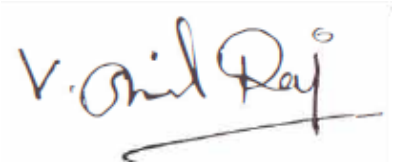
Ubifly Technologies Pvt Ltd

ATVA-1 MAINTENANCE MANUAL

AMBER WINGS	Ubifly Technologies Pvt Ltd Chennai, India

Prepared By	Checked By	Approved By
		
Sriram V	Sumilraj V	Rajasekar V
Novice Imagineer	Novice Imagineer	Head of Manufacturing
Date:09/04/2025	Date:10/04/2025	Date:10/04/2025

CONTROLLED COPY – DO NOT REPLICATE WITHOUT PROPER PERMISSIONS

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Record of Revision

Any revision to this report is recorded along with the date of modification, revision number, a summary of amendments, the section and page number of the affected in the Revision History page accordingly. The report issue is identified by revision codes reported on each page, top right-hand side.

The revision code is numerical and starting at the number "0"; subsequent revisions are identified by the change of the code from "0" to "1" for the first revision to the basic publication, "2" for the second one, etc.

Additions, deletions and revisions to existing text will be identified by a revision bar (black line) in the left-hand margin of the page, adjacent to the change.

NOTE: It is the responsibility of the owner to maintain this handbook in a current status when it is being used for operational purposes.

Date	Revision No	Revision Details	Section & Pg no
05/09/2023	0	Initial Release	-
01/07/2024	1	Added Safety Information	Section 2 & Pg.no 9
22/07/2024	2	Updated Maintenance Schedule	Section 4 & Pg.no 18
23/08/2024	3	Updated Annexure I	Annexure I & pg.no 34
26/12/2024	4	Updated Technical details	All Section
21/02/2025	5	Updated Technical details	All Section
10/04/2025	6	Updated Technical details	All Section

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

TABLE OF CONTENTS

1. General..... 7
2.System..... 7
2.1 System Specifications..... 8
2.2 Tools Required for Maintenance..... 9
2.3 Support Software..... 9
3. Safety Information..... 9
3.1 Safety precautions:..... 9
3.2 Risk management:..... 11
3.3 Personal protective equipment..... 11
4. System Maintenance..... 13
4.1 Power System..... 13
4.1.1 Battery Eliminator Circuit..... 13
4.1.2 Current Sensor..... 14
4.1.3 Power Connectors..... 14
4.2 Avionics..... 15
4.2.1 Flight Controller..... 15
4.2.2 GNSS (GPS Module)..... 15
4.2.3 Pitot Tube..... 16
4.3 Propulsion System..... 16
4.3.1 Cruise Propulsion..... 16
4.3.2 Hover Propulsion..... 16
4.4 Communication System..... 17
4.4.1 Herelink Datalink..... 17
4.4.2 RF Antenna Check..... 17
4.5 Software..... 17
4.5.1 Amber GCS..... 17
5. Airframe Maintenance..... 18
5.1 Airframe..... 18
5.1.1 Primary / Secondary Components List..... 19
5.1.2 The Flight critical components of ATVA-1..... 23
5.2 Airframe Fasteners maintenance..... 24
5.2.1 Airframe Fasterners..... 24
5.3 Control surface and servo maintenance..... 26
6. Battery Maintenance..... 26

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

6.1 Procedure to add entries to the Log Book....28
6.2 Battery Storage and Transportation:.... 29
6.2.1 Battery Storage Guidelines.... 30
6.2.2 Battery Storage Procedure:.... 31
6.2.3 Transportation Requirements:....32
6.2.4 Battery Disposal Procedure:.... 33
6.3 Handling batteries.... 34
7. Payload Maintenance....34
8. Maintenance Schedule....38
8.1 ATVA-1 Maintenance Checks.... 38
8.2 Every Flight Check....40
8.2.1 Pre-Flight Checklist.... 42
8.2.2 In-Flight Checklist.... 42
8.2.3 Post-Flight Checklist....44
8.3 Everyday Logging/Check....45
8.3.1 Operational Log....45
8.3.2 Continuous Monitoring Process for UAS components.... 46
8.4 Every Charge Cycle Check (Battery)....54
8.5 Scheduled Maintenance of ATVA-1.... 58
8.4.6 UIN plate and Void Stickers:.... 66
9.Un-Scheduled Maintenance....67
9.2 Unscheduled Monitoring Checks....68
9.2.1 Payload maintenance:.... 69
9.2.2 Equipment and Payload Check.... 69
9.2.3 GCS software maintenance:.... 69
10.Component Performance and Reliability based on Continuous Monitoring Plan....70
10.1 Continuous Monitoring of Component performance and reliability – To be Filled by User.... 72
10.1.1 MAINTENANCE LOG & DOCUMENTATION....77
10.2 In-service difficulties (post sales).... 78
10.2.1 ATVA-1 Contingency Servicing Procedure....78
10.2.2 Service Centre Procedure carried out for ATVA-1....79
11.Factory maintenance....81
11.1 Pre-Maintenance Preparation.... 81
11.2 Contact Ubifly Technologies.... 81
11.3 Prepare the UAV for Shipment.... 82

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

11.4 Ship the UAV to Ubifly Technologies..... 82
11.5 Factory Maintenance Process at UbiFly Technologies..... 83
11.6 Post-Maintenance Steps..... 83
11.7 Update Records..... 84
Summary Checklist:..... 84
12.Crash of UAS..... 85
Summary Checklist:..... 87
13.Troubleshooting of UAS..... 87
13.1 General Warnings or error..... 87
13.2 Flight Controller Warnings..... 88
13.3 Flight Behavior..... 89
14.Best Practices for Operating and Maintaining ATVA-1..... 90
15.Life of Components..... 91
16. Packing and Unpacking of ATVA-1..... 92
16.1 Unboxing ATVA-1..... 92
16.1.1 Structure Of Process of Boom Attachment..... 94
16.1.2 Structure of Process of Tail wing Attachment..... 97
16.2 Drone Inspection and Setup..... 100
16.2.1 Key Notes..... 101
DECLARATION..... 102
Annexure I – Pre/Post Flight Checklist..... 103
Annexure II – Continuous Monitoring process for UAS components..... 109
Annexure III – Operational Flight log..... 113
Annexure IV – Maintenance Log..... 115
Annexure V – Unscheduled Maintenance log..... 117
Annexure VI – Loctite SOP..... 119

