MINUTES OF 12TH MEETING OF UNMANNED AERIAL VEHICLES SECTIONAL COMMITTEE

Meeting Date: 08.11.2024, Mode: Hybrid, Time 11 AM, Attendance: available on BIS portal login

Item 0 Welcome and Opening Remarks

Chairperson Dr. S N Omkar welcomed the members present in the meeting through physical mode at meeting hall, aerospace department at IISc and to the members present virtually in the meeting through WebEx. He requested the members to take the new subjects forward so that standards can be developed in time and integrated with national priorities.

Member Secretary informed the committee that there was a proposal from IN-SPACe to merge TED 14 with TED 32 which was dropped as DGCA advised to go ahead with present roles in line with policy divisions at DGCA; and because of these discussions and decisions the meeting of TED 32 could not be held earlier as planned.

Item 1 Confirmation of Minutes of the last Meeting

There being no comments, the committee confirmed the minutes of last meeting.

Item 2 Scope and Composition of Committee

The committee noted its present scope and composition and welcomed new members co-opted in the committee. Members absent from two consecutive meetings will be removed from composition as per BIS guidelines.

Item 3 New Subjects to Be Taken

3.1 The committee discussed in detail on the new subjects to be undertaken in the committee for Standardisation and decided to work upon following subjects. It was decided to allocate the subjects to the working groups created for the purpose who would have the responsibility to do the action research through literature review/industry interaction and prepare the working drafts for consideration of the committee and submit their recommendations for the way forward-

S. No.	Subject	*Corresponding Working Group*
1	Testing requirements of subsystems	Dr. SN Omkar Dr. Jeppu Yogananda Sh Udit Kaul
2	Detection and Avoidance System for UAS	Flt Lt A T Kishore Capt. Raejus Job
3	Communication requirements for UAS	Dr. Kamlesh Kumar Flt Lt A T Kishore Sh Chirag Gupta
4	Categorization and Classification of UAS	Sh Manish Kumar Sh Praveen Kumar

5	Vertiports for VTOL UAS	Flt Lt A T Kishore Capt. Raejus Job
6	Noise Measurements for UAS	Sh Udit Kaul Sh Dinesh Baluraj
7	Training of Personnel Involved in UAS	Dr. Sumeet Susheelan Flt Lt A T Kishore
8	Unmanned Traffic Management	Dr. S N Omkar Flt Lt A T Kishore Capt. Raejus Job Capt. Vinayak Sheshadri Sh Prasanna Ramamurthy

Other members who are willing to provide inputs/take lead in development of working drafts on the above subjects may join the working groups in consultation with the respective group members.

BIS Secretariat would provide all necessary ISO/International standards needed for literature review by the working groups.

It was also discussed to work upon integrating AI aspect into corresponding drone standards and to co-opt experts working in the area so that the work can be taken up further.

Item 4 Creation of New Working Panels under TED 32

4.1 Following new Working Panels have been created in four broad areas of UAVs, comprising all corresponding working group leads, which will take report from the respective subject specific working groups and submit the recommendations and Preliminary Draft to sectional committee for consideration-

Panel – 1	Manufacturing, Operation and Maintenance
Panel – 2	Testing and Evaluation
Panel – 3	Traffic Management
Panel – 4	Training

Item 5 Presentation on UTM (Unmanned Traffic Management) Draft Standard

A presentation on Standardisation of Unmanned Traffic Management was delivered by Capt. Rhejus Jobs and IISc team. Sh. Khatavkar from Airports Authority of India (AAI) informed the committee that AAI is the nodal authority for UTM related matters and requested that suitable guidelines should be incorporated in the standard in consultation with AAI.

The presentation delivered by the working group is attached.

Item 6 Presentation by Sh A V Joshi on New Subjects for Standardisation

Sh. Joshi thanked the committee for co-opting him as new member of the committee and expressed his willingness for providing inputs on new subjects. He further delivered a detailed presentation on AI and Software Integration in standards.

