciated by World Economic Forum. Centum was also recognized by the 'Forbes Asia's 200 Best Companies under Billion' apart from our CMD being recognized as EFY-ELCINA "Electronics Man of the Year".

# CIELO INERTIAL SOLUTIONS LTD.

5 Nahum Hefzadi St.  
Jerusalem 95484010, Israel

**Website :** [www.cielo-inertial.com](http://www.cielo-inertial.com)

## **Product Details:**

- IMU – Inertial Measurement Units – Several different performance grades.
- INS – Inertial Navigation Systems for both land and air platforms
- IRU – Inertial Reference Systems for space applications

**Company Profile:** Cielo Inertial Solutions is a subsidiary of Rafael of Israel and Kearfott of the US. Cielo is a global technology expert of inertial solutions, which employ our in-house, Closed-Loop Fiber-Optic Gyroscope (CL-FOG) technology. We focus on navigation, reference, control, and stabilization solutions for defense and commercial operations.

We manufacture in-house Inertial Navigation Systems (INSs), GyroCompasses, North Finding Systems and Inertial Measurement Units (IMUs) - off the shelf as well as custom tailored solutions. Full range of performance for a wide range of applications on land, air, marine and space, both military and commercial.

Our field proven inertial systems are integrated into world class fully operational systems, such as launchers, fighting vehicles rocket systems, guided munitions, payloads, UAVs, civilian aircraft protection systems, satellites and many others in Israel as well as in the international defense market.

## **Cielo Space Activities:**

Cielo offers a decade and a half of experience in high-end space navigation systems. The company's Starlight 1000 IRU (also known as IRU 24) is successfully operating on several LEO satellites, some of them for more than 5 years. The Starlight 1000 Inertial Reference Unit is a space grade, ultra-high performance Inertial Reference Unit (IRU), suited for satellites and space navigation applications. This includes EO, SAR, multispectral, and COMMs satellites, for line-of-sight stabilization, pointing, and guidance applications. Starlight 1000 IRU employs Cielo's latest closed-loop fiber-optic gyro (FOG) technology.

Overall our space sensors have accumulated more than 300,000 operating hours in orbit, with zero failures and no performance degradation. This number will start growing rapidly as more of our IRUs will be launched in the near future.



Cielo is in the midst of developing a smaller, lighter and cost effective space IMU building on our COTS IMU-42XP and from the knowledge gained from developing the STARLIGHT 1000 space IRU. The IMU-42 is a family of high-end tactical IMUs, enclosed in less than 0.5 liter volume, weighing 850-1100 grams. The XP variant offers 0.1 deg/hr gyros in this small enclosure. The IMU42 is mass produced and field proven with multiple customers, mostly for aerial GNC applications.

# DELFT UNIVERSITY OF TECHNOLOGY

Mekelweg 4 2628 CD Delft,  
Netherlands

**Website :** <https://zebro.space>

**Product Details:** Lunar Zebro is a student /faculty project with a aim to be the world's smallest and lightest lunar rover ever. The rover will piggyback to the Moon aboard one of the private or national space agencies' moon landers. The rover's main objective is to survive the harsh lunar conditions for one lunar day (14 Earth days). It will communicate directly back to Earth with its location and health conditions. In the 14 days, it will test out the unique locomotion system, while using its cameras for navigation, as well as returning images to Earth.

**Company Profile:** The Technical University of Delft, founded in 1842, is a highly regarded and rigorous and innovative engineering school attracting the best minds from all over the world to its programs with 8 faculties offer 16 bachelor's and more than 30 master's programmes. Our more than 25,000 students and 6,000 employees share a fascination for science, design and technology. Our common mission: impact for a better society. Located in the lovely and historic medieval city of Delft, TU Delft is the perfect place for research and for enjoying university life in the Netherlands. Its proximity to Amsterdam, reached by train in less than an hour, is ideal for those interested in exploring Europe

## DEPARTMENT FOR INTERNATIONAL TRADE – UK

British Deputy High Commission, Prestige Takt  
23 Kasturba Road Cross, Bengaluru  
Bengaluru 560001, Karnataka

**Website** : [www.gov.uk/dit](http://www.gov.uk/dit)

**Product Details:** Government Services, Market Entry Strategy, Market Consultancy

**Company Profile:** The Department for International Trade (DIT) is a UK government department which extends support to help businesses expand and grow in global markets. We support organisations exploring to collaborate with UK industry to leverage commercial opportunities in the Space market. DIT has trade specialists who can help you identify technologies and market opportunities and help provide assistance in exploring strategic partnerships models.

If you are a business with interest in either upstream or downstream Space business do connect with us. We will be happy to discuss.

Contact us -

Amrut Yalagi, Head – Space

[amrut.yalagi@fco.gov.uk](mailto:amrut.yalagi@fco.gov.uk)

Arun Abraham, Senior Trade & Investment Advisor – Space and Aerospace

[arun.abraham@fco.gov.uk](mailto:arun.abraham@fco.gov.uk)

## DHRUVA SPACE PVT LTD.

Flat No: 702, White House Building  
Block I, Kundanbagh Colony, Begumpet  
Hyderabad 500016, Telengana, India

**Website :** [www.dhruvaspace.com](http://www.dhruvaspace.com)

### **Product Details:**

1. Satellite Platforms.
2. Launch Services.
3. Ground station solutions.

**Company Profile:** Dhruva Space is a National Award-winning Space Technology startup focused on building full-stack space engineering solutions. The company is based out of Hyderabad, India, and Graz, Austria. We have been actively involved in building application-agnostic satellite platforms.

Our vision is to offer satellites coupled with Earth stations and launch services as an integrated solution or individually as a technology solution to power space-based applications on Earth & beyond. The founding team comprises of business & technology leaders who formerly were working with Exseed Space, amg AG, Cisco & KPMG

# DUPONT ELECTRONICS & INDUSTRIAL (PERFORMANCE SPECIALTY PRODUCTS (INDIA) PVT. LTD.)

974 Centre Rd. (HQ)  
8th Floor, 81-83, 2nd North Avenue, Maker Maxity  
Bandra Kurla Complex, Bandra -East (India Office)  
Wilmington, DE 19805(HQ)  
Mumbai, Maharashtra 400051, India Office

**Website :** DuPont Electronic Solutions | Electronic Materials

## Product Details:

- Printed Circuit Board Materials
- Thick Film Materials
- Electrical Insulation Materials
- Electronic Components
- Semiconductor Materials
- Thermal Management Materials
- LED Materials

**Company Profile:** DuPont Electronics & Industrial brings a unique depth and breadth of knowledge, applications and technical expertise, and product portfolio to address customers' needs for connectivity today and in the future.

Our drive to provide our customers with industry-leading innovation is complimented by large scale, best-in-class manufacturing capability, and a team of scientists with deep materials science expertise to make next generation technology a reality for our customers.

With research centers and manufacturing operations located close to our customers in the U.S., China, Taiwan, Korea, and Japan, we pride ourselves on a customer-centric view to ensure we support our customers' success.

At DuPont Electronics & Industrial, we're bringing a whole new world into view.

# ETERNUS PERFORMANCE MATERIALS PVT. LTD.

D71, Five Star MIDC, Kagal Hatkanangale,  
Kolhapur 416236, Maharashtra

**Website :** [www.eternus.biz](http://www.eternus.biz)

## **Product Details:**

Launch Vehicle, Lander, Satellite & Space Optics

- a. Structural Composites (Satellite Bus and Lunar Lander Structures, Lunar Rover Chassis and Wheels, Solar Panel Substrates, Lander Landing Gear with Composite Footpad and Payload related composites, Umbilical Housings and Brackets)
- b. Precision Machined Metallic parts for Space, Satellite and Launch Vehicles – Titanium, Tungsten, INCONEL, INVAR, Aluminium and Special Steels
- c. Assembly and Integration of subassemblies for Space, Satellite and Launch Vehicles
- d. Thermally Stable – Zero CTE Struts and ISOGRID Structures

## **Design**

- a. Composite Design & FEA based Optimization
- b. Characterization & Qualification - Pre Design Support
- c. One-off Prototyping and New Product Development
- d. Composite Tooling & Manufacturing Process Development

## **Unmanned Aerospace**

- a. Structural Composites (Airframe, Propulsion, Landing and Payload related) for Unmanned Aerial Vehicles (UAV) & Unmanned Underwater Vehicles (UUV)
- b. Micro, Mini, HALE, MALE, Target & Expendable UAVs
- c. Precision Machined Metallic parts for UUV & UAV
- d. Assembly, Integration and Mechanical Testing Services for UUV & UAV
- e. Riveting and Bonding of Composites



**Company Profile:** Eternus Performance Materials Private Limited (ETERNUS) is engaged in high end research and development oriented manufacturing of Advanced Composite Products.

Eternus is CERTIFIED under AS 9100 Rev. D AEROSPACE STANDARD with the scope as “Design, Development, Manufacturing and Assembly of Advanced Composites for Aviation & Space Applications”. NADCAP certification for Special Processes is underway.

Eternus designs, develops, prototypes, tests and manufactures Advanced Composite and Precision Machined products for Aerospace, Space & Satellite applications.

Based out of Kolhapur (Maharashtra - India) in Kagal 5 Star Industrial Zone – it operates out of 15000 sqft factory with an additional 80000 SQFT expansion in progress.

# EXSEED SPACE INNOVATIONS PRIVATE LIMITED

Plot no. 37-B, Perry Cross Road  
Opp Delite Apprt, Bandra west, Mumbai  
Mumbai 400050, Maharashtra

**Website :** [satellize.com](http://satellize.com)

## Product Details:

1. We provide cubesat solutions to meet different customer requirements
2. We provide tracking and data collection related solutions
3. We provide research and development services for building space technology for customers.

**Company Profile:** Satellize is India's first private company in space, with two satellites orbiting the earth currently. We build customized nanosatellites, and offer solutions and services to customers across the world.

In March, 2020 we used our expertise in creating reliable electronics control systems to come up with OS Vent – a controller for a low cost emergency ventilator to tackle the covid crisis.

We are all set for when the COVID-19 situation eases up, with a series of launches.

We are ready to launch a record 10 universities, colleges and NGO's through our SpaceShare program into space jointly with ISRO in the next few months. To put this in perspective, the total number of student satellites launched in India so far over decades are hardly 9. We will also be launching our own experimental satellite meant for High Frequency radio transmission, at the same time.

In 2020, the company has actively focused on creating solutions for the Indian Defence Sector among others. It was an exhibitor in India DefExpo 2020. We have solutions for Education & Research, Defence & Security, Agriculture, Oil & Gas and Logistics.