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

LIST OF ABBREVIATIONS

BLDC	–	Brushless Direct Current
CAD	–	Computer Aided Design
C.G	–	Centre of Gravity
CFRP	–	Carbon Fiber Reinforced Polymer
EPDM	–	Ethylene Propylene Diene Terpolymer
FEA	–	Finite Element Analysis
MTOM	–	Maximum Take Off Mass
OEM	–	Original Equipment Manufacturer
PU	–	Polyurethane
PWM	–	Pulse Width Modulation
RPA	–	Remotely Piloted Aircraft
RPAS	–	Remotely Piloted Aircraft System
RTL	–	Return to launch.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

1. General

This manual is a guide to help the user of the ATVA-1 vehicle to carry out inspection and give an idea about life and change of corresponding components.

The ATVA-1 is composed of several movable and induced to constant vibrations Therefore components that require regular checking and inspection before every flight which are detailed in below sections. ATVA-1 is used for Logistics purposes such as delivery of goods.

In this Manual, the warning, cautions, and recommendations are provided and defined as follows:



Recommendation / Note

The recommendation is only a means of providing the user with extra information about a specific act.



Warning

Warnings are used to highlight procedures that, if not strictly observed, may result in personal injury or loss of life.



Caution

Cautions are used to highlight procedures that, if not strictly observed, may cause damage to equipment.

2.System

The ATVA-1 comprises various components, categorized into active and passive types. Active is any component when the parameters of the component change with respect to time from start to end of the ATVA-1 operation and generate digital outputs to indicate their status on the Amber GCS. On the other hand, passive components don’t maintain consistent properties over time, requiring visual inspection by the user to assess their condition detailed in below sections.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Table 1-1 Specifications - ATVA 1

S.NO	Item	Description	Type
1	Battery	Li-ion Solid State No of Cell: 6S Capacity: 30000mAH 2 batteries connected in series for 12s	Active
2	Flight Controller	Pixhawk Cube Orange with 3X Accelerometer 3X Gyroscope 2X Magnetometer 1X Barometer 1X Airspeed Sensor	Active
3	VTOL Propeller	Diameter: 22 Inch Pitch: 7.4 Inch Material: Carbon Composite	Passive
4	Forward Propeller	Diameter: 16 Inch Pitch: 16 Inch Material:APC	Passive
5	Ground Control Station (GCS)	Herelink	Active
6	Airframe	High Strength Hybrid airframe built with CFRP Composite and aluminium	Passive
7	GPS	M9N	Active

2.1 System Specifications

S. No	Particular	Value
1	**Category**	**Hybrid**
2	**Max Weight**	**18 kg**
3	Max Payload	2 kg
4	**Max Speed in cruise**	**30 m/s**
5	**Operational Speed in cruise**	**23-29 m/s**
6	**Min Speed in cruise**	**23 m/s**
7	**Max operating Altitude**	**Less than 120m**

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

8	**Max Wind resistance**	**10 m/s**
9	**Endurance**	**36 minutes**

2.2 Tools Required for Maintenance

The necessary basic tools are

- Allen Keys
- Nuts/Bolts
- Torque wrench
- Spanner set

Under no circumstances should the electronics of the ATVA-1 be modified or the Electronics flight controller hatch should be opened . In the event of a malfunction or crash, it is imperative to take the ATVA-1 to the Ubifly Technologies for proper assessment and resolution.

2.3 Support Software

Amber GCS Engineer Version 0.1.0 is the specific ground control station software that is to be used for controlling , performing planned missions and monitoring live status of ATVA-1.

Support files check

- For the operation of Amber GCS, the user is in need of an important file.
    - checksums.txt
- Both these files must be placed inside the Amber GCS “Security” folder
- Navigate to **Amber GCS Daily > Security** and check for the files

These Files are very important to operation of flights, having a backup is advisable in case of any queries kindly contact Ubifly Technologies.

3. Safety Information

3.1 Safety precautions:

safety precautions to follow when handling a VTOL (Vertical Take-Off and Landing) Hybrid UAV:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

1. Pre-Flight Inspection:

- Check for structural damage or loose components.
- Ensure propellers, motors, and control surfaces are secure and functioning properly.
- Verify battery levels and connections.

2. Perform Periodic Inspection:

- Perform the Periodic Inspections 30 Days/75 Flights Without fail .
- Share the completed logs(Maintenence , Operational, Battery, Continuous monitoring etc each and every month to Ubify Technologies.

3. Secure the Area:

- Establish a safety perimeter to keep bystanders at a safe distance.
- Avoid operating near power lines, trees, or other obstacles.

4. Battery Handling:

- Use only approved batteries and follow manufacturer guidelines for charging and storage.
- Inspect batteries for damage before use and handle them with care to avoid short circuits or overheating.

5. Communication and Coordination:

- Maintain clear communication with your team during setup and operation.
- Use a designated spotter to assist with monitoring the UAV's surroundings.

6. Software and System Checks:

- Update firmware and perform system diagnostics before each flight.
- Ensure GPS and other navigation systems are functioning accurately.

7. Emergency Preparedness:

- Have a clear plan for dealing with malfunctions or crashes.
- Keep a fire extinguisher on hand, especially when handling lithium batteries.
- Immediately inform Ubifly technologies on any contingencies.

