

**MINUTES OF THE MEETING OF MEMBERS OF HUB GOVERNING BOARD OF NMICPS TECHNOLOGY INNOVATION HUB ON AUTONOMOUS NAVIGATION FOUNDATION HELD ON FRIDAY 18<sup>TH</sup> JUNE 2021 AT BOARD ROOM, ACADEMIC BLOCK-A, INDIAN INSTITUTE OF TECHNOLOGY HYDERABAD, KANDI CAMPUS, SANGAREDDY 502285 AT 11.00 AM.**

Time of commencement of the Meeting: 10.00 AM

Time of conclusion of the Meeting: 11.30 AM

**1. ATTENDANCE**

Sr. No.	Name	Designation	Mode of Attendance Physical/Electronic mode
<b>Directors:</b>			
1.	Prof. B. S. Murty	Chairman	Physically
2.	Dr. Rajalakshmi Pachamuthu	Member	Through VC from Hyderabad
3.	Dr. Kiran Kumar Kuchi	Member	Through VC from Hyderabad
4.	Dr. S Suryakumar	Member	Through VC from Hyderabad
5.	Dr. Bheemarjuna Reddy Tamma	Member	Through VC from Hyderabad
6.	Mr. Samir Kumar	Member	Through VC from Bangalore
7.	Mr. Kumar N. Sivarajan	Member	Through VC from Bangalore
8.	Dr. Gopichand Katragadda	Member	Through VC from Bengaluru
9.	Dr. Rajeev Sharma	Proxy of Dr. K R Murali Mohan	Through VC from Delhi
<b>Invitees:</b>			
10.	CA Saurabh Dashottar	Internal Auditor	Through VC from Hyderabad
11.	CS Jayata Agarwal	Practising Company Secretary	Through VC from Jaipur

**2. ELECTION OF THE CHAIRMAN:**

As per article 27 of Articles of Association of the company, the Director of IIT Hyderabad (Host Institute) is deemed to be the chairman of TIHAN Foundations and as per Mission communications; Chairman of Host Institute will be Chairman of the HGB. Thus, **Prof. B. S. Murty** was elected as the chairman of the meeting and occupied the chair.

**3. QUORUM:**

At 10.00 A.M, the Chairman (Prof. B. S. Murty) welcomed the Members present through video conferencing. Thereafter, the Chairman announced that the requisite quorum was present and called the Meeting to order. The Chairman extended a warm and hearty welcome to all the members present at the Meeting of Hub Governing Board (HGB) of the Company.

**4. LEAVE OF ABSENCE:**

Leave of absence was granted to Mr. Krishna Bodanapu for not attending the meeting, due to unavoidable circumstances and had requested for the same.

**5. CONFIRMATION OF MINUTES OF THE FIRST MEETING OF MEMBERS OF HGB HELD ON 17<sup>TH</sup> SEPTEMBER 2020:**

Minutes of the meeting of the Hub Governing Board held on 17<sup>th</sup> September 2020 duly initialed by the Chairman were placed before the Board and Board approved the same.

**6. APPOINTMENT OF DR. KIRAN KUCHI AS DEAN R&D OF IIT HYDERABAD (EX-OFFICIO ACADEMIC REPRESENTATIVE):**

The Chairman informed the board that as per HGB structure, Dean R&D is an ex-Officio designation on Hub Governing Board as Academic Representative, by virtue of his/her office in IIT, Hyderabad. The Ex-Officio director shall hold office of the director in the company, so long as he holds the office in IIT Hyderabad.

Dr. Sumohana has stepped down as a Dean R&D of IIT Hyderabad and Thus he is no longer Ex-Officio Member of the HGB as an academic representative

Further, Dr. Kiran Kumar Kuchi is appointed as Dean R&D of IIT Hyderabad. Hence, he will be appointed as Academic Representative of HGB.

The Members considered his appointment.

**7. OPENING REMARKS BY CHAIRMAN:**

Prof. B. S. Murty- the Chairman delivered his speech highlighting that the TiHAN at IIT Hyderabad is the source for fundamental knowledge and technologies in the technology vertical of Autonomous Navigation and Data Acquisition Systems (UAVs, ROVs, etc.), Performance Highlights of the Company and Future Strategy of the Company etc.

