TEJA - M

INDEX

1. Introduction

Welcome to the TEJA-M Drone Maintenance Manual. This comprehensive document is designed to guide OEM personnel through the detailed maintenance procedures required to ensure the safe, efficient, and long-lasting operation of the TEJA-M agricultural drone. Proper maintenance is critical to maintaining performance, ensuring safety, and prolonging the life of the drone.

1.1. Purpose

This manual serves as a guide for maintenance personnel to perform inspections, repairs, and routine maintenance, ensuring the drone's safety, reliability, and efficiency.

1.2. Importance of Regular Maintenance

Regular maintenance is crucial for preventing unexpected failures, ensuring safety, and maintaining the drone's operational efficiency.

1.3. Scope of the Maintenance Manual

The TEJA-M Drone Maintenance Manual is an internal document intended for use by the OEM, Pavaman Aviation Private Limited. It outlines the detailed maintenance procedures, schedules, and responsibilities necessary to ensure the airworthiness and operational readiness of the TEJA-M drone. This manual is not distributed to end-users; instead, a summarized maintenance plan is provided to users, which outlines their responsibilities and the maintenance tasks they are authorized to perform.

1.4. Definitions and Abbreviations

1.4.1. Definitions

1. Airframe: The main structural component of the TEJA-M drone, excluding the propulsion system, payload, and control system.
2. Battery Pack: A collection of cells or batteries connected together to provide the required power for the drone's operations.
3. Component Monitoring: The process of regularly checking and recording the condition and performance of various components to detect signs of wear or potential failure.
4. Control Systems: The systems and components used to control the flight and operation of the drone, including the remote control and onboard flight control systems.
5. Corrective Measures: Actions taken to correct or mitigate issues identified during inspections, maintenance, or following an incident.

6. Crash Recovery: The process of inspecting, analyzing, and repairing a drone after it has crashed.
7. Emergency Procedures: Protocols and actions to be followed in case of an emergency, such as a crash or component failure.
8. Inspection: The act of examining the drone or its components to ensure they are in proper working condition and free of defects or damage.
9. Logbook: A record-keeping book or digital file where maintenance activities, inspections, incidents, and corrective measures are documented.
10. Maintenance Manager: The individual responsible for overseeing and coordinating all maintenance activities, ensuring compliance with maintenance schedules and protocols.
11. Maintenance Technician: Personnel who perform hands-on maintenance tasks, including inspections, repairs, and component replacements.
12. OEM (Original Equipment Manufacturer): The company that designs and manufactures the TEJA-M drone, responsible for providing maintenance guidelines, support, and updates.
13. Root Cause Analysis (RCA): A method used to determine the underlying cause of a failure or problem to prevent recurrence.
14. Spray System: The components of the drone used for agricultural spraying, including the tank, pump, and nozzles.
15. User: The operator or owner of the TEJA-M drone, responsible for performing regular inspections and basic maintenance tasks.

1.4.2. Abbreviations

1. AGL: Above Ground Level
2. ASML: Above Sea Mean Level
3. GCS: Ground Control Station
4. GNSS: Global Navigation Satellite System
5. OEM: Original Equipment Manufacturer
6. RCA: Root Cause Analysis
7. RPA: Remotely Piloted Aircraft
8. RPAS: Remotely Piloted Aircraft System
9. RPM: Revolutions Per Minute
10. SSR: Secondary Surveillance Radar
11. UAS: Unmanned Aerial Vehicle
12. UIN: Unique Identification Number

1.4.3. Detailed Definitions for Maintenance Tasks

1. Daily Maintenance Tasks: Routine checks and cleaning performed by the user after each flight to ensure the drone is in optimal condition for the next use.

2. Weekly Maintenance Tasks: More detailed inspections conducted by the user on a weekly basis to identify and address any developing issues.
3. Monthly Maintenance Tasks: Comprehensive inspections and maintenance activities performed monthly, often requiring the submission of detailed logs to the OEM.
4. Half Yearly Maintenance Tasks: Extensive checks and component tests performed every three months to ensure all systems are functioning correctly and to preemptively address potential failures.
5. Annual Maintenance Tasks: A full inspection and overhaul of the drone, including updating maintenance procedures and training materials, typically performed by the OEM maintenance team.
6. As Needed Maintenance: Maintenance activities that are performed in response to specific issues, incidents, or component failures as they arise.
7. Emergency Procedures: Specific steps to be taken in the event of an emergency, such as a crash, including inspection, reporting, and corrective actions.
8. Inspection and Recovery from a Crash: A thorough examination of the drone and its components following a crash, aimed at identifying damage and determining the cause.
9. Incident Reporting: The process of documenting and reporting any incidents or crashes to the OEM, including all relevant details and findings.
10. OEM Investigation and Support: The involvement of the OEM in investigating incidents, providing guidance on corrective actions, and updating maintenance procedures based on findings.

2. Safety Precautions

2.1. General Safety Guidelines

To ensure safe maintenance procedures, it is essential to follow these safety precautions. Prioritize your safety and the safety of those around you by adhering to the following guidelines:

2.2. Personal Protective Equipment (PPE)

- Always wear safety goggles to protect your eyes from potential debris or splashing fluids.
- Use gloves to shield your hands from sharp edges, electrical components, or chemicals.
- Wear appropriate protective clothing and footwear to minimize the risk of injuries.

2.3. Safety Measures during Maintenance

- Electrical Safety:
  - Always disconnect the power supply before working on electrical components.
  - Use insulated tools to prevent electrical shocks.
- Mechanical Safety:
  - Secure the hexacopter on a stable surface before performing mechanical maintenance.
  - Use proper lifting techniques to avoid strain injuries.
- Chemical Safety:
  - Ensure the work area is well-ventilated when using cleaning solvents or adhesives.
  - Store chemicals in labeled, sealed containers away from heat sources.
- Fire Safety:
  - Keep a fire extinguisher (Class D) nearby when working with batteries or other flammable materials.
  - Avoid charging batteries near flammable materials.
- Environmental Safety:
  - Dispose of used chemicals, batteries, and damaged parts according to local environmental regulations.
  - Avoid spilling chemicals or fuel on the ground.
- Documentation:
  - Record all maintenance activities in the maintenance logbook.
  - Report any anomalies or potential hazards immediately to the OEM.

2.4. Emergency Procedures

- Battery Fire:
  - Immediately use a Class D fire extinguisher designed for lithium-ion battery fires.
  - Evacuate the area and call emergency services.
- Chemical Spill:
  - Evacuate the area and ventilate if necessary.
  - Use appropriate spill containment materials to control and clean the spill.
  - Dispose of materials following local regulations.
- Electrical Shock:
  - Disconnect the power source immediately.
  - Avoid touching the person until the power source is secured.
  - Call for medical assistance and provide first aid if trained to do so.
- Injury:
  - Administer first aid if trained and call for medical help.
  - Report the injury to a supervisor and document the incident.
- Equipment Malfunction:
  - Cease all operations if a critical malfunction occurs.
  - Report the issue to the OEM for further instructions.
  - Do not attempt to repair without proper guidance or training.

3. Maintenance Responsibilities

3.1. User Responsibilities

This section details the specific tasks and duties that the end-user is responsible for. These responsibilities ensure that the TEJA - M hexacopter remains in optimal working condition and helps to prevent any potential issues.

- Daily Inspections:
  - Visual Check: Inspect the hexacopter for any visible damage, wear, or loose components.
  - Battery Check: Ensure that the batteries are charged and show no signs of swelling or damage.
  - Propeller Inspection: Check propellers for cracks, chips, or other signs of damage.
  - Nozzle Inspection: Verify that the nozzles are not clogged and are securely attached.
  - Pipe Check: Inspect the spray system pipes for any leaks or blockages.
  - Firmware Check: Ensure that the firmware is up to date.
- Weekly Inspections:
  - Detailed Component Check: Conduct a more thorough inspection of all components including the frame, motors, and electronics.
  - Calibration: Calibrate the sensors and flight control system.
  - Spray System Maintenance: Clean the nozzles and pipes thoroughly to prevent clogging and ensure even spray distribution.
- Operational Logging:
  - Flight Logs: Maintain a log of each flight including flight duration, any issues encountered, and maintenance performed.
  - Maintenance Logs: Record all maintenance tasks performed, including inspections, cleanings, and parts replacements.
- Routine Cleaning:
  - Surface Cleaning: Wipe down the hexacopter to remove dirt, dust, and pesticide residues.
  - Component Cleaning: Clean individual components such as the propellers, battery contacts, and the spray system.
- Safe Storage:
  - Proper Storage Conditions: Store the hexacopter in a dry, cool place away from direct sunlight and extreme temperatures.
  - Battery Storage: Store batteries at the recommended charge level and in a safe environment to prevent damage.

3.2. OEM Responsibilities

This section outlines the duties and tasks that the Original Equipment Manufacturer (OEM) is responsible for. The OEM's responsibilities are crucial for providing technical support, specialized maintenance, and ensuring the hexacopter's long-term reliability.

- Technical Support:
  - Customer Service: Provide prompt and knowledgeable support to users for troubleshooting and technical issues.
  - Guidance and Training: Offer training sessions and detailed guidance documents for proper maintenance and operation of the hexacopter.
  - Firmware Updates: Release and notify users of any firmware updates, including installation instructions and benefits of the update.
- Annual Inspections:
  - Comprehensive Check: Perform a thorough inspection of the hexacopter, including internal components that are not user-serviceable.
  - Performance Testing: Conduct tests to ensure the hexacopter meets performance standards and specifications.
  - Parts Replacement: Identify and replace any components that show signs of wear or potential failure.
- Warranty and Repairs:
  - Warranty Services: Honor warranty claims for defective components and provide replacements or repairs as necessary.
  - Repair Services: Offer repair services for non-warranty issues at a reasonable cost.
- Documentation and Updates:
  - Manual Updates: Regularly update the maintenance manual with new information, best practices, and procedural changes.
  - Component Specifications: Provide updated specifications and part numbers for replacement components.
- OEM Investigations:
  - Crash Analysis: Investigate reported crashes to determine the cause and provide recommendations or solutions.
  - Issue Resolution: Address any systemic issues identified through user reports and implement corrective actions.
- Proactive Communication:
  - User Notifications: Communicate proactively with users regarding any safety notices, recalls, or important updates.
  - Feedback Mechanism: Implement a feedback system to gather user experiences and improve product and support services continuously.

