



भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान
Indian Institute of Space Science and Technology

दसवां दीक्षांत समारोह *Tenth Convocation*

17 दिसंबर / December, 2022

Convocation Address
Shri. G. Madhavan Nair

President, GB, IIST
Shri. S. Somanath

Chancellor's Address
Dr. B. N. Suresh

Director's Report
Dr. S. Unnikrishnan Nair





Shri. G. Madhavan Nair

Former Secretary, DoS / Chairman, ISRO

Chief Guest, Tenth Convocation, IIST



Dr. B. N. Suresh, Founder Director, IIST; Shri S. Somanath, Chairman ISRO; Dr. S Unnikrishanan Nair, Director IIST; Dr V. Narayanan, Director, LPSC; Dr. YVN Krishnamurthy, Registrar, IIST; Distinguished members of the governing board, Respected members of the faculty, the proud parents of the graduands and my dear students. Warm greetings to all of you in this special occasion of the tenth convocation of the Indian Institute of Space Science and Technology, Thiruvananthapuram.

My dear students, this is an occasion for you to celebrate as you are receiving degrees and recognition from this leading institution of learning in India. As you enter into a new world of challenges from the protective environment of the institute, you have great opportunities awaiting you and a great canvas on a global scale to chalk out your career. You have to be grateful to your teachers and colleagues for their efforts they have put in, to help you tide over this significant milestone in your life. You are lucky that you are one of the chosen few to emerge as a graduate from a highly specialised and advanced institute of space science and technology. My heartiest congratulations to all of you

As I stand here, my memories go back to 2007, when IIST was established. Starting from 2000 there was an exodus of talented engineers from ISRO to IT industries. Not only that, top ranking students were not joining the Space Program at that time. It was in this backdrop the issue was taken to the notice of the then Prime Minister Manmohanji. In order to overcome the difficulties, ISRO mooted the idea of a captive institute to catch talented youngsters and train them in the exclusive domain of space technology. Manmohanji cleared the proposal on the spot and within three months the institute was started in a makeshift campus at VSSC in Veli and later at the permanent one at Valiamala. This was a unique example of how programs can be



realised on a fast track mode in ISRO

Though the institute was started for a limited purpose to provide human resource to ISRO, in the 15 years of its functioning, it has further dynamically evolved and expanded as a centre of multi disciplinary learning and research. From a humble beginning, today the institute has seven departments and eminent faculty members totalling to a hundred. In addition to the regular undergraduate program, the postgraduate, doctoral and post-doctoral programmes in IIST engages students in innovative and interdisciplinary areas of research that are geared to address the pressing needs of the country. IIST has a leading position among similar institutes in the country and also tie up with sister institutes abroad. My compliments to the entire team who have toiled to achieve this enviable position. Founder Director Dr Suresh have contributed significantly for this. I also pay my respect to the past chancellors Dr APJ Abdul Kalam and Prof UR Rao who have guided us and not with us today.

Indian Space program is unique in several ways. Its founding father, Dr. Vikram Sarabhai, had envisioned that we should be second to none in mastering the advanced technologies related to space exploration and declared that the benefits of these high technologies will have to be used for enriching the quality of life of the people in the country. Though we had a late start by more than 20 years, today India has emerged as a leading space power comparable to global players like USA, Russia, Europe, and China. The uniqueness of the India space program is that the entire development activity is carried out in the civilian domain and with a shoestring budget. Today, ISRO has the indigenous capability to provide access to space, building and orbiting space crafts for communication and earth observation and also scientific exploration of planets and galaxies.



I had the opportunity to join the space program in its early stage itself and have grown up with the organisation. I was fortunate to witness the birth of the first satellite launch vehicle, SLV3, under the leadership of our late President, Dr.APJ Abdul Kalam. The development of technologies like huge solid propellant rockets, navigation control and guidance systems, including materials manufacturing and test facilities had to be established from scratch. Though the first mission in 1979 was not a success, within a year mistakes were corrected and the first 40kg Rohini satellite was placed into earth orbit in 1980. This was followed by two more successful missions. Since then, we have made a quantum jump through PSLV, GSLV Mk3, heavy satellites for communication and remote sensing.

India is the only country where large rockets, and satellites were developed in the civilian domain for space research. Whereas in other countries missile systems and rocket hardware developed for weapon delivery were converted to launch the spacecraft into earth orbit and beyond. During the initial period of space research activity initiated by Dr.Vikram Sarabhai in India, there were a lot of collaborations from developed countries like the USA, Russia, France and Japan. When India had achieved self-reliant capability in launching satellites there were embargos on high tech subsystems and materials used for development of rocket systems. Such denials have become worse after the launch of the first SLV 3 and after the nuclear test by the Atomic energy establishment. But these embargos were a blessing in disguise. Indigenous efforts to develop materials and subsystems for space exploration had derived additional momentum and the achievements in home-grown technologies are enviable. Today we have the PSLV, GSLV and space crafts which are meeting not only countries needs but also gives opportunity for several foreign countries to orbit their space crafts using our launchers.



The country is proud of its achievements in space science. We have made a very impressive beginning in planetary explorations: through the Astrosat and the probes Chandrayan and MOM sent to moon and mars respectively. Another notable achievement is the confirmation of the presence of water on the surface of the Moon for the first time through Chandrayan1. We have also demonstrated how international cooperation can be harnessed for planetary explorations. IIST also has made a humble beginning through its small satellites.

The uniqueness of the Indian space program is the application of such advanced technologies for earth observations and geostationary communication programmes benefiting the common man. Disaster warning systems, tele-education, tele-medicine, and natural resource management systems are typical examples. The entire program in the past had been funded by the government and the program is managed in an efficient way. To quote a foreign agency, “India's space program is achieved through a shoestring budget”. An independent study conducted by the Chennai Mathematical research institute had brought out that the direct and indirect returns from the space program far exceed the total investments by the government. Not only that, if the technologies developed and the competence are evaluated, the returns will be several times more.

The future demands of the country from the space sector is increasing and the recently announced liberalisation policies permit the private sector to provide services based on space assets and development of space systems, including rockets in the private domain. It is a golden opportunity for private operators and start-ups to capitalize on the liberalised space policy and expand space commerce within the country and abroad.



So far, the primary focus was in achieving self-reliant capabilities to access space and capabilities for earth observation, communication and scientific exploration. We have truly fulfilled the dreams and expectations of our visionary founding father, Dr. Vikram Sarabhai and the time has come to chalk out future plans. The quest for fundamental knowledge of stellar systems and galaxies should find a place in our agenda. Giving a major thrust to expanding the activities on the planet earth and ensuring our presence on nearby Moon and Mars, human presence in space and robotic exploration will be an essential part of future endeavours.