Our customers are private organizations as well as governments. We're one of the very few companies in the world that have launched successfully on both SpaceX and ISRO rockets and that are space-qualified on both platforms.

# GALAXEYE SPACE

NCCRD

Machine Design Section Rd, Indian Institute of Technology  
Chennai 600036, Tamil Nadu

**Website :** <https://galaxeye.space>

**Product Details:** Shaping the future of Satellite Image Acquisition by launching an advanced constellation of Earth Observation Satellites in Space, providing the most meaningful dataset, enabling businesses and governments make efficient data-driven decisions

**Company Profile:** GalaxEye is a SpaceTech Startup, incubated at IIT Madras Incubation Cell, aiming to shape the future of Satellite Image Acquisition. Experimented with Satellite Image Analytics, GalaxEye realized a gap in the Earth Observation data provider segment and is therefore working on an advanced constellation of Earth Observation Satellites in Space, providing “The Most Meaningful Dataset” using advanced sensors. This would enable businesses and governments to make efficient decisions based on data obtained from a high-resolution dataset with high frequency of coverage.

Founded in 2020, GalaxEye is the brainchild of a few members hived out of Avishkar Hyperloop, a global competition organised by Elon Musk’s aerospace manufacturer and space transportation services company SpaceX. Team Avishkar Hyperloop was one of the top 21 teams out of the 1,600 plus participants from across the world. Led by Suyash Singh, Denil Chawda, Kishan Thakkar, Pranit Mehta, Rakshit Bhatt and Prof. S. R. Chakravarthy. The company develops technologies that work in space, monitoring Earth and envisions to monitor outer space as well, while also accelerating the growth of space infrastructure enabling multi-planetary evolution. The company would majorly be a B2B and B2G entity. It will operate on a subscription-based Data-as-a-Service model.

GalaxEye aims to launch the first satellite by early 2023, with a long term plan of launching satellites into space in a phased manner. Looking at the immediate timeline, the goal is to develop and test a Prototype of the Satellite and its Payloads to de-risk the technologies being developed. Since its inception, the Company has won a couple of grants from CIIE.CO, IIM Ahmedabad, and from the Government of Tamilnadu under the TANSEED Programme. In the month of June 2021, GalaxEye also announced to have raised a Pre-Seed Fundraising Round from Speciale Invest. As per the Release, the funds will be deployed to strengthen and build robust technology infrastructure, prototype development and build a world class team to help GalaxEye in accelerating the growth of space infrastructure in India.

# HICAL TECHNOLOGIES PRIVATE LIMITED

Sy. No. 46 & 47, Electronics city, Phase 2, Hosur Road,  
Bangalore 560100, Karnataka

**Website :** [www.hical.com](http://www.hical.com)

**Product Details:** Transformers, Solenoids, Motors and Systems Integration

1. Actuators, Motors, Transformers and Solenoids
2. Systems Integration: (Box builds, Cable harness & Wiring integration, Mechanical integration, Navigation Consoles integration) Mechanical Assemblies: Sheet Metal and Precision Machining.

**Company Profile:** For over 33 years, Hical has been supplying Electromagnetic and Electromechanical components and systems to leading corporations worldwide. In addition, we also offer Systems Integration Services. Hical has a team of over 800 members located in Bangalore, Hassan and Chennai spread across 32 Acres and 200,000 square feet of manufacturing space. We will be opening another facility in Bangalore Aerospace Park end of next year.

Our Products:

1. Actuators, Motors, Solenoids, Transformers and LVDTs
2. Wiring Integration, Box builds and Cable Harness
3. Mechanical Integration: Sheet metal and Machining

Hical became a 100% exporter in 1997. Since 2006, we are focused on the international Aerospace and Military markets and supply to Raytheon Technologies (USA), Thales (France), Boeing (USA) to name a few. For the Indian market, Hical is an approved supplier for Indian Space Research Organization, DRDO and HAL. In all these years, we have earned a fierce customer loyalty, through always exceeding customer expectations at every stage of engagement. We have proved ourselves strong in each step in the chain: Technology, Design, Development, Manufacturing, and Logistics.

We are the Indian Offset Partners for Indo-US, Indo-French, Indo-UK contracts to support the Indian Offset Program. We have also established an Indo-French Joint Venture for one of our existing French Aerospace customer.

## **HINDALCO-ALMEX AEROSPACE LIMITED (HAAL)**

AL-1, SEZ MIDC Shendra,  
Aurangabad 431007, Maharashtra

**Website :** [www.hindalcoalmx.com](http://www.hindalcoalmx.com)

### **Product Details:**

Aluminium Hard Alloys in Billet and Slab form, in UT Class A quality, for Aerospace & Defense end applications.

Suitable for Forging, Extrusion and Hot/Cold Rolling processes

Available in Wide range of Billet sizes, from 7" upto 42".

Typical Alloys include AA2014, AA2219, AA2618, AA7075, AA7175, AA7050, AA6061, AA6351, AA5083.

Also regularly offering customised alloys for special requirements.

**Company Profile:** Hindalco-Almex Aerospace Limited (HAAL) was set up in year 2008 and is the first and only manufacturer of high-performance A&D grade Aluminium hard alloys in India. Its operations facility in Aurangabad has played a crucial role in supplying Aluminium hard alloys for component manufacturing for various advanced programmes undertaken in India's Space research programmes as well as in India's Defense sector, especially the missile programmes.

An AS9100 certified company complying with other ISO as well Safety standards supplying guaranteed A&D grade quality with one specific advantage of short lead times.

Company's Aurangabad plant is 12,000 TPA plant which uses state-of-the-art Almex CASTRIGHT II TM automation system and the LARS TM in-line Aluminium purification system as well as clean and efficient homogenising and fully equipped machining and ultrasonic testing for manufacturing Aluminium hard alloy Billets and Slabs.

Products meet the stringent quality requirements for input raw materials in the forging, extrusion and rolling processes of the Aerospace and Defense Industry.

In addition to the wide range of 2xxx, 6xxx and 7xxx alloy series in which Billets and slabs are cast, HAAL is also fully capable of casting in customized alloys, as per the stringent and specific requirements of end users in A&D sector.

HAAL is certified by major OEMs such as Boeing, which gives additional confidence about the reliability of product quality and stringent adherence to international quality standards.

As a result, HAAL is the supplier of choice for various marquee projects of India's Aerospace and Defence sector alike - including ISRO's PSLV, GSLV, HSP projects and prestigious missile programmes like Brahmos, Akash by DRDO and other DPSUs.

The initiative of 'Make in India' becoming more and more critical for ensuring indigenization and self-sufficiency, gels perfectly with HAAL's business of manufacturing the high-grade aluminium alloys within India. Along with the parent company, Hindalco and its subsidiaries, HAAL aspires to become the one-stop shop that caters to the growing raw materials required for not just Indian but also the overseas supply chain in A&D industry.



# HINDUSTAN AERONAUTICS LIMITED- AEROSPACE DIVISION

HAL Aerospace Division

Post Bag No: 7502

Suranjandas Road, New Thippasandra  
Bengaluru 560075, Karnataka

**Website :** [www.hal-india.co.in](http://www.hal-india.co.in)

## **Product Details:**

- Manufacture of Space Launch Vehicle Hardware
- Stage Integration and Equipping
- Satellite Structures

**Company Profile:** Hindustan Aeronautics Limited (HAL), a Defence Public Sector Undertaking under Ministry of Defence, Govt. of India is a premier Aerospace company engaged in design, development, manufacture, repair and overhaul of aircraft, helicopter, engines and related systems like avionics, instruments and accessories.

HAL has achieved self-reliance in the area of design and development of Helicopters and Aircraft.

Apart from supporting the Indian Defence Forces, the company contributes in a major way to the space programmes of the country.

HAL's association with India's prestigious Space Program dates back to early 70's , when HAL provided technical inputs and manufacturing support to Indian Space Research Organisation (ISRO) for realisation of light alloy structural assemblies for satellites and launch vehicle. HAL had built the structural assembly of India's first satellite "Aryabhata" which was launched on April 19, 1975.

**Aerospace Division** of HAL was conceptualised in early 80s by a MOU signed between Prof. Satish Dhawan Chairman, ISRO and Air Chief Marshal L.M.Katre, Chairman, HAL in May 1983. The Division took birth on 25th March 1988 and was dedicated to the nation on 19th April 1991.

The Division started off with fabrication of structures & tankages for SLV, ASLV, PSLV Launch Vehicles. Today Aerospace Division is the only facility in the country

that brings under one roof activities ranging from methodizing, high-tech tooling, precision machining, welding, complex riveted & welded assemblies, integration and quality assurance of aerospace systems. It is spread over 53 acres and has a skilled workforce of 490 employees. Aerospace Division has been accredited with ISO 9001:2008, AS 9100D and ISO 14001: 2004 certified by NVT Quality Certification Private Limited.

HAL has been the mainstay partner of ISRO for five decades, from the era of experimentation to the present era of commercialisation. The facilities have been augmented/modernised continuously over time to manufacture structures and propellant tankages of different types & sizes, different materials and varied complexities. The manufacturing excellence of the division is visible in production of space worthy large components and assemblies with stringent dimensional and quality requirements

# HYPERION TECHNOLOGIES

Vlinderweg 2  
2623 AX Delft, The Netherlands

**Website :** [www.hyperion.space](http://www.hyperion.space)

**Product Details:** Among the most popular products – and at the same time those with most flight heritage – Hyperion counts its Star Tracker, which is at the same time claimed to be the world's smallest Star Tracker. In addition, the company provides a full range of sensors for attitude determination, attitude control, integrated ADCS, navigation, payload processing, chemical propulsion and laser communication for SmallSats. A large amount of these components has been co-developed with partner companies; other members of Hyperion's partner network complement the value chain in the areas of launch, operations and testing; while Hyperion provides additional expertise in mission analysis, spacecraft design, qualification and end-of life. Although not in its core of activities, Hyperion has also developed key payloads for clients.

**Company Profile:** Hyperion Technologies is a space company located in Delft, Netherlands. Having been active since 2013, it specialises in the development of miniaturised, high-performance and smart components for small satellites as well as satellite platforms for complete missions. This includes both hardware and software. Hyperion follows the philosophy to provide the best-in-class products to its clients worldwide, scratching at the limits of the physically possible within the scope of miniaturisation.

The company leverages to a large extent on the availability of COTS components. High robustness, reliability and testing are the leading principles.