3.3. Maintenance Personnel Qualifications

This section outlines the necessary qualifications, training, and experience required for personnel responsible for maintaining the TEJA - M hexacopter. Ensuring that maintenance personnel are properly qualified is critical to the safe and efficient operation of the hexacopter.

- Certifications:
  - UAS Maintenance Certification: Maintenance personnel must possess a recognized certification in UAS (Unmanned Aerial Vehicle) maintenance. This ensures they have the fundamental knowledge required to maintain UAS systems.
  - Safety Training Certification: Personnel should also have up-to-date safety training certification relevant to UAS operation and maintenance.
- Experience:
  - Minimum Experience: Maintenance personnel should have at least 2 years of practical experience in UAS maintenance or a related field. This experience should include hands-on work with UAS systems similar to the TEJA - M hexacopter.
  - Specialized Experience: Experience specifically with agricultural UASs and spraying systems is highly desirable, as this will ensure familiarity with the specific needs and potential issues of the TEJA - M.
- Skills:
  - Technical Skills: Proficiency in diagnosing and repairing UAS components, including electronics, mechanical systems, and software.
  - Attention to Detail: Ability to conduct thorough inspections and identify potential issues before they become critical.
  - Record-Keeping: Competence in maintaining detailed maintenance logs and documentation.
- Training:
  - OEM Training: Personnel should complete any training programs provided by the Original Equipment Manufacturer (OEM) for the TEJA - M hexacopter. This includes initial training and any update or refresher courses.
  - Ongoing Education: Maintenance personnel should engage in ongoing education to stay current with the latest UAS technologies and maintenance practices.

3.4. Role Description

- **Maintenance Manager**: A professional role within the customer's organization or an external service provider responsible for overseeing the maintenance activities, ensuring compliance with the maintenance schedule, and coordinating with the OEM as necessary.
- **Maintenance Technician**: A trained individual, either part of the customer's organization or an external service provider, responsible for performing the hands-on maintenance tasks, particularly those that are more technical and require specific expertise.
- **OEM Team**: This refers to the Original Equipment Manufacturer (Pavaman Aviation Private Limited) personnel who provide technical support, perform comprehensive inspections, and conduct non-destructive testing as required. They are also involved in updating maintenance procedures and providing training updates.
- **User**: The end-user or operator of the TEJA - M hexacopter, who is responsible for performing daily, weekly, and monthly maintenance tasks, maintaining the maintenance logbook, and ensuring the hexacopter is sent to the OEM or authorized service centers for more complex maintenance tasks.

4. Maintenance Schedule

4.1. Daily Maintenance

Maintenance Task	Component(s)	Frequency	Responsible Personnel	Description
Clean airframe	Airframe	After each flight	User	Clean dirt and mud from the chassis to prevent buildup and potential damage.
Inspect for cracks	Airframe, Arms	After each flight	User	Visual inspection for any visible cracks or damage.
Inspect battery packs	Battery	After each flight	User	Check for bulges, leaks, and ensure secure connections.
Check tank for leakage	Spray System (Tank)	After each flight	User	Inspect for any signs of leakage or damage.
Clean tank	Spray System (Tank)	After each flight	User	Clean the tank to prevent clogging and contamination.
Check GPS mount	GPS	After each flight	User	Ensure the GPS mount is secure and properly aligned.
Check motors for debris	Motors	After each flight	User	Inspect motors for any debris or obstructions and clean if necessary.
Check landing gear condition	Landing Gear	After each flight	User	Inspect for damage, wear, and secure attachment.
Control check	Control Systems	After each flight	User	Perform functional tests on control systems.
Check Propellers	Propellers	After each flight	User	Perform visual inspection for cracks or chips.

4.2. Weekly Maintenance

Maintenance Task	Component(s)	Frequency	Responsible Personnel	Description
Inspect arm rods	Arm Rods	Weekly	User	Check for cracks, bends, and secure attachment.
Inspect central hub	Central Hub	Weekly	User	Inspect for loose screws and wear.
Inspect canopy	Canopy	Weekly	User	Check for cracks and secure attachment.
Inspect landing gear connectors	Landing Gear Connectors	Weekly	User	Check for secure attachment and wear.
Inspect arm boom	Arm Boom	Weekly	User	Inspect for cracks, bends, and secure attachment.
Inspect motors	Motors	Weekly	User	Perform detailed inspection for wear, vibrations, and overheating.
Inspect propellers	Propellers	Weekly	User	Check for cracks, chips, and balance.
Inspect transmitter	Transmitter	Weekly	User	Ensure proper functionality and secure connection.
Inspect GPS	GPS	Weekly	User	Check for signal integrity and secure mounting.
Inspect battery plate and velcro	Battery Plate, Velcro	Weekly	User	Ensure secure attachment and no wear.
Inspect pneumatic connectors and pipes	Pneumatic Connectors, Pipes	Weekly	User	Check for leaks and secure connections.
Inspect XT 90 connectors	XT 90 Connectors	Weekly	User	Ensure secure connection and no wear.

4.3. Monthly Maintenance

Maintenance Task	Component(s)	Frequency	Responsible Personnel	Description
Submit maintenance logbook	All Components	Monthly	User	Compile and submit detailed maintenance logs to OEM.
Inspect whole spray system	Spray System	Monthly	User	Perform a thorough cleaning and inspection of the spray system.

4.4. Half Yearly Maintenance

Maintenance Task	Component(s)	Frequency	Responsible Personnel	Description
Perform detailed component tests	All Components	Half Yearly	Maintenance Technician, OEM Team	Conduct non-destructive testing on critical components.
Review and analyze maintenance logs	All Components	Half Yearly	Maintenance Manager, OEM team	Analyze maintenance logs for trends and implement preventive measures.

4.5. Annual Maintenance

Maintenance Task	Component(s)	Frequency	Responsible Personnel	Description
Conduct comprehensive inspection	All Components	Annually	OEM Maintenance Team	Perform a full inspection and non-destructive testing on all components.
Update maintenance procedures	Maintenance Procedures	Annually	Maintenance Manager, OEM Team	Review and update maintenance procedures based on analysis and new findings.
Provide training updates	Training Materials	Annually	Training Team	Conduct training sessions for maintenance personnel with updated procedures and best practices.

4.6. As Needed Maintenance

Maintenance Task	Component(s)	Frequency	Responsible Personnel	Description
Perform root cause analysis	Faulty Components	As Needed	Maintenance Manager, OEM Team	Conduct analysis for any component failure or premature withdrawal.
Implement corrective measures	Affected Components	As Needed	Maintenance Technician, Manager, OEM team	Take necessary corrective actions based on root cause analysis and update records.

4.7. Emergency Procedures

Maintenance Task	Component(s)	Frequency	Responsible Personnel	Description
Inspect and recover from a crash	All Components	After Incident	Maintenance Manager, Technician	Conduct a thorough inspection and root cause analysis following a crash or incident. Document findings and corrective actions.
Report incidents to OEM	Incident Reporting	After Incident	User, Maintenance Manager	Submit a detailed report of the incident to OEM with all relevant information and documentation.
OEM investigation and support	All Components	After Incident	OEM Maintenance Team	OEM conducts a detailed investigation, provides support and guidance for corrective actions, and updates maintenance procedures based on findings.

Explanation of Maintenance Schedules:

- Daily Maintenance:
    - Focuses on routine cleaning and basic inspections after each flight to catch immediate issues and maintain cleanliness.
- Weekly Maintenance:
    - Involves more thorough inspections of structural and critical components to identify any emerging issues before they escalate.
- Monthly Maintenance:

    - Ensures detailed inspection and cleaning of major systems, and maintains logs for tracking and reporting purposes.
- Half Yearly Maintenance:
    - Conducts comprehensive tests and analysis of maintenance data to ensure the overall health of the hexacopter and preemptive measures are taken.
- Annual Maintenance:
    - Includes a full-scale inspection and potential replacement of parts to ensure long-term reliability and updates to procedures and training based on the latest findings and best practices.
- As Needed Maintenance:
    - Addresses specific issues as they arise, ensuring targeted and effective responses to any problems detected during routine operations.
- Emergency Procedures:
    - Provides a structured response to incidents, ensuring thorough investigation, reporting, and corrective actions are taken promptly.

5. Maintenance Procedures

5.1. Effect of In-Service Wear on Critical Components

This section elaborates on inspection, maintenance, and troubleshooting of the critical components in the TEJA-M drone. It also provides specific actions, frequencies, and key precautions to avoid operational risks.

5.1.1. Critical Components

- Arm Joint
- Landing Gear Connector
- T Joint Connector
- Inner Arm
- Outer Arm
- Main Frame
- Vertical Landing Gear
- Horizontal Landing Gear
- Motors
- Propellers

Critical components are to be inspected for in-service wear and tear after every flight.

List of PSEs:

S.No	Name of the Component
1	Arm Joint
2	Landing Gear Connector
3	T Joint Connector
4	Inner Arm
5	Outer Arm
6	Main Frame
7	Vertical Landing Gear
8	Horizontal Landing Gear
9	Propeller Hub

Periodic inspection of PSEs are necessary to check looseness and integrity after every flight.

5.2. User Removable Components

- Propellers

- Pipes of Spray System
- Nozzles
- Velcro Straps
- Battery Plate

5.3. Propellers

Propellers are critical components of the TEJA-M airframe, impacting flight stability and efficiency. Regular maintenance, including inspection, cleaning, and replacement, is essential to ensure optimal performance.

5.3.1. Inspection

Frequency: Before each flight and after any significant impact or rough landing.

Procedure:

- Visually inspect each propeller for cracks, chips, or deformations.
- Check for any loose or missing screws on the propeller clips and blades.
- Rotate each propeller manually to ensure they spin freely without resistance or wobbling.
- Inspect the propeller clips for wear or damage.

When Not to Replace:

- If the propeller shows no visible damage or wear.
- If the propeller spins freely and smoothly without any wobbling or noise.