The committee deliberated on same and decided to integrate the reference of the technology suitably in standards, where required. Sh Joshi was further requested to submit a working paper on the aspects discussed for deliberation in the committee. The presentation is attached.

Item 7 International Activities

7.1 The committee noted the programme of work of ISO TC 20/ SC 16 and requested Sh Manish Kumar and Sh Praveen Kumar from DGCA to submit report of visit to Zhuhai, China for participation in plenary meeting of ISO TC 20/ SC 16 to the committee after completion of the visit.

Item 8 Programme of Work

The committee noted that standards published so far by TED 32 are as following-

I**S 18381 (Part 1) : 2023**	Unmanned Aerial Vehicles (UAV) - General Requirements Part 1 Applications other than Military Purposes
IS 19031 : 2023	Unmanned Aircraft Systems – Cybersecurity

IS 17799 : 2022	Unmanned Aerial Vehicles UAV - Drones for Agricultural Purposes
IS 18749 (Part 4) : 2024	Unmanned Aircraft Systems – Vocabulary

Item 9 Date and Place of Next Meeting

The date and place of next meeting will be decided in consultation of the Chairperson, after satisfactory completion of working drafts preparation by the working groups created.

Item 10 Any Other Business

There being no other business, the meeting ended with hearty vote of thanks to the Chair and all members.

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UTM FAST-TRACK

UTM Fast-Track Draft

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Introduction

This document provides a consolidated summary of the discussions, decisions, and action items related to the UTM (Unmanned Traffic Management) system, which is being developed to manage the integration of drones into the national airspace, ensuring safety, efficiency, and scalability between manned and unmanned aircraft. The following sections provide a structured overview of topics, including framework, operational requirements, communication protocols, safety measures, and future implementation strategies.

1. Importance and Challenges of UTM in India

- **Need for UTM**: UTM is essential for integrating drones safely into national airspace. It improves safety by preventing collisions, enhances efficiency in managing traffic, and allows scalable operations between manned and unmanned systems. For instance, UTM can manage the increasing use of delivery drones in urban areas, ensuring they do not interfere with manned aircraft or each other.
- **Challenges**: Implementing UTM in India involves adapting existing Air Traffic Management (ATM) procedures to accommodate drones. Challenges include network limitations like inadequate 4G/5G coverage in rural areas, which affects communication reliability, and ensuring safe operations beyond visual line of sight (BVLOS), which requires robust monitoring and control mechanisms.

2. Framework for UTM System

- **Airspace Management**: UTM involves segregating airspace for different drone operations and dynamically reallocating this space as needed. Civil authorities like the DGCA are responsible for managing the inclusion of

restricted zones like ADIZ (Air Defense Identification Zone) to ensure safety and prevent unauthorized drone activity.

- **Registration and Identification**: All drones must be registered and assigned unique identification numbers, similar to vehicle license plates. BVLOS operations require drones to have transponders, which help track them in real-time and ensure they are visible to air traffic controllers.
- **Communication and Navigation**: Reliable communication is crucial for safe drone operations. UTM uses SATCOM (satellite communication), LORA (Long Range Radio), and HF (High Frequency) communication protocols to maintain contact between drones, ATC, and GCS. These protocols ensure that drones are always monitored and can be controlled effectively, even in areas without cellular network coverage.
- **Weather Monitoring**: Real-time weather data integration, using systems like ATIS (Automatic Terminal Information Service) and METAR (Meteorological Aerodrome Report), helps drone operators make informed decisions. For example, real-time wind speed and direction information can prevent accidents during takeoff or landing.
- **Safety and Security**: Cybersecurity measures are implemented to protect UTM systems from hacking, while failsafe mechanisms like automatic return-to-home actions are in place if communication fails. BVLOS pilots are also trained to handle emergencies effectively.
- **Regulatory Compliance**: UTM must adhere to international regulations set by ICAO (International Civil Aviation Organization) and ensure that all UAS operators comply with these rules through regular audits.
- **Data Management**: Secure storage and sharing protocols are essential for maintaining operational safety and coordinating between different

authorities. Data related to drone flights must be protected to prevent misuse or unauthorized access.