The Chairman further informed that the Hub focuses mainly on technology development; human resource & skill development; innovation, entrepreneurship, start-up ecosystem; and international collaborations. As DST is planning to identify 4 Hubs among all its HUBs as TIRP, with top-up grant and TiHAN will try its level best to hold that position.

The Chairman concluded his speech by placing on record his sincere thanks to the Department of Science and Technology (DST) under National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS) for sanctioning, the prestigious Technology Innovation Hub (TIH) on Autonomous Navigation and Data Acquisition Systems (UAVs, RoVs, etc.) to IIT Hyderabad (IITH).

## **8. REVIEW ON THE ACTIVITIES OF THE HUB SINCE THE FIRST BOARD MEETING:**

Prof. Rajalakshmi Pachamuthu- Project Director/Member Secretary informed the board about the activities performed in the TiHAN in last six months. She has informed the Objective of the Hub for safe sustainable smart next generation mobility.

She further explained that TiHAN at IIT Hyderabad importantly focuses on the research, design, and development of autonomous navigation and data acquisition systems for UAVs, ROVs, etc. With a synergistic industry and academic collaborations, the hub aims at realizing the utilization of autonomous navigation and data acquisition systems with a aim towards transitional technology research and development considering the commercialization aspects in the area of Autonomous and Intelligent Navigation Systems for Ground, Aerial, and Water Surface Vehicles; Applications of Autonomous Navigation Technologies in Agriculture, Infrastructure Monitoring (Power Line, Constructions, Pipelines, Railway Tracks, etc.), Surveillance (Maritime, Airtime, Terrestrial), and Environmental Monitoring (Air, Water, Industrial Pollutants, etc.).

She has also informed about the activities taken by the TiHAN in Research and technology development, Industry Collaboration, Innovation, Entrepreneurship Start-up Ecosystem, International Collaborations, Human Resource and skill Development and Intelligent testbed. (The detail summery is attached herewith).

She further explained about Testbed on Autonomous Navigation (Aerial/Terrestrial) which is setup at IITH and informed about Testbed with Mechanical Integration Facility, Test circuits/tracks, and required Equipment, Area to setup testbed in IITH Campus and Master Plan and Design. TiHAN has also registered copyright on Testbed as it is one of its kind in country.

She also informed about the achievements of TiHAN that it has already started working on R&D projects at the Hub level on autonomous Terrestrial/aerial vehicles and also collaboratively with other Institutions and R&D Labs.

She has also informed about the Human Resource Skill Developments and the recruitments. TiHAN has started identifying chair professors through nominations. It has also invited Faculty fellow ships involved in R&D activities through advertisement. It has hired research staff and administrative staff. The Hub Operations Officer Mr. Vishnu Charan is recruited on 16 Feb 2021, for heading the overall operations of the Hub was introduced during the meeting. She has also informed about Workshops, Trainings, Symposiums and Calls for proposals for workshop (Guidelines Techqip, ATAL).

TiHAN under the Incubation Activities have started identifying startups for funding, attracting private funding (CSR, VCs and equity based), Technology commercialization, Promotional Outreach, Accelerator programs for early stage startups.

In Industry Relationships TiHAN has interacted with many industries like Suzuki, Maruti, Altran, ANRA, Infenion, Continental etc. in area of Autonomous Navigation.

She has further informed about the futuristic research in pipeline i.e. micro and nano category drones, Next Generation Hybrid Mobility ground and arial vehicle like flying cars.

**9. BUDGET FOR F.Y. 2020-2021:**

Dr. Rajalakshmi has also present the budget for F.Y. 2021-2022. She explained that the budget is 20.25 Crore and as of now we total commitment planned for 15.95 crore (tenders, PO, etc.). Remaining funds are also being planning.