Even today, there is a large gap in the country in terms of providing high bandwidth data connectivity to remote regions. Continuous earth observation data from satellites is needed for several applications, including security needs, weather and climate change studies. Strengthening the observation system for monitoring greenhouse gases, aerosols temperature, water cycle etc. will have to be prioritised. Improving the resolution of weather observations and monitoring global warming should be the focus for space research activities. More powerful rocket systems and reusable launch systems should be a reality in the future to reduce the cost of access to space in the future

ISRO's experience for the past 6 decades is a unique example of how complex multi-disciplinary systems can be developed within the shortest time and budget. Almost all disciplines of science and technology are available under one roof. The cooperative and collaborative work and the open review system being practiced in ISRO are finest examples of self-reliant technology development in the country. The organisation structure is worth copying. Much hyped SpaceX which is a recent success story in US follows ISRO style of functioning.



Space is the next frontier for human endeavour. Robotics and human exploration of outer spaces, solar system and nearby planets like Mars should be the thrust areas. The driving force behind this is the desire to find an alternate habitat for human beings and additional natural resources on the Moon and Mars. Several new programmes for future space exploration pose technological and managerial challenges. Human space flight has been a dream with us for several years and it is going to be reality soon. India has made small step towards this through the Gaganyaan. But it is a long way to achieve the dream of landing human on the moon or the mars. Life sciences related to human flight need to be addressed. I understand that IIST is actively contributing to ISRO's Gaganyaan program through different projects such as analysing spaceflight induced changes in kidney stone formation in *Drosophila Melanogaster* and indigenised gas sensors for environment control life support system and thermal modelling of crew suits meeting asian requirements. IIST should consider exploring more in this new regime. Many technical issues in providing a comfortable habitat in the extremes of the gravitational field, especially under zero g condition and to protect against high radiation levels need innovative solutions.

Lots of innovation and inventions are required to meet the challenges of the future Indian space program. Research is the hallmark of an educational institute. Over the last few years there has been an impressive growth in terms of research projects and researchers totalling to nearly 300 in this institute. I am happy to learn that IIST has taken a lead in applied research related to space as demonstrated through their Advanced Space Research Group, InspireSat and the student sounding rocket, VYOM. The Institute should continue to be a symbiotic counterpart of ISRO, infusing thought, and cutting edge technology in ISRO's fields of



action. IIST is actively working with ISRO on several problems including the future electric propulsion system development and for this, a very advanced Electric Propulsion Diagnostics Lab is established in the campus. The thrust given for hands on experience by building equipment systems for researchers is impressive.

Golden opportunities await all of you to master the cutting edge of technologies and fructify your dreams. Your knowledge and skills should lead to appropriate solutions to the problems faced by the common people and enable India to become a leading player in the space arena. The young graduates coming out of this prestigious institute have a unique opportunity to become the torch bearers of advanced technology in the country. Today is only the beginning of a challenging journey and success will depend on your ability to master the fine art of techniques and their application through a continuous lifelong learning process.

May I take this opportunity to extend my sincere appreciations to the faculty members of IIST for the noble work they are engaged in, to mould the young minds of our country. May God bless all the graduates to excel in the field of choice and enable you to write success stories in the years ahead. Once again, my Heartiest congratulations to all those who have graduated today and wish you all an illustrious career ahead.

Jaihind



Shri G. Madhavan Nair

Shri G. Madhavan Nair is a prominent Indian Space Scientist, former Chairman of the Indian Space Research Organisation (ISRO), and Secretary to the Department of Space (DoS), Government of India. He has also been the Chairman of the Space Commission and Chairman of the Governing Body of the Antrix Corporation, Bangalore. He initiated and implemented the establishment of the Indian Institute of Space Science and Technology in Thiruvananthapuram.

Shri Madhavan Nair is a leading technologist in the field of rocket systems and has made significant contributions to the development of multi-stage satellite launch vehicles, achieving self-reliance in independent access to space using indigenous technologies. He, with his team, advanced their work in the face of several challenges in the regime of technology denials by adopting several innovations and novel techniques to realise world-class launch vehicle systems. This helped India to have a pride of place amongst the space-faring nations in launch vehicle technology. Specifically, as the Project Director, he led the development of the Polar Satellite Launch Vehicle (PSLV), which has since become the workhorse for launching mainly Indian remote-sensing satellites.

As the Director of the Liquid Propulsion Systems Centre (LPSC), he played a central role in designing and developing the crucial cryogenic engine for GSLV. As the Director of Vikram Sarabhai Space Centre (VSSC), he saw India's Geo-synchronous Satellite Launch Vehicle (GSLV) successfully come to fruition.

As the Chairman of the Indian Space Research Organization (ISRO), he took the responsibility for the development of space



technology and its application to national development. During his tenure as Chairman, ISRO/Secretary, DoS, twenty-seven successful missions were accomplished, i.e., INSAT-3E, Resourcesat-1, Edusat, Cartosat-1, Hamsat-1, INSAT-4A, PSLV-C5, GSLV-F01, PSLV-C6, Cartosat-2, INSAT-4B, SRE-1, PSLV-C7, PSLV-C8, GSLV-F04, INSAT-4CR, PSLV-C10, Cartosat-2A, IMS-1, PSLV-C9, Chandrayaan-1, PSLV-C11, PSLV-C12, RISAT-2, ANUSAT, PSLV-C14 and Oceansat-2. He has taken initiatives for the development of futuristic technologies to enhance the space systems capabilities as well as to reduce the cost of access to space. He has given significant thrust to evolving application programmes such as tele-education, tele-medicine and village resource centres for meeting the needs of society at large. As the Chairman of Space Commission, he was responsible for chalking out the country's future plan for space research. Major thrusts were in the scientific exploration of outer space using the Astrosat and Chandrayaan missions apart from implementing schemes for natural resource management and disaster management support systems.

In the international arena, he has led the Indian delegations for bilateral cooperation and negotiations with many Space Agencies and Countries, especially with France, Russia, Brazil, Israel, etc. He has been instrumental in working out mutually beneficial international cooperative agreements. He has led the Indian delegation to the S&T Sub-Committee of the United Nations Committee on Peaceful Uses of Outer Space (UNCOPUOS) since 1998.

His main focus was always to achieve self-reliance in the high technology areas and to bring the benefits of space technology to India's development, especially targeting the requirements of the rural and most needed sections of society.