8. Weather Conditions:

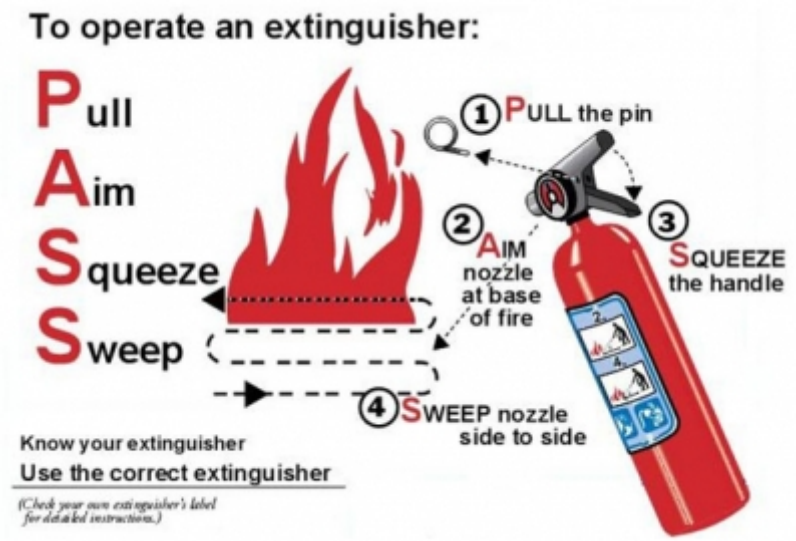
This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Avoid flying in adverse weather, such as strong winds(Gusts), rain, or fog.
- Monitor weather forecasts to ensure safe operation.

9. Transportation and Storage:

- Use protective cases for transportation to prevent damage as provided along with ATVA-1.
- Store in a cool, dry place away from direct sunlight and flammable materials.

10. Fire Safety on Fire:



3.2 Risk management:

In India, guidelines for drone operations, including obtaining permission to fly, flying within visual line-of-sight, and flying below 400 feet. Additionally, drones must have a unique identification number. To manage risks associated with drones, it is important to comply with these regulations and guidelines, as well as to conduct regular maintenance and safety checks on the drone. It is also important to have liability insurance to cover any potential damages or injuries caused by the drone.

3.3 Personal protective equipment

Personal protective equipment is recommended during UAV operations and during performing all checks

The some of the PPE Equipments Includes

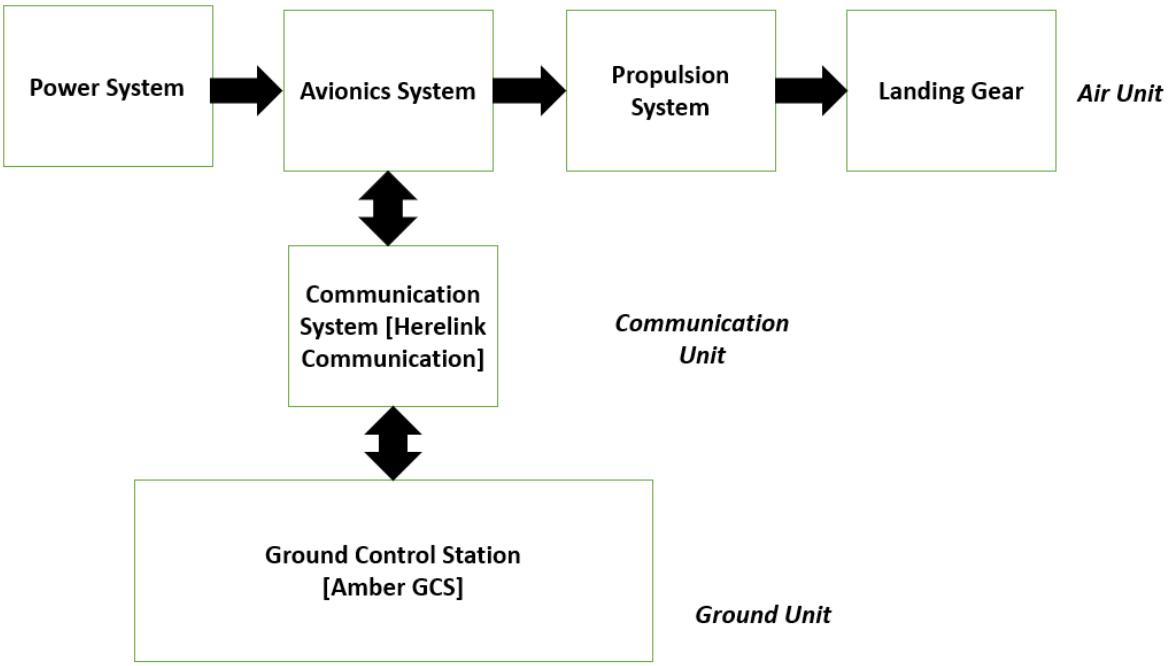
This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Gloves
- Shoes
- Eye Protection
- Head Protection
- Foot Protection



This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

4. System Maintenance



Electrical and Avionics Architecture of ATVA-1

The Airframe comes perfectly aligned and perfectly balanced from the factory. Opening the airframe parts in any way will prevent the ATVA-1 from efficient operations.

> In any case, the operator or the user should not dismount or add additional components to the ATVA-1. The addition of components will void the warranty and make the ATVA-1 ineligible for service.

4.1 Power System

4.1.1 Battery Eliminator Circuit

The BEC (Battery Eliminator Circuit) in ATVA-1 is a vital component that regulates the power supply from the main battery to various electronic systems, such as the flight controller, servos, and other onboard electronics. Regular

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

inspection and maintenance of the BEC are important to ensure that these systems are receiving stable and reliable power, preventing power failure during flight.

1. **Flight Controller Hatch is inaccessible** to the end user for inspecting the BEC, requiring ATVA-1 to be taken back to the Manufacturer (Ubifly Technologies Pvt. Ltd.) **for regular checks (every six months),**
2. **Visual Checks :** need to be carried out by the end-user to observe any visible cracks.
3. **Check for Electrical Noise :** Excessive noise from the BEC can interfere with sensitive components like the flight controller or GPS.