Among the most popular products – and at the same time those with most flight heritage – Hyperion counts its Star Tracker, which is at the same time claimed to be the world's smallest Star Tracker. In addition, the company provides a full range of sensors for attitude determination, attitude control, integrated ADCS, navigation, payload processing, chemical propulsion and laser communication for SmallSats. A large amount of these components has been co-developed with partner companies; other members of Hyperion's partner network complement the value chain in the areas of launch, operations and testing; while Hyperion provides additional expertise in mission analysis, spacecraft design, qualification and end-of life.

Ever since late 2020, Hyperion is part of the AAC Clyde Space Group. With over 150 employees worldwide, stretched across business locations in Sweden, United

Kingdom, Netherlands and the United States, the Group specialises in advanced nanosatellite spacecraft, mission services, and reliable subsystems. Its market-leading New Space solutions and services enable government, commercial, and educational organisations. By making use of AAC Clyde Space's Space-as-a-Service offering, customers can focus on their core business and entrust us with what we do best, from spacecraft design to satellite operations and data delivery.

## ISRO INERTIAL SYSTEMS UNIT (IISU)

Vattiyoorkavu Complex, Nettayam,  
Thiruvananthapuram 695013, Kerala, India

**Company Profile:** ISRO Inertial Systems Unit (IISU), Thiruvananthapuram is responsible for the design and development of Inertial Systems for Launch Vehicles and Spacecraft programmes of ISRO. Major systems like Inertial Navigation Systems based on mechanical gyros and optical gyros, Attitude Reference Systems, Rate Gyro Packages and Accelerometer Packages are developed indigenously and used in various missions of ISRO. IISU also designs and develops Actuators and Mechanisms for spacecraft and allied applications.

IISU is engaged in continuous Research and Development too. The experience and knowledge gained over the years are used for perfecting the present class of sensors and systems and developing new technologies. Further IISU has also initiated advanced technology development programs in niche areas to adapt itself as a Centre of Excellence in Inertial Sensors and Systems. IISU strives to make the systems cost effective, reliable and realisable in tune with global trends.

## ISRO PROPULSION COMPLEX (IPRC)

Vattiyoorkavu Complex, Nettayam,  
Thiruvananthapuram 695013, Kerala, India

**Website :** [www.iprc.gov.in](http://www.iprc.gov.in)

**Product Details:** Integration and Testing of Liquid Propulsion systems for ISRO's Launch Vehicles and Spacecraft programme. Company

**Company Profile:** ISRO PROPULSION COMPLEX (IPRC) formerly Liquid Propulsion Systems Centre, Mahendragiri (LPSC-M), is located near Kanyakumari at Mahendragiri Hills, Tirunelveli District, Tamil Nadu. It is the major testing hub of ISRO's liquid propulsion systems. The role of IPRC is to carry out research for the development of liquid propulsion systems both for Launch Vehicles and Satellites. IPRC is equipped with state of the art facilities for the assembly, integration and testing of liquid propulsion systems. It is responsible for the development, qualification and acceptance testing of sub-systems and systems for launch vehicles and spacecraft projects. Before qualifying an engine through hot test, its subsystems are qualified by conducting cold flow test by using water or simulant fluids. For this cold flow test facilities are established. Apart from this, facilities are established to test/simulate upper stage rocket engines and thrusters/ Liquid apogee motors of satellites in vacuum environment. These facilities are also used for developing propulsion systems for inter-planetary missions. IPRC has the responsibility of delivering the second and fourth stages of ISRO's workhorse launch vehicle PSLV. The improvements and indigenization of components in the above launch vehicle was a major step towards self-reliance. IPRC has played a major role in the development of indigenous cryogenic engine of 75kN thrust capacity for Geosynchronous Satellite Launch Vehicle MK II (GSLV MKII) and 200kN thrust capacity engine for GSLV MK III. Towards these developments IPRC has done extensive testing and analysis to perfect the cryogenic technology. ISRO is now working for the development of a high thrust semi-cryogenic engine which uses Liquid Oxygen and Rocket grade Kerosene called Isrosene. This ecofriendly Semi Cryo engine of 2000kN thrust capacity is being developed by ISRO and IPRC has a significant role in establishing the test facilities for this development. IPRC houses state of the art facilities for assembly, integration and testing of the ISRO Propulsion technology. IPRC has over the years established world class facilities with ambitious Technology development programmes and is a pioneer in the liquid propulsion area



# ISRO TELEMETRY, TRACKING AND COMMAND NETWORK (ISTRAC)

Plot No. 12 & 13, 3rd Main, 2nd phase,  
Peenya Industrial Area,  
Bengaluru 560058, Karnataka, India

**Company Profile:** ISRO Telemetry, Tracking and Command Network (ISTRAC), Bengaluru is entrusted with the major responsibility to provide tracking support for all the satellite and launch vehicle missions of ISRO. The major objectives of the centre are: carrying out mission operations of all operational remote sensing and scientific satellites, providing Telemetry, Tracking and Command (TTC) services from launch vehicle lift-off till injection of satellite into orbit and to estimate its preliminary orbit in space and hardware and software developmental activities that enhance the capabilities of ISTRAC for providing flawless TTC and Mission Operations services. Towards, these objectives, ISTRAC has established a network of ground stations at Bengaluru, Lucknow, Mauritius, Sriharikota, Port Blair, Thiruvananthapuram, Brunei, Biak (Indonesia) and the Deep Space Network Stations.

In keeping with its long-established TTC support responsibility, ISTRAC has also been mandated to provide space operations support for Deep Space Missions of ISRO, undertake development of radar systems for launch vehicle tracking and meteorological applications, establish and operationalise the ground segment for Indian Regional Navigational Satellite System, provide Search & Rescue and Disaster Management Services and support space based services like telemedicine, Village Resource Centre (VRC) and tele-education

# ITC FACULTY, UNIVERSITY OF TWENTE

Hengelosestraat 99  
7514 AE, Enschede

**Website** : <http://www.itc.nl/>

**Product Details:** Education, Research, Institutional Strengthening

**Company Profile:** Fundamental and problem-solving research, addressing complex global challenges where geoinformation can make a real difference.

ITC is recognized worldwide for achievements in teaching, research and capacity development in the field of geo-information science and earth observation. With domain focus in:

- Food security and Biodiversity
- Hazard, risk, and resilience
- Geohealth
- Big geodata and governance

We educate our students to be professionals, capable of acquiring knowledge and translating this into practical applications for solving real-world problems.

At the Faculty of Geo-Information Science and Earth Observation, our aim is to build capacity and strengthen the institutional development of both professional and academic organizations as well as individuals. We work specifically in countries that are economically and/or technologically less developed.

Our education is based on knowledge exchange between organizations in less developed countries on the one hand and in the Western world on the other, whereby ITC acts as a two-directional gateway for knowledge exchange.

We take an application-oriented approach, directed at finding solutions for and strengthening civil society in addressing issues of local, national and global dimensions. The multifunctional use of scarce resources, including space, the effects of climate change and environmental security are examples of those issues.

# LAKSHMI MACHINE WORKS LIMITED - ADVANCED TECHNOLOGY CENTRE

489-511, Sathy Road,  
Coimbatore 641 006, Telengana, India

**Website :** [www.lmwatc.com](http://www.lmwatc.com)

**Product Details:** Components for Satellites and Launch Vehicles

## Composite Structures

- payload fairing for Launch Vehicles.
- Satellite primary structure
- Antenna Reflectors
- Solar panels substrates
- Satellite supporting structures
- Satellite Optical units as well as primary interstage structures

## Metallic Structures

- Launch Vehicle interstage structures
- Nose cone for strap on boosters
- Structures of Antenna and Radars

## Control Units

- Pressure Sensors / Transducers
- Torque Motors
- Actuators
- Latchable Series Redundancy Valve
- Valves
- Modules

**Company Profile:** Shri G. K. Devarajulu, more famously known as GKD established Lakshmi Machine Works Limited (LMW) in the year 1962 to enable indigenous manufacture and supply of Textile Machinery in India – with a vision that is quite similar to the wishes today of the Government of India– “SELF RELIANCE’. LMW today is a global player and one among the three manufacturers of the entire range of Textile Spinning Machinery. LMW has successfully diversified into making

CNC Machine Tool and is a brand leader in manufacturing customised products. LMW's Foundry makes environment-friendly Precision Castings for industries the world over.

Since 2004 LMW and its associate companies manufacture and supply of components and products for the Indian Space programs and to the Defence Aerospace PSUs as well as global Aerospace Industry. Research and Development is the bedrock on which this conglomerate has been built. LMW and its associated entities have developed and delivered many critical systems to ISRO.

Lakshmi Technology and Engineering - LTE incorporated in 1968 has been renamed as Chakradhara Aerospace and Cargo Private Limited (CACPL) to cater to the needs of internal consolidation and grouping. CACPL (earlier LTE) with guidance from ISRO has designed and developed Solenoids, Control Valves, Fluid Control Components, Torque Motors, Gear Head Motors, Electrical Actuators, Pressure Transducers since 2004. These components are fitted and flown in every ISRO mission. Apart from ISRO, many precision systems and components for Aviation segment both Defence and civil sector are being manufactured by CACPL. This include Gimbals for Electro-Optic Payloads, Power Take-off Shafts, Retractable Landing Gear Systems. This manufacturing unit has been engaged with many DRDO projects as well.

In 2010, LMW has added the Advanced Technology Centre (ATC), a new plant to produce systems, modules, assemblies and components for Aerospace sector. The facility spans the composite and metallic arena. Aerospace Composite facility has international class processing and assembly facility to deliver a spectrum of composite and hybrid structures for space, aviation and strategic requirements meeting all the quality protocols.

ATC is one stop solution to the Aerospace customer. In terms of infrastructure and capability, ATC has world class manufacturing facilities and its Quality Assurance standards are aligned to AS 9100 D Certification and NADCAP for special process viz chemical process, NDT, welding and Heat treatment. NADCAP qualification for composite is in progress, will be obtained by Oct 2021. ATC has ongoing projects with Indian Space Research Organisation, Defence Public Sector Units, Defence Research and Development Organisation and major OEMs in US, Europe. ATC has been identified as Indian Offsets Partner (IOP) in a few significant programs.

# LARSEN & TOUBRO LIMITED

L&T House, N. M. Marg Ballard Estate  
Mumbai 400 001

**Website :** [www.Larsentoubro.com](http://www.Larsentoubro.com)

**Product Details:** Larsen & Toubro, India's largest private sector Defence & Aerospace Company, has been the most dependable partner to ISRO for more than 5 decades by supplying sub-systems for Launch Vehicles & Satellites, establishing R&D/Testing facilities, installing SATCOMM Infrastructure and much more.