3. Policies and Responsibilities of UAS Operators

- **Authorization and Registration**: UAS operators must register their drones and obtain authorization for specific operations. This ensures accountability and enables proper monitoring by regulatory bodies.
- **Training and Compliance**: Operators are responsible for training drone pilots to follow safety protocols. Compliance with these protocols is regularly verified to ensure safe operations.
- **Incident Management**: Operators must have procedures in place for responding to incidents, such as crashes or unauthorized interference. This includes emergency response actions and reporting requirements.
- **Post Holder Requirements**: Each UAS operator must designate a post holder who is responsible for ensuring regulatory compliance. This role includes managing documentation and overseeing the replacement process if needed.

4. UTM Operational Requirements

- **Airspace Structure**: The airspace for UAV operations is segmented horizontally and vertically to accommodate different types of drone activities. This includes designated zones for commercial and recreational operations, minimizing the risk of conflicts.
- **Operational Concepts**: UTM integrates with existing air traffic management to ensure seamless operations. UTM service providers help facilitate data exchange, while pre-flight planning, including mandatory MET (Meteorological) reports, ensures safe flight paths.

- **Operational Limitations**: UTM currently focuses on managing micro and mini UAVs up to 25 kg. Discussions are ongoing about extending these limits to 150 kg for both visual line of sight (VLOS) and BVLOS operations, which would allow for larger drones to operate safely.

5. Safety and Risk Management

- **Failsafe Mechanisms**: Failsafe actions, such as an automatic return-to-home feature, are implemented to mitigate risks during communication failures. For example, if a drone loses contact with the ground station, it will automatically return to a pre-designated safe location.
- **Separation Standards**: Maintaining vertical separation up to 1000 ft and horizontal separation of 8 nautical miles from airports is crucial for avoiding conflicts with manned aircraft. The potential reduction to 5 nautical miles may be considered if safety data supports such changes.
- **Risk Assessment**: BVLOS operations require pilots to meet stringent safety standards equivalent to those of manned aircraft pilots. This ensures that operators are prepared to handle emergencies effectively and minimize risks.

6. Automation and AI in UTM

- **Role of Automation**: AI and machine learning assist in autonomous guidance systems and deconfliction, which helps prevent collisions between drones. For example, AI algorithms can predict the flight paths of multiple drones and adjust them to avoid conflicts.
- **Levels of Autonomy**: The autonomy of drones is gradually increasing, with future systems expected to be fully automated. This includes automated decision-making for BVLOS operations, reducing the need for constant human oversight.

7. Communication Protocols

- **Radio Frequencies**: Drones are assigned standardized radio call signs to ensure unique identification and prevent confusion with other services, such as military or police operations.
- **Communication Failures**: In case of communication failures, drones can switch to secondary methods, such as using mobile phones for direct messaging between the operator and ATC. This ensures continuous control and reduces the risk of accidents.
- **Integration with ATC**: UTM procedures are designed to integrate smoothly with ATC protocols, ensuring that drones follow standard arrival, departure, and clearance procedures to maintain airspace safety.

8. UTM Implementation Strategy

- **Multi-Organizational Ownership**: The implementation of UTM involves multiple organizations, including the DGCA, Ministry of Civil Aviation, Defense Ministry, and others. Each organization has specific roles, such as managing regulatory compliance or ensuring communication infrastructure is in place.
- **Implementation Phases**: The UTM implementation is divided into short-term, mid-term, and long-term phases. Government subsidies may be provided to private service providers to encourage participation and expedite the rollout of UTM systems.