4.1.2 Current Sensor

1. **Flight Controller Hatch is inaccessible** to the end user for inspecting Current Sensor, requiring ATVA-1 to be taken back to the Manufacturer (Ubifly Technologies Pvt. Ltd.) **for regular checks (every six months),**
2. **Visual Checks :** Needs to be carried out by the end-user to observe any visible cracks.
3. **Check for Electrical Noise :** Excessive noise from the current sensor can interfere with sensitive components like the flight controller or GPS.
4. **Check for Updates in GCS** : The Current (A) and Voltage (V) values is displayed in the Ground Control Station (GCS)

4.1.3 Power Connectors

1. **Visual Checks** : The user needs to observe any visible cracks present in the power connectors on the ATVA-1 , as well as the connectors present in the Battery.

   Anti-Spark Connectors are present in the Battery packs present in ATVA-1, which helps in the user to change or take required actions once they witness visible sparks or smoke present from connectors.(While connecting Battery to ATVA-1).
2. **Tangle-free** : Users must ensure the power connectors are not tied up or tangled at any cause which might result in severe situations.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

3. **Check for Updates in GCS** : User must ensure to receive data in GCS

4.2 Avionics

4.2.1 Flight Controller

A flight controller inspection for ATVA-1 involves checking the physical condition of the controller for damage or wear, ensuring proper mounting, verifying connections and wiring for security, and ensuring no corrosion or loose contacts.

Additionally, it's important to perform software checks such as verifying firmware versions and updating as needed. The functionality of sensors connected to the controller should also be tested, and any unusual behavior should be logged. Periodic checks help maintain system stability and ensure the flight controller operates reliably during flight.

1. **Flight Controller Hatch is inaccessible** to the end user for inspecting Current Sensor, requiring ATVA-1 to be taken back to the Manufacturer (Ubifly Technologies Pvt. Ltd.) **for regular checks (every six months),**
2. **Visual Checks :** Needs to be carried out by the end-user to observe any visible cracks, Make sure the **VOID sticker** is intact.
3. **Check for Updates in GCS** : User must ensure to receive data in GCS
4. **Check for Electrical Noise :** Make sure no electrical noise is observed during the operation or powering, If observed, Immediately disconnect the Power connectors (Drone-Battery) and bring back the ATVA-1 to Ubifly Technologies Pvt. Ltd.
5. **I/O from GCS** : Users can provide inputs to the control surfaces of ATVA-1 to make sure that the Flight controller is working properly.

4.2.2 GNSS (GPS Module)

1. **Physical Inspection**: Check for any signs of damage or wear on the GPS antenna and cables.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

2. **Antenna Check**: Ensure the antenna is correctly oriented and free of obstructions (Not being covered by any foreign particles) that could impair signal reception.
3. **Signal Testing via GCS**: Test signal strength and accuracy to ensure the GPS module is providing correct positioning.
4. **Software Calibration**: Recalibrate if necessary for optimal performance.

4.2.3 Pitot Tube

Visual Checks : Inspect for physical damage, such as cracks or dents, which could affect airflow.
Obstruction Removal : Ensure the pitot tube is clear of dirt, ice, or debris that could block airflow.
Functionality Test via GCS : Test the sensor's output to confirm it is reading airflow correctly.
Calibration via GCS : Recalibrate if necessary to maintain accurate readings.

4.3 Propulsion System

4.3.1 Cruise Propulsion

1. **Visual Checks :** Inspect for physical damage, such as cracks or dents, which could affect airflow.
2. **Obstruction Removal :** Ensure motor & the propeller are clear of dirt, ice, or debris that impact the functioning.
3. Check for the motor life

4.3.2 Hover Propulsion

1. **Visual Checks :** Inspect for physical damage, such as cracks or dents, which could affect airflow.
2. **Obstruction Removal :** Ensure motor & the propeller are clear of dirt, ice, or debris that impact the functioning.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

4.4 Communication System

4.4.1 Herelink Datalink

1. **Visual Checks :** Inspect for physical damage, such as cracks or dents, which could affect airflow.
2. **Connectivity Checks :** Make sure that the data transferring is working via GCS.
3. **Check for Updates in GCS** : The user needs to make sure the GCS screen is being updated with the realtime data transfer,
    a. Check the RSSI value between the ground station and the drone to make sure it's within acceptable levels.
    b. Test the communication link in both command and telemetry modes, ensuring a stable signal with minimal delay between the drone and ground station.

4.4.2 RF Antenna Check

1. **Visual Checks :** Inspect for physical damage, such as cracks or dents,
3. **Obstruction Removal :** Ensure the RF Antenna are clear of dirt, ice, or debris that impact its functioning.

4.5 Software

4.5.1 Amber GCS

1. **Check for updates via GCS :** User needs to ensure the Software is working properly with the updates from drone.
2. **I/O via GCS :** User needs to ensure the control communication is working properly .

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

3. **Application Version :** The application AMBER GCS can be only updated once The Ubifly Technologies Pvt. Ltd. releases one. Users will be notified respectively.

5. Airframe Maintenance

Any maintainable components in the ATVA-1 do not require any opening of the enclosure.

5.1 Airframe

All the airframe structural components must be inspected for physical damages that are crucial for the ATVA-1 vehicle.

- The Airframe includes
  a. Airframe body(Fuselage and wings)
  b. Landing Gears
  c. Control surfaces
  d. VTOL Booms
  e. Fasteners
  f. External modules (GNSS Holders, Pitot Tube .Etc)

- Inspection of Airframe involves

  1) **Airframe Cleaning**
     a) Clean the airframe thoroughly, removing dirt, debris, or residue after each flight or as required.
  2) **Airframe Visual Check**
     a) Inspect the airframe for cracks, dents,debond,delamination.
     b) or any structural damage. Pay close attention to stress points or areas prone to wear.
  3) **Screws Torque Check**
     a) Verify that all screws are securely fastened and torqued with respect to our specifications.
  4) **Landing Gear Visual Check**
     a) Inspect the landing gear for any damage, bending, or stress marks that could compromise landing performance.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Visually inspect the motors and propellers, landing gears, connectors and the control surfaces. Look for any cracks, dents, breakages. Also check for any dust, stone particles settled in the airframe, if any damage, approach Ubifly Technologies Pvt. Ltd..