Our philosophy and operational effectiveness are characterized by our long-term commitment, dedicated capability, and specialized collaborations. Collectively, these characteristics have empowered us to consistently deliver the decisive edge solutions for "Deep Sea to Deep Space".

Our Range of products includes:

- Launch Vehicles:
  - System Integration
  - Solid Stage Rocket Motor Casings;
  - Light Alloy Inter-Stage Structures;
  - Heat Shields; and
  - Deck Panels
- Satellite sub-systems:  
Manufacturing and supply of
  - Solar Array Deployment Mechanism; and
  - Reflector Array Deployment Mechanism
- SATCOMM Infrastructure:
  - Installation and Commissioning of Ground Systems for GSAT-11, GSAT-20 and GSAT-29 satellites;
  - The project included systems design engineering, associated design and development, supply of hardware and software, integration and testing of gateways.
- Space Navigation and Exploration involving:
  - Design and development of C&S band Radar Systems;
  - Installation & commissioning of Deep Space Antenna at ISRO Deep Space Network (DSN) Centre, Byalalu; and

- Segment Support Assembly for Thirty Metre Telescope (TMT) project which is a collaboration between 5 nations;
- Ground Testing Stations (Design and Development):
  - Hypersonic Wind Tunnel and Shock Tunnel at VSSC Trivandrum; &
  - High Altitude Engine Test Facility at IPRC Mahendragiri
- Near Term Prospects  
Ongoing R&D in the field of:
  - Transfer Orbit Support Services
  - Additive Manufacturing;
  - Composites;
  - Space Grade Materials; and
  - Semi-Cryo engines.

**Company Profile:** Larsen & Toubro is an Indian multinational engaged in engineering, procurement and construction projects, manufacturing, defence and services with over USD 21 billion in revenue.

It operates in over 30 countries worldwide. A strong, customer-focused approach and the constant quest for top-class quality have enabled L&T to attain and sustain leadership in its major lines of business for eight decades.



# LENS RESEARCH & DEVELOPMENT

's-Gravendijckseweg 41b  
2201CZ Noordwijk

**Website :** [www.lens-rnd.com](http://www.lens-rnd.com)

## **Product Details:**

Radiation hardened high reliability Sun sensors for space applications

BiSon64-ET, has been qualification tested over a very wide temperature range of -125°C..+125°C

BiSon64-ET-B, is the same sensor but with integrated straylight baffle, thus easing accommodation on the spacecraft and limiting albedo sensitivity

MAUS, is the world's first truly rad-hard Cubesat Sun sensor

**Company Profile:** Lens R&D is a small company in Noordwijk specialized in high reliability Sun sensors for space applications.

Based on proprietary photodiodes that have been tested up to  $8E14$  1MeV electrons (19.2MRad TID and  $25E9$  MeV/g TNID equivalent) and a 0.65mm thick Sapphire membrane, the Titanium sensors are to be considered radiation hardened and suited for any known mission.

The products are optimised for volume production and offered in a space grade commercial off the shelf (SCOTS) approach, but can be ordered with additional meetings, inspections and tests if so required.

Custom designs and re-qualification can be provided for high volume applications.

# LIQUID PROPULSION SYSTEMS CENTRE (LPSC)

Valiamala PO, Thiruvanthapuram 695547, Kerala, India

**Company Profile:** Liquid Propulsion Systems Centre (LPSC) is the centre for design, development and realisation of liquid propulsion stages for ISRO's Launch Vehicles. Development of fluid control valves, transducers, propellant management devices for vacuum conditions and other key components of liquid propulsion systems are also under the purview of this centre. LPSC activities and facilities are spread across its two campuses namely, LPSC, Valiamala, Thiruvananthapuram and LPSC, Bengaluru, Karnataka.

# LOGIC FRUIT TECHNOLOGIES PVT. LTD.

806, 8th Floor BPTP Park Centra Sector-30, NH-8  
Gurgaon 122001 Haryana (India)

**Website :** <https://www.logic-fruit.com/>

## Product Details:

1. High Data Rate Satellite Demodulator & Receiver
  2. IF/RF/Video- Real time- Long Duration Video Recorder & Playback System
  3. State-of-art EtherCAT Data Acquisition System with Built-in Signal Conditioner
  4. IQ-AWG
  5. Various IPs & Expertise around Sensor Electronics
  6. ARINC 818 IP, STANAG Receiver/Generator, Symbology, SBC SMFD
  7. Radio Modem
- **ARINC 818 Video Processing & Switching Module:** In aircraft, an ever-increasing amount of information is supplied in the form of images, this information passes through a complex video system before reaching cockpit and crew displays. The most of the video systems used in current Indian Aircrafts is Analog, e.g. PAL/NTSC, VGA, STANEG 3350, and RS-343. Due to increasing number of sensors and displays, and continuous up gradation of their resolution and frame-rate, etc., it becomes cumbersome to handle many wires carrying individual videos from one sensor to display.
    - This system will have ARINC-818 based video switching capability, and also converting Analog video to new ARINC-818 based video output for display units. ARINC 818 is a video interface and protocol standard developed for high bandwidth, low latency, un-compressed digital video transmission. For control ARINC 429 and 1553 interfaces are available. This hardware is having VPX form factor, and includes an Intel Atom and Xilinx based FPGA. Real time OS VxWorks 7.0 is ported on Intel AtomIt involves design of schematic layout, card fabrication, assembly, and chassis design and software module development. The DO254 and DO-178B Cemilec certification of Design Assurance Level (DAL)-B is involved. Various tools for airborne certification like LDRA, Aldec, Questasim, etc. are involved.
  - **Data Acquisition System**
    - Data Acquisition System Chassis shall accommodate all type of Functional
    - Input modules (Pressure, Temperature, Flow and Voltage).

- Provision for card wise variable sampling rate.
  - DAS should amplify, acquire and log the test data at correct sampling rate with Time synchronization.
  - On-line monitoring of parameters (mV/EU/FFT) during preparation and test phase.
  - Processing of acquired data with calibration constants for data analysis.
  - Real time performance calculation with on-line data.
- **Onboard Data Acquisition and Recorder(ODAR):** Function of (ODAR) is to collect data in Real time from the different onboard sensors (total 64), condition it and store it which can be later extracted wirelessly for further analysis. This ODAR is to be used in an environment with max achievable velocities of Mach 3 and max vibration 40 g rms. being an on-board article it is expected to be small in size. The unit is rugged enough to qualify Environmental Tests like (EMI-EMC, Vibration, Shock etc). Various sensor modules include accelerometer, 3-axis vibration, pressure, thermocouple, voltage, strain gauge. The sensor calibration and looms formation is also done by us. It consists of state of art technology for Instrument amplifier, anti-aliasing filter and analog to digital converter.
  - **Extended View Imaging System(EVIS):** It involves precise registration, alignment, robust feature extraction and blur and smear free stitching of video frames captured from rotating head of optronics surveillance sight to generate Extended field of View in real time, automatic change detection in the scene, archival of extended view surveillance video in standard and efficient format and relay of stored video.
  - **Video Enhancement Unit (VEU):** Electronics for day camera video enhancement consists of a single board based on SPARTAN 6 FPGA, having dimensions ≤ 65 mm X 65 mm X 12 mm.
  - **Hardware for Dynamic Testing:** It was a custom build tester for testing signal processing and embedded software's for Radar , sonar & weapon communication systems.
  - **Data Acquisition System Multichannel IF Signal Recorder & Play back system.** Data Acquisition System will be 2 board stacked solution through a Samtec connection. One board will be acting as Analog board, and other will be acting as Digital Board.
  - **High Data Rate Telemetry Receiver and Simulator**  
The project involved CCSDS130.B2 compliant telemetry receiver and

corresponding simulator. The maximum data rate supported is 750Mbps using 8PSK modulation. Complete modem IP with Viterbi/RS decoding support was done inhouse.

**Company Profile:** We work with innovative R&D and PM's, who need a proven, flexible partner that can provide extensive FPGA programming expertise, prototyping capabilities, or other real-time embedded development services, delivering a high-quality embedded solution they can trust. With specialized teams, we create solutions and proof-of-concept (PoC) designs that require precise, supported FPGA development and real-time data generation, acquisition, and analysis.

Our deep expertise in the telecom, semiconductor, security/surveillance, defense/aerospace, medical instrumentation, and industrial automation industries allows us to understand requirements and complete projects quickly. To each project, we bring experience in a variety of digital (and MIPI) protocols, communication buses, and tools, including M-Phy, C-Phy, CSI, DSI, 1G, 10G Ethernet, PCIe, DIGRF, USB3.0, STM, HDMI, and software-defined radio (SDR), as well as encryption, protocol compliance, signal generation, data analysis, IoT technology, and multiple image processing techniques. Our low latency (~real time) image processing solutions includes image stabilization, Panorama generation, Object detection and classification. Hardwares (upto 16 layers) designed are complex, compact, stable adhering all the safety and environmental guidelines (MIL/CSPR/EMI-EMC),

For years, we've delivered successful projects by becoming extensions of our customers' teams to design, develop, and later support the best solutions possible. Internally, we stay aware of all high-speed digital communication advancements, digital compliances, and certification standards and protocols, so that you don't have to, and we assign each client a specific project manager to ensure your evolving needs and application demands are understood and met with our solution. With experience in a variety of digital protocols, communication busses, and IoT technologies, we integrate successful embedded technology into your application.

LFT has been trusted with embedded FPGA development and have delivered end-to-end embedded solutions of ~\$10 Mn to companies like DRDO, Keysight, Mentor Graphics, NEC and Synopsys. LFT has created solutions for the telecom, semiconductor, security/surveillance, defense/aerospace, medical instrumentation, and industrial automation industries, remaining flexible to the evolving demands and aggressive timelines of customers.

# LUNAR ZEBRO PROJECT (FROM DELFT UNIVERSITY OF TECHNOLOGY)

TU Delft Faculty of Electrical Engineering  
Mathematics and Computer Science/ Dept.  
Micro Electronics Building 36, Room 18.130  
Mekelweg 4 - 2628 CD Delft

**Website :** <http://zerbo.space>

**Product Details:** Micro-rover developed for moon by university students

**Company Profile:** The rover is designed to piggyback on any of the private or national space agency's Moon landers. Once on the Moon, the rover's main objective is to survive the harsh lunar conditions for one lunar day (14 Earth days) and communicate its location and health directly back to Earth.