The Government of India awarded him the Padma Bhushan in 1998 and the Padma Vibhushan in 2009. He has won several other awards, such as the National Aeronautical Award, FIE Foundation's Award, Shri Om Prakash Bhasin Award, Swadeshi Sastra Puraskar Award, Vikram Sarabhai Memorial Gold Medal of the Indian Science Congress Association, Dr.Yelavarthy Nayudamma Memorial Award-2004, HK Firodia Award-2005, Fifth Shri Balvantbhai Parekh Award, Lokmanya Tilak Award, Sree Chithira Thirunal Award, MP Birla Memorial Award 2009, Bhu Ratna Award, Mohamed Abdu Rahiman Sahib National Award, AV Rama Rao Technology Award, Chanakya Award etc. He also received Gold Medal from the Prime Minister at the 94th Indian Science Congress at Chidambaram in 2007.

He is a fellow in many prestigious societies such as the Indian National Academy of Engineering, Astronautical Society of India, National Academy of Sciences, India, Honorary Fellow, Indian Society for Non-Destruction Testing (ISNT), Member, System Society of India, Member, Working Committee of the Current Science Association 2004-06, Member, International Academy of Astronautics (2004), Senior Associate, National Institute of Advanced Studies (2004–2007)., President, Intersputnik Board (2005), Honorary Fellow of The Aeronautical Society of India (2007), Honorary Life fellow Institution of Engineers (India) Kolkata (2008), Chairman, Research Council of National Aerospace Laboratories (April 2007 to March 2010), President of the International Academy of Astronautics (2009).





Shri. S. Somanath

President, Governing Body, IIST
Secretary, DoS / Chairman, ISRO



Shri. S. Somanath

Shri. S. Somanath is a Distinguished Scientist and Secretary, Department of Space, Chairman, Space Commission and Chairman, ISRO since 14 January 2022. Shri. Somanath spanning a distinguished career of nearly 36 years has made significant contribution in the area of space technology. Shri Somanath is an expert in the area of system engineering of launch vehicles .

In his previous assignment as Director, Vikram Sarabhai Space Centre (VSSC) in 2018, the lead Centre of ISRO he was responsible for Launch vehicle technology development. Under his leadership, VSSC has achieved significant feats like Crew Escape System demonstration through Pad Abort Test (PAT), launch of GSLV Mk-III M1/Chandrayaan 2, and he spearheading the upcoming Gaganyaan mission and the development of Small Satellite Launch Vehicle (SSLV).

Prior to that he had been the Director of Liquid Propulsion Systems Centre (LPSC) where he led the team to complete the development and qualification of CE20 cryogenic engine and the C25 stagewhich was successfully flown in GSLV Mk-III D1 flight. In his capacity as the Associate Director (Projects) of Vikram Sarabhai Space Centre and Project Director of GSLV Mk-III Launch vehicle, the first Experimental flight of LVM3-X/CARE mission was successfully accomplished on 18th December, 2014.

He is a Fellow of Indian National Academy of Engineering (INAE), Fellow of Aeronautical Society of India (AeSI), Astronautical Society of India (ASI) and a member of International Academy of Astronautics (IAA).



He has published several papers in journals & seminars in the area of structural dynamics and control, dynamic analysis of separation mechanisms, vibration & acoustic testing, launch vehicle design and launch services management.





Dr. B. N. Suresh
Honourable Chancellor, IIST



Chief guest of the programme, Dr G Madhavan Nair, former Chairman ISRO, and the architect of this Institute, IIST, Sri.S Somanath, President, IIST Governing Board and Chairman ISRO, Dr V Narayanan, Director LPSC and Guest of Honour, Dr. S Unnikrishnan Nair, Director VSSC and IIST, Dr. YVN Krishnamurthy, Registrar, IIST, Distinguished invitees, Deans, Faculty members, IIST Staff, my dear young degree recipients, prize winners, their proud parents, ladies and gentlemen:

I feel very elated to be amongst you on this august occasion to preside over the Convocation of this great Space Institute. The stars of Convocation today are no doubt the graduating students. At the very outset let me convey my warm greetings and hearty congratulations to each and every recipient of the degree and my special word of congratulations and appreciation to all award winners. I also extend my warm congratulations to the proud parents who, certainly will remember this day with much greater fondness than the graduating students. I also wish each one of the graduates a very bright and eventful future and also a very successful career.

It was in the middle of 2006, ISRO had launched one of the PSLVs successfully. Those days we had a tradition of briefing the Prime Minister about the performance of the launch vehicle and also the spacecraft after the launch. In this case too Dr G Madhvan Nair, the then Chairman of ISRO arranged a meeting with Hon'ble PM at Delhi. After the briefing was over, we all adjourned for a cup of tea, which was customary, but on that day to our surprise the Hon'ble Prime Minister Dr Manamohan Singh joined us for the tea. Chairman ISRO, myself and a few others were chatting with PM on various programmes of ISRO and during the discussions one of the questions asked by Hon'ble PM was, you have many more ambitious and challenging programmes ahead at ISRO and how are you going to manage



your human resources?. Pat came a reply from Dr G Madhavan Nair saying Sir, due to prevailing IT boom we are finding it very difficult to get quality human resources. The response from PM was equally swift. He observed, why not you come out with your own plan of preparing the youngsters to meet your requirements. The Government will support. Dr Madhavan Nair grabbed this idea and all of us acted with highest priority and we got the approval in record time of 8 months in April 2007 to initiate IIST. Within four and half months we started the Institute on 14th September 2007 by putting everything in place. The entire credit of creating IIST should go to Dr G Madhavan Nair. I am extremely happy that he is with us today as chief Guest.

This year is special for IIST, because the Institute has completed 15 years and celebrating its crystal jubilee. The contribution of IIST is very significant in preparing high quality human resources, more than 1200 scientists and engineers whose innovative and significant contributions to various cutting edge technology projects at ISRO have paved the way to record a string of successes in many of our exciting and challenging programmes. In the arena of research too, the Institute has done commendably well with more than 250 research scholars in the campus. Our alumni have been making continuously incredible marks in science, technology, start-ups, management and leadership both nationally and internationally too. I am very proud of having associated with this pre-eminent Institution from the day one to till date, starting as a founding Director and subsequently in different capacities.