5.1.1 Primary / Secondary Components List

The ATVA-1 needs special inspection on the following components for observing the Wear & Tear on the Critical components.

All the Primary / Secondary components passed the wear and tear test are mentioned in the following table.

Components	Category	Number of Quantity	Material	Inspection Interval (Hours)	Type of Inspection
FWD and Rear VTOL Boom	Primary	2 (LH and RH)	Carbon Fiber	Monthly / 75 Flights	Visual Check
Landing Gear	Primary	4 (FWD2 Rear 2)	Carbon Fiber	Monthly / 75 Flights	Visual Check
Lift Motor & Propeller	Primary	4	Carbon Fiber	Every Flight	Visual Check
Cruise Motor & Propeller	Secondary	1	APC	Every Flight	Visual Check
Fasteners	Check all screws, bolts, and fasteners for tightness and integrity.				Tightness
Batteries	Secondary	2	-	Every Flight	Visual Check

*Ubifly Technologies Pvt. Ltd.

FWD and Rear VTOL Boom :

- Needs a visual inspection for any crack,dents and misalignments,
- Check all screws, bolts, and fasteners for tightness and integrity.
- Inspect landing gear for damage and proper operation.

Landing Gear :

- Needs a visual inspection for any crack,dents and misalignments,

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Inspect landing gear for damage and proper operation,
- Check all screws, bolts, and fasteners for tightness and integrity.

Lift Motor & Propeller :

- Needs a visual inspection for any crack,dents and misalignments,
- Examine propellers for cracks, chips, and secure mounting.
- Verify that motors spin up smoothly and respond correctly.
- Check all screws, bolts, and fasteners for tightness and integrity.
- Check motors for damage, loose wires, and cleanliness.

Cruise Motor & Propeller

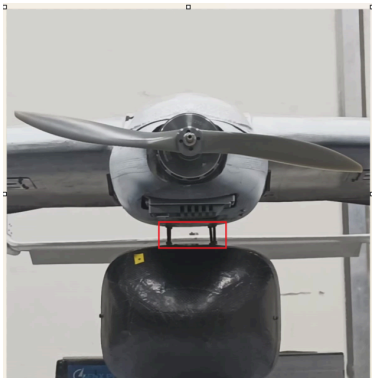
- Needs a visual inspection for any crack,dents and misalignments,
- Verify that motors spin up smoothly and respond correctly.
- Check all screws, bolts, and fasteners for tightness and integrity.
- Check motors for damage, loose wires, and cleanliness.
- Examine propellers for cracks, chips, and secure mounting.

Flight Controller,GPS and Herelink

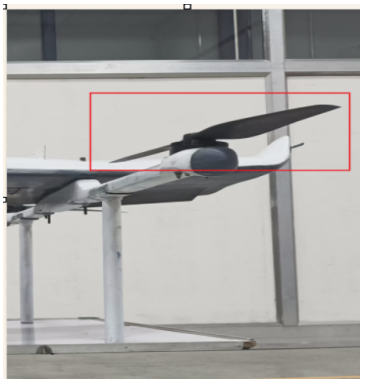
- Undo Remove the fasteners of mounting fasteners and remove the existing tapes.
- Needs a replacement of tapes with fresh one
- Place the components and fasteners it

5.1.1.1 Primary Structures Maintenance Procedure

The primary structure that carries flight and ground loads whose failure would reduce the aircraft's structural integrity, any failure in secondary structures would affect the operation of the aircraft but not lead to its loss. The primary structures are tabulated below in the table and the following figures highlight about the same.

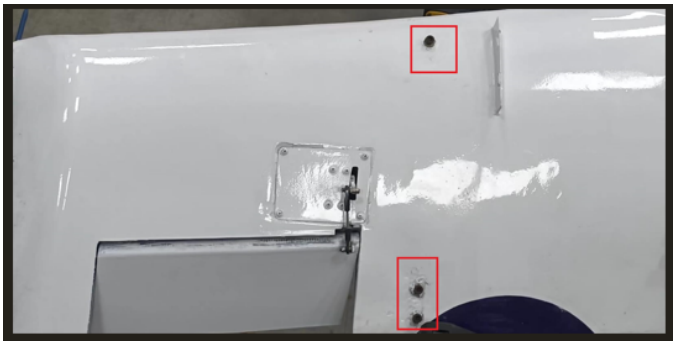


(i)

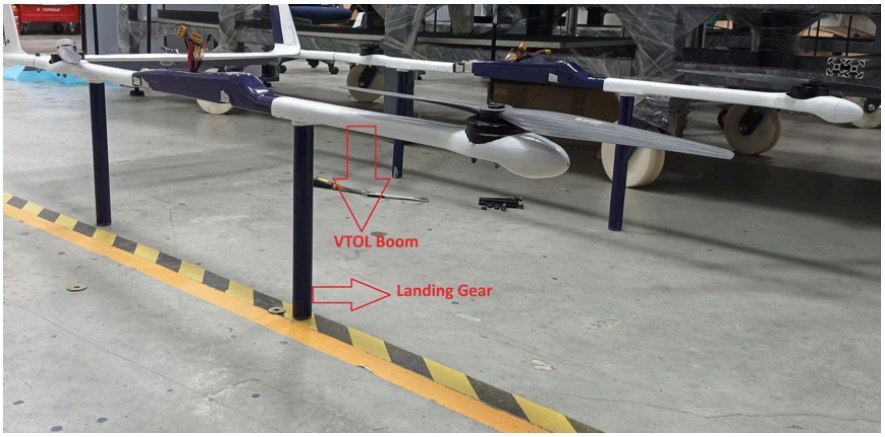


(ii)

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved



(iii)



(iv)

Figure 5.1(h): (i) Payload Bay Connector to Payload (ii) VTOL Propellers (X 4) (iii) Boom to Wing with Fasteners Attached (iv) VTOL Boom and Landing Gear.