In the course of the lunar day, the rover will test its unique six-legged locomotion. Once distant enough, this will allow it to take a unique picture of the lander and Earth. While walking, the rover shall avoid craters and boulders bigger than itself by using the onboard Semi-Autonomous Navigation System (SANS). At the end of the day, the rover will enter hibernation mode to face the -233°C lunar night. It will beacon when it wakes up, if ever.

# M/S. ASTRA MICROWAVE PRODUCTS LIMITED

ASTRA Towers, Survey No. 12(P), Kothaguda Post,  
Kondapur, Hitechcity, Hyderabad 500084  
Telangana. INDIA

**Website** [www.astramwp.com](http://www.astramwp.com)

**Product Details:** Astra Microwave Design, Development, Fabrication & Screening of Sub-systems for Space Applications

Products: T/R Modules, High Power PIN diode switches, Power Distribution Networks, Calibration Networks, Integration Block, T/R control unit and Tile control units have been fabricated for Radar Imaging Satellite. AMPL has also screened RF Power devices for the same Application

AMPL has fabricated and screened Ku-Band Beacon sources and Ku-band Receivers. AMPL has developed Mesh Processor, down converters and IF switch filter bank at VHF range for Communication Satellites. AMPL has supplied a number of MMIC based systems to Indian Space Research Organization. AMPL has developed Flight Model Switch Matrix with low power consumption and in small size for Communication Satellites.

Apart from on-board subsystems and components, AMPL has supplied Ka-Band out door units with 10 Watts and 5 Watts output power for ground applications.

A number of data Transmitters for X-Band and S-Band have been supplied to ISRO for use in different satellites. This comprises of PSK and BPSK transmitters with data rates up to 200 MBPs. X-Band 2 Watts Amplifiers and X-Band Phase Shifter Amplifiers have also been supplied by AMPL. L-Band T/R Modules working with 200 Watt output have been developed for ground application for Multi Object Tracking Radar. AMPL has developed a TRU consisting of 8 T/R modules along with the control circuitry, power supply & cold plate for this application.

**Company Profile:** AMPL is ISO 9001 and AS 9100 revision D certified Public Limited company. We are into Design, Development and Manufacture of RF / Microwave sub-systems, Digital Sub systems, wind profiler Radars and Doppler Weather Radars. AMPL supplies sub systems and systems for Defence, Paramilitary Forces, DRDO Labs, ISRO Centers, Public Sector undertakings etc. AMPL also export modules to friendly countries. At Present AMPL operates from 8 Locations. Out of



that 6 Locations are based in Hyderabad. One each in Bangalore and Ahmedabad with its regular manpower of 1250+ peoples. AMPL has all necessary design, fabrication, Electrical testing and environmental testing infrastructure under one roof. Which includes design software's, 10,000 class multiple clean rooms, Laser welding facility, Seam sealing facility, 3 Automated SMT Lines, ESS Chambers, Thermovac chambers, Vibration machines, HASS HALT facility, NABL accredited EMI/ EMC testing facility, FFTR, NFTR etc.

AMPL has rich experience of working in the Space domain, having developed and manufactured component and subsystems for the Indian Space Research Organization and we look forward to take up more challenging work like building full Payload and total satellite in future. Space Heritage: Astra Microwave Products Ltd (AMPL) started working on Space Related projects in the year 2003 and a separate Space Division was created for this purpose at its Research and Development facility located at Hardware Park in Hyderabad. AMPL space group provides a total solution from Design to delivery of the subsystems in various bands up to Ka band frequency under one roof. We are also associated with the screening of components and modules like PSBT, SCBT etc. for the Satellite launch vehicle. Design Capabilities: AMPL has a dedicated RF and Microwave design centre for the space group with experienced design engineers. AMPL has multiple AWR stations for design of high end RF and Microwave circuits. For EM simulation, Momentum/ Axim software is utilized. In addition, AMPL has capability to add digital circuits and can design the Automated test Equipment that can accommodate digital testing.

## **M/S. DATA PATTERNS INDIA PVT. LTD.**

Block 2, Plot No. H9, Ground Floor, Fourth Main Road SIPCOT IT Park,  
Siruseri Off Rajiv Gandhi Salai (OMR)  
Chennai 603 103, Tamil Nadu

**Website :** [www.datapatternsindia.com](http://www.datapatternsindia.com)

### **Product Details:**

1. Rugged Military Electronics
2. COTS/ MOTS Modules
3. Satellite Onboard computers
4. V/UHF Transceivers
5. Nano satellites
6. Launch vehicles electronics
7. Communication systems
8. Automatic test equipment
9. Check out systems for launch vehicles
10. Checkout systems for Missiles
11. Aircraft cockpit displays
12. Radars and Radar Electronics
13. Missile seekers
14. Avionics LRU's for fixed & rotary wing platforms
15. Electronic Warfare LRUs
16. Fire Control systems for Missiles and torpedoes
17. Un-Manned Air vehicles (UAV) electronics
18. Built to print activities & Build to Spec in space electronics.

**Company Profile:** DATA PATTERNS (INDIA) PRIVATE LIMITED is an ISO 9001:2015, AS 9100 D, ISMS 27001:2013, Dept of Space and CEMILAC certified company. It has more than 35 years old presence in the Indian defence Aerospace market segment offering turnkey solutions in high reliable electronic Systems.

A state of the art integrated facilities at Chennai with a 700+ strong engineering strength, it has been focusing in domain areas like Space (Satellites and Launch vehicles electronics), Avionics, Displays, Radar, Electronic Warfare, Control &

Navigation systems, Fire control Systems, Communications, Opto electronics and Automated Test Equipment.

Data Patterns has built Nano Satellites and has complete range of proven COTS building blocks realise Satellites along with ground Station solutions. These are already offered to ISRO labs and other Universities . It has capabilities to offer a reliable turnkey Satellites in a quick turn around time.

It also has solutions covering RF & Microwave, Digital, Power and communication. Some of them include Complete Weather Radars, Phased Array radars, Tracking radar upgrades, EW suits, Full range of Avionics & Glass cockpit solutions for Dept of Space, DRDO and MoD. The company provides solutions for Air, Sea and Land platform applications for Defence segment, satellite and Launch vehicles in space segment.

# MANASTU SPACE TECHNOLOGIES PVT LTD

Flat No 503, Wing F, Rustomjee Azziano  
Behind Vrundavan Society, Majiwade, Thane West – 400601 IN  
Thane West, Maharashtra – 400601 IN

**Website :** [www.manastuspace.com](http://www.manastuspace.com)

**Product Details:** At Manastu Space we are building a high performance green propulsion system for satellites to replace the current hydrazine based toxic propulsion systems. We innovated new Fuel and Engine system for satellites that is 3X Cheaper, 4X Safer, and 50% more efficient than the current system. This is to replace earlier extremely toxic, and very in-efficient satellite fuel.

**Company Profile:** Manastu Space started in 2017 by IIT Bombay alumni with a dream, one day every problem on the earth will be solved using space directly, indirectly or by spin-offs. We have a dream, every last person on earth has access to world-class education and health care. No one should die because of lack of information. Space might just be the way to realize this dream. This is not possible without low cost and sustainable access to the space. So we develop the technologies to achieve this dream.

Founding team realised the power and potential of space while building their own satellite in IIT Bombay who was leading the project. ISRO launched it on PSLV C 35. Also, the team has experience of designing a cruise missile engine for DRDO. This technology development is supported by IIT Bombay and Shell, oil and gas company. We envision to democratize the space for every purse and person with the mission to make access to space cheaper and safer.

# MARK TECHPRO & CONSULTANTS PVT LTD.

Regus Olympia Tech Park, Guindy  
Chennai 600032, Tamilnadu

**Website :** [www.mark-seals.com](http://www.mark-seals.com)

**Product Details:** Wave springs, Retainer Rings, Dicronite coatings

## MARMORIS B.V.

Kapteynstraat 1,  
Noordwijk 2201 CZ  
Netherlands

**Website :** <https://marmoris.nl/>

**Product Details:** Spatial Decision Support System

Monitoring and Early warning tools

Geospatial Analytics

**Company Profile:** Marmoris uses GIS, Remote Sensing, and Artificial intelligence (GIS-RS-AI) to help stakeholders involved in coastal ecosystem conservation make data-driven decisions.

Our aim is to provide solutions that are relevant, easy to access, and offer actionable insights. This will allow stakeholders to increase the effectiveness of their work and lower their costs.

To address different phenomena of interest at the right scale and with the correct resolution (both spatial and temporal) we use the data and the data collection methods that are the best fit for the purpose.

### SEMI-CONDUCTOR LABORATORY

Semi-Conductor Laboratory (SCL), an Autonomous Body under the Department of Space is engaged in providing end-to-end solutions for Development of Application Specific Integrated Circuits (ASICs), Opto-electronics Devices and Micro Electro Mechanical System (MEMS) Devices encompassing Design, Fabrication, Assembly, Packaging, Testing and Reliability Assurance. SCL has 180nm CMOS Technology on 8" Wafer Fab Line as per international standards and has a 6" Wafer Fab Line with CMOS/MEMS process capability. The efforts at SCL are directed towards creating a strong microelectronics base with activities focused on realization of critical and high reliability device requirements of DOS/ISRO Centres & Units and other users.

### SCL CAMPUS

The operations at SCL also include fabrication of Hi-Rel Boards, Radio Sonde Systems and indigenization of electronic sub systems.

SCL has developed more than 200 Devices/Products for ISRO Centers for applications in Satellites, Launch Vehicle and Ground Applications. The designed

and developed products are of various categories such as Analog, Digital, Mixed Signal etc. The major categories of devices are given below:

- Application Specific Integrated Circuit (ASIC)
- Linear Voltage Regulators, Voltage Reference & Voltage Switch
- Data Converters
- Interface, Supervisory, Amplifiers & Drivers
- Standard Devices
- Semiconductor Memories
- Imagers & Detectors
- MEMS



# MASTER CONTROL FACILITY (ISRO)

Dept. of Space, Govt. of India  
Master Control facility  
PB#66, Salagame Road,  
Hassan, Karnataka - 573201

**Website :** [www.mcf.gov.in](http://www.mcf.gov.in)

## Product Details:

### Services Offered:

- Spacecraft Operations and Maintenance
- Launch & Early Orbit Phase Operations (LEOP)
- Ground station support
- In-orbit Testing of satellites (IOT)
- Payload Monitoring, Interference resolution and User Support.
- End of Life Operations

**Company Profile:** Master Control facility (MCF) of ISRO located in Hassan, Karnataka houses the Spacecraft Control Centre (SCC) that is responsible for operation of geo-synchronous class (Communication, Navigation & Meteorological) of satellites. It was established in 1980-81. Later in 2005 a second SCC was added in Bhopal, Madhya Pradesh, and it works hand in hand with the facility at Hassan.