We are all witnessing that the Country's economy is on a higher growth trajectory thanks to the cumulative impact of economic reforms implemented over the past several years. In the last three years the Indian space sector too has been witnessing



the much needed reforms to enable the private enterprises and the start-ups to actively participate in all phases of space activities with innovative ideas to boost the Indian economy. To sustain this national growth and to boost the space activities beyond the Government sector consistent with the reforms introduced, it is imperative that we need an expanded supply of highly skilled scientists and engineers capable of meeting the competitive edge we need to prosper in this globalised world. This premier Institution, IIST has equipped all of you very well to provide the much needed competitive edge to meet the ever expanding demands.

My dear young friends, this is your day, a very special day for all of you. I along with many others here could not be prouder. You will be receiving your degrees and honours which is a testimony to your sheer hard work during the past few years in this prestigious Institution.

In my opinion, Convocation is an occasion to gaze both past and future. While it is a day for you to look back with a sense of satisfaction, recalling your experiences, your trials and tribulations in this Institute, it is also a day to look forward to the exciting days ahead with hopes and expectations in the days and years to come. Truly it is a right transition and a moment where transformation gets initiated.

Today, we are also witnessing, rapidly evolving, potentially transformative ideas, out-of-box technologies in several areas like information science, biological sciences, material science, energy, so on so forth. It is for us to choose the right technologies which have massive and economically disruptive impact on society and the nation in the coming decades. We need to assess the potential effect of these disruptive technologies, choose the right ones that can cause substantial economic impact and



disruption in future. Some of the examples are, internet of things which can influence every domain, including health, safety, productivity of the nation and many more, next-generation genomics which will revolutionize the medical area, like how doctors diagnose and treat the diseases, energy storage technologies which is posing major challenges in all new technology applications and many many more.

Even in space-based systems the future is quite challenging with several focus areas like constellations of small satellites, mostly in low Earth/ medium altitude orbits with a frequent coverage to meet the goals of mobile communications and operational Earth observation. Big satellites, as much as the launcher can accommodate mostly in geostationary orbit, to harness maximum system performance with only a few satellites to cater to communications and permanent Earth observation but with a low resolution. Small advanced scientific satellites and specific exciting interplanetary missions are ahead of us. There are many such path breaking ideas on the anvil. Already some of these trends are seen world wide and to name a few; Starlink by Space-X is aiming to develop high-performance satellites and customer terminals with a deployment of up to 40,000 satellites around 560 Km. with an aim to provide excellent services. The speed planned is around 300 Mb/s with a latency of 20 milliseconds or lower.

Trimble Navigation started by Charles Trimble with a wide range of commercial and business applications helping many industries in agriculture, transportation, civil construction, and telecommunications. Another equally interesting project is world's largest imaging constellation by Planet Labs, with around 200 satellites with imaging capabilities up to 12 times per day helping agriculture business, wildfire mitigations, and many other applications.



You as young budding scientists and engineers are very fortunate to face these forthcoming national aspirations in these frontier areas of technologies and also to derive the fulfillment of your cherished ideals and goals. If you are able to Integrate your learnings so far, with your research capabilities in your own innovative manner you can not only meet these goals but excel too.

One word of caution to my young friends. Once you take up a career and enter into a leadership role you encounter situations much beyond what you have learnt through education all these years. How you are going to approach the problems in a new environment, in a new context as you move along, more than what you have learned here, is incredibly important. Your ability to grasp, to engage with and to learn from diverse perspectives, will surely be the key to your success.

Many of the fields, such as cloud computing, artificial intelligence, machine learning, big data analytics so on so forth, which are in greatest demand today did not even exist a few years ago. Therefore, to compete and contribute meaningfully in this globalized world, in the coming years, one has to prepare not only in his/her field of expertise what has been learnt hitherto, but one should continue to learn and lead in newer and newer fields, some of which may not even exist today.

If you ask me, your learning truly starts now. It is imperative that you develop the habit of continuous learning as you move along. Swami Vivekananda, one of the great sons of India, has eloquently articulated the importance of continuous learning. He says, I quote: “Experience is the greatest teacher and the learning should continue till our last breath. Gaining knowledge should be our prime aim as we move on, in our lives.”.unquote. You need to learn new facts, analyze new information,



that surrounds you and discern what is important for the task you are handling.

My friends, the challenge is about the value of staying flexible and nimble, the importance of learning from multiple perspectives, and also the willingness to take risks. It only means that you can not be so fixed in your intentions that you close the new doors even before they are open.

You will play a dominant role in shaping the future of this country and the world. You are starting your career at a time; when competitions are intense, opportunities are plenty and challenges are daunting. Rapidly changing world, coupled with an unpredictable future throws out a lot of challenges but remember they also create immense opportunities.

I want to visualise that many of you, IISTians would transform yourselves into highly intellectual leaders either at ISRO or elsewhere in the Country having your own chosen path, start-ups or industries. You will have opportunities to engage with some of the great minds and they would surely open up new horizons for you. In the present multi disciplinary world, I strongly believe that the truly big ideas and important critical developments take place at the intersection of disciplines. Therefore, team work becomes absolutely imperative.

On this august occasion and when you are chartering your own future it is only proper to remind you the words of wisdom by Dr. APJ Abdul Kalam our first Chancellor. It was his advice that one should not only have high aspirations but the aspirations have to be matched with hard work. Only the right combination of hard work and aspirations enables one to achieve the set goals.



My young friends, the very fact that all of us being together here, today exemplifies the spirit of this august occasion. A day to recall your collective experiences and memories at IIST with faculty members, staff, friends or whoever else in this Institution. At the same time, remember to stay in touch with your alma mater while you go out to work, learn and excel. We would like to extend a warm invitation to each one of you to remain engaged with this Institute and in taking a keen interest in enhancing the future of this Institute. Today, after 15 long years of IIST, the role of alumni association has a dominant role to play. Your inputs are vital to strengthen your alma mater in meeting new challenges in a rapidly changing world.

Finally, I conclude by conveying my very best wishes once again, to each one of you and earnestly hope that you will have a very bright career in ISRO or anywhere else in India, so that you become instrumental in transforming India as a developed nation very soon.

Thank you, Jai Hind



Dr. B. N. Suresh

Dr. BN Suresh is presently, Chancellor, Indian Institute of Space science and Technology, (IIST)Thiruvananthapuram and Honorary Distinguished Professor at ISRO HQ, Bangalore. He was President for Indian National Academy of Engineering (INAE), Delhi, a premier Engineering Academy of the Country for 4 years and also he was Member of Board of Governors of IIT Madras for 7 years.