5.3.2. Cleaning

Frequency: After each flight, particularly if the drone has been used in dusty or muddy conditions.

Procedure:

- Use a soft, lint-free cloth to wipe down each propeller.
- For stubborn dirt or mud, use a mild soap solution and a soft brush.
- Avoid using harsh chemicals or abrasive materials that can damage the propeller surface.
- Dry the propellers thoroughly with a clean cloth before reassembly.

When Not to Replace:

- If cleaning restores the propeller to its original condition without any damage or wear.

5.3.3. Replacement

Frequency:

- Every 500 flight hours or immediately if damage is detected.
- After any significant impact or if performance issues are noticed during flight.

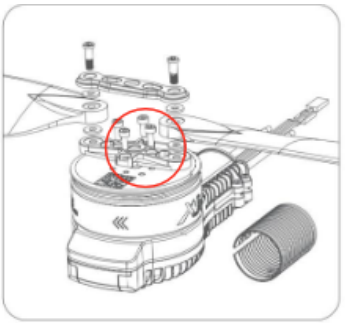
Procedure:

Prepare Tools and Materials:

- 2.5mm Allen key
- New propeller and hub (if needed)
- Loctite 243 (thread fastener)
- Clean cloth or wipes

Remove Old Propellers:

- Use the 2.5mm Allen key to gently unscrew the 4 M3 x 8 screws on the motor propeller hub.
- Carefully remove the old propeller from the motor.



Clean and Apply Loctite:

- Clean the screws and threads with a cloth or wipe.
- Apply Loctite 243 to the threads of each screw to secure them.

Install New Propeller:

- Place the new propeller and hub onto the motor.
- Align the propeller correctly with the motor direction.

Reattach the Screws:

- Using the 2.5mm Allen key, screw in the 4 M3 screws into the propeller hub.
- Tighten each screw securely, ensuring the propeller is firmly mounted.

Check Alignment:

- Ensure the propeller is facing the correct direction and is tightly attached to the motor.

Final Check:

- Verify that all screws are tight and secure.

When to Replace:

- If cracks, chips, or significant deformations are found.
- If the propeller does not spin freely or shows signs of imbalance.
- If there is visible wear on the propeller clips or they do not secure the propeller properly.

5.3.4. Cleaning and Replacement Materials:

- Mild soap solution for cleaning.
- Soft brush for dirt removal.
- Lint-free cloth for drying.
- Appropriate propeller and clip replacements as supplied by Pavaman Aviation Private Limited.

5.3.5. Maintenance Schedule Summary:

- Daily (Pre-Flight & Post-Flight): Inspect propellers.
- After Each Flight: Clean propellers.
- Every 500 Flight Hours or As Needed: Replace propellers.

5.3.6. Notes:

- Only use propellers and clips recommended and supplied by Pavaman Aviation Private Limited.
- Record all inspections, cleaning, and replacements in the maintenance logbook.
- If uncertain about the condition of a propeller, err on the side of caution and replace it.

5.4. Pipes of Spray System

The pipes of the spray system are essential for delivering pesticides or other liquids during drone operations. Regular maintenance is crucial to ensure the system functions correctly and efficiently.

5.4.1. Inspection

Frequency: Before each flight and after any significant impact or rough landing.

Procedure:

- Visually inspect all pipes for cracks, leaks, or any signs of wear.
- Check for any blockages or obstructions within the pipes.
- Ensure that all connections between the pipes and other components (e.g., nozzles, pumps) are secure and leak-free.
- Inspect for any signs of corrosion, particularly if the drone has been used with corrosive substances.

When Not to Replace:

- If the pipes show no visible damage or wear.
- If there are no leaks and all connections are secure.
- If there are no blockages or obstructions within the pipes.

5.4.2. Cleaning

Frequency: After each flight, especially if the drone has been used with sticky or corrosive liquids.

Procedure:

- Flush the pipes with clean water immediately after use to prevent residue buildup.
- For more thorough cleaning, use a mild detergent solution to rinse the pipes, followed by a flush with clean water.
- Use a soft brush or pipe cleaner to remove any stubborn residue or blockages.
- Ensure the pipes are completely dry before storage or next use to prevent mold or bacterial growth.

When Not to Replace:

- If cleaning restores the pipes to their original condition without any damage or wear.
- If there are no residual blockages or obstructions after cleaning.

5.4.3. Replacement

Frequency:

- Every 6500 flight hours or immediately if damage or severe wear is detected.
- If any leaks or persistent blockages are identified during inspection or cleaning.

Procedure:

- Tools Required: Appropriate wrenches or pliers, replacement pipes as supplied by Pavaman Aviation Private Limited.
- Steps:
    1. Disconnect the affected pipe from the spray system.
    2. Remove the pipe carefully to avoid spilling any residual liquid.

3. Install the new pipe, ensuring it matches the specifications provided by Pavaman Aviation Private Limited.
4. Secure all connections tightly to prevent leaks.
5. Test the new pipe by running clean water through the system to ensure there are no leaks or blockages.
6. Record the replacement in the maintenance logbook, noting the date and the reason for replacement.

When to Replace:

- If cracks, leaks, or significant wear are found.
- If blockages cannot be removed through cleaning.
- If there is visible corrosion or damage that affects the pipe's integrity.

5.4.4. Cleaning and Replacement Materials:

- Clean water and mild detergent for cleaning.
- Soft brush or pipe cleaner for removing blockages.
- Replacement pipes as supplied by Pavaman Aviation Private Limited.

5.4.5. Maintenance Schedule Summary:

- Daily (Pre-Flight & Post-Flight): Inspect pipes.
- After Each Flight: Clean pipes.
- Every 6500 Flight Hours or As Needed: Replace pipes.

5.4.6. Notes:

- Only use pipes recommended and supplied by Pavaman Aviation Private Limited.
- Record all inspections, cleaning, and replacements in the maintenance logbook.
- If uncertain about the condition of a pipe, err on the side of caution and replace it.

5.5. Nozzles

The nozzles are critical components of the spray system, responsible for distributing the pesticide or other liquids evenly. Regular maintenance ensures optimal performance and prevents clogging or uneven spraying.

5.5.1. Inspection

Frequency: Before each flight and after any significant impact or rough landing.

Procedure:

- Visually inspect the nozzles for any signs of clogging, wear, or damage.
- Check for uniform spray patterns by running water or a cleaning solution through the nozzles.
- Ensure that the nozzles are securely attached to the spray system.

When Not to Replace:

- If there are no visible signs of damage or wear.
- If the spray pattern is uniform and unobstructed.

5.5.2. Cleaning

Frequency: After each flight, especially if the drone has been used with sticky or viscous liquids.

Procedure:

- Remove the nozzles carefully from the spray system.
- Soak the nozzles in warm, soapy water or a mild cleaning solution for several minutes.
- Use a soft brush or a nozzle cleaning tool to remove any residue or blockages.
- Rinse the nozzles thoroughly with clean water.
- Reattach the nozzles securely to the spray system.
- Test the nozzles by running clean water through them to ensure there are no blockages.

When Not to Replace:

- If cleaning restores the nozzles to their original condition without any blockages or wear.

5.5.3. Replacement

Frequency:

- Every 6500 flight hours or immediately if damage or severe wear is detected.
- If persistent blockages or uneven spray patterns are identified during inspection or cleaning.

Procedure:

This process applies to switching between **flathead and centrifugal nozzles** or replacing old nozzles with identical ones.

Step 1: Remove Existing Nozzle

1. **Detach the nozzle**:

- Use a **2.5 mm Allen key** to remove the **four M3 x 16 screws** securing the nozzle to the mounting plate.

2. **Disconnect connections**:
   - For a **flathead nozzle**, disconnect the pipes from the **1288 pneumatic connector**.
   - For a **centrifugal nozzle**, disconnect the **power and signal cable** and the **8 mm pipe** from the **1288 pneumatic connector**.

Step 2: Install the New Nozzle

1. **Mount the new nozzle**:
   - Align the new nozzle with the mounting plate.
   - Secure it using **M3 x 16 screws** and tighten with a **2.5 mm Allen key**.
2. **Reconnect connections**:
   - For a **flathead nozzle**, connect the **pipes** to the **1288 pneumatic connector**.
   - For a **centrifugal nozzle**, connect the **8 mm pipe** to the **1288 pneumatic connector** and plug in the **power and signal cable**.

Step 3: Handle Unused Connections

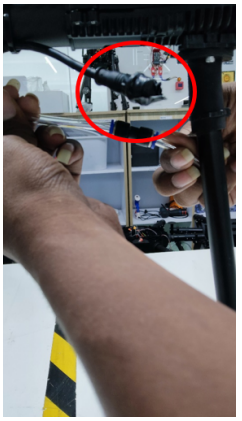
1. If **installing a flathead nozzle**, wrap the **centrifugal nozzle power cable connector** with **PVC tape** to protect it from environmental exposure.

Step 4: Secure the Setup

1. For a **centrifugal nozzle**, secure the **power cable** with **insulation tape** after connection to ensure safety and reliability.







Notes:

- Always inspect the nozzle for damage or wear before installation.

- Replace nozzles if the spray pattern is uneven or obstructed, or if cleaning fails to remove blockages.
- Ensure all connections are tight to prevent leaks or power failures during operation.

When to Replace:

- If there are visible signs of damage or wear.
- If blockages cannot be removed through cleaning.
- If the spray pattern is uneven or obstructed.

5.5.4. Cleaning and Replacement Materials:

- Warm, soapy water or a mild cleaning solution for cleaning.
- Soft brush or nozzle cleaning tool for removing blockages.
- Replacement nozzles as supplied by Pavaman Aviation Private Limited.

5.5.5. Maintenance Schedule Summary:

- Daily (Pre-Flight & Post-Flight): Inspect nozzles.
- After Each Flight: Clean nozzles.
- Every 50 Flight Hours or As Needed: Replace nozzles.

5.6. Velcro Straps

Velcro straps are used to secure the batteries with a battery plate. They must be maintained to ensure they provide a secure hold during operation.

5.6.1. Inspection

Frequency: Before each flight and as needed.