MCF is capable of Orbit Raising of spacecraft, that are injected into the Transfer Orbit by the launch vehicle, this activity referred to as Launch and Early Orbit Phase (LEOP) operations, In-Orbit Testing (IOT) of payloads, and subsequent On-Orbit Operations. Hassan has overall radio visibility coverage extending from Persian Gulf in the West to Australia in the East, a geo- arc of 150 degrees. Dual launches and dual injection of spacecraft are also possible to be supported from MCF.

MCF has Satellite Control Earth Stations (SCES) to support the above activities and in addition to this, Interference monitoring and Geo-location facilities are also established to take up critical & special operations. These stations network with stations around the globe for LEOP phase. Capability to support Multi-Satellite TTC operations has exponentially reduced costs and facilitates efficient utilization of hardware and frequency band. Payloads in UHF, L, S, C, Ext-C, Ku and Ka bands are covered.

# MEASAT GLOBAL BERHAD

MEASAT Teleport & Broadcast Centre  
Malaysia  
Cyberjaya 63000 Selangor

**Website :** [www.measat.com](http://www.measat.com)

## **Product Details:**

- Satellite Transponder Leasing
- Broadcast Solutions
- Telecommunications Solutions
- Value Added Services

**Company Profile:** MEASAT is a premium supplier of communication and video services to leading broadcasters, Direct-To-Home (DTH) platforms and telecom operators, with a footprint covering 130 countries representing 80% of the world's population across Asia, Africa, Europe and Australia.

Soon, the MEASAT fleet will be further strengthened with the addition of MEASAT-3d at 91.5°E in 2022 which will support cost-effective high-speed broadband with up to 100 Mbps speeds in areas without any terrestrial network throughout Malaysia; increase video distribution capacity across the Asia Pacific region and provide unrivalled in-orbit satellite redundancy for the region.

For more information, please visit [www.measat.com](http://www.measat.com)

# MISHRA DHATU NIGAM LTD

P.O Kanchanbagh  
Hyderabad 500058

**Website :** [www.midhani-india.in](http://www.midhani-india.in)

## **Product Details:**

1. Titanium & its alloy.
2. Super alloys (Nickel, cobalt & Ferrous base)
3. Special purpose steels.
4. Armouring & personal protection products.

**Company Profile:** Mishra Dhatu Nigam Limited (MIDHANI), A Govt. of India Enterprises company was setup in 1973 at Hyderabad, INDIA. MIDHANI is an ISO 9001: 2016, AS9100:2015, ISO 14001:2015 & ISO 45001:2018 certified company with modern metallurgical facilities and highly technical competence. MIDHANI is listed at BSE / NSE (Code BSE:541195 / NSE: MIDHANI) with 26% shares in public.

MIDHANI specialises in manufacturing wide range of Super alloys, Titanium alloys and Special steels meeting stringent international standards for application in Aerospace, Space, Defence, Energy, Chemical and other hi-tech industries. With the dedicated research facilities and more than 4 decades of experience, MIDHANI is capable of manufacturing more than 500 different grades of speciality materials under single roof.

# NATIONAL REMOTE SENSING CENTRE (NRSC)

Balanagar, Hyderabad 500037  
Telangana, India

**Website :** [www.nrsc.gov.in/](http://www.nrsc.gov.in/)

**Company Profile:** National Remote Sensing Centre (NRSC) at Hyderabad is responsible for remote sensing satellite data acquisition and processing, data dissemination, aerial remote sensing and decision support for disaster management. NRSC has a data reception station at Shadnagar near Hyderabad for acquiring data from Indian remote sensing satellites as well as others.

NRSC Ground station at Shadnagar acquires Earth Observation data from Indian remote-sensing satellites as well as from different foreign satellites. NRSC is also engaged in executing remote sensing application projects in collaboration with the users. The Aerial Services and Digital Mapping (ASDM) Area provides end-to-end Aerial Remote Sensing services and value-added solutions for various large scale applications like aerial photography and digital mapping, infrastructure planning, scanner surveys, aeromagnetic surveys, large scale base map, topographic and cadastral level mapping, etc.

Regional Remote Sensing Centres (RRSCs) support various remote sensing tasks specific to their regions as well as at the national level. RRSCs are carrying out application projects encompassing all the fields of natural resources. RRSCs are also, involved in software development, customisation and packaging specific to user requirements and conducting regular training programmes for users in geospatial technology, particularly digital image processing and Geographical Information System (GIS) applications

# NATIONAL SPACE ORGANIZATION (NSPO)

8F, 9 Prosperity 1st Road, Hsinchu Science Park

HsinChu City 300, Taiwan (R.O.C.)

Website : <https://www.nspo.narl.org.tw/>

## Product Details:

- Space Components
- Spacecraft Subsystems
- Spacecraft Bus
- Systems Engineering
- Mission Operation
- Ground Communication Service
- Satellite Integration & Test
- Remote Sensing Data Processing and Application
- Radio Occultation Data Processing and Application
- Payload Instrument

**Company Profile:** This year of 2021 is the 30th Anniversary of National Space Organization (NSPO). NSPO was established in October 1991 and was established as the execution of Taiwan's space program in accordance with the 15 years of "National Space Technology Development Long-Term Plan" (Phase One Program) approved by Executive Yuan. Through the progress of the national space program, the establishment of domestic large-scale high-tech system integration capabilities, lay the foundation for the development of Taiwan's space science and technology, and shape Taiwan's future competitive resources in the international space market and application industry.

The "Second-Phase National Space Technology Development Long-Term Plan" was reviewed and approved by the Committee of National Science Council in December 2002. The entire program is planned for 15 years and the period is from 2004 to 2018. The "Second-Phase National Space Technology Development Long-Term Plan" continues the first phase of the space science and technology program, with the implementation of satellite programs as the main axis, promotes academic research and industrial development, comprehensively enhances the energy development of Taiwan's space science and technology, and meets the needs of the state, civilian, and social services.

**Vision:**

- Become a center of innovation and excellence for space technology,
- Conduct space programs with Taiwan's strength and global competitiveness.

**Mission:**

- Establish indigenous space technology,
- Fulfill pronounced societal impacts
- Promote frontier space science research.

**Value:**

- Innovative space technology
- Core competence heritage
- Elite integrity team

## NEW SPACE INDIA LIMITED (NSIL)

ISRO HQ Campus  
New BEL Road  
Bengaluru 560094

**Tel** : 080 2217 2693/2695  
**Email** : [contact-nsil@isro.gov.in](mailto:contact-nsil@isro.gov.in)

**Company Profile:** NewSpace India Limited (NSIL), incorporated on 6 March 2019 (under the Companies Act, 2013), is a wholly owned Government of India company, under the administrative control of Department of Space (DOS). NSIL is the commercial arm of Indian Space Research Organisation (ISRO), with the responsibility of undertaking end-to-end commercial space operational activities. NSIL is also responsible for commercial exploitation of the products and services emanating from the Indian space programme. NSIL provides services to domestic and international customers. NSIL will utilize the indigenous capabilities thereby enabling Indian industries to take up high technology space related activities.

NSIL has the primary mandate of undertaking space missions on a “Demand Driven” based model as compared to the “Supply Driven” model that existed earlier.

Since inception, NSIL has adopted industry centric approach towards enabling them to scale up high-technology manufacturing and production base for Indian space programme. As part its future missions, NSIL is poised to engage with Industry in much more comprehensive manner to not only provide better services to the domestic and international customers but also significantly improve India’s position in global space Industry.

NSIL look forward to collaborate with Indian Industry at several fronts in developing cost-effective quality products and services in space domain specifically in launcher production, satellite building and subsystem, technology transfer and bringing innovation in providing space-based services to the customers to gain competitive advantage over global players.



# PERMALI WALLACE PVT LTD

Opp. RBI, Hoshangabad Road  
Bhopal 462011

# ROGERS CORPORATION

100 N Dobson Road | Chandler, AZ 85224  
Arizona – USA, USA

**Website :** [www.rogerscorp.com](http://www.rogerscorp.com)

**Product Details:** Rogers provides leading advanced circuit material solutions and manufactures high frequency laminates, bondplys and prepregs, engineered to meet stringent performance requirements. With exceptional dielectric constant control, Rogers' specialty materials are a consistent and reliable choice for applications including 5G wireless communication, automotive radar sensors, aerospace, satellites and more.

**Company Profile:** Rogers Corporation (NYSE:ROG) is a global leader in engineered materials to power, protect and connect our world. Rogers delivers innovative solutions to help our customers solve their toughest material challenges. Rogers' advanced electronic and elastomeric materials are used in applications for EV/HEV, automotive safety and radar systems, mobile devices, renewable energy, wireless infrastructure, energy-efficient motor drives, industrial equipment and more. Headquartered in Chandler, Arizona, Rogers operates manufacturing facilities in the United States, Asia and Europe, with sales offices worldwide.

# SAANKHYA LABS PRIVATE LIMITED

Embassy Icon, Third Floor, #3, Infantry Rd, Vasanth Nagar  
Bengaluru 560001, Karnataka, India

**Website :** [www.saankhyalabs.com](http://www.saankhyalabs.com)

## Product Details:

### 1) Tarang

TARANG is an SDR based, L-Band Multi-Channel Burst Demodulator for MSS network. Deployed at the hub-side, TARANG receives the signal from a satellite and demodulates the burst data generated by an interoperable Saankhya Labs MSS terminal

### 2) Samrat

SAMRAT is a handheld, two-way, S-Band Satellite Mobile Radio Terminal device, that can transform an Android Phone into a Satellite Smartphone. Designed to operate over ISRO's GSAT satellite network, SAMRAT supports voice, data, short message and geo locations services in a compact form factor befitting any standard 5.5" Android Smartphone.

### 3) Navdoot

NAVDOOT is a Two-way MSS terminal for tracking of vessels and fishing trawlers in deep sea. It uses S-Band signals from GSAT satellite to track vessels at sea. Apart from tracking, it is possible to send emergency alert messages from shore to the vessel.