After his degree in Science and Engineering from Mysore University he took his Post Graduate degree from IIT Madras. He got his Doctorate under Commonwealth Scholarship in Control Systems from Salford University, UK. He joined Vikram Sarabhai Space Centre, Trivandrum in 1969, and contributed significantly for the design and development Indian launch vehicles like ASLV, PSLV and GSLV and GSLV Mk3. He has contributed for the development of Inertial Guidance System for all launch vehicles, development of advanced launch vehicles like Reusable launch Vehicle Technology Demonstrator, and air breathing propulsion.

He was the Director of Vikram Sarabhai Space Centre for four and half years till November 2007. He was also the Founder Director of the newly established Indian Institute of Space Science and Technology (IIST) at Thiruvananthapuram for three years till end of 2010. He served as Member, Space Commission for four years. He was Vikram Sarabhai Distinguished Professor for 5 years. He was also distinguished Professor at IIT, Bombay and MIT Manipal. He is a fellow of several professional bodies like Indian National Academy of Engineering (INAE), Indian National Science Academy (INSA), Delhi, Astronautical Society of India (ASI), Aeronautical Society Of India (AeSI)



India Society of systems for Science and Engineering (ISSE) and International Academy of Astronautics (IAA) at Paris. He is also Fellow and past President for System Society of India (SSI).

He was Head of Indian delegation for the United Nations Committee for space on Peaceful Uses of Outer Space (UNCOPUOS) at Vienna, Austria during 2004-07. He was elected as Chairman of the prestigious United Nations Scientific and Technical Committee for the year 2006 from the Asia Pacific Countries. He was Chairman for the selection of members in S&T area for IAA for five years.

He has won around 25 awards & honours and prominent among them are “Dr. Biren Roy Space Science design Award” from Aeronautical Society of India, “Distinguished Alumni Award” from IIT Madras, “Lifetime Contribution Award” in engineering by Indian National Academy of Engineering (INAE), “Aryabhata Award” the highest award by Astronautical Society of India, “Lifetime Achievement Award” by ISRO, Government of India, in 2016. He has received the international recognitions like “Global Pioneer Award” by International Council of System Engineering (INCOSE) at Washington, DC, USA in July 2018, “Engineering Sciences Book Award”, by the International Academy of Astronautics, (IAA) Paris for his book 'Integrated Design for Space Transportation System' by Springer, at Washington DC in October 2019 and IEEE Simon Ramo award 2020, by IEEE, USA for outstanding leadership in developing space program and pioneering in space technology.

In recognition of his meritorious contributions for Science and Technology, Govt. of India conferred on him “Padmasree” during the year 2002 and third highest civilian Award “Padma Bhushan” during the year 2013.





Dr. S. Unnikrishnan Nair

Director and Chairman, BoM, IIST



Most Respected Dr. B. N. Suresh, Honourable Chancellor and Founding Director, IIST, Shri. S Somanath, President of the Governing Body of IIST, Secretary, Department of Space and Chairman of Space Commission, Shri. G Madhavan Nair, former Secretary DOS/Chairman, ISRO, the Chief Guest of this Convocation at IIST, Members of IIST Board of Management, Dr. V Narayanan, today's guest of honour, Director, Liquid Propulsion Systems Centre (LPSC). All the esteemed directors of ISRO Centers, distinguished guests, faculty members, officers and staff of IIST, invitees from the media, and most importantly, graduands and their proud parents and family members have a perfect morning to one and all.

I am pleased to welcome you all to the 10th Convocation of the Indian Institute of Space Science and Technology. On this joyous occasion, as we wish our new batch of passing out graduates the best in life, I feel that 'You all are capable of more than you know. The world needs all you can give.' On behalf of the entire IIST and DoS fraternity, I offer my congratulations to all of you for your hard-earned degrees, and I wish you all the best in your life and career.

I am privileged to submit, on this Tenth Convocation day, before the august audience, a brief report of some of the notable achievements and progress of IIST since the last convocation, the goals we had set for ourselves, and the new targets set for the future. Our endeavor has always been to raise the bar and set higher benchmarks for ourselves, and the reporting period has been no exception. Due to time constraints, I will present only a gist of activities IIST undertook during the reporting period. Detailed report is available in the document.

We are extremely happy to have Shri. G Madhavan Nair, former Secretary DOS/Chairman, ISRO, the founding person of our



Institute, as the chief guest for the tenth convocation. He joined Thumba Equatorial Rocket Launching Station (TERLS) in 1967 and has held various illustrious positions in ISRO/DOS. During his tenure as Chairman, ISRO/Secretary DOS, 25 successful missions were accomplished including the prestigious Chandrayaan 1 mission in which the Indian tricolor was taken to the Moon using PSLV as an ascent vehicle.

Shri G Madhavan Nair's focus has made outstanding contributions to the Indian space program to achieve self-reliance in high technology areas and to bring the benefits of space technology to national development, especially targeting the needs of the rural and needy sections of society. I am also delighted to inform you that IIST was the brainchild of him and was formally inaugurated on 14 September 2007 by Shri G. Madhavan Nair, when he was the Chairman of ISRO. It is more gratifying that he is with us as chief guest for the tenth convocation in the crystal anniversary year of IIST.

I wish to record our gratitude to Shri S Somanath, Chairman ISRO and Secretary, DoS, who is also the President of IIST Governing Body for his presence today. Sir, during your short stint in IIST as the Director concurrently with Director VSSC, you have set new standards and academic benchmarks, thereby transforming the education and research landscape of IIST. As we progress to the sixteenth year, I also take this opportunity to thank the Department of Space for the continued support to different programs and infrastructure development of IIST since its inception. I am glad to mention that various infrastructures such as the Space Technology Innovation and Incubation Centre (STIIC), IIST health center, SAC indoor badminton, and squash courts, were inaugurated by Shri Somanath.



I acknowledge all the support extended by Dr. V Narayanan, Director Liquid Propulsion Systems Centre (LPSC), for the 10th convocation function being held in this beautiful Pearl Jubilee Auditorium. Moreover, he was instrumental in shaping various R&D infrastructure at the institute with timely advice. Furthermore, he always extends all the support to our students and faculty to use the facilities at the LPSC campus.

I express my deep gratitude towards Dr. Sam Dayala Dev, former Director of IIST and Director of IISU, for implementing several measures to boost the research and academic activities in the institute. He was instrumental in realizing the institute's first successful INSPIRESat-1 mission, launched from Satish Dhawan Space Center on 14th February 2022 using PSLV-C-52 mission.