**10. SUGGESTIONS FROM THE MEMBERS, DISCUSSION AND ACTION PLAN:**

The Chairman invited all the Industry Representatives for their Opinions and Suggestion. Following points were discussed and suggested:

- Set early targets  
It should have targets for each year and at the year-and progress reports must be given about the achievements. Dr. P Rajalaksmi explained that DST itself is given year wise targets up to 5 years and progress of the targets we have been submitting to DST in every month basis. Same copy will be circulated members.
- Financial self-sufficiency:
  - Testbed on autonomous navigation will be the revenue generation model for TiHAN. Strong collaboration with industry, academia and RnD labs is expected.
  - Membership fee
  - ToT fees from industries and Royalty.

**VOTE OF THANKS:**

Chairman announced the summary of the discussion, recommendations and decisions taken in the meeting. Before the conclusion of the Meeting, Chairman made the roll call at the conclusion of the meeting and ensured presence of quorum throughout the meeting.

With the item of the agenda being transacted, the chairman thanked the members for making it convenient to attend the meeting and thanked them for their active participation.

Thereafter, the chairman declared the meeting as concluded.

Date:

Place: IITH



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**Prof. B. S. Murty**  
**Chairman**



## TIHAN-IITH: Objectives

TIHAN-IIT Hyderabad  
 Indian Institute of Technology Hyderabad



### Hub for Safe, Sustainable Smart Next Generation Mobility

**Real-time Autonomous Navigation and Data Acquisition Systems (Unmanned - UAVs, ROVs, etc.)**

Quality Data Acquisition System for Aerial/Terrestrial Mobile Environments Under Multi-sensory Perception Scenario (UAVs, ROVs, etc.), AI Framework, End-to-End Edge Computing Architecture, Communication & Networking Architectures

**Standard Operating Procedures (UAVs, ROVs, etc.)**

**Testbed for Autonomous Navigation Systems (Aerial and Terrestrial Vehicles)**

**Autonomous Transportation Systems (Aerial/ Terrestrial/surface)**

**Agriculture & Farming**

**Infrastructure & Surveillance**

**Environment**

*Re-imagine ways of working with industry and academic partners to accelerate change*



## TIHAN – IITH: Activities

TIHAN-IIT Hyderabad  
 Indian Institute of Technology Hyderabad



**TIHAN-IITH: Source for fundamental knowledge and technologies (IPs, Publications, Products, Commercialisation as Licencing, ToTs...) in the technology vertical of Autonomous Navigation and Data Acquisition Systems.**

*... and we do this every day*





## TiHAN-IITH- Executive Summary

TiHAN-IIT Hyderabad



- Nurturing the R&D portfolio of the hub and promoting commercially viable translational research, National & International Institutes.
- Increase in CPS Research Base: Hub projects, 9 collaborative R&D projects with other organizations
- Publications: 11
- No. of Technology (IP, Licensing, Patent Etc.) 2 (1 copy right on Autonomous navigation testbed, 1 patent on Bio-inspired nav)
- Technology Products: 3 (Bio-inspired UAVs, UAV with high end sensors-Lidar/HSL)

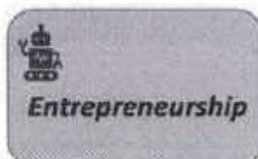


- 30 Faculty from different Departments of IITH
- 2 Year Interdisciplinary M.Tech in Smart Mobility (EE,CSE,MAE,CE,Math) -17 (2020)
- Phds – 13 , Post Doc- 2
- Chair professors– Identification based on Nomination – on going
- Faculty Fellowships- Advertisement is live
- Research Staffs - 14
- Workshops, Trainings, Symposiums: 7 Workshops on Drones (800 Participants )
- Call for proposals for workshop (GuidelinesTechqip, ATAT) is live



## TiHAN– Executive Summary

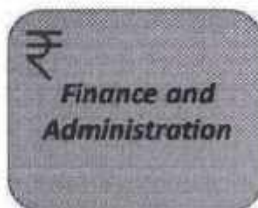
TiHAN-IIT Hyderabad



- Incubation Activities – startups funding, Attracting private funding (CSR, VCs and equity based), Technology commercialization, Promotional Outreach, Accelerator programs for early-stage startups
- Technology Business Incubator (TBI) – 1 - MoU with iTIC (TBI of IITH)
- Startup funding 2 funded – CBAI Tech: India's first drone agnostic 'Detect' and 'Avoid' for safe navigation, AVIAC: Drone with multispec camera for Agriculture
- TiHAN PRAYASEE/EIR: (3) Advertisement live