Procedure:

- Check the velcro straps for any signs of wear, fraying, or loss of adhesion.
- Ensure that the straps hold components securely without slipping.

When Not to Replace:

- If there are no signs of wear or loss of adhesion.
- If the straps hold components securely.

5.6.2. Replacement

Frequency:

- Every 6500 flight hours or immediately if significant wear or loss of adhesion is detected.

Procedure:

- Tools Required: Replacement velcro straps as supplied by Pavaman Aviation Private Limited.
- Steps:
    1. Remove the worn or damaged velcro strap.
    2. Install the new velcro strap, ensuring it matches the specifications provided by Pavaman Aviation Private Limited.
    3. Secure the new strap tightly to ensure it provides a secure hold.
    4. Record the replacement in the maintenance logbook, noting the date and the reason for replacement.

When to Replace:

- If there are visible signs of wear or fraying.
- If the strap loses its adhesive properties and does not hold securely.

5.6.3. Maintenance Schedule Summary:

- Daily (Pre-Flight & Post-Flight): Inspect velcro straps.
- Every 100 Flight Hours or As Needed: Replace velcro straps.

5.7. Battery Plate

The battery plate secures the battery during operation. It must be maintained to ensure the battery remains in place and is not subject to excessive movement or vibration.

5.7.1. Inspection

Frequency: Before each flight and after any significant impact or rough landing.

Procedure:

- Check the battery plate for any signs of cracks, wear, or damage.
- Ensure that the battery plate holds the battery securely without movement.
- Inspect the mounting points and fasteners to ensure they are secure and not loose.

When Not to Replace:

- If there are no signs of damage or wear.
- If the battery plate holds the battery securely.

5.7.2. Replacement

Frequency:

- Every 6500 flight hours or immediately if significant damage or wear is detected.

Procedure:

- Tools Required: Appropriate tools to remove and install the battery plate, replacement battery plate as supplied by Pavaman Aviation Private Limited.
- Steps:
    1. Remove the damaged or worn battery plate.
    2. Install the new battery plate, ensuring it matches the specifications provided by Pavaman Aviation Private Limited.
    3. Secure all mounting points and fasteners tightly to prevent movement or vibration.
    4. Test the battery plate by installing the battery and ensuring it is held securely.
    5. Record the replacement in the maintenance logbook, noting the date and the reason for replacement.

When to Replace:

- If there are visible signs of cracks or damage.
- If the plate does not hold the battery securely.
- If mounting points or fasteners are worn or damaged.

5.8. Non-User Removable Components

1. Arm Rods
2. Central Hub
3. Landing Gear
4. Arm Sleeves
5. Landing Gear Connectors
6. Arm Boom
7. Canopy
8. Motors
9. Transmitter
10. GPS
11. Pneumatic Connectors, Pipes
12. XT 90 Connectors
13. Tank, Pump

5.8.1. Inspection and Monitoring

1. Arm Rods

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after any significant impact or rough landing.
- Procedure:
    - Visually inspect for any signs of cracks, bends, or wear.
    - Check for secure attachment to the central hub and motors.

Monitoring:

- Record any observations of wear or damage in the maintenance logbook.
- Note any unusual vibrations or noises during flight operations.

Actions by OEM:

- If cracks, significant bends, or wear are detected, the OEM should replace the arm rods or after 6500 hours of operation.
- Conduct a thorough inspection and stress test of the replaced component to ensure airworthiness.

2. **Central Hub**

Inspection:

Frequency: Every week or 50 flight hours (whichever comes first) or after any significant impact.

- Procedure:
    - Check for structural integrity, including any cracks or deformations.
    - Inspect mounting points for secure attachment of arm rods and other components.

Monitoring:

- Record observations of any structural issues in the maintenance logbook.
- Note any difficulty in maintaining stability during flight.

Actions by OEM:

- Replace the central hub if any structural compromises are found or after 6500 hours of operation.
- Perform stress tests on the replaced hub to ensure overall airframe stability.

3. **Landing Gear**

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after rough landings.
- Procedure:
    - Inspect for cracks, bends, or wear.
    - Ensure secure attachment to the airframe.

Monitoring:

- Document any signs of wear or damage in the maintenance logbook.
- Report any issues with landing stability.

Actions by OEM:

- Replace landing gear components showing damage or excessive wear or after 8500 landings of operation.
- Test the airframe's balance and stability post-replacement.

4. **Arm Sleeves**

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after significant impacts.
- Procedure:
    - Check for cracks or wear.
    - Ensure secure attachment to the arm rods and central hub.

Monitoring:

- Record any signs of wear or damage in the maintenance logbook.

Actions by OEM:

- Replace arm sleeves if any cracks or significant wear are detected or after 6500 hours of operation.
- Ensure proper fit and secure attachment after replacement.

5. **Landing Gear Connectors**

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after rough landings.
- Procedure:
    - Inspect for any signs of wear or damage.
    - Ensure connectors are securely attached.

Monitoring:

- Record observations of any issues in the maintenance logbook.
- Note any problems with landing gear stability.

Actions by OEM:

- Replace connectors if any damage or wear is found or after 8500 landings of operation.
- Test the landing gear function post-replacement.

6. **Arm Boom**

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after significant impacts.
- Procedure:

- Check for structural integrity, including cracks or bends.
- Ensure secure attachment to the central hub and motor mounts.

Monitoring:

- Record any signs of structural issues in the maintenance logbook.
- Report any unusual vibrations or flight instability.

Actions by OEM:

- Replace arm booms if any structural compromises are found or after 6500 hours of operation.
- Conduct a thorough stress test on the replaced component to ensure airworthiness.

7. Canopy

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after any significant impact.
- Procedure:
  - Inspect for cracks, wear, or damage.
  - Ensure secure attachment to the airframe.

Monitoring:

- Record observations of any damage or wear in the maintenance logbook.

Actions by OEM:

- Replace the canopy if any cracks or significant wear are detected or after 6500 hours of operation.
- Ensure proper fit and secure attachment post-replacement.

8. Motors

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after rough landings.
- Procedure:
  - Check for debris or obstructions.
  - Inspect for signs of wear or overheating.
  - Ensure secure attachment to the arm rods.

Monitoring:

- Record any signs of wear, damage, or overheating in the maintenance logbook.

- Report any issues with motor performance.

Actions by OEM:

- Replace motors showing signs of significant wear or overheating or after 6500 hours of operation.
- Test motor performance post-replacement to ensure optimal functionality.

9. Transmitter

Inspection:

- Frequency: Every 50 flight hours or weekly (whichever comes first).
- Procedure:
    - Check for physical damage.
    - Test functionality and range.

Monitoring:

- Document any issues with the transmitter in the maintenance logbook.

Actions by OEM:

- Replace the transmitter if it shows any signs of physical damage or functionality issues or after 6500 hours of operation.
- Test the new transmitter to ensure proper communication with the drone.

10. GPS

Inspection:

- Frequency: Every week or 50 flight hours (whichever comes first) or after significant impacts.
- Procedure:
    - Inspect for physical damage.
    - Test for proper functionality and signal reception.

Monitoring:

- Record any issues with GPS functionality in the maintenance logbook.

Actions by OEM:

- Replace the GPS unit if it shows any signs of damage or signal issues or after 6500 hours of operation.
- Test the new GPS unit to ensure accurate positioning and signal strength.

11. Pneumatic Connectors, Pipes (Non-removable parts)

Inspection:

- Frequency: Every 50 flight hours or weekly (whichever comes first).
- Procedure:
    - Check for leaks, cracks, or blockages.
    - Ensure all connections are secure.

Monitoring:

- Record any signs of wear or leaks in the maintenance logbook.

Actions by OEM:

- Replace pneumatic connectors and pipes if any leaks, cracks, or blockages are found or after 6500 hours of operation.
- Test the spray system post-replacement to ensure proper functionality.

12. XT 90 Connectors

Inspection:

- Frequency: Every 50 flight hours or weekly (whichever comes first).
- Procedure:
    - Check for signs of wear, corrosion, or damage.
    - Ensure secure and tight connections.

Monitoring:

- Document any signs of wear or damage in the maintenance logbook.

Actions by OEM:

- Replace XT 90 connectors if any wear, corrosion, or damage is detected or after 6500 hours of operation.
- Test the electrical connections post-replacement to ensure proper functionality.

13. Tank, Pump

Inspection:

- Frequency: Every week or after each use.
- Procedure:
    - Check for leaks, cracks, or wear in the tank.
    - Inspect the pump for proper operation and signs of wear.

Monitoring:

- Record any signs of leaks or pump performance issues in the maintenance logbook.

Actions by OEM:

- Replace the tank if any leaks or cracks are found or after 6500 hours of operation.
- Replace the pump if it shows signs of wear or performance issues or after 6500 hours of operation.
- Test the tank and pump post-replacement to ensure proper functionality.

6. Maintenance Logs and Documentation

6.1. Maintenance Logbook

Maintaining a detailed logbook is essential for tracking the maintenance history of the TEJA-M drone. The logbook should include entries for all routine inspections, repairs, replacements, and any other maintenance activities. This helps in identifying recurring issues, ensuring compliance with maintenance schedules, and maintaining the overall reliability and safety of the drone.

6.1.1. Logbook Format

The maintenance logbook should have the following columns to capture all necessary details:

Maintenance Frequency	Maintenance Task	Component (s)	Responsible Personnel	Description
Daily	Clean airframe	Airframe	User	Clean dirt and mud from the chassis to prevent buildup and potential damage.
	Inspect for cracks	Airframe, Arms	User	Visual inspection for any visible cracks or damage.
	Inspect battery packs	Battery	User	Check for bulges, leaks, and ensure secure connections.
	Check tank for leakage	Spray System (Tank)	User	Inspect for any signs of leakage or damage.
	Clean tank	Spray System (Tank)	User	Clean the tank to prevent clogging and contamination.
	Check GPS mount	GPS	User	Ensure the GPS mount is secure and properly aligned.
	Check motors for debris	Motors	User	Inspect motors for any debris or obstructions and clean if necessary.
	Check landing gear condition	Landing Gear	User	Inspect for damage, wear, and secure attachment.
	Control check	Control Systems	User	Perform functional tests on control systems.

