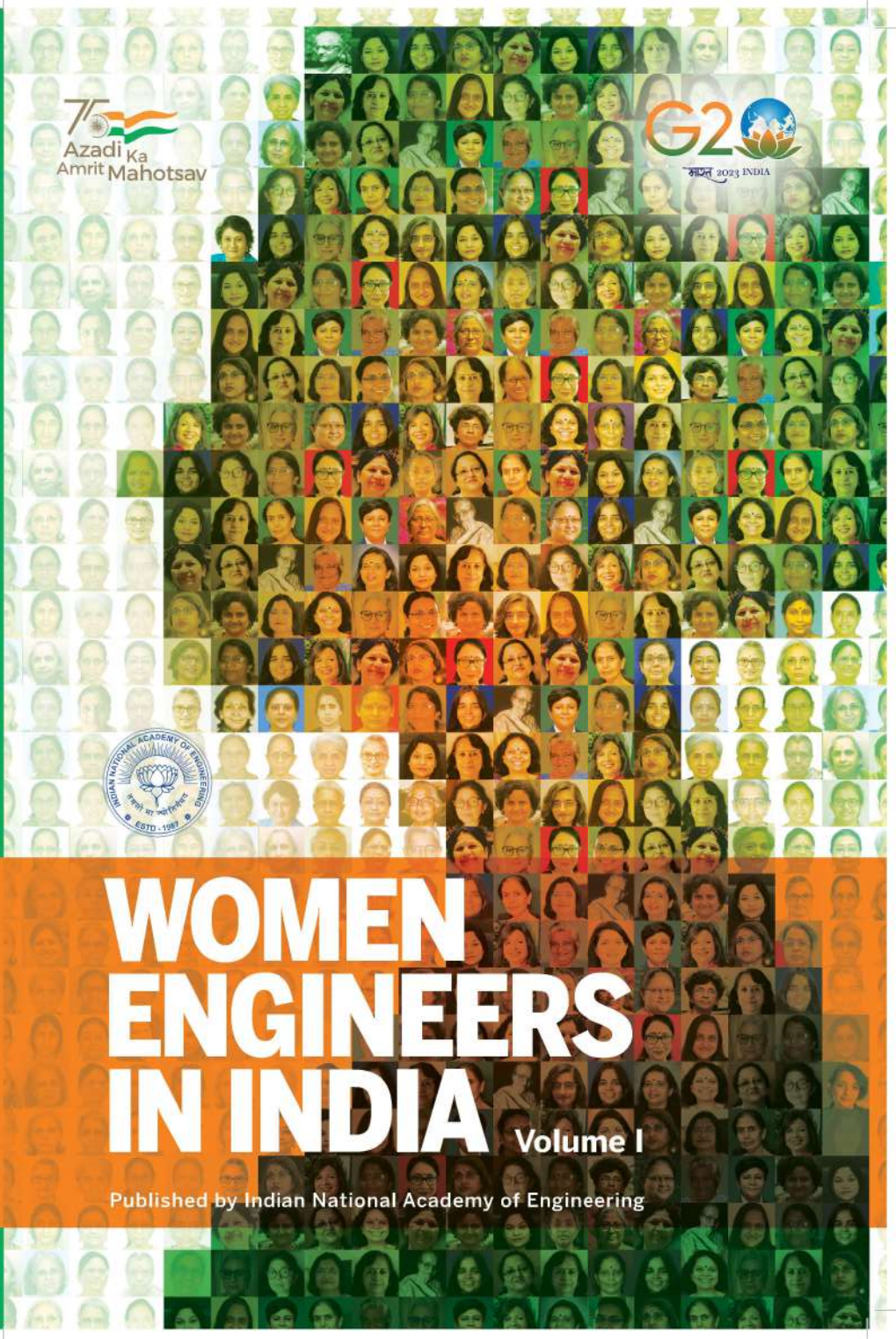

WOMEN ENGINEERS IN INDIA

Volume I

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Geeta Varadan

Geeta Varadan, a Fellow of IETE, born on September 30, 1951, at Secunderabad, Andhra Pradesh, is one among the six siblings. Her father was the only earning member and retired in the mid-eighties as Financial Controller and CAO, Praga Tools Ltd. Her childhood days until the completion of education was spent in a single bedroom, zinc sheeted rented house in a 20-acre field growing paddy and fruits along with twelve other houses. Due to electricity shortage, most of the studies were under one the trees in the field or a kerosene lantern. Her husband was Managing Director of one of the TTK Group of companies. She has one son settled abroad.

She studied at St. Ann's High School, Secunderabad, and Pre-University Course from Nizam College, Hyderabad. She won a Gold Medal for having stood first among the women candidates in Andhra Pradesh State. A graduate in Electronics and Communication Engineering from Osmania University, Hyderabad, with distinction, she gave tuition to support herself for buying books throughout her education. She completed her Master of Engineering in Controls and Computer Sciences from the School of Automation, Indian Institute of Science Bangalore in 1975.

She joined LRDE, Bangalore in 1976 and, after that, the National Remote Sensing Centre, ISRO, Department of Space at Hyderabad and worked in Satellite Data Processing and Analysis. In 1985, at the Indian Space Research Organisation, Bangalore, she was the Leader of a nine-member delegation to France and was responsible for setting up and operationalizing five Remote Sensing Service Centres and four State Centres in the country and also the Remote Sensing Centre at Mauritius. She was instrumental in developing various software packages for Drought Mission, Landuse Landcover Mapping, CAPE Mission etc. As Programme Director (Special Projects), ISRO HQ, she was the single point interface responsible for conceptualization and operationalization of all the projects for Special Users, in the areas of Communications and Surveillance for National Security.