- Joint R&D initiatives on cost-sharing basis, Consultancy projects with both Govt. and Private entities, Consortium – Framework
- Identified Areas of Collaboration with 10 Industries (NDA signing & Project Agreement going on)



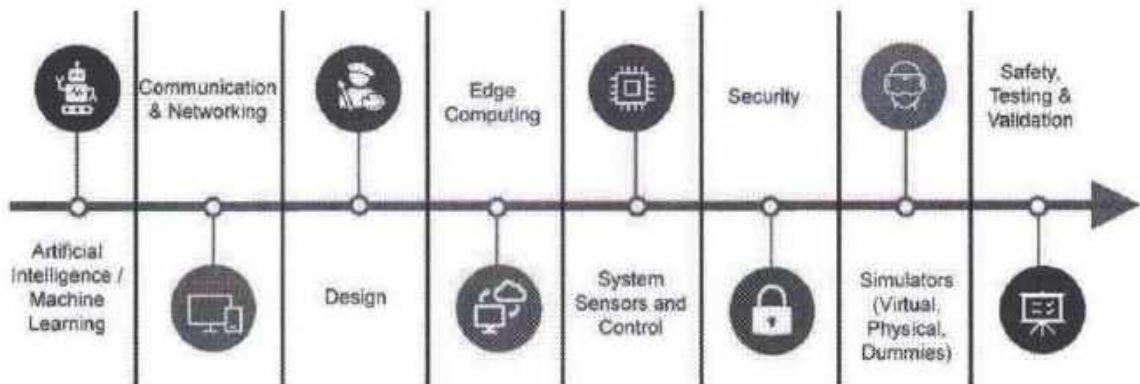
- SoP defined for various activities: Stores and Purchase (Procurement Policy in place), Budget approvals for academic, R&D and Incubation activities, Finance and expenses management (all transactions through PFMS portal), Book keeping
- IPR (as per tripartite agreement of DST), Legal aspects and Logistics management
- Overall hub administration
- Staffs - 10: Hub Operations Officer, Project Management Consultant, Manager Community Engagement, Junior Officers (SNP, Accounts, Admin, Academics, Documentation), Web developer, Office Assistant



**TIHAN-IIT Hyderabad**  
 Research, Advancement, Innovation



## TiHAN Core Research Focus

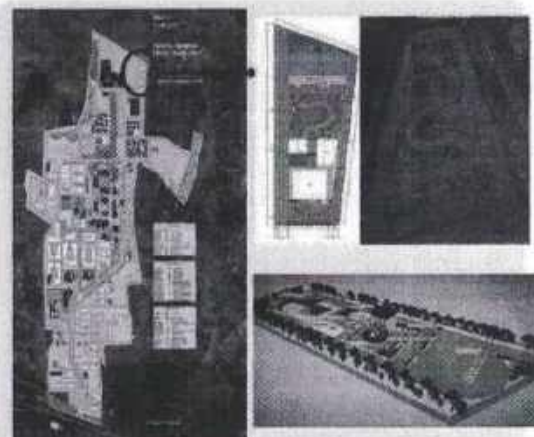


## Autonomous Navigation Testbed (Aerial/Terrestrial) at IITH



### Testbed Facility

- A first of its kind state-of-the-art testbed for Autonomous Navigation (Aerial/Terrestrial)
- Technology development and thorough validation before going for real field deployment
- Facilities include – Proving Grounds, Test tracks, Mechanical integration facilities like Hangers, Ground control stations, State of the art Simulation tools (SIL, MIL, HIL, VIL), Test tracks/circuits, Road infra – Smart Poles, Intersections, Environment Emulators like Rainfall Simulators, V2X Communications, Drone Runways & Landing area, Control Test centers...