Weekly	Inspect arm rods	Arm Rods	User	Check for cracks, bends, and secure attachment.
	Inspect central hub	Central Hub	User	Inspect for loose screws and wear.
	Inspect canopy	Canopy	User	Check for cracks and secure attachment.
	Inspect landing gear connectors	Landing Gear Connectors	User	Check for secure attachment and wear.
	Inspect arm boom	Arm Boom	User	Inspect for cracks, bends, and secure attachment.
	Inspect motors	Motors	User	Perform detailed inspection for wear, vibrations, and overheating.
	Inspect propellers	Propellers	User	Check for cracks, chips, and balance.
	Inspect transmitter	Transmitter	User	Ensure proper functionality and secure connection.
	Inspect GPS	GPS	User	Check for signal integrity and secure mounting.
	Inspect battery plate and velcro	Battery Plate, Velcro	User	Ensure secure attachment and no wear.
	Inspect pneumatic connectors and pipes	Pneumatic Connectors, Pipes	User	Check for leaks and secure connections.
	Inspect XT 90 connectors	XT 90 Connectors	User	Ensure secure connection and no wear.
Monthly	Submit maintenance logbook	All Components	User	Compile and submit detailed maintenance logs to OEM.
	Inspect whole spray system	Spray System	User	Perform a thorough cleaning and inspection of the spray system.

Half Yearly	Perform detailed component tests	All Components	Maintenance Technician	Conduct non-destructive testing on critical components.
	Review and analyze maintenance logs	All Components	Maintenance Manager	Analyze maintenance logs for trends and implement preventive measures.
Annual	Conduct comprehensive inspection	All Components	OEM Maintenance Team	Perform a full inspection and non-destructive testing on all components.
	Update maintenance procedures	Maintenance Procedures	Maintenance Manager, OEM Team	Review and update maintenance procedures based on analysis and new findings.
	Provide training updates	Training Materials	Training Team	Conduct training sessions for maintenance personnel with updated procedures and best practices.
As Needed	Perform root cause analysis	Faulty Components	Maintenance Manager, OEM Team	Conduct analysis for any component failure or premature withdrawal.
	Implement corrective measures	Affected Components	Maintenance Technician, Manager	Take necessary corrective actions based on root cause analysis and update records.
Emergency	Inspect and recover from a crash	All Components	Maintenance Manager, Technician	Conduct a thorough inspection and root cause analysis following a crash or incident. Document findings and corrective actions.
	Report incidents to OEM	Incident Reporting	User, Maintenance Manager	Submit a detailed report of the incident to OEM with all relevant information and documentation.
	OEM investigation and support	All Components	OEM Maintenance Team	OEM conducts a detailed investigation, provides support and guidance for corrective actions, and updates maintenance procedures based on findings.

Sample Format for Emergency Maintenance

Emergency Incident Report

1) Incident Details
    - Date and Time of Incident:
    - Location of Incident:
    - Weather Conditions:
    - Hexacopter Serial Number:
    - Flight Mission Description:
2) Description of Incident

- Type of Incident: (e.g., crash, component failure, loss of control, etc.)
- Detailed Description of Incident:
    - What Happened: (Provide a detailed account of the events leading up to, during, and after the incident)
    - Immediate Actions Taken: (Describe any immediate actions taken by the user or maintenance personnel to manage the situation)

3) Damage Assessment

- Physical Damage:
    - Chassis:
    - Arms:
    - Propellers:
    - Motors:
    - Battery:
    - Spray System:
    - Control Systems:
    - GPS:
    - Landing Gear:
- Other Components:
    - (List any other components that were damaged)

4) Root Cause Analysis

- Initial Observations:
    - (Describe any preliminary findings or suspicions regarding the cause of the incident)
- Detailed Analysis:
    - (Include detailed analysis conducted by maintenance personnel or technicians to determine the root cause of the incident)

5) Corrective Actions Taken

- Immediate Corrective Actions:
    - (Describe any immediate corrective actions taken following the incident)
- Long-term Corrective Measures:

- (Outline any long-term measures planned or implemented to prevent recurrence of the incident)

6) Recommendations

- User Recommendations:
  - (Provide any recommendations from the user or maintenance personnel for preventing future incidents)
- OEM Recommendations:
  - (Include any requests or recommendations for the OEM, such as changes to maintenance procedures, component upgrades, additional training, etc.)

7) Additional Information

- Flight Data: (Attach any relevant flight data logs, telemetry, or video footage)
- Photographs: (Attach photographs of the damaged hexacopter and components)
- Witness Statements: (Include statements from any witnesses or operators involved)

8) Contact Information

- Submitted by:
  - Name:
  - Title:
  - Contact Information:
- User Contact Information:
  - Name:
  - Company/Farm:
  - Contact Number:
  - Email:
- Maintenance Manager Contact Information:
  - Name:
  - Title:
  - Contact Number:
  - Email:

Acknowledgement

I, [Name], hereby confirm that the information provided in this report is accurate and complete to the best of my knowledge.

Signature:

Date:

OEM Response Section (To be filled out by OEM)

- OEM Representative:
- Title:
- Date of Response:
- Response Summary:
    - (Provide a summary of the OEM's response, including any actions to be taken, support provided, or changes recommended)

6.1.2. Example Entries

S. No.	Date	Check for Loose Screws	Inspect Transmitter	Inspect Battery Packs for Bulges or Leakage	Cleaning of Whole Spray System	Inspector Name & Signature	Remarks
1	2024-06-01	All screws checked and tightened. No issues found.	Transmitter functioning correctly. No issues found.	One battery pack found swollen, replaced with a new pack.	System flushed and cleaned. Nozzles were slightly clogged, cleaned and now functioning properly.	John Smith	Noticed minor wear on the landing gear, should monitor for future replacement.
2	2024-07-01	Two screws on the landing gear were loose, tightened them.	Transmitter display flickering, recalibrated and issue resolved.	Battery packs in good condition.	System cleaned, no issues found.	Jane Doe	Suggested to check landing gear more frequently due to repeated issues.
3	2024-08-01	All screws checked and tightened. No issues found.	Transmitter functioning correctly. No issues found.	Battery packs in good condition.	System cleaned, minor clogging in nozzles resolved.	John Smith	None

4	2024-09-01	One screw on the arm rod was loose, tightened.	Transmitter joystick slightly stiff, lubricated and now functioning smoothly.	Battery packs in good condition.	System flushed and cleaned. No issues found.	Jane Doe	Monitor joystick stiffness in future inspections.
5	2024-10-01	All screws checked and tightened. No issues found.	Transmitter functioning correctly. No issues found.	One battery pack slightly bulging, replaced with a new pack.	System cleaned, no issues found.	John Smith	Noticed minor wear on the arm sleeves, should monitor for future replacement.

6.2. Operations Logbook

The operations logbook records all flights, including routine operations and any anomalies or incidents.

Operation logbook format

UIN: _____
Serial No. : _____

Sr. No.	Date	PIC	Purpose of Flight	Name of Payload	Location			Time Up	Time Down	Duration	Weather Condition	Remarks	Signature
					Place	Latitude	Longitude						

6.3. Component Monitoring Records

A robust Component Performance Monitoring System, identifying root causes of component failures, deficiencies and implementing corrective measures is considered essential to improve the Product Safety and Reliability in Aviation. A Component Performance Monitoring System is designed with the aim of meeting the objective mentioned above.

Procedure

1. Every failure, replacement of, premature withdrawal of component, crash, damage is data point, hence it is recorded to be recorded meticulously. There must be a system to get this data from the users to the manufacturer. Instructions to the user for sending this data must be available in the Flight/Maintenance manual.
2. Associated information regarding drone life, component life, name, specs, etc. of affected component, date/hours since installed, are recorded.
3. Root causes analysis of cause of failure/ premature withdrawal is attempted by the manufacturer, if not possible, details are sent to the manufacturer.
4. On the basis of root cause the causes of failures are bucketed in different categories.
5. The max cause factors (Causes which lead to maximum number of failures) identified
6. Are further analyzed and a corrective measure which could be implemented at manufacturers level are implemented, else the same is referred to component OEM, whose recommendations are adopted.
7. The same measures are adopted for the next highest cause factors. Once these measures are adopted, continually, over a period of time the product, safety and reliability would be considerably improved.

Conclusion

Continual Component Performance Monitoring followed by corrective actions would lead to improved safety and reliability of Drone operations.

6.3.1. Component Monitoring Records Format

Inspection Records

Sr. No.	Component Name	Date of Defect	Component Hours	Cumulative Failures	Root Cause Analysis	Corrective Measures

1	Motor XYZ (10 KV)	2024-10-18	120 Hours	2	Overheating	Applied thermal paste

Replacement Records

Sr. No.	Component Name	Date of Replacement	Replaced By	Reason for Replacement	Old Serial Number	New Serial Number
1	Battery Pack (6S)	2024-10-18	Maintenance Team	Swelling detected	BP12345	BP67890

Note

1. **User Responsibilities**
   - Perform only visual inspections and basic tightening checks as specified in the maintenance guidelines.
   - Report any major cracks, failures, or abnormal performance to **Pavaman Aviation Private Limited**.
2. **Manufacturer's Role**
   - Address root cause analysis and corrective measures for failures beyond user capabilities.
   - Provide feedback and updates to enhance component monitoring practices.
3. **Critical Observations**
   - Components such as **propellers**, **motors**, **battery packs**, and **radar systems** require priority monitoring due to their criticality in ensuring flight safety.