5.1.1.2 Maintenance Checklist for Fasteners on ATVA-1, Primary Structure Elements

Task	Frequency	Inspection Detail	Action Required	Remarks
Visual Inspection	Pre-Flight/Monthly	Inspect fasteners for rust, corrosion, cracks, or looseness	Tighten or replace damaged fasteners	Report findings to maintenance team

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Torque Check	Pre-Flight/Monthly	Verify all fasteners are tightened to the correct torque	Re-tighten to manufacturer specs	Use torque wrench with correct adapters
Thread Integrity	Quarterly/Annually	Check for stripped or worn threads on bolts/nuts	Replace worn fasteners	Inspect with thread gauges if needed
Washer Condition	Quarterly/Annually	Examine washers for deformation or wear	Replace washers if needed	Ensure proper washer type is used
Corrosion Check	Quarterly/Annually	Inspect for corrosion, especially on motor and boom areas	Replace corroded fasteners	Use corrosion-resistant fasteners for replacements
Loose Fastener Check	Pre-Flight/Monthly	Check for fasteners that may have loosened	Re-tighten or replace as necessary	Use torque wrench for precision
Post-Incident Check	As needed	After crash, hard landing, or abnormal event, inspect all critical fasteners	Replace any compromised fasteners	Record incident and fastener inspection detail

5.1.1.3 Guidelines for Fastener Inspections on ATVA-1

Pre-Flight Inspection: Always conduct a quick pre-flight visual inspection of the fasteners securing the booms, wings, motor boom, and propeller attachments. Look for any signs of looseness, damage, or corrosion.

Follow the Torque Specifications: Ensure that fasteners are not overtightened or undertightened. Always use a torque wrench to check and re-tighten as needed, especially for motor and propeller attachments.

Monitor Vibration: Keep an eye on any vibrations during flight on the vibe parameter in GCS if it exceeds 25 m/s If you notice abnormal vibrations, stop the UAV and check the fasteners immediately.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Prompt Reporting: If you detect any unusual behavior in the UAV or observe signs of damage to the fasteners, report it immediately to Ubifly technologies Pvt. Ltd. for further inspection.

Scheduled Maintenance: Stick to the Ubifly technologies Pvt. Ltd. -recommended maintenance schedule for detailed inspections, especially for critical components such as the motor boom and propeller attachments.

Replace Damaged Fasteners: Do not attempt to reuse damaged, corroded, or worn fasteners. Always replaced with the same type and grade specified by the Ubifly Technologies Pvt. Ltd.

5.1.2 The Flight critical components of ATVA-1

The performance and safety of the ATVA-1 rely on the condition of its critical components, such as the Flight Controller, GPS, and Herelink system. Users must inspect these components' status each time before use from the GCS by checking parameters on the GCS. Periodic inspections of these critical components are necessary to avoid performance-related issues over time. This guide outlines the effects of wear on these parts and provides a maintenance and inspection schedule to help operators maintain the ATVA-1 in optimal condition, ensuring safe and reliable operation.

Components	Number of Quantity	Parameters of Inspection	Inspection Interval	Inspection Interval (Hours)	Type of Inspection
Flight controller	1	Pre-flight Checks on GCS	Every Flight	Every 6 Months (By the *Manufacturer)	Visual Check of Flight Controller , Mounts and Fasterners
Herelink	1	Pre-flight Checks on GCS	Every Flight	Every 6 Months (By the *Manufacturer)	Visual Check of Flight Controller , Mounts and Fasterners
GPS Module	2	Pre-flight Checks on GCS	Every Flight	Every 6 Months (By the *Manufacturer)	Visual Check of Flight Controller , Mounts and Fasterners

*Ubifly Technologies Pvt. Ltd.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

The inspection protocol for critical UAV components ensures reliability and safety during operations. Flight Controller Inspection involves pre-arm checks on the Ground Control Station (GCS), where built-in algorithms verify sensor calibration and EKF status. Errors identified during these checks prevent arming, requiring calibration or technical support from Ubifly Technologies. A visual inspection of the flight controller, mounts, and fasteners is performed pre-flight and every six months. Similarly, Herelink Inspection ensures operational integrity by monitoring RSSI and control surface responses during pre-flight checks, with visual checks covering wear, button functionality, and connectivity ports. For GPS Modules, pre-arm checks verify satellite counts and HDOP values within the optimal range (0.5-1.3), essential for performance. Visual inspections confirm physical integrity and secure mounting of GPS antennas. Routine pre-flight checks are mandatory, while general inspections every six months involve thorough assessments of wiring, mounts, and component conditions to maintain system reliability.



Visually inspect the motors and propellers, landing gears, connectors and the control surfaces. Look for any cracks, dents, breakages. Also check for any dust, stone particles settled in the airframe, if any damage, approach Ubifly Technologies Pvt. Ltd..

5.2 Airframe Fasteners maintenance

5.2.1 Airframe Fasterners

Inspect every fastener if they are hand tightened properly to a snug fit. Check for the fastener thread wear and tear conditions for loosening. In case of any damage, approach Ubifly Technologies Pvt. Ltd., If needed, replace the Fasteners.



Make sure to inspect all the fasteners on the airframe to ensure they are properly tightened and to identify any potential damages or signs of wear and tear.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

5.2.1.1 Fastener Torque Requirements

The Fasteners that are outside the ATVA-1 should be checked once before every flight; any loose fastener shall be tightened optimally.

Torque Requirements for the essential fasteners on ATVA-1 primary structural elements are

Location	Fasteners	Category	Torque (Nm)
Boom detach at front location	M6	Primary	0.32
Boom detach at rear location	M6	Primary	0.023
VTOL motor mount to boom	M4	Primary	0.056
Cruise motor mount to composite plate	M4	Primary	0.049
VTOL and cruise motors to propeller	M3	Primary	1.37

To avoid opening/gap creating during loading or intact condition a fastener to be installed with a pretension torque of at least 1Nm which is greater than top four primary elements torque values (0.32, 0.023, 0.056, 0.049Nm) the calculated torque due to fastener tension.