She pioneered the development of real-time satellite data processing system using state-of-art GP/GPU technology. Another achievement is the development of the unique FPGA-based IP Packet Encryptor for deployment in sensitive networks.

As a Director of ADRIN since 2008, she was the first woman Director of an ISRO Centre. She played an essential role in developing tools and techniques for the quick turnaround of data products using grid and high-performance computing. She pioneered the development of real-time satellite data processing system using state-of-art GP/GPU technology. Another achievement is the development of the unique FPGA-based IP Packet Encryptor for deployment in sensitive networks

She has received several awards and honours including Y Nayudamma Memorial Award; Distinguished Alumnus Award, College of Engg. Osmania University, Hyderabad; Millenium Plaque of Honour" from Hon'ble Prime Minister of India in the 99th Indian Science Congress; ISRO Performance Excellence Award; ISRO Merit Award from Hon'ble Prime Minister of India; ISRO Team Award from the Erstwhile President of India, Late Dr. APJ Kalam; Women Scientist Award by Astronautical Society of India and India Today 'Woman in Science' award. She superannuated in September 2015 after 39 years of service and then served as Satish Dhawan Visiting Professor at ISRO Headquarters for five years. •

Valarmathi Natarajan

Valarmathi Natarajan was born in 1959 in Kumbakonam, Tamil Nadu, to A.S. Natarajan and Ramasita N. Her childhood was spent in Konapet and Ariyalur in Tamil Nadu. From a young age, she was introduced to different cultures and people from different backgrounds. She is married to G. Vasudevan and currently lives in Bangalore. She has a son, Hemanth Vasudevan, and a daughter, Deepika Vasudevan.

She completed her schooling till 10th Standard in Saraswathi High School, Konapet, Tamil Nadu and did her pre-university education in Ariyalur, Tamil Nadu. She completed her Bachelor's degree in Electronics & Communication from Government College of Technology, Coimbatore. She graduated with her Master's degree from College of Engineering, Anna University, Chennai in 1984. Her expertise is in Communication Systems. After her Post-graduation, she joined ISRO Satellite Centre in 1984.