9. Key Topics Covered in UTM Implementation

- **ICAO Framework and India's UTM Implementation**: The ICAO framework provides the principles and scope for UTM implementation. India has adapted these principles to integrate UTM with existing ATM

systems, analyzing feasibility and addressing challenges unique to the country.

- **Identification and Tracking**: UAVs are color-coded for easy identification—trainer drones are painted yellow, while drones used by defense or carrying hazardous goods are red. Unique identification numbers (UID/UIN) are also used for QCI-certified drones, making it easier to track and regulate them.
- **Weather and Environmental Factors**: Real-time weather data integration helps operators plan safe routes. The use of digital twin models, which simulate real-world environments, allows for detailed analysis of wind patterns and microclimatic conditions, improving safety and operational efficiency.
- **Challenges in UTM Implementation**: Challenges include managing airspace congestion, addressing regulatory hurdles, handling technical complexities, and gaining public acceptance. A phased implementation, collaborative policy development, and public awareness campaigns are some of the strategies proposed to overcome these challenges.
- **International Perspectives**: A comparison of EASA (European Union), Dubai, and FAA (United States) UTM policies reveals differences in regulatory approaches, operational concepts, and stakeholder roles. These international perspectives provide valuable insights for shaping India's UTM policies.

10. Future Directions and Innovations

- **Scaling UTM**: Expanding UTM coverage is necessary to accommodate the growing number of drone operations. This includes integrating advances in UAV technology and supporting future applications like

Advanced Air Mobility (AAM), such as drone taxis or medical supply deliveries.

- **Advanced AI Integration**: AI is being incorporated to predict traffic patterns and manage drones autonomously. For example, AI can analyze historical flight data to predict peak times and suggest optimal flight paths.
- **Urban Air Mobility**: UTM will be expanded to support urban air mobility, which includes flying taxis and personal aerial vehicles. This will require integrating UTM with city infrastructure to ensure safe and efficient airspace use.
- **Cross-Border Operations**: Frameworks are being developed to allow seamless UTM operations across international borders, which will facilitate global drone connectivity for applications like cargo delivery.
- **Advanced Visualization and Swarm Intelligence**: 3D visualization tools will provide better situational awareness for airspace management, while swarm intelligence algorithms will enable coordinated drone operations in complex environments, such as disaster response scenarios.
- **Sustainable Operations**: UTM is also focusing on sustainable solutions, such as integrating green energy sources for drones and developing noise reduction technologies to minimize the impact on urban areas.

11. Economic Impact of UTM in India

- **Job Creation**: The UTM sector is expected to create numerous high-skilled jobs, particularly in technology, operations, and support services. This includes roles in software development, drone operation, and regulatory compliance.
- **Industry Growth**: A robust UTM system will help grow the drone industry in India, potentially contributing billions to the economy. This

growth will be driven by increased use of drones in sectors like agriculture, logistics, and infrastructure inspection.

- **Efficiency Gains**: Implementing UTM will improve efficiency in various sectors. For instance, drones can be used for quicker and more accurate agricultural surveys, reducing the need for manual labor and increasing crop yields.
- **Foreign Investment**: A well-established UTM framework is likely to attract foreign investment, as international companies will see India as a viable market for expanding their drone and aviation technologies.

Conclusion

The importance of creating a robust and adaptable UTM system to safely integrate drones into the national airspace is emphasized. The implementation strategy involves multi-organizational cooperation, ensuring compliance with regulatory requirements, and adopting advanced technologies for communication and automation. The evolving nature of drone operations necessitates continuous updates to the UTM framework, fostering a safe and scalable environment for both commercial and recreational UAV activities.