Location of Testbed Within IITH

*Envisaged Testbed at IITH will be the Destination for Next Generation Mobility Research Platform for collaborative research between Academia, Industry, R&D Labs –National and International*

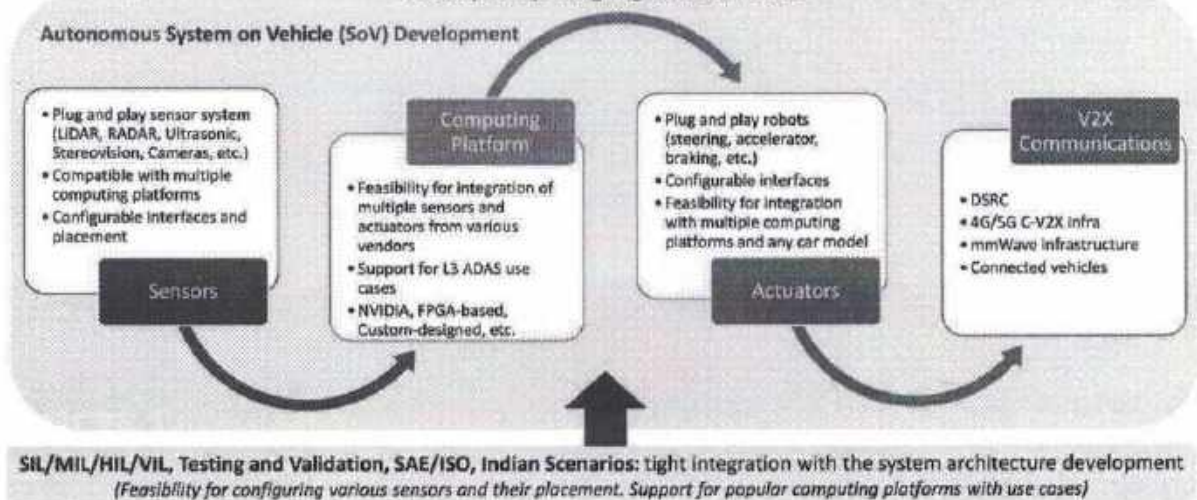


TIHAN-IIT Hyderabad  
 Autonomous Navigation Foundation



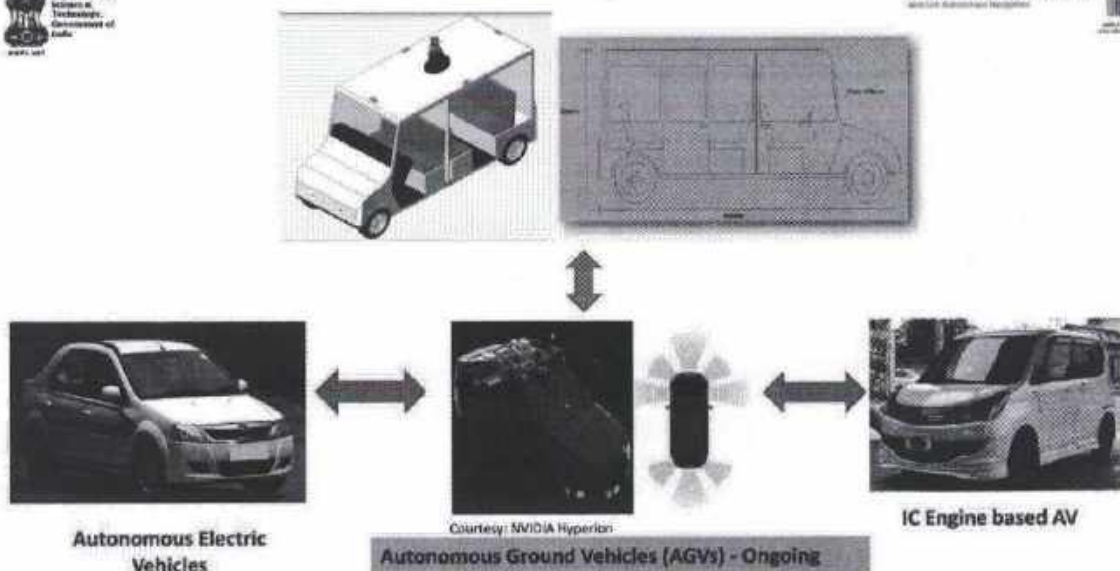
## Autonomous Ground Vehicles (AGVs)