6.3.2. Component Monitoring Summary Table

Component	Parameters to Check	Frequency	Method
Propellers	Cracks, deformation, alignment	Pre-/Post-Flight, Weekly	Visual inspection, balance tool
Motors	Vibrations, noise, overheating	Post-Flight, Weekly	Diagnostics, thermal gun, manual rotation
Battery Pack	Voltage, temperature, charge cycle	Pre-/Post-Flight, Monthly	Regularly follow battery charging , discharging and storage safety protocols, physical inspection
Radar	Calibration, range accuracy	Pre-Flight, Monthly	Visual inspection, manual tightening
Obstacle Avoidance Radar	Calibration, alignment	Pre-Flight, Monthly	Visual inspection, manual tightening
Landing Gear	Cracks, fastener tightness	Pre-/Post-Flight, Monthly	Visual inspection, manual tightening
Pipes of Spray System	Clogs, leaks	Pre-/Post-Flight	Visual inspection, water flow test
Nozzles	Blockages, spray patterns	Post-Flight, Weekly	Visual inspection, cleaning tools
Velcro Straps	Wear, looseness	Pre-/Post-Flight	Manual check, replace if necessary
Battery Plate	Cracks, secure fitting	Pre-/Post-Flight	Visual and manual inspection

6.3.3. Inspection Records

Sample Daily / Post-Flight Checks

S. No.	Date	Clean chassis for mud and dirt	Inspect chassis for cracks	Inspect battery packs for bulges or leakage	Check tank for leakage	Tank cleaning	Check the GPS mount	Check motors for debris and obstru-ctions	Check landing gear condition	Controls check	Remarks
1											
2											
3											
4											
5											
6											
7											
8											
9											

Sample Weekly / 50-hour Checks

Date					
Sr.	**Location Inspected**	**Condition**	**Actions Required/Taken**	**Inspector Name & Signature**	**Notes**
1	Arm Rods				
2	Central Hub				
3	Landing Gear				
4	Arm Sleeves				
5	Landing Gear Connectors				
6	Arm Boom				
7	Canopy				
8	Motors				
9	Propeller				
10	GPS				
11	Battery plate, velcro				
12	Pneumatic connectors, Pipes				
13	XT 90 connectors				
14	Tank , Pump, Nozzles				

Sample Monthly Checks

S. No.	Date	Check for loose screws of PSEs	Inspect transmitter & Critical Components	Cleaning of whole spray system	Remarks
1					
2					

Sample Component Monitoring Records

Sr. No.	Name of Component with specifications	Date of Defect	Component hours at defect	Cumulative failure (numbers)	Root Cause Analysis (Reason for defect)	Corrective Measure Implemented
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

6.3.4. Replacement Records

Keep track of component replacements to ensure maintenance history is well-documented. The replacement records are mentioned in the maintenance logbook and are recorded in the same.

Sr. No.	Name of Component with specifications	Date of Defect	Replaced by	Reason for replacement	Old component serial number	New Component Serial Number
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

6.4. Monthly Submission of logs and maintenance record

Ensure regular review of maintenance and operations logs to maintain high standards of performance and safety.

6.4.1. Submission Process

Steps

1. Compile Logbooks: Gather all operations, inspection, and replacement records for the month.
2. Review by User: The user reviews entries for accuracy and completeness.
3. Submit to OEM:

- Method: Email
- Deadline: By the 30th of each month
- Recipient: OEM Maintenance Department (Email: vijay.veeramallu@pavaman.in)

Monthly Submission Format:

Model	TEJA-M		
UIN			
User Name			
Date			
Flying Hours			
Number of Landings			
Battery Life Cycles			
Any Components Replaced			
Sr. No.	**Name of Component**	**Hours at which it is replaced**	**Reason of Failure**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

6.4.2. Review and Feedback by OEM

OEM reviews submitted logbooks to ensure compliance and identify areas for improvement.

Review Process

1. Initial Review: OEM receives and acknowledges receipt of the logbooks.
2. Detailed Analysis: OEM maintenance team analyzes logs for trends, recurring issues, and compliance with maintenance schedules.
3. Feedback Report: Within 10 business days, OEM provides a detailed feedback report, including:
    - Assessment of Maintenance Quality:
    - Identified Issues:

- Recommendations for Improvements:
- Required Actions:

Example Feedback Report Summary

- Date: 2024-05-15
- Submitted by: John Doe
- OEM Reviewer: Jane Brown
- Summary of Findings: Maintenance logs are thorough and complete. Noted an increase in motor inspections due to minor vibrations; recommend closer monitoring and potential early replacement.
- Actions Required: Continue monitoring motor vibrations, consider ordering replacement motors if issue persists.
- Next Steps: Implement vibration damping checks and report findings in the next monthly submission.

7. In-Service Difficulties and Solutions

In the event of in-service difficulties or issues encountered during the operation of the TEJA-M drone, it is crucial to follow a systematic approach to ensure proper documentation and resolution. The first step is to accurately record the specifics of the issue, including the date, time, and operational circumstances under which the problem occurred. This information helps provide context for the situation and allows for a comprehensive investigation. A thorough investigation should then be conducted to identify the root cause of the problem, considering all potential factors such as component malfunction, environmental conditions, or user error. Once the cause is determined, appropriate corrective actions should be implemented to resolve the issue, whether it involves repairing or replacing components, adjusting operational procedures, or updating software configurations. After the corrective measures are applied, it is essential to document the details of the resolution, including the actions taken, any parts replaced, and any relevant changes made to the drone's systems. Finally, the drone's service records should be updated with this information, ensuring that the issue and its resolution are recorded for future reference. This comprehensive approach not only addresses the immediate problem but also helps improve the drone's overall reliability and ensures that similar issues are proactively managed in future operations.

7.1. Common Issues

This section lists common issues that may arise during the operation of the TEJA - M hexacopter and provides general guidance for identifying and addressing these issues.

Common Issues

- Loss of GPS Signal: GPS signal drops intermittently or is lost.
- Battery Issues: Battery fails to hold charge, swells, or overheats.
- Motor Malfunctions: Motors exhibit unusual noises, vibrations, or overheating.
- Spray System Blockages: Nozzles or pipes become clogged, reducing spray efficiency.
- Control System Failures: Control responses are delayed or inconsistent.
- Propeller Damage: Propellers become chipped, cracked, or imbalanced.
- Connectivity Problems: Issues with the transmitter or signal interference.

7.2. Troubleshooting Guide

This guide provides step-by-step instructions for diagnosing and resolving common issues encountered during the operation of the TEJA - M hexacopter.

Troubleshooting Steps

1. Loss of GPS Signal
    - Check GPS Mount: Ensure the GPS mount is secure and aligned.

- Signal Interference: Verify there is no signal interference from nearby electronic devices.
- Relocate: Move to an area with a clear line of sight to the sky.

2. Battery Issues
    - Visual Inspection: Check for bulges, leaks, or damage.
    - Charge Status: Ensure the battery is fully charged before use.
    - Replace Battery: If the battery shows signs of swelling or fails to hold charge, replace it immediately.
    - Storage Conditions: Store batteries in a cool, dry place.

3. Motor Malfunctions
    - Debris Check: Inspect motors for debris and clean if necessary.
    - Noise/Vibration: Listen for unusual noises or vibrations and check for secure mounting.
    - Temperature Check: Ensure motors are not overheating; allow cooling periods between flights.
    - Replace Motor: If problems persist, contact Pavaman Aviation Private Limited.

4. Spray System Blockages
    - Clean Nozzles: Regularly clean nozzles to prevent clogs.
    - Inspect Pipes: Check for blockages in pipes and clean thoroughly.
    - Check Filters: Ensure filters are clean and properly installed.
    - Use Proper Mixes: Avoid using thick or improperly mixed pesticides that can clog the system.

5. Control System Failures
    - Signal Check: Ensure the transmitter and receiver are properly connected and functioning.
    - Calibration: Perform calibration of control systems as per the user manual.
    - Replace Components: If issues persist, contact Pavaman Aviation Private Limited.

6. Propeller Damage
    - Visual Inspection: Check for cracks, chips, or imbalances.
    - Replace Propeller: Replace damaged or imbalanced propellers.

7. Leak Prevention and Inspection Procedure (Standard Operating Procedure)

To ensure leak-free operation of the fluid handling system (tank, tubing, valves, nozzles, pump), the following steps must be followed:

Power ON: Power ON the spraying system or pump and allow normal operating pressure to build up.

Leak Detection:

- Apply a soap-water solution to all joints, fittings, nozzles, and seals.
- Observe for bubble formation or dripping, which indicates leaks.
- Check for any pressure drop, if applicable.
- Check for leaks from the tank.

Criteria for Pass:

- No bubbles, drips, or seepage observed.
- No pressure drop within 5 minutes.
- Nozzles should remain dry when the system is OFF.
- There should not be any leaks on the tank.

If Leak Found:

- Identify and record the location of the leak.
- Repair or replace the affected component.
- Retest the area for confirmation.
- Update the leak check log with the result and action taken.
- In case of a leak found on a tank, contact Pavaman Aviation Private Limited for tank replacement according to the reporting procedure mentioned in 7.3.

Frequency:

- Brief pre-flight check daily.

8. Connectivity Problems
    - Signal Strength: Ensure strong signal strength between the transmitter and receiver.
    - Interference Check: Check for and eliminate sources of signal interference.
    - Antenna Check: Ensure antennas on both the hexacopter and transmitter are secure and undamaged.

7.3. Reporting Procedures

Proper reporting of issues ensures they are documented and addressed systematically, allowing for continuous improvement in maintenance practices.

Steps for Reporting Issues

1. Identify the Issue: Document the specific problem and its symptoms.
2. Immediate Actions Taken: Note any immediate actions taken to address the issue.
3. Notify Supervisor: Inform the maintenance supervisor or responsible personnel.
4. Create a Report: Fill out an issue report including:
    - Date and Time:
    - Component Affected:
    - Description of Issue:
    - Immediate Actions Taken:
    - Additional Observations:
5. Submit Report: Send the report to the OEM via designated communication channels (e.g., email, online portal).

Example Report Entry

- Date and Time: 2024-05-20, 11:00 AM
- Component Affected: Motor
- Description of Issue: Motor 3 producing unusual noise and overheating
- Immediate Actions Taken: Cleaned debris and checked connections
- Additional Observations: Noise persisted; motor feels unusually hot
- Submitted by: John Doe
- Submitted to: OEM Support (Email: support@pavaman.in)

7.4. OEM Response Protocol

The OEM response protocol outlines the steps the OEM will take upon receiving a report of an issue to ensure timely and effective resolution.