She was Project Director of Radar Imaging Satellite (RISAT) 1, India's first indigenous active-microwave remote-sensing satellite.

Her career began with developing test systems and testing spacecraft until launch. She has the unique distinction of working on multiple categories of satellites: namely Communication Satellites, Optical Remote Sensing Satellites, and Microwave Remote Sensing Satellites. She also worked on ground equipment for testing and evaluation of various payloads for multiple spacecraft. She also worked as a Deputy Project Director where she coordinated and managed the assembly, integration, and testing of the Technology Experimental Satellite which carried many sub-systems with new technologies. She notably was the Project Director of Radar Imaging Satellite (RISAT) 1, India's first indigenous active-microwave remote-sensing satellite. As a Program Director of the Microwave Satellite Program, she was instrumental in the planning and configuration of sub-systems in microwave remote sensing satellites like RISAT-2B. RISAT-2B is a radar imaging Earth observation satellite launched in 2019. She supported various satellite programs with the delivery of low and high-speed digital systems as a Group Director. From 2017 till her retirement in 2019, she was a Deputy Director at ISRO and was responsible for successfully delivering several digital systems and science payloads for spacecraft. During her tenure, she has been conferred with the ISRO merit award, Team excellence award and Performance excellence awards. Her most significant scientific contributions are the successful launches of TES in 2001, RISAT-1 in 2012, and the delivery of high-capacity Solid State Recorders. TES carried many new and advanced satellite sub-systems and was completed months before its planned launch. RISAT-1 is a state-of-the-art indigenous microwave satellite carrying a Synthetic Aperture Radar Payload. It was software and hardware intensive and was the heaviest Earth observation satellite launched by India then.

From 2015 till her retirement, she effectively led the development and delivery of high-speed data handling systems and high-capacity Solid State Recorder. Under her leadership, a large area spectrometer was delivered and successfully launched as a part of Chandrayaan-2. This spectrometer, named CLASS, is used to measure the Moon's X-ray Fluorescence to examine the presence of major elements such as Magnesium, Aluminium, Silicon and so on. In 2015, she became the first recipient of the Dr. APJ Abdul Kalam Award for contributing to the development of Science, Humanities, and welfare of students in the Tamil Nadu Government. •

TK Anuradha

TK Anuradha was born in 1960 in Tumkur, Karnataka. Her parents were TS Krishnamurthy, a Professor in Sanskrit and T K Sulochana Devi, a homemaker. Her spouse V Kiran is Retd. General Manager, Bharat Electronics and her daughters Shruthi K Harve and Sindhu K Harve are engineering Post Graduates. She has spent her childhood in Shivamogga and Bengaluru. She grew up with three sisters. She was brought up in an atmosphere emphasizing education and values; parents encouraging them to be independent and think freely.

Her primary schooling was in Kannada Medium at Sarodiya Elementary School, Shivamogga. Her secondary schooling was at Malleswaram Ladies Association, Bengaluru. She received the National Merit Scholarship and was active in extracurricular activities. She pursued Bachelor of Engineering, Electronics & Communication at University Visvesvaraya College of Engineering, Bengaluru with distinction and was a University topper.

She joined ISRO Satellite centre in 1982 as Engineer 'SB' and superannuated in 2020 as Distinguished Scientist holding the post as Director, SATCOM Programme at ISRO Head Quarters. She started her career as a Satellite Test Engineer with the responsibility of designing test systems and interfaces to satellites and carrying out tests for the operational effectiveness of the integrated satellites in various mission environments. Over the years, she has executed the responsibilities of project manager, deputy and associate project director and design team leader for several series of ISRO satellites with responsibilities overlapping in the timeframe. She was the Project Director for indigenous communication satellites of the GSAT series, the first woman to hold the post of Project Director at ISRO. She was Programme Director for Satellites in Geosynchronous orbit. She also acquired expertise in the design and realisation of embedded system, Automation, interface protocol development, digital and power electronics systems. She is experienced in system management of satellites for Remote sensing, Communication and Navigation and the related ground systems and in the launch interfaces and launch base operations, management of SATCOM systems.