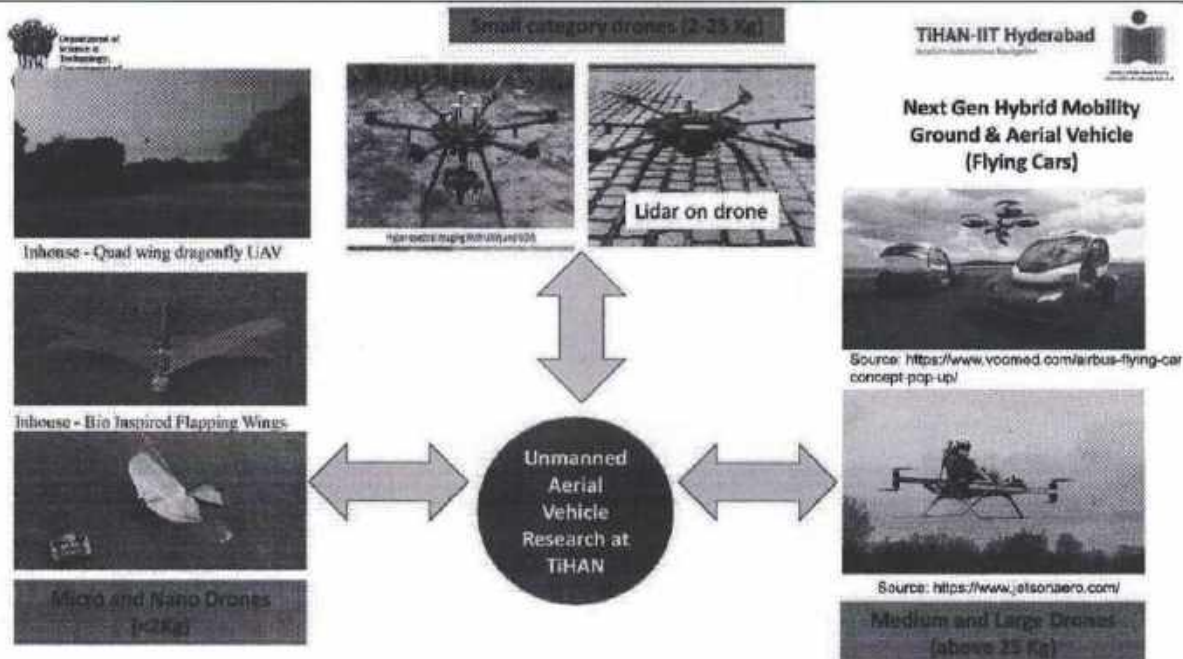
TIHAN start with "Level 3 Autonomy" and connected vehicle – Testing and Validation in Testbed during the Phase 1 development, then going for Level 4 and 5



### Autonomous/Smart Campus Shuttle E-cart

TIHAN-IIT Hyderabad  
 Autonomous Navigation Foundation





## R&D Collaborators

### TIHAN Foundation (Section 8 Company)

Academia & Labs	Industry (via Consortium mapping)
<ol style="list-style-type: none"> <li>1. IIT Dharwad - UAVs &amp; RoVs for agriculture and infrastructure</li> <li>2. IIT Dharwad- Development of Terrestrial Robotic Systems</li> <li>3. IIT Shri City- UAVs in Environment, Agricultural tasks</li> <li>4. KRISAT - UAVs based Precision Agriculture, Phenotyping, Livestock</li> <li>5. C-DAC Hyderabad- 5G CV2X Platform</li> <li>6. C-DAC Trivandrum- Autonomous Water Surface Vehicles</li> <li>7. IITDM Kancheepuram- Vision Intelligence Systems</li> <li>8. IIT Hyderabad- Fault Tolerant UAVs, Edgevice for real time Traffic</li> <li>9. Automotive Research Association of India (ARAI)-Autonomous terrestrial vehicle for testing the autonomous navigation framework</li> <li>10. Quality Control of India (QCIN)- testing and validation of UAVs</li> <li>11. NTU Singapore- CEATRIAN Testbed Collaboration for testing and validation (ongoing)</li> <li>12. Univ of Michigan- MCity Testbed (ongoing)</li> </ol>	<ul style="list-style-type: none"> <li>• Suzuki Motor Corporation, Japan- Autonomous Road Vehicles and Testbed Facility</li> <li>• Maruti Suzuki India Limited- Testbed Facility</li> <li>• CYRUS- HD Maps, Autonomous Navigation</li> <li>• ANSYS- Cloud based cloud computing architecture for autonomous navigation (both aerial and terrestrial use cases)</li> <li>• Infineon- Sensors and Autonomous Navigation</li> <li>• ANRA- UAV Technologies and command control stations</li> <li>• ALTRAN- Sensors, Testbed, 5G and Connected Vehicle</li> <li>• Continental- Testbed, Perception for Autonomous Vehicles</li> <li>• Inventa Robotics- Humanoid Robots</li> <li>• ETK- UAVs</li> <li>• Tata Consultancy Services (TCS)- UAVs for Agriculture applications and high throughput data processing</li> </ul>