5.2.1.2 Propeller fasteners maintenance

Inspect all the fasteners on the propellers for proper tightness, any potential damages or wear and tear.

Inspect fasteners on every propeller if they are hand tightened properly to a snug fit. Check the fastener heads for strips or wear and tear.Replace if necessary. If in doubt check with Ubifly Technologies Pvt. Ltd.

The Propeller is a part that undergoes a high rate of mounting and dismounting unless operated in a single environment without shipping.

Table 3-1. Condition and reaction of propeller

S.NO	Condition	Reaction
1	Propeller Fasteners are loose	Tight the fasteners with Allen keys (with Minimal hand torque)
2	Visible Propeller Cracks	Contact Ubifly Technologies Pvt. Ltd. to Replace Propeller

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Always check the propeller rotation before ATVA-1 operation. Use only authorized propellers from the Ubifly Technologies Pvt. Ltd. Use of other OEM Propellers will result in damage to motors and affect the performance of the ATVA-1.

5.3 Control surface and servo maintenance

Control surfaces in ATVA-1 includes 2X ailerons, 1X elevator and 2X rudders. Regular maintenance is crucial for a VTOL drone's control surfaces, which are vital for safe and precise flight. This includes pre-flight inspections for cracks, warping, or hinge looseness. Clean and lubricate hinges to ensure smooth movement. After flights, check for any debris or damage that may have occurred. During pre-flight checks, thoroughly inspect all control surface hinge points for cracks, warping, or loose fasteners,Delamination or any debonds. Ensure hinges move freely without binding. After flights, look for any accumulated dirt, debris, or signs of damage. Address any concerns like loose hinges or minor cracks immediately to maintain optimal control of your VTOL drone.

Inspect all the hinges, clevis and push pull rods on the control surface for proper deflection/movement, any potential damages or wear and tear.

Inspect hinges on every control surface if they are moving smoothly and in the right direction according to the input. Check the joints for dust or wear and tear. Replace if necessary and clean with dry cloth.

Ignoring minor issues can lead to bigger problems, so address any concerns promptly to keep your VTOL drone operating at its best.

6. Battery Maintenance

The Battery is the most critical part of the ATVA-1. It needs proper maintenance and handling to ensure the life of the battery.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Table 3-2 Condition and reaction of battery

S.N	Condition	Reaction
1	Battery Heating	Battery heating is not an issue but is recommended to prevent heating of the battery. Battery heating can be prevented by not operating the forward propulsion motors in higher thrust levels.
2	Battery Bulging	Replace the Battery with a new one.
3	Low battery Life	Use the Recommended battery charging and discharging practice.

Safe Storage temperature for the battery pack

- While Charging - 0℃ - 45℃
- While Discharging - -20℃ - 55℃
- For short term storage: -20℃ - 45℃
- For long term storage: -10℃ - 35℃

If the storage and operational temperatures of the battery pack are within the prescribed values mentioned above, additional cooling or heating facilities are not required.

As a good practice, it is advisable to store the batteries in an air conditioned room with a constant temperature of around 20°C and 25°C, for long term storage.

Safe Storage Humidity: < 75% RH
Safe Storage Pressure: The battery pack must be maintained at normal atmospheric pressure.

The usage of old batteries will not only affect the ATVA-1 ’s electronic system but will also risk the national airspace and its stakeholders.

Usage of Batteries with specifications other than the recommended one will result in a crash or will put other people at risk.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Keep the battery contacts clean, as dirty or corroded contacts can lead to poor connections and reduced battery performance
Visually inspect the battery for any signs of physical damage, swelling, or leakage. If you notice any issues, discontinue use immediately

6.1 Procedure to add entries to the Log Book

The batteries A and B for each set of AT00x, will be used in pairs at all times - during flight tests and while charging. By tracking the charging cycles for battery AT00x, we can track the life cycles for both batteries AT00xA and AT00xB (Here, x = 1/2/3/4/5).

Battery Log:

Battery Log Data Book

Model name: ATVA-1				UIN Number:					Battery ID:					
Cycle no	Room Temperature (During Charging)°C	Voltage before charge(V)		Date	Charging Start time (MM:SS)		Charging Current(A)		Type of charge	Charger ID	Charging Time durations (MM:SS)		Voltage After Charge(V)	
		Battery A	Battery B		Battery A	Battery B	Battery A	Battery B			Battery A	Battery B	Battery A	Battery B

After each flight:

- Equip yourself with necessary PPE is recommended.
- Carefully disconnect the positive terminal first, and then the negative terminal of the battery pack from the plane.
- Remove the battery pack from the plane.
- Place them in the fire safe battery pouch / bag, and bring them back indoors.
- The Battery pack is ready to charge once it reaches a temperature which is lesser than 30^0 C.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

After reaching to the indoors:

- In the charging area, remove the battery packs from the fire safe battery pouch / bag.
- Identify the right charging log, for example, for batteries **AT001A** and **AT001B**, use the log corresponding to the **AT001** batteries. (The Battery ID can be identified from the labels on each battery).
- Measure and record the room temperature from the Temperature & Humidity monitoring device kept in the charging area.
- Measure and record individual 6S battery voltages using a multimeter.
- Connect the batteries to the charger. Do not initiate charging.
- Record the following information:
    - Date and Time of start of charging
    - Charging Current
    - Type of Charging Mode (Storage / Balance / Fast)
    - Charger ID (The Charger ID can be identified from the labels on each charger)
- Now initiate charging.
- Once charging is completed, monitor the time of completion of charging and record the total charging duration.
- Using a multimeter, measure the individual 6S battery voltages and record the same.



Please charge the Battery only with the PC1080 charger provided with the Drone and follow the instructions mentioned below carefully.