As Project Director for indigenous communication satellites of the GSAT series, the first woman to hold the post of Project Director at ISRO, she contributed to designing and launching the indigenous GSAT-12.

Her major engineering contributions were designing and launching the indigenous GSAT-12 as the first ISRO I1K bus-based communication satellite compatible for launching on Indian soil, with PSLV. She designed extended Bus configurations for advanced communication satellites with All-electric propulsion systems and advanced interfaces for verifying the functional effectiveness of indigenously developed onboard systems of TES satellites. She contributed to the automation of Ground test systems using indigenous interface standards and protocols. She also played a role in the design & realisation of interface protection systems and Fault-tolerant systems for satellite interfaces and launch vehicle interfaces of the satellite.

She has been conferred with several awards and recognitions including the Space Gold Medal award by the Astronautical Society of India; ISRO Merit Award; ISRO Team Award as team leader for GSAT-12; Smt Triveni Devi Gupta Memorial Award by IETE; "Space Systems Management award" by Astronautical Society of India; Honorary Doctorate by Akkamahadevi University, Vijayapura, and ISRO Performance Excellence Award. •

Lalithambika V.R.

Lalithambika V.R. was born in Thiruvananthapuram, Kerala, in 1962 to V. S. Ramachandran Nair, a civil engineer, and Vijayalekshmi Amma, a homemaker. She is married to Pradeep Kumar (Chairman, Kerala State Pollution Control Board). She has two children, Poornima, a postgraduate doctor, and Aravind, a postgraduate engineer, and three grandchildren, Sidharth, Souparnika, and Parvathy.

During her childhood, she used to watch the regular-sounding rocket launches from Thumba near her hometown with her grandfather, M.N. Ramakrishna Pillai, a mathematician, and that made her interested in space program. Her education took place in Providence Convent, Kozhikode, Chovva High School, Kannur, and Holy Angels Convent, Thiruvananthapuram. She passed the SSLC examination as the South Kerala topper. She graduated with an Electrical engineering degree from the College of Engineering, Trivandrum, with the best outgoing student award and second rank (University of Kerala). Her MTech degree is from the same college, and her Ph.D. in Electrical Engineering from the University of Kerala (2009).

She joined the Vikram Sarabhai Space Centre in 1988 as a launch vehicle autopilot design engineer. She subsequently expanded her sphere of activity and responsibility to include the entire gamut of design and validation activities and flight telemetry data management for ISRO launch vehicle missions. Over the years, she has held various positions such as Division Head, Group Director, and Deputy Director of the Vikram Sarabhai Space Centre. She took over as the first Director of the Directorate of Human Space Programme, ISRO in 2018 and was later designated as Distinguished Scientist. Her efforts were instrumental in the way forward for India's human spaceflight endeavour, Gaganyaan and in establishment of a Human Spaceflight Centre. Her contributions include evolving crew selection criteria, training curriculum, and enabling the selection of Indian Astronaut trainees.

Her efforts have been instrumental in the way forward for India's human spaceflight endeavour, Gaganyaan. She has also designed the autopilot for PSLV, GSLV, and GSLV MkIII.

She has designed the autopilot for PSLV, GSLV, and GSLV MkIII and later led the team in developing guidance and autopilot systems, flight software, and validation of Navigation, Guidance and Control systems for all ascent and re-entry missions. She has played a significant role in the conceptualization and operationalization of day of launch wind biasing, enabling all-season launch. She has also been instrumental in devising innovative mission management strategy and robust guidance system design of India's first winged re-entry vehicle RLV-TD with a unique ascent/descent configuration. For ISRO's prestigious Mars Orbiter Mission, she has steered the team to manage mission design challenges while optimizing the design and validation cycle. For long-duration missions with an upper stage in orbit, innovative design strategies have culminated in versatile missions injecting multiple satellites in different orbits. Under her leadership, the integrated simulation facility of VSSC was expanded into a world-class facility with new testbeds, including the iron bird for actuator-in-loop simulation.