1. Academic Report (2021-22)

As humanity adapted to the dynamically changing situations and learned to navigate these extraordinary times, IIST had a share of its experience in teaching, learning, and research areas. IIST has put in every effort and engaged all its resources to ensure that the teaching-learning process continues unabated and uncompromised. Despite the pandemic and the associated restrictions, we have done pretty well in all aspects of institutional activities - be it teaching, research, or outreach. I am happy to share my deep sense of satisfaction with the timely completion of the academic calendar and year under these testing circumstances and wish to congratulate the students, faculty members, and administration for all their support that made this possible.

IIST currently offers B.Tech in Aerospace Engineering and Electronics and Communication Engineering (Avionics), with 75 seats each, and a dual degree program with B.Tech in



Engineering Physics with 24 seats. Students of the Dual degree program spend an additional fifth year to acquire either a Master of Technology degree in Optical Engineering, Solid State Physics, or Earth System Sciences or a Master of Sciences in Astronomy or Astrophysics. 168 students enrolled in the current academic year for B.Tech and Dual degree programs.

IIST currently offers 14 Master of Technology and 1 Master of Science program. Admission for the new M.Tech batch was completed in July 2022, and a total of 133 students had joined IIST, including 123 non-sponsored and ten sponsored students. The sponsored seats this year include seven from ISRO and three from DRDO as well

To enhance our research output, IIST has been continuously striving to admit quality candidates to the institute especially for the Ph.D. programs. Admission to the Ph.D. programs was held this year in January and July, and 68 students had registered for Ph.D., which include 10 from ISRO. Currently, 265 students are pursuing their Ph.D. degrees in IIST.

Today, in the tenth convocation of IIST, a total of 271 students are graduating on this august occasion. B.Tech. degrees will be conferred on 112 students, 51 graduating in Aerospace Engineering and 61 in Electronics and Communication Engineering. 104 Students are receiving their M.Tech degree, with 20 students from the fourth batch of the Dual degree program. Ph.D. degrees will be awarded to 35 students across all seven departments. It is also noteworthy to mention that 3 students who are receiving their doctoral degrees have jointly carried out their research work in IIST and NARL that was initiated as part of an MOU signed between IIST and various ISRO centers. I am sure more such collaborations across various ISRO centers will be witnessed in the coming years.



Mr. Sri Aditya Deevi of B Tech, Electronics and Communication Engineering (Avionics) is awarded the coveted Gold Medal for being the best academic performer in all UG programs put together and Mr Kiran L of Master of Science in Astronomy and Astrophysics under the Dual Degree program receives the Gold Medal for topping in all PG Programs. The excellence certificate and cash award for the students who secured Best academic score in Aerospace Engineering goes to Mr. Subrahmanya V Bhide, and Mr Abhishek A is selected as the all-rounder of the UG Programs. The toppers of Aerospace Engineering and Electronics and Communication Engineering branches will undertake a Masters' Program at California Institute of Technology (Caltech), USA, before joining ISRO. The 9-month program is financially supported under the DoS-Caltech Professor Satish Dhawan Endowment Fellowship.

After degrees are conferred in this convocation, the total degrees awarded by the institute will be 1577 B.Tech, 86 dual degrees, 687 M.Tech, and 137 Ph.D. degrees. A total of 1234 graduates from the institute have joined ISRO so far. In the year 2022, 93 students who graduated from IIST were absorbed in various DOS/ISRO Centres.

To continue imparting high-quality and holistic education to the much larger student population and to keep pace with the scientific, technological advancements and socio-economic realities, the Institute ensures that the syllabus of all the programs is modified once in 3 yrs. To boost the research in the institute, a large number of PhD students were admitted. Furthermore, the M.Tech.seats in 10 different programs have been increased to 20 to cater to a close collaboration between ISRO and IIST joint projects. The offline classes, labs, and exams were resumed in the institute for all UG and PG batches by strictly following all the standard operating procedures as laid down by the COVID regulatory committee of IIST.



The Institute has 99 faculty members on rolls, among the finest in the country, and recognized nationally and internationally for their research, teaching, and learning quality. Our student-to-faculty ratio remains at 1:10 in comparison to the AICTE norm of 1: 20. The institute is keen on recruiting talented faculty in cutting-edge research areas of science and technology and new faculty recruitment in niche areas is initiated.

2. Progress in Research, Space Technology Research and Collaborations

International Satellite Program in Research and Education (INSPIRE)

IIST has entered into a collaboration with the Laboratory of Atmospheric and Space Physics (LASP), University of Colorado, Boulder, the USA to carry out studies on Earth's ionosphere in 2011. Let me take this opportunity to inform you that a fully integrated and tested InspireSat-1 has been launched successfully from Sriharikota on 14th February 2022 in the PSLV-C-52 mission. IIST students have actively participated in this program by designing the OBC and Electrical Power supply (EPS). The spacecraft is healthy and transmitting the necessary scientific data to the IIST ground station.

ARIS 2

The second hardware of the ARIS -2 payload is ready and awaiting a launch opportunity. Activities for RPA-V payload for the Venus mission are in progress. IIST is also part of ISRO's TDS-01 satellite mission. IIST will provide the satellite's IDM payload. We have demonstrated a large area soil moisture sensor based on thermal neutron detection. The technology will greatly reduce the dependence on imports and make the sensor compact and affordable to small farming communities.



ASRG

Recognizing the imperative of strengthening and streamlining IIST's research environment and catching up with the advances in the Indian Space Sector, an Advanced Space Research Group (ASRG) was constituted in IIST. ASRG, with its vision to facilitate the seamless integration of ideas, expertise and know-how between IIST and ISRO Centers, thereby leveraging collective wisdom to forge the puzzle pieces for futuristic space programs. ASRG has an empowerment committee headed by Registrar, IIST, an ASRG headed by Chief Technology Officer, IIST and has members from all the academic departments, various ISRO Centres as well as from the Capacity Building Program Office (CBPO), ISRO. As of June 2021, a total of 20 projects are approved with VSSC, LPSC, IISU, and HSFC. A total budget of 971 lakhs has been earmarked for various projects. Recently, MoUs have been signed with VSSC for eight projects and SAC, Ahmedabad for two projects.

External Projects

The Research output of the Institute has shown significant enhancement due to several external projects brought in with the concerted efforts of IIST faculty members. Currently, 40 funded research projects are being undertaken by the faculty members of IIST with funding support from ISRO, DST, DST- SERB, Dept of Biotechnology, ICSSR, DRDO, Max Planck Institute for Radio Astronomy, Ministry of Electronics and Information Technology, and MoES.