OEM Response Steps

1. Acknowledge Receipt: OEM acknowledges receipt of the issue report within 24 hours.
2. Initial Assessment: Perform an initial assessment based on the report details.
3. Request Additional Information: If necessary, request additional details or clarification from the user.
4. Technical Analysis: Conduct a technical analysis to diagnose the problem.
5. Action Plan: Develop an action plan which may include:
    - Remote Troubleshooting: Provide troubleshooting steps the user can perform.
    - Component Replacement: Dispatch replacement parts if a component failure is confirmed.

- On-Site Support: Schedule an on-site visit by an OEM technician if required.

6. Feedback Report: Send a detailed feedback report to the user outlining:
   - Findings: Results of the technical analysis.
   - Actions Taken: Steps taken to resolve the issue.
   - Preventive Measures: Recommendations for preventing similar issues in the future.
7. Follow-Up: Follow up with the user to ensure the issue is fully resolved and gather feedback on the support provided.

Example OEM Feedback Report

- Date: 2024-05-22
- Report Received From: John Doe
- Issue: Motor 3 producing unusual noise and overheating
- OEM Technician: Jane Smith
- Findings: Motor bearings were worn out, causing noise and overheating
- Actions Taken: Dispatched replacement motor; provided installation guidance
- Preventive Measures: Recommend regular lubrication of motor bearings
- Next Steps: Follow-up scheduled for 2024-05-29 to ensure issue resolution

7.5. Monthly Submission of logs and maintenance record

Ensure regular review of maintenance and operations logs to maintain high standards of performance and safety.

7.5.1. Submission Process

Steps

1. Compile Logbooks: Gather all operations, inspection, and replacement records for the month.
2. Review by User: The user reviews entries for accuracy and completeness.
3. Submit to OEM:
   - Method: Email
   - Deadline: By the 30th of each month
   - Recipient: OEM Maintenance Department (Email: vijay.veeramallu@pavaman.in)

7.5.2. Monthly Submission Format:

User's Monthly Maintenance Submission Format:

UIN		**UAS Serial No.**	
User Name		**UAS Model name:**	
Date		**Manufacturer name:**	
Flying Hours			
Number of Landings			
Battery Life Cycles			

Any Components Replaced				
Sr. No.	**Name of Component**	**Hours at which it is replaced**	**Reason of Failure**	**Signature**
1				
2				
3				
4				

Any Other Issues

8. Post-Maintenance Procedures

8.1. Testing and Verification

Ensure all maintenance work performed on the TEJA - M hexacopter is verified and the system is functioning correctly before returning to operational use.

Steps

1. Visual Inspection:
    - Conduct a thorough visual inspection of the hexacopter to ensure all components are properly reassembled and no tools or parts are left inside.
2. System Checks:
    - Power up the hexacopter and perform initial system checks, including control systems, GPS, and battery status.
3. Component Testing:
    - Motors: Run each motor to ensure smooth operation without unusual noises or vibrations.
    - Propellers: Check for proper balance and secure attachment.
    - Spray System: Test the spray system for proper flow and function without leaks.
    - Control Systems: Perform a full range check to ensure proper communication and control response.
4. Flight Test:
    - Conduct a short, controlled test flight to verify overall performance and stability. Observe any abnormalities.
5. Data Review:
    - Review telemetry and flight data to ensure all systems are operating within normal parameters.

Example Verification Checklist

- ☐ Visual inspection completed
- ☐ System checks completed
- ☐ Motors tested
- ☐ Propellers checked
- ☐ Spray system tested
- ☐ Control systems checked
- ☐ Flight test completed
- ☐ Data review completed

Format for Maintaining Post-Sales Component Performance Monitoring Record

S.No	Model Number/ Serial Number	Date of Manufacture	UIN	Customer Name	Hours completed	Date of occurence	Location (Onsite/Transport)	Affected components	Component serial number	RCA Report Reference	Root Cause Reason	Resolution/status (Closed/ Pending) Date of closing	Event classification (Incident/ Accident/None)	Reported to DGCA (Yes/No)	Remarks	Name and Signature

8.2. Documentation of Completed Maintenance

STEPS:

1. Log Maintenance Activities:
    a. Document all maintenance tasks performed, including inspections, cleanings, replacements, and tests.
2. Record Details:
    a. Date of Maintenance:
    b. Components Serviced:
    c. Tasks Performed:
    d. Technician Name:
    e. Observations and Findings:
3. Sign-Off:
    a. Maintenance technician and supervisor sign off on the completed maintenance tasks to verify accuracy and completeness.

Example Maintenance Record Entry

- Date of Maintenance: 2024-05-20
- Components Serviced: Propellers, Motors, Spray System
- Tasks Performed: Replaced propellers, cleaned motors, tested spray system
- Technician Name: Jane Smith
- Observations and Findings: No issues found, system operating normally
- Technician Signature: Jane Smith
- Supervisor Signature: John Doe

9. Crash and Accident Protocol

9.1. Immediate Actions

Ensure swift and effective response to crashes or accidents to minimize damage and prevent further incidents.

Steps

1. Ensure Safety:
    - Ensure the safety of personnel and bystanders. If there is a risk of injury or fire, take appropriate safety measures.
2. Power Down:
    - Immediately power down the hexacopter to prevent further damage or injury.
3. Secure Area:
    - Secure the area around the crash site to prevent unauthorized access and further damage.
4. Initial Assessment:
    - Conduct an initial assessment of the damage and note any visible issues.

9.2. Reporting to OEM

Provide detailed information to the OEM to initiate an investigation and receive support.

Steps

1. Prepare Incident Report:
    - Document the incident details, including date, time, location, and description of the crash.
2. Capture Evidence:
    - Take photographs and collect any relevant data logs or telemetry information.
3. Submit Report:
    - Send the incident report and evidence to the OEM via designated communication channels (e.g., email, online portal).

9.3. Sample Format for Emergency Incident

Emergency Incident Report

1) Incident Details
    - Date and Time of Incident:
    - Location of Incident:
    - Weather Conditions:
    - Hexacopter Serial Number:
    - Flight Mission Description:
2) Description of Incident

- Type of Incident: (e.g., crash, component failure, loss of control, etc.)
- Detailed Description of Incident:
    - What Happened: (Provide a detailed account of the events leading up to, during, and after the incident)
    - Immediate Actions Taken: (Describe any immediate actions taken by the user or maintenance personnel to manage the situation)

3) Damage Assessment

- Physical Damage:
    - Chassis:
    - Arms:
    - Propellers:
    - Motors:
    - Battery:
    - Spray System:
    - Control Systems:
    - GPS:
    - Landing Gear:
- Other Components:
    - (List any other components that were damaged)

4) Root Cause Analysis

- Initial Observations:
    - (Describe any preliminary findings or suspicions regarding the cause of the incident)
- Detailed Analysis:
    - (Include detailed analysis conducted by maintenance personnel or technicians to determine the root cause of the incident)

5) Corrective Actions Taken

- Immediate Corrective Actions:
    - (Describe any immediate corrective actions taken following the incident)
- Long-term Corrective Measures:

- (Outline any long-term measures planned or implemented to prevent recurrence of the incident)

6) Recommendations

- User Recommendations:
  - (Provide any recommendations from the user or maintenance personnel for preventing future incidents)
- OEM Recommendations:
  - (Include any requests or recommendations for the OEM, such as changes to maintenance procedures, component upgrades, additional training, etc.)

7) Additional Information

- Flight Data: (Attach any relevant flight data logs, telemetry, or video footage)
- Photographs: (Attach photographs of the damaged hexacopter and components)
- Witness Statements: (Include statements from any witnesses or operators involved)

8) Contact Information

- Submitted by:
  - Name:
  - Title:
  - Contact Information:
- User Contact Information:
  - Name:
  - Company/Farm:
  - Contact Number:
  - Email:
- Maintenance Manager Contact Information:
  - Name:
  - Title:
  - Contact Number:
  - Email:

Acknowledgement

I, [Name], hereby confirm that the information provided in this report is accurate and complete to the best of my knowledge.

Signature:

Date:

OEM Response Section (To be filled out by OEM)

- OEM Representative:
- Title:
- Date of Response:
- Response Summary:
  - (Provide a summary of the OEM's response, including any actions to be taken, support provided, or changes recommended)

9.4. OEM Investigation Process

Ensure thorough investigation of the incident to determine root causes and prevent recurrence.

Steps

1. Acknowledge Receipt: OEM acknowledges receipt of the incident report within 24 hours.
2. Initial Review: Conduct an initial review of the submitted information and evidence.
3. Request Additional Information: If necessary, request further details or clarifications from the user.
4. Technical Analysis: Perform a detailed technical analysis to identify root causes.
5. Site Visit: If required, dispatch an OEM technician for an on-site investigation.
6. Report Findings: Compile findings into a comprehensive report.

9.5. Repair and Replacement Guidelines

Provide clear guidelines for repairing or replacing damaged components to restore the hexacopter to operational status.

Steps

1. Damage Assessment: OEM technician assesses the extent of damage and identifies components that need repair or replacement.
2. Repair Plan: Develop a repair plan, including required parts, tools, and procedures.
3. Component Replacement:
    - Procure Parts: Obtain OEM-approved replacement parts.
    - Perform Repairs: Conduct repairs or replacements as per OEM guidelines.
    - Test and Verify: After repairs, perform thorough testing and verification to ensure functionality.
4. Documentation: Update maintenance logs and records with details of the repairs performed.

Example Repair Plan

- Damage Assessment: Propellers, motors, landing gear damaged.
- Required Parts: Set of propellers, motor replacement kit, landing gear assembly.
- Repair Procedures: Replace damaged propellers and motors, install new landing gear.
- Testing: Conduct flight tests to verify repairs.
- Technician: John Smith
- Verification: Complete system test and document results.

10. Maintenance Tools and Equipment

10.1. Required Tools

These tools are essential for performing routine maintenance and repairs on the TEJA - M hexacopter.

1. Screwdrivers: Phillips and flat-head screwdrivers for general disassembly and assembly.
2. Hex Keys/Allen Wrenches: Various sizes for tightening and loosening hex screws.
3. Pliers: Needle-nose and standard pliers for gripping and manipulating small parts.
4. Wire Cutters: For cutting and stripping wires.
5. Soldering Kit: Soldering iron and solder for electrical repairs.
6. Multimeter: For checking voltage, current, and resistance.
7. Cleaning Brushes: Various sizes for cleaning debris from components.
8. Lubricants: Appropriate lubricants for moving parts.
9. Safety Gear: Gloves, safety glasses, and anti-static wristbands.