New Subjects for Standardisation

Shri A V Joshi BIS Member (No.2405753421)

(Vetaran Aeronautical Engineer, Aviator of IAF & Scientist of DRDO B'lore)

Future challenges

- Certification and STD of S/W in BIS Products
- Drone Cyber Security & Forensics
- AI in Drones
- Legal Aspects - Collateral Damage ‘Drone Rule 2021’
- MRO for Drones - Life Cycle Management
- New Role of BIS – In the new world order (4th largest GDP)
- BIS as eyes & ears of Govt against unscrupulous players
- How to Stop dumping cheap items by Chaina
- Formation of Think at National Level-Experts to aid Govt
- Royalty for BIS approved products used by our nasighbours

Certification & STD of S/W in BIS Products

- **Multi Disciplinary Approach – STD of H/W & S/W**
- **On Ground**
  - **Civil**
  - **Mechanical**
  - **Electrical**
  - **Electronics**
  - **Robotics**
  - **Consumer Goods, Toys etc**
  - **Adu muttada Gidvilla BiS mada da STD illa– lika MAGA**
- **In Air**
  - **UAVs (Micro, Mini, Small, SRLR, SRMR, Male & HALE) – CIVIL/MIL**
  - **For Cargo & Passengers**

Certification of S/W & CEH for Drones

- Software is Ubiquitous - Penetratated every walk of life
- Paradigm Shift - H/W cant exist without S/W
- S/W every where - code W/M, Fridge & in Toilet as well
- Embedded S/W Certification
  - STDs followed - DO 178, IEC 61508 (Ind. Electronics), ISO 26262(Automotive)
- CEH Complex Electronic H/W
- Certification similar S/W – Treated like S/W
  - Firm Ware Certification – FPGA (VHDL)
  - STDs followed - DO 254,IEEE 12207
  - S/W testing – Robustness, Stress Testing
- Criticality Levels of based on SSA(System safety Analysys)
  - Level A - Safety Critical & Severity of Damage to lives & Property
  - Level B - Mission Critical
  - Level C – Non Critical

Importance of IV & V for S/W & CEH

- B’lore is the S/W capital of India may be of world also
- These days Coding is taught in Kindergarten
- Routine & mundane coding is done on Chat GPT - Meta 60%
- But who will ensure - QA of millions of lines of Code?
- There comes V&V - Its akin to Pottery - Potter does V&V
- Verification : Are we doing the right thing?
- Validation : Have we done the right thing at the end of the day?
- S/W certification is based on criticality levels - A,B & C
- I V &V – Independent (Generally entrusted to Third Party)
- DGCA Drone Gazette dt 26 Dec 22 - addresses IV & V

Need for Cyber security & Drones forensics

- **S/W is a double edged Sword - its good friend & enemy as well**
- **Perils of unverified / non regulate S/W-Endanger lives & Security**
  - **Trojans - National Security &Privacy Concerns**
  - **Malware - Hacking, Fishing**
  - **Spoofing in UAVs-enticing Drone to follow unauthorised commands e,g Iran**
  - **Converting IOT/Drones into Kamikaze Weapons - Explosion of Pagers by IDF**
  - **Drone Forensics:**
  - **Post mortem of Captured/shot down Drones used for Drugs & Weapons**
  - **It helps in identifying the handler sending weapons &Drugs in J&K**
  - **Way Point & wind directions are a give aways**
  - **Once identified by forensics we can check future infiltration by Drones**

Perils of AI in Drones

- **Gen AI gives autonomy for Drones & that's the prblem**
- **AI malfunction can make Drones go rouge**
- **Rogue Drones Pose hazard & risk to life, property & National security**
- **AI in Swarm Drones is an un stoppable hazard - cant kill all in one shot**
- **Solution :**
- **Go for Supervised AI i.e Co-pilot**
- **self kill capability mandatory to destroy uncontrollable Drones**

Thanks Giving

- I am grateful to BIS, especially Shri Ravindra Beniwal DDRB TED 32 & Prof Dr Omkar,Chairman of TED 32 SC for this opportunity.
- I am also thankful to all Hon, members for a patient hearing.
- Open to Q&A now.
- May God bless all good souls in BIS TED 32 SC