### 4) Navrail

NAVRAIL is a Two-way MSS terminal for tracking of locomotives. Designed to enable Real Time Information System (RTIS) of Indian Railways, NAVRAIL has S-band modem and GPS modules, transmitting geo-location coordinates and other data to remote HUB through ISRO's GSAT satellite

### 5) Lehar

Lehar is a very compact S-band satellite broadcast receiver, capable of receiving satellite signals and demodulating them to provide digital data over USB to a host system such as Smartphone, Tablet/PC. An application on the host system decodes the audio & video data.

**Company Profile:** Saankhya Labs is a premier semiconductor and wireless communication solutions company. We offer a wide range of communication

solutions, technologies and platforms across 5G Open RAN, Broadcast and Satellite IoT systems. The communication solutions are based on our award winning, patented, ultra-low power, small footprint, fully programmable Software Defined Radio (SDR) chipsets and platforms.

Saankhya Labs has a focus on development of Next-Gen Satcom and Satellite IoT Solutions. We have strategic partnerships with wide spectrum of satellite enterprises including national space agencies such as ISRO and leading satellite operators like Ligado Networks. We have developed frontline SDR Based Satellite IoT Solutions for real time tracking of fixed and mobile assets, two-way communication in remote locations, emergency communication systems, edutainment systems for remote areas and secure encrypted, defence communication. Our solutions include Two-Way MSS Terminals, Hub-Side Equipment, Receive Only Terminals and Satellite-to-Terrestrial Gateways for 5G Broadcast.

# SATSURE ANALYTICS INDIA PRIVATE LIMITED

Rock Line Chambers, 2nd Floor, 54, Richmond Rd  
Craig Park Layout, Ashok Nagar,  
Bengaluru 560025, Karnataka

**Website:** <https://satsure.co/>

**Product Details:** SatSure Argus is a first of its kind AI-on-the-Edge driven high-resolution optical satellite fleet. SatSure's proprietary algorithms will run on the edge, on the satellites with a sensor imaging at 1m ground resolution. With Argus, we plan to develop a full-stack satellite technology firm, operating assets in space, a platform running on the cloud, and enterprise software suite servicing infrastructure and agriculture product lines of SatSure. This will enable total control of the end-to-end hi-res data value chain and reduce the turnaround time to decision from space.

**Company Profile:** SatSure is a technology platform company, with its solutions designed at the intersection of the sustainability nexus of food, water, and energy security. By creating solutions that lie at the convergence of satellite image analytics, cloud computing, Big Data, and artificial intelligence, SatSure is building decision intelligence that guides the stakeholders towards actionable interventions. SatSure's founding team comprises friends with a background in space technology and entrepreneurship. Prateep Basu and Abhishek Raju built the initial idea of SatSure and were joined later by Rashmit Singh Sukhmani as a co-founder.

Having built their careers under the umbrella of the Indian Space Research Organization, the consensus was that technology capability exists to address structural problems of the society, but it was the business model for which there was no precedent. Today, SatSure is providing B2B and B2G one-stop-shop SaaS and PaaS solutions for financial services and public sector clients across three continents.

We are a member of the World Economic Forum's Global Innovators Community.

We have won awards and recognition:

- Top 3 award winner at the Global AgTech Pitch organized by the Government of AP and Bill & Melinda Gates Foundation in Vizag on Nov 17, 2017.
- SatSure is the first Indian company to receive an honorable mention at the Better Satellite World Awards from Space & Satellite Professionals International, UK. (2017)

- Asian Development Bank Ventures Award - Future Food Asia, 2019 in Singapore
- 20 Most Promising InsureTech companies of 2017 by CIOReview magazine.
- SSPI - Recipients of the 2020 Better Satellite Awards

# SES

501 Orchard Road  
#18-00 Wheelock Place  
Singapore 38880

**Website :** [www.ses.com](http://www.ses.com)

## **Product Details:**

- O3b mPOWER: Next-generation Satellite Communication System
- SES Video Solutions: Innovative Hybrid Broadcast Services
- SES Networks' Managed Mobile Backhaul
- SES Cloud Direct

**Company Profile:** SES operates the world's only multi-orbit constellation of satellites with the unique combination of global coverage and high performance, including the commercially-proven, low-latency Medium Earth Orbit O3b system.

By leveraging a vast and intelligent, cloud-enabled network, SES is able to deliver high-quality connectivity solutions anywhere on land, at sea or in the air, and is a trusted partner to the world's leading telecommunications companies, mobile network operators, governments, connectivity and cloud service providers, broadcasters, video platform operators and content owners.

SES's video network carries over 8,200 channels and has an unparalleled reach of 361 million households, delivering managed media services for both linear and non-linear content.

Visit [www.ses.com](http://www.ses.com) for more info.



## SHELL-N-TUBE PVT LTD

3, Gulmohar Orchid, 29/37 Sahaney Sujan Park, Lullanagar  
Pune 411040, Maharashtra, India

**Website :** [www.shell-n-tube.com](http://www.shell-n-tube.com)

**Product Details:** Vacuum Insulated Pipeline

Super Insulated Storage Tanks

Cryogenic Vaporizers

Cryogenic Treatment Chambers

Phase Separator

Telemetry - Data Online

Cylinder Tracking System - TrackAbout

Gas Mixer - BSL

**Company Profile:** Shell-N-Tube is a leading cryogenic equipment manufacturer in India. We take pride in designing, developing, and supplying high-quality cryogenic equipment for various industries like steel plants, space research, atomic research, superconductivity, pharmaceuticals, beverage bottling, and ice cream making. Right from process conceptualization and product development to prompt and extensive after-sales service, Shell-N-Tube is a one-stop solution provider to the cryogenic industry.

## SKYROOT AEROSPACE PVT. LTD

Ground Floor, Hive Space, Modern Profound tech Park  
White Field Rd, Kondapur  
Hyderabad 500084, Telangana, India

**Website :** <https://skyroot.in/>

**Product Details:** The Vikram launch Vehicle Series Vikram, named after Dr. Vikram Sarabhai, the father of Indian Space Program, is a series of launch vehicles(VK-I,II, and III) especially crafted for the small satellite market. Built on common architecture and covering a wide range of payloads, they offer the most affordable and on demand ride to space.

**Company Profile:** Skyroot Aerospace is a National Award-winning startup developing small satellite launch vehicles, Vikram series with 200-700 Kg capacity. Skyroot's services mainly focus towards Low Earth Orbit (500 km) insertions. In addition, we also have Orbit Adjustment Module which can take the satellites to desired altitude and inclination with 0.2-degree accuracy. Rideshare options available with heavy-capacity launch vehicles involve long waiting periods. In contrast, the Vikram series of launch vehicles offers perfect solution, not only for on-demand dedicated and rideshare launches, but also for the constellation rollouts. Offering preferential services to long-term customers at Skyroot, we build long-term relations by extending end-to-end solutions, bundled at extremely competitive prices. By creating a seamless and hassle-free customer-experience, we support the client in enabling their focus on their mission-objectives and revenue generation activities. Despite providing services to the major geographies, Skyroot also provides economic solutions to other developing economies. With an aim to expand globally, we intend to establish our units worldwide, aiding to the development and economic growth of the regions. Through the utilization of capital, human and commodity resources available inherently in these locations, we aim to empower these regions with space technological advancements. Presenting long-term viable solutions in combination with the swift and successful technological progress, Skyroot aims to provide on-demand, reliable, economic launch solutions to the society.

# SPACE APPLICATIONS CENTRE (ISRO)

Ambawadi Vistar PO Ahmedabad 380015, Gujarat

**Website :** [www.sac.gov.in](http://www.sac.gov.in)

**Product Details:** Antenna, RF subsystems, Hi-Rel PCB and Microwave Integrated Circuits (MIC), NavIC receiver, Distress Alert Transmitter (DAT), Burst Demodulator, Ground Penetrating Radar (GPR), Mechanical Fabrication, Environmental Test Facility, MOSDAC, VEDAS etc.,

**Company Profile:** Space Applications Centre (SAC), is a major R&D centre of Indian Space Research Organisation (ISRO). It plays a key role in realizing vision and mission of ISRO.

The core competence of the centre lies in development of space borne and airborne instruments/payloads and their applications for national development and societal benefits. These applications primarily meet the communication, navigation and remote sensing needs of the country. Besides these, the centre also contributes significantly in scientific and planetary missions of ISRO like Chandrayan-1, Mars Orbiter Mission etc.

The communication transponders developed at this centre for Indian National Satellite (INSAT) and Geo-Synchronous Satellite (GSAT) series of satellites are used for VSAT, DTH, broadcasting, telephony etc. These satellites are instrumental in reaching remote parts of the country. The payloads for navigation systems of the country – Navigation with Indian Constellation (NavIC) and GPS Aided Geo Augmented Navigation (GAGAN) are being developed by this centre.

This centre designs and develops the optical and microwave sensors for the satellites, signal and image processing software, GIS software and many applications for Earth Observation (EO) programme of ISRO. These applications are in diverse areas of Geosciences, Agriculture, Environment and Climate Change, Physical Oceanography, Biological Oceanography, Atmosphere, Cryosphere, Hydrosphere etc.

The facilities at SAC includes highly sophisticated payload integration laboratories, electronic and mechanical fabrication facilities, environmental test facilities, systems reliability/assurance group, image processing facilities etc. SAC has active collaborations with industry, academia, and national institutes for research and development and technology transfer. The centre also has state-of-art in-house and mobile exhibitions to propagate space technology and applications amongst students and public.

# SPACE MACHINES COMPANY

Suite 36, Stone & Chalk  
Level 2 McEwin Building, Lot Fourteen,  
North Terrace, Adelaide SA 5000  
Adelaide - 5000 , South Australia

**Website:** <https://www.spacemachines.co>

**Product Details:** Optimus - space mobility platform, supporting rideshare and dedicated flights

**Company Profile:** Space Machines Company is an Australian startup focused on contributing to the development of sovereign space capability in Australia, with a vision of developing space infrastructure.

This vision will be built on a foundation of in space transportation capability, enabled by the Optimus space mobility platform.

SMC is truly excited to be uniquely placed to drive international collaboration around its bold vision, with an R&D subsidiary in India, relationships across space agencies, an understanding of intergovernmental agreements and a keen interest in continuing to build the partner ecosystem.

We are thrilled about the opportunities that lay before us and the programs that we're working on to leverage them.

One such program is the Lunar Ascent Mission - with a goal of placing a 60kg payload into lunar orbit by 2024 for test and development of Lunar communication, exploration and situational awareness infrastructure.

SMC looks forward to the conversations we'll strike up in the course of our participation here and the initiatives they will result in.