10.2. Recommended Equipment

These items, while not essential, are highly recommended to enhance the maintenance process and ensure precision.
List of Recommended Equipment:

- Torque Wrench: To apply precise torque to bolts and nuts.
- Battery Tester: For detailed analysis of battery health.
- Workbench: A stable work surface with proper lighting.
- Storage Bins: For organizing tools and spare parts.
- First Aid Kit: For addressing minor injuries during maintenance.

10.3. Tool Maintenance and Calibration

To ensure tools remain in good condition and provide accurate results, regular maintenance and calibration are necessary.

1. Cleaning:
    - Regularly clean tools to remove dirt, debris, and residues. Use appropriate cleaning agents for each tool.
2. Inspection:
    - Conduct routine inspections to check for signs of wear, damage, or malfunction. Replace any tools that are no longer reliable.
3. Calibration:

- Calibrate tools that require precision, such as torque wrenches and multimeters, according to the manufacturer's specifications. This should be done periodically or after any impact or significant use.

4. Storage:
    - Store tools in a clean, dry environment to prevent rust and damage. Use storage bins or toolboxes to keep them organized.
5. Documentation:
    - Maintain records of tool maintenance and calibration activities, including dates and findings.

11. Appendix

11.1. Maintenance Checklists

11.1.1. Daily Maintenance Checklist:

- ☐ Clean chassis
- ☐ Inspect for cracks (chassis, arms)
- ☐ Inspect battery packs
- ☐ Check tank for leakage
- ☐ Clean tank
- ☐ Check GPS mount
- ☐ Inspect motors for debris
- ☐ Check landing gear condition
- ☐ Control check

11.1.2. Weekly Maintenance Checklist:

- ☐ Inspect arm rods
- ☐ Inspect central hub
- ☐ Inspect canopy
- ☐ Inspect landing gear connectors
- ☐ Inspect arm boom
- ☐ Inspect motors
- ☐ Inspect propellers
- ☐ Inspect transmitter
- ☐ Inspect GPS
- ☐ Inspect battery plate and velcro
- ☐ Inspect pneumatic connectors and pipes
- ☐ Inspect XT 90 connectors

11.1.3. Monthly Maintenance Checklist:

- ☐ Submit maintenance logbook
- ☐ Inspect Critical components and PSEs
- ☐ Inspect whole spray system

11.1.4. Half-Yearly Maintenance Checklist:

- ☐ Perform detailed component tests
- ☐ Review and analyze maintenance logs

11.1.5. Annual Maintenance Checklist:

- ☐ Conduct comprehensive inspection
- ☐ Update maintenance procedures
- ☐ Provide training updates

11.2. Glossary of Terms

1. OEM: Original Equipment Manufacturer
2. PPE: Personal Protective Equipment
3. GPS: Global Positioning System
4. UAS: Unmanned Aerial System

11.3. Contact Information for OEM Support

Manufacturer Name	Pavaman Aviation private limited
Company Address	TEJA-M
Contact Details	8465859571
Company Website	kapil kavuri hub.144 Survey 37, 2nd floor ,Financial District Nanakramguda, Telangana 500032, Hyderabad, Telangana 501504

11.4. Component Specifications and Part Numbers

1. Propellers:
    a. Specification: 24 x 8.0 inch Nylon 6 propeller
    b. Part Number: PA0029
2. Motors:
    a. Specification: Hobbywing X6 plus 150 KV
    b. Part Number: PA0028
3. Battery:
    a. Specification: Li-Ion 25200mAh 6S battery
    b. Part Number: PA0050
4. Spray Nozzles:
    a. Specification: Centrifugal Nozzle & Flat Head Nozzle
    b. Part Number: PA0079
5. GPS Module:
    a. Specification: Here 3+
    b. Part Number: PA0046

12. References

12.1. Relevant Standards and Regulations

- FAA Regulations: Federal Aviation Administration (FAA) guidelines for UAS operation
- ISO 9001: Quality management systems requirements
- ANSI/ESD S20.20: Protection of electrical and electronic parts, assemblies, and equipment

Annexure A

Critical Components of TEJA-M

S.No	Name of the Component	Type of Screw	Fastener per Component	Total No. of Components	Total Qty of Fasteners
1	Arm Joint	M3x8	8	6	48
2	Landing Gear Connector	M3x8	4	4	16
3	T Joint Connector	M3x8 - 2, M3x12 - 1, M3x20 - 1	4	4	16
4	Inner Arm	M3x12	6	6	36
5	Outer Arm	M4x12	8	6	48
6	Main Frame	M3x8 - 2, Clips	8	1	8
7	Vertical Landing Gear	M3x8 - 1, Hub Mount M3x12 - 2	5	2	10
8	Horizontal Landing Gear	M3x12	2	2	4
9	Motors	M3 x 12	4	6	24
10	Propellers	M3 x 8 - 4 nos , M3 x 16 - 2 nos	6	6	36

Note: Before commencing any flight all the fasteners must be checked for any loseness.

Primary Structural Elements of TEJA-M

S.No	Name of the Component
1	Arm Joint
2	Landing Gear Connector
3	T Joint Connector
4	Inner Arm
5	Outer Arm
6	Main Frame
7	Vertical Landing Gear
8	Horizontal Landing Gear
9	Propeller Hub

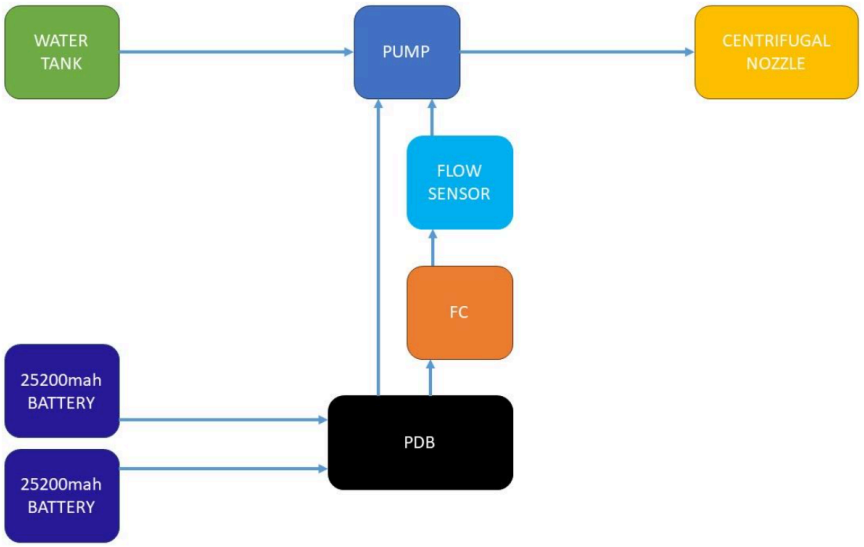
List of Fasteners of PSEs:

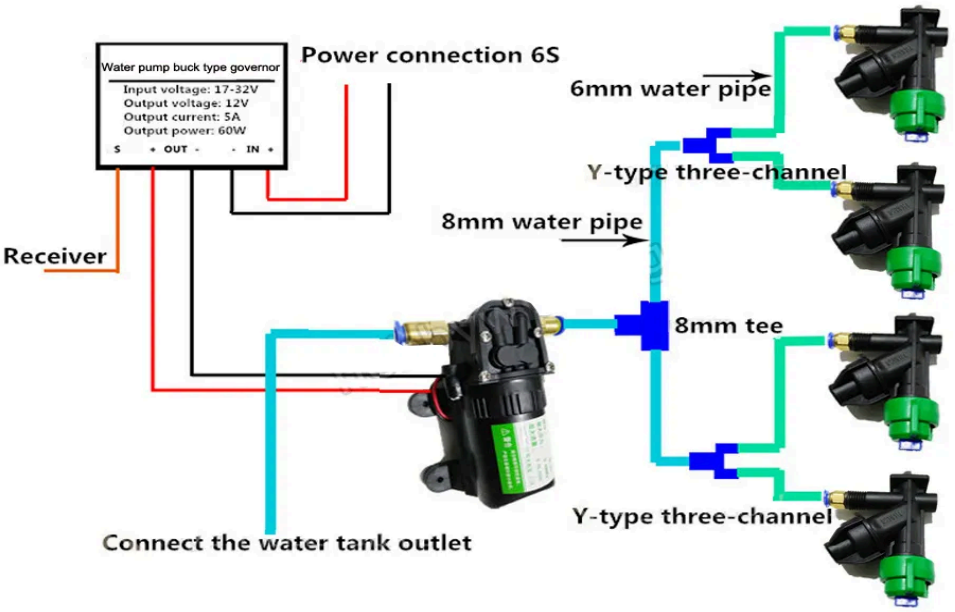
S.No	Name of the Component	Type of Screw	Fastener per Component	Total No. of Components	Total Qty of Fasteners
1	Arm Joint	M3x8	8	6	48
2	Landing Gear Connector	M3x8	4	4	16
3	T Joint Connector	M3x8 - 2, M3x12 - 1, M3x20 - 1	4	4	16
4	Inner Arm	M3x12	6	6	36
5	Outer Arm	M4x12	8	6	48
6	Main Frame	M3x8 - 2, Clips	8	1	8
7	Vertical Landing Gear	M3x8 - 1, Hub Mount M3x12 - 2	5	2	10
8	Horizontal Landing Gear	M3x12	2	2	4
9	Propeller Hub	M3x10 -2 M3x8 -4	6	6	36

Note: Regularly check the fasteners of PSEs and regularly maintain them for safety.

Annexure B

Working of spraying system





Annexure C

List of lifed components

Component	Life
Airframe	6500 hours
Landing Gear	8500 landings
Battery	384 cycles
Propeller	500 hours
Motor	500 hours

On completion of life of the airframe, the user is to return the UAS and take up with the manufacturer for replacement of the life expired airframe with a new one. Replacement of airframe is not a user level activity. It is to be replaced by the manufacturer only.