Other Projects

Besides the externally funded projects, four projects are progressing with IIST research fund. In order to kick-start the research activities of newly joined faculty members, IIST has



provided seed research funding in the form of fast-track projects. Four such fast track projects are currently sanctioned by IIST during the reporting period.

The institute always thrives on innovations. Hybrid rocket experimentation is proposed as part of the student's hands-on experiments in developing reusable launch vehicle technologies. IIST Hybrid Rocket Experiments (IHRX) is a student-driven program that will be mentored by faculty from the institute and eminent scientists from ISRO.

National and International Collaborations

IIST has been striving to build a strong research foundation, which the impressive statistics can show in terms of various research indicators, including active collaboration with other universities/institutes at the national and international levels. A Memorandum of Understanding (MoU) was signed with The Delft Technical University (TU Delft), The Netherlands in July, 2021, for carrying out Academic programs and Joint Research activities, including students and faculty exchange programs. In the reporting year, IIST signed MoUs with various institutes such as Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum, L&T, Danish Aerospace, Humans Space Flight Control (HSFC), IISU and KIMS, Thiruvananthapuram.

To align with the vision of strengthening the public-private partnership, an MoU between IIST and L&T was signed in March 2022 to broaden the cooperation in the area of specific research, innovation, and applied science. L&T will be engaging with IIST for Ph.D. & M Tech programs, where in L&T engineers, who are interested, will be doing research & studies at IIST. L&T will also be engaging with IIST to work on funded projects under the Space Technology Innovation and Incubation Center (STIIC).



IIST already has existing MoUs with international institutes like the Laboratory of Atmospheric and Space Physics (LASP), University of Colorado; University of Cambridge; Technion-Israel Institute of Technology; Nanyang Technical University; Niigata University; CNRS, Femto-St, Besançon and IsaeSupaero, France. IIST will actively consider extending this cooperation by facilitating student and faculty exchange programs across universities, Joint Doctoral Programs, etc., in the future.

IIST is part of an international consortium (GLOSTAR) that is carrying out an extensive new survey of our galaxy, the Milky Way, to get a global view on star formation activity. Department of Earth and Space Sciences, IIST, along with IISc, Bangalore, Max Planck Institute for Radio Astronomy and an international team of astronomers, have revealed previously unseen signatures with unprecedented sensitivity and details that hint at how stars form and die.

IIST has signed an MoU with TIFR, Mumbai, for the hardware required for space life science experiments and work on the advanced technological applications using the Superconducting Quantum Interference Device. Discussions and approval processes on MoUs are underway with the Center for Development Studies Trivandrum for Research and Academic Activities in Economics and with Sociology and National Central University (NCU), Taiwan.

3.New Facilities

The institute is continually working towards enhancing the infrastructure within the institute. Recently a Medical and



Counseling Service Facility and new sports facilities in the Student Activity Center, IIST, were opened for the students. The institute has also initiated work on establishing faculty accommodation and new residential hostels for students. IIST is also implementing outcome-based education initiatives in central engineering departments and is in the initial stages of discussion for implementing the New Education Policy, which will be taken up vigorously in the coming days.

IIST recently inaugurated a Space Technology Innovation and Incubation Cell (STIIC). The STIIC is established on the campus, with the support of the Dept. of Space, to facilitate the incubation of new enterprises with innovative technologies. STIIC would facilitate and support product innovations and developments, simulation and prototyping, pilot experimentation, software testing, training, and other technology-related works. It would also support the startups in their research processes. While the emphasis of the STIIC is on Space related innovations/technologies, it also supports all areas of Science and Technology. A total of Five startup companies related to space science and technologies were incubated at IIST in recent times.

4.New Courses

The Department of Physics has started a two-year master's program, M.Tech. in Quantum Technology in place of M.Tech. in Solid State Technology, to prepare young engineers and science graduates in quantum science and technology. The M.Tech.in Quantum Technologies at IIST will join the global effort to prepare young engineering and science graduates for industry and research, meeting the specific goals of ISRO and other national scientific establishments.



5. Other Achievements

Many of the faculty members and students were bestowed with honors and awards and elected as Fellows of several professional national and international bodies, thereby adding to the glory of the Institute. We are proud to declare that Dr. B. N. Suresh has been elected as an International Member of the United States of National Academy of Engineering (INE). The honour was bestowed upon him in recognition to his distinguished contributions in engineering, contributions to advances in technologies for space exploration and leadership in promoting peaceful uses of outer space.

I am very proud to inform you that Prof. C S Narayanamurthy, Senior Professor of Physics and founding faculty member of IIST is awarded the 2022 Galileo Galilei award by the International Commission for Optics (ICO), Institut d'Optique, France. Prof. Narayanamurthy is the sixth Indian and first non-IIT faculty to receive this prestigious award since its inception in 1994. Notably, Prof. Kuruvilla Joseph was listed among the top 2 percent scientists by Stanford University, across the world in all subject fields for the year 2020 - 2021. Dr. S. Jayanthi from the department of Physics at IIST with her collaborators at the Weizmann Institute of Science Israel, have found a novel sensitivity-enhanced method in NMR. It is named as the 'extended Hadamard scheme and is demonstrated in SARS-CoV2 derived RNA fragments.

Dr. Chinmoy Saha selected for the national award "AICTE Visvesvaraya Best Teacher Award and IETE Prof. SN Mitra Memorial Award 2021. Similarly, for their exemplary contributions, Dr. AM Ramiya and Dr. Anoop C S, received the Kerala State Young Scientist Award, 2021.



The IIST student team has won the “Texas Instruments India Chairman Award” in the India Innovation Challenge and Design Competition (IICDC) organized by DST, AICTE, Texas Instruments, IIM Bangalore and mygov.in. I am also happy to inform you that some of our BTech and MTech students have won the prestigious INAE awards in various categories for their final year project work.

It is a proud moment to share that six students of the institute have won the Australian National University Future Research Talent (ANU-FRT) 2022 Internship Awards.

6.Publications and Patents

IIST has been continuously improving its credentials in research as evidenced by way of publications and patents. 16 patent applications have been filed by IIST faculty and students so far. A total of 9 patents have been approved so far. During the last one year, 4 were granted Indian patents and 12 are under processing. In the reporting period, IIST has 223 publications in International and national journals and as book chapters. Four books were published by IIST faculty members.

7.Institute Events, Continuing Education and Outreach

Dr. AS Kiran Kumar, Member, Space Commission and Former Chairman ISRO, inaugurated the 15th IIST Foundation Day Celebrations and delivered the 7th Dr. APJ Abdul Kalam Lecture. Considering the recent policy changes and future space activities, an IIST- industry interface was organized as part of the foundation day celebrations to reach out to the industries.