## SPACE4GOOD B.V.

Fluwelen Burgwal 58 Den Haag  
2511 CJ, Zuid-Holland The Netherlands

**Website :** [www.space4good.com](http://www.space4good.com)

**Product details :** Space4Good is an innovative social enterprise utilising earth observation technology for social and environmental impact. Using remote sensing, GIS and artificial intelligence, we map, analyse and model complex ecosystems and support leading organisations and institutions on topics such as environmental crime detection, regenerative agriculture, tropical agroforestry management, humanitarian aid, air pollution and sustainable urban development. By doing so we help impact makers on the ground to make more informed decisions, improve operational efficiency, create data-driven transparency and unlock new revenue sources. Our service offerings range from consultancy, project work, bespoke developments as well as automated applications. Current applications include:

- ReForestER: Integrated agroforestry monitoring and management platform
- CarboMetrica: Above-ground remote sensing-based biomass assessments
- ILDAP: Illegal logging detection and prediction
- RoofMapr: Urban rooftop analysis
- Air Pollution Observatory: NO2 monitoring and detection application
- Space4Fauna: Pest & Disease monitoring and prediction for Agri and horticulture
- CropLens: Pest & Disease Early Warning Systems for Rice
- RoadEO: predictive road quality maintenance

**Company Profile:** Space4Good was incorporated as a social enterprise in 2017 according to the globally applicable B. Corp standard and started its journey at the European Space Agency Business Incubation Centred in The Netherlands. It originated from the eagerness of highly skilled space technology professionals to put their expertise and experience into good use by supporting projects which are aligned with the UN Sustainability Goals. Beginning with a few pro-bono projects from our local networks and a grass-roots, network organisational structure, Space4Good rapidly acquired more and bigger projects which allowed it to evolve into a professional, self-financed company. As of September 2021, Space4Good works with 9 full-time employees, with a contributing network growing to a total of 25 specialists to date. We span a wide range of skills and experience to fulfil our company's mission of using "Earth observation, geographic information systems,

and big data analysis for meaningful geospatial insights”. This particularly includes remote sensing, software development, and AI, which we pair with deep contextual understanding. As a consequence, all of our employees graduated from leading universities with either Masters or PhDs as well as previous experience in a variety of sectors ranging from infrastructure to agriculture and forestry. We are a highly diverse team with an equal gender balance and 12 different nationalities which allow us to easily engage with international project partners and customers all around the world. Our customers are social enterprises, NGOs, or governmental agencies who require Space4Good expertise in geospatial analysis to create new insights, improve operational processes, and/or provide transparency to internal and external stakeholders. Our service offerings range from consultancy, project work as well as application development according to the needs and expertise of our customers. Notable customers include the World Bank, Rabobank, the European Commission, The Halo Trust, The Carter Center, Amnesty International and Ecosia while in total having completed more than 40 projects and assignments

## SPACENED

Huygensstraat 34  
2201 DK Noordwijk

**Product Details:** Home - Spacened - brancheorganisatie voor de Nederlandse ruimtevaartsector

**Company Profile:** SpaceNed is the trade association for the Dutch space sector. SpaceNed has about 40 members and aims to strengthen the position of the Dutch space sector and thus contribute to a dynamic and competitive sector.

SpaceNed connects the Dutch space sector – both companies and knowledge institutions – to strengthen the international market position of the Dutch space sector.



## U R RAO SATELLITE CENTRE (URSC)

Old Airport Road, Vimanapura PO  
Bengaluru 560017, Karnataka, India

**Website :** [www.ursc.gov.in/index.jsp](http://www.ursc.gov.in/index.jsp)

**Company Profile:** U R Rao Satellite Centre (URSC), Bengaluru, formerly known as ISRO Satellite Centre (ISAC) is the lead centre for building satellites and developing associated satellite technologies. These spacecraft are used for providing applications to various users in the area of Communication, Navigation, Meteorology, Remote Sensing, Space Science and interplanetary explorations. The Centre is also pursuing advanced technologies for future missions. URSC is housed with the state-of-the-art facilities for building satellites on end-to-end basis. ISRO Satellite Integration and Test Establishment (ISITE) is equipped with state-of-the-art clean room facilities for spacecraft integration and test facilities including a 6.5 Metre thermo vacuum chamber, 29 Ton vibration facility, Compact Antenna Test Facility and acoustic test facility under one roof. Assembly, Integration and Testing of all Communication and Navigation Spacecraft is carried out at ISITE. A dedicated facility for the productionisation of standardised subsystems is established at ISITE.

URSC has a unit called Laboratory for Electro Optics System (LEOS), which is situated in Peenya, Bengaluru and is mainly responsible for research, development and productionisation of Sensors for ISRO programmes.

Since inception, URSC has the distinction of building more than 100 satellites for various applications like scientific, communication, Navigation and remote sensing. Many private and public sector industries are also supporting ISAC in realising standard satellite hardware

## VIKRAM SARABHAI SPACE CENTRE

Vikram Sarabhai Space Centre,  
Thiruvananthapuram 695022, Kerala, India

**Website :** [www.vssc.gov.in](http://www.vssc.gov.in)

**Company Profile:** Vikram Sarabhai Space Centre is the lead Centre of Indian Space Research Organisation (ISRO) under the Department of Space (DOS), Government of India. The Centre is named in fond memory of Dr Vikram A Sarabhai, the great visionary and the father of Indian Space Programme. VSSC pioneers in rocket research and launch vehicle projects of ISRO. The Centre also pursues research and development activities in associated areas like propellants, solid propulsion technology, aerodynamics, aero structural and aero thermal fields, avionics, polymers and composites, guidance, control & simulation, computer and information, mechanical engineering, aerospace mechanisms, vehicle integration and testing, space ordnance, chemicals and materials. Systems reliability and quality assurance of all aspects of engineering and operations are studied and evaluated to the levels of perfection required in each field. Programme planning and evaluation, technology transfer and industrial coordination, indigenisation, human resources development, safety and personnel and general administration groups support the Centre for all its activities.

The ongoing programmes at VSSC include launch vehicle projects like Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle (GSLV), LVM3- the heavy lift launch vehicle of ISRO, Rohini Sounding Rockets and other Advanced Launch Vehicle design and testing Experiments

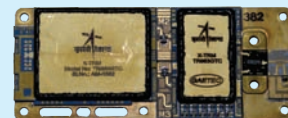


# Astra Microwave Products Ltd.

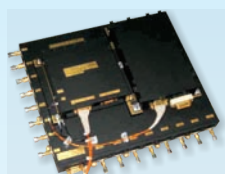
## On A Winning Wavelength



C-Band TRiM



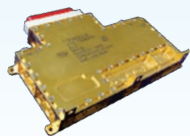
X-Band LTCC TRM



Switch Matrix



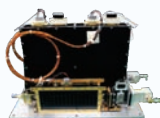
Switch Matrix



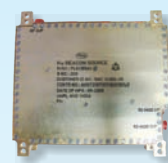
C-BAND T/R MODULE



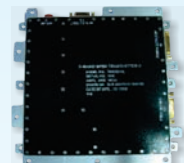
Ku-BAND RECEIVER



Ku-BAND LNA



Beacon Source



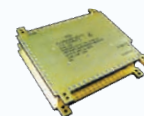
S-band  
Qpsk Transmitter



INTEGRATION BLOCK



C-Band Receiver  
(IRNSS)



Ku-BAND  
BEACON SOURCE

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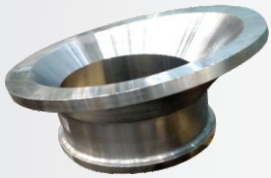


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# Thrust for mammoth aspirations

SSLV (S-85 Motor)	PSLV (S-139 Motor)	GSLV (S-139 Motor)	MK-III (S-200 Motor)
<ul style="list-style-type: none"> <li>• Tongue Ring</li> <li>• Groove Ring</li> <li>• Nozzle End Dome</li> <li>• AFT End Ring</li> <li>• Fore End Ring</li> <li>• Bucket Flange</li> <li>• Flex Seal Shim</li> </ul>	<ul style="list-style-type: none"> <li>• Head End Dome</li> <li>• Nozzle End Dome</li> <li>• Nozzle Convergent</li> <li>• Nozzle Divergent</li> </ul>	<ul style="list-style-type: none"> <li>• Head End Dome</li> <li>• Nozzle End Dome</li> <li>• Nozzle Convergent</li> <li>• Nozzle Divergent</li> </ul>	<ul style="list-style-type: none"> <li>• Fore End Ring</li> <li>• AFT End Ring</li> <li>• Compliance Ring</li> <li>• Flex Seal Re-inforcement Ring</li> <li>• Bucket Flange</li> </ul>



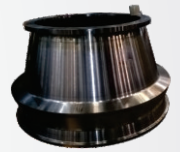
PSOXL-Nozzle  
Convergent (15CDV6)



PSOXL-Nozzle  
Divergent (15CDV6)



S-139 Ring-Nozzle  
Convergent(15CDV6)



S-139 Ring-Divergent  
Fore End (15CDV6)



Ti Hemisphere



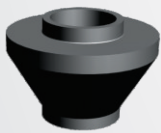
Intermediate Conical  
Component -Ti6AL4V



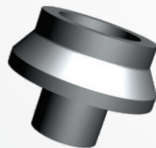
Ps4 Dome -Ti6Al4V



Conical Ring -15CDV6



LEM Nozzle  
Convergent-15CDV6



Equilibrium Regulator  
Body AISI 420 ESR



Principle Shaft  
AISI 420 ESR



Regulator Piston  
AISI 420 ESR



Bulk Head  
Forging - 15CDV6

Bharat Forge is a technology driven global leader in metal forming, having a transcontinental presence across ten manufacturing locations, serving several sectors including automotive, aerospace & defence, power, oil and gas, construction & mining, locomotive and marine. Bharat Forge has the largest repository of metallurgical knowledge in the region and offers full service supply capability to its geographically dispersed marquee customers from concept to product design, engineering, manufacturing, testing and validation. The world's largest forging company with manufacturing facilities spread across India, Germany, Sweden, France and North America, Bharat Forge manufactures a wide range of high performance, critical & safety components for the automotive & non-automotive sector.

Bharat Forge is the first Indian company to secure NADCAP approval for heat treatment of Titanium alloys. Bharat Forge is AS9100D, DGAQA, Cemilac and Testing Lab ISO-IEC 17025 certified and has over the past few years manufactured critical components for the Aerospace sector.

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- ♦ Titanium Alloys

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- ♦ Armament Steels
- ♦ Nuclear Grade Steels
- ♦ Special Stainless Steel

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