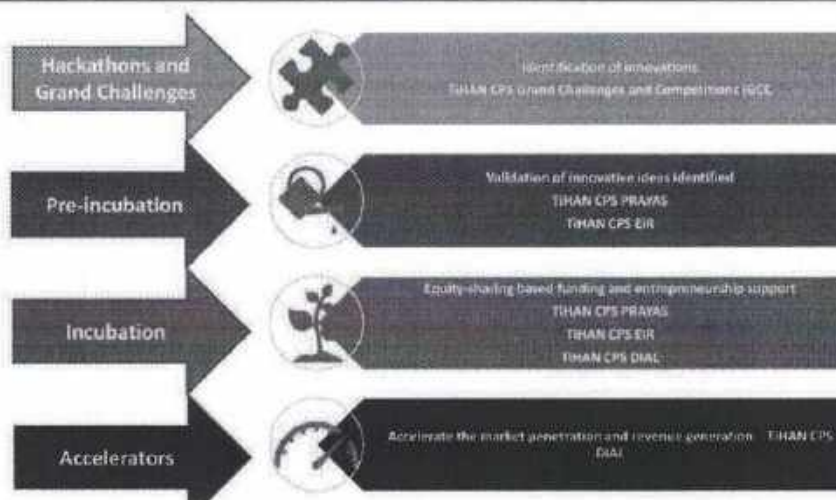


## Innovation and Entrepreneurship

IIT Hyderabad  
Indian Institute of Technology



**MoU with iTIC – IITH for the innovation and entrepreneurship activities funded by TIHAN**



**TIHAN-IIT Hyderabad**



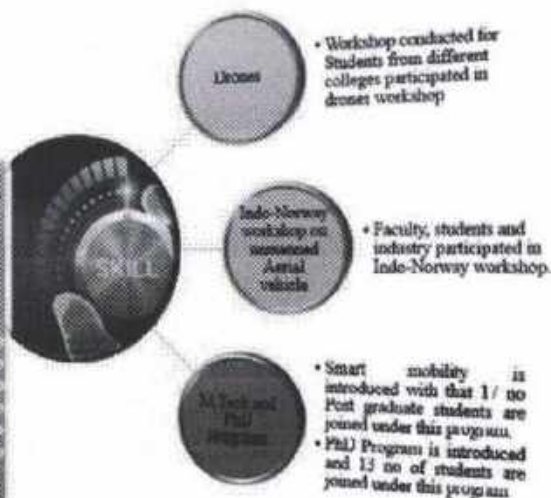
**TIHAN-IIT Hyderabad**

Technology Innovation Hub on Autonomous Navigation



### SKILL DEVELOPMENT

As a part of skill development activity various certification programs/ workshops are being planned going forward



## **NMICPS Technology Innovation Hub on Autonomous Navigation Foundation**

**Registered office:** C/o Indian Institute of Technology Hyderabad, IIT Hyderabad Kandi(V) Sangareddy,  
Kandi, Medak-502285  
CIN: U73200TG2020NPL140558

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Thereafter, the chairman declared the meeting as concluded.

Date: 08-07-2021

Place: IITH



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**Prof. B. S. Murty**  
**Chairman**