Dr. K Radhakrishnan, Member, Space Commission and former Chairman, ISRO delivered the 8th Dr APJ Abdul Kalam lecture on “Life Lessons in Leadership” on 12th October 2022.



IIST organized a National conference on recent trends in material science and technology (NCMST 2021). To acknowledge the contributions of women in science and technology, IIST has been organizing multiple talks by various renowned Women scientists. On National Science day and International Women's day Prof. Jaya. N. Iyer, Institute of Mathematical Sciences, Chennai and one of the famous Indian Mathematicians, Prof. Sujatha Ramdorai, University of British Columbia, Canada, have delivered lectures on advanced mathematics topics. Similarly, on international women's day, an event on "Women and Spaceflight: Charting the Future", featuring eminent women panelists from the Indian Air Force and Indian Space Research Organization, was organized.

The other activities included National Conferences in Webinar mode, faculty development programs and research conclaves, lecture series, talks on various topics of relevance, induction programs for the fresh batch of students and celebrating days of importance. Several programs were also organized by the Hindi section of IIST.

Service to the society has always been a motto of IIST. This year IIST organized Episteme 2022, a camp for the highly abled students which was organised in association with the Pravaha-Agastya Foundation. The students attended classes, activities, and experiments within the IIST campus and outdoor programs, which are of scholarly significance. The camp was an expedition into the world of space science, mathematics, and natural sciences and included expert lectures, scientific experiments, demonstrations, cultural events and visits to certain places of academic importance.



Nirmaan, the social outreach club of IIST, provided online classes on Space Science, Technology, Values and Career Guidance to the students of Government School, Chullimanoor in the Jan- May 2021 session. Masks and sanitizers were distributed to the students. The club also conducted classes for the students of Kumari Aruvial Perumal, Kanyakumari in the July-Dec 2021 session. Around 305 students participated in the classes conducted in online mode.

Dhwani, a program to audio record the textbooks were also done to help the visually challenged students of Jagathy Blind School.

8. Alumni

The alumni of the Institute have made their alma mater proud through their achievements and contributions in diverse fields, and our engagements with them are steadily growing. Many innovative programs were organized by the IIST alumni association, including a joint Alumni Day & 15th Foundation Day of IIST (11th, 12th & 14th September 2021), a Moderated Webinar on “Challenges in Leadership”, and Ankesh Mishra Memorial Quiz for various students. Two alumni PhD scholars of the Department of Humanities, Dr. Sabu M (Economics) and Dr. AnuKuriakose (English Literature), are selected for the first ever Chief Minister's Nava Kerala Post-doctoral position Fellowships 2022 introduced by the Govt of Kerala.

Let me conclude this report with a big thank you to all, especially the graduating students, for making the institute proud of its profession, the former directors of IIST, the registrar of IIST, the deans, the faculty, and the staff of IIST for the tireless effort to meet the vision of IIST. Our gratitude to our honorable



Chancellor Dr. BN Suresh, who spares no effort to transform IIST into an institute of national importance, Shri S. Somanath, Chairman, GC, for his unstinted support and guidance, and Dr. V Naraynan, who is a constant source of inspiration for the institute. Finally, I feel exalted to express our deepest gratitude to the beloved Chief Guest, Shri. G Madhavan Nair, for gracing this function and his consent to deliver the convocation address.

I also congratulate all the proud parents on their child's graduation day and wish them best wishes for the next part of their journey.

Finally, let me wish all the best to the graduating students for an exciting career, and a fruitful and fulfilling life. I firmly believe that you will make our country and the institution proud. It must be remembered that success is not measured by the triumphs achieved but by the ability to get up as many times as necessary to achieve what we strive to achieve.

Thank you all
Jai Hind



Dr. S Unnikrishnan Nair

Dr. S Unnikrishnan Nair, Distinguished Scientist, took charge as Director, VSSC in February, 2022. He is also the Director of IIST, Thiruvananthapuram. He is the Founding Director of Human Space Flight Centre, Bangalore. He is BTech in Mechanical Engineering from MA College of Engineering, Kerala University, ME in Aerospace engineering from IISc, Bangalore and PhD in Mechanical Engineering from IIT(M), Chennai. He also holds an MA in Telecommunications and Space Law from NALSAR, Hyderabad.

He started his career in Vikram Sarabhai Space Centre (VSSC), Trivandrum in 1985 and was involved in the development of various aerospace systems and mechanisms for PSLV, GSLV and LVM3.

He played a key role in the maiden orbital re-entry experiment, Space Capsule Recovery Experiment (SRE), right from the study phase onwards to its mission accomplishment in 2007. He has made seminal contributions in developing the Parachute and other Recovery systems for are-entering vehicle for the first time in the country. He has also played a pivotal role in lining up various national agencies including the services for formulating the recovery procedures and implementation for the recovery of SRE from sea.

He was associated with Human Spaceflight Programme from its study phase since 2004 and was the Project director for Pre-project technology development activities. He led the project team for defining the Vehicle configuration, Systems engineering and in identifying various critical technology development areas to initiate the pre-project activities. He was the Payload Director for CARE [Crew module Atmospheric Re-entry Experiment], where a full-scale Crew Module,



was flown successfully in the LVM3X-CARE sub-orbital mission held in December 2014. He also served as Deputy Director, Structures Entity of VSSC concurrently with the human space flight technology development.

He has significantly contributed in defining the Crew Escape System, a vital system in manned missions for crew rescue under any contingency and was the Mission Director for the first Crew escape system - Pad abort test held in July 2018. He served as the Programme director of Advanced Space Transportation System, a unified entity created for integrating the various technology development activities of Human space flight, Reusable launch vehicle, Air breathing propulsion and Advanced test vehicle.

He is the founding Director of the youngest Centre in ISRO, the Human Space Flight Centre, HSFC, and has led the team for establishing the Astronaut Training Centre at Bangalore in HSFC at Bangalore.

He has received ISRO team excellence award for his contributions to SRE, ISRO excellence award as team leader for CARE in 2014 and ISRO Individual Merit award for the year 2014 for his contributions towards technology development for manned space mission.

He is a member of many professional bodies and is the national president of the Indian National Society for Aerospace and Related Mechanism (INSARM). He has authored several papers including 12 for international journals/conferences. He is holding a patent and received an honorary doctorate for the contributions to human space flight activities. He is the co-editor of a text book on Finite element analysis which is under publishing. He is an ardent nature lover and works for its preservation. He has also published a few short stories in leading Malayalam magazines.



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