She has been conferred with several awards and recognitions, such as the Space gold medal by the Astronautical Society of India; ISRO merit award; ISRO performance excellence award; Doctor of Science (Honoris Causa), Satyabhama University; Marie Curie Mahila Vijnana Puraskara by Karnataka Swadeshi Vijnana Andolana and INAE Woman Engineer of the Year Award. •

PV Radhadevi

PV Radhadevi was born in 1964 in Irinjalakuda, Trichur District, Kerala, India. Her parents were late C.V.K. Warrier and late P.V. Malathy. She is married to T.P. Sasikumar, (Retd. Scientist, ISRO) and is a mother of two sons S. Harikrishnan, a Post-Doctoral student and S. Yadukrishnan, a PhD Student.

She had a very happy childhood. Her father nurtured her love for art and literature and inculcated an interest to study mathematics. She attended her Primary and High School in Little Flower Convent High School, Irinjalakuda with Distinction. She pursued her Pre-degree and BSc. (Mathematics) in St. Joseph's College Irinjalakuda with 91% (Distinction) grade. She did her MSc in Applied Mathematics from Cochin University of Science & Technology in the year 1984 with 84% distinction grade. Her M.Phil. degree was in Fluid Mechanics from Bangalore University in the year 1986. She has scored 91% marks and second rank with distinction. She is also a PhD holder in Applied Mathematics from Bangalore University, 1994.

Radhadevi joined ADRIN, Department of Space in 1989. Over the years, she has served the organization in various capacities as Division Head, Group Head, Deputy Director and presently working as Director, ADRIN. She has been responsible for coordinating and executing many Projects and activities at ADRIN including development of modules in Photogrammetry and Mapping. Radhadevi is PMC Member & Focal Point for High Resolution Cartosat-3 series of Satellites; Project Coordinator, ISRO-IAF Project; Project Director, ADEM Project and Coordinator, Base Layer Creation Activity from Cartosat-1 Over 8 Neighboring Countries.

She has pioneered in understanding and conceptualizing satellite imaging geometries and bringing Satellite Photogrammetry technology as a prominent tool for mapping.

Radhadevi has pioneered in understanding and conceptualizing satellite imaging geometries and bringing Satellite Photogrammetry technology as a prominent tool for mapping. She made outstanding contributions in the ground segment of Cartosat-1/2/2A/2B/2C/2D/2F/RS2/RS2A and Cartosat-3 satellites. Recognition on the work is recorded by publications in reputed international journals.

Radhadevi had been instrumental in bringing out the potential of Cartosat series of satellites for large scale mapping in the country. The method of single GCP solution developed for Orbit Attitude updating was a breakthrough. This innovative idea minimized the control requirements and made the value addition in satellite imagery cost-effective. She had worked with geometries of all Indian Remote Sensing Satellites as well as few foreign satellites like SPOT, ALOS and EROS. The sensor model developed by her has been modified over a period to take care of challenges of high-resolution satellite sensors and is the backbone of value-added products generation systems developed by ADRIN. Her understanding of the area and a penchant for indigenization has led to development of various software packages such as IRS Block Adjustment, Satellite Triangulation and Mensuration, Soft Space, Lunar Mapping System, Value Added Products, Large Area Multi-sensor mapping and Production System to name a few.

She was conferred several awards and recognitions, such as Space Gold Medal by Astronautical Society of India; ASI Woman Scientist Award; ISRO Merit Award and an ISRO Team Award. She also received Edward Dolezal Award, Prestigious International award from ISPRS given by the Austrian Society for Surveying and Geo-information for the Contribution in the area of Photogrammetry. •