6.2 Battery Storage and Transportation:

- Transporting and storing lithium-ion (Li-Ion) batteries safely is crucial due to the potential fire and safety risks associated with these batteries. Whether for personal use, commercial applications, or industrial purposes, following safety guidelines and regulations is essential. Here are some key requirements and best practices for storing and transporting Li-Ion batteries:
- Store Li-Ion batteries at a temperature range between 0°C to 30°C.
- Protect batteries from physical damage, such as punctures or crushing. Store them in a secure, stable location where they won't be subjected to mechanical stress.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Store batteries in a dry and cool location, preferably in a non-conductive container or packaging to prevent contact with conductive materials that could short-circuit the battery.
- Ensure proper ventilation in storage areas to dissipate heat in case of thermal runaway. Do not store batteries in sealed or airtight containers.
- Store Li-Ion batteries with a charge level between 30% and 50%. Storing batteries at full charge or completely discharged for extended periods can lead to capacity degradation.

.Clearly label storage containers with information about the type and quantity of batteries stored and any relevant safety precautions.



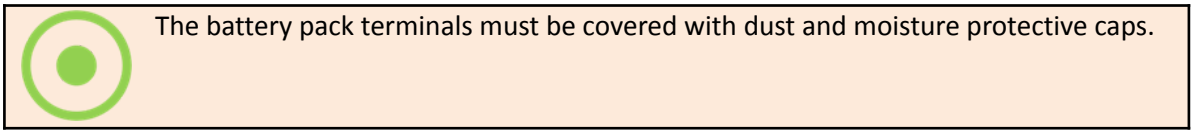
Figure 6.1 The Lithium-Ion battery stored in Fire safe Battery bags/pouches

6.2.1 Battery Storage Guidelines

- Battery packs must be kept in a room on a separate table.
- Fire extinguishers must be placed near the Battery storage rack for safety actions in case of any emergencies. These fire extinguishers must be capable of handling electrical fires, especially ones caused by Lithium Batteries.
- The battery pack storage area must be maintained with utmost cleanliness.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

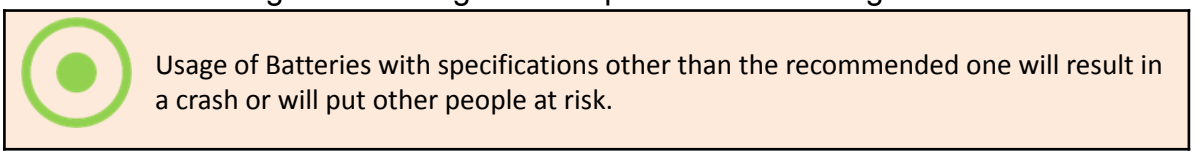
- The battery pack storage area must be devoid of strong acids, oxidizers or any reactive chemicals.
- Maintain storage area temperature between 0°C and 30°C.
- Maintain storage area humidity below 75% RH.
- The battery packs must be stored and carried around safely, in their respective fire-proof safety bags.



6.2.2 Battery Storage Procedure:

- Storage area Preparation:
  - Pack each battery in its designated safety bag.
  - Store batteries in the designated storage area.
- The Storage area must be:
  - Dry and well-ventilated.
  - Maintained within the manufacturer's recommended temperature range (typically, at or below ambient room temperature).
- Guidelines for Long-Term Storage (Over 6 Months):
  - Charge 6S batteries to a voltage of around 21.6V to 22.8V (Cell voltages between 3.6V to 3.8V)
  - This can be done using the ‘Storage’ mode charging on the battery charger. The charger is capable of discharging up to 50W from the battery if needed, to bring down the voltages to the values specified above.

- Maintain storage area temperature between 0°C and 30°C.
- Maintain storage area humidity below 75% RH.
- Handling potential anomalies during storage:
  - During periodic checks, if a battery is found to have a voltage lesser than the prescribed voltage levels for storage, the battery should be taken out and charged again in ‘Storage’ mode.
  - The battery with reduced voltage must be taken out, charged up to storage level voltages and replaced in the storage area.



This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

6.2.3 Transportation Requirements:

- When transporting Li-Ion batteries, use appropriate packaging that provides mechanical protection and electrical insulation.
- Follow regulations regarding the maximum quantity of Li-Ion batteries that can be transported in a single shipment. These limits depend on the battery's watt-hour rating and whether it's carried as carry-on or checked baggage on passenger aircraft.
- Li-Ion batteries should be transported with a state of charge between 30% and 50%. Some regulations may require batteries to be transported at a specific state of charge.
- Prevent short-circuiting during transport by insulating battery terminals with non-conductive material or tape. This is particularly important for loose or spare batteries.
- Be prepared for emergencies by having suitable fire extinguishing equipment and training personnel on how to respond to Li-Ion battery fires or incidents.
- Personnel involved in transporting Li-Ion batteries should receive training on the safe handling, packaging, and transport of these batteries.
- Always check the latest regulations and guidelines from relevant authorities and organizations, as they may evolve over time to address emerging safety concerns related to Li-Ion batteries. Additionally, consulting with experienced professionals or organizations specializing in battery safety and transport can provide valuable guidance.
- Store the Battery packs in a low temperature room (0°C - 30°C).
- Damage to a cell in a pack will permanently damage the pack and may cause a fire.
- Store the damaged battery in a cool, dry chamber to avoid smoke or flame.
- Fire extinguishers must be available during storage, transportation and loading.
- Store the battery pack in nominal voltage 21.6V or 22.2V (3.6V or 3.7V per cell). This makes the pack last longer and less volatile.
- Keep Li-Ion battery packs out of children’s reach.
- Do not put batteries near conducting metal where they can short out.
- Do not store, transport, or carry the battery where it can come into contact with sharp or metallic objects.
- Do not store Li-Ion batteries in extreme temperatures below 0°C or above 30°C.
- Always store Li-Ion packs in safe, non-flammable containers and away from combustible materials.
- Avoid bulk-storage in non-laboratory areas such as offices.
- Always store Li-Ion batteries partially charged. They maintain their level of performance over time and do not need to be cycled unless stored for more than 3-6 months ideally.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved



Make sure to visually inspect battery storage areas weekly.

LONG TERM STORAGE

If the mPower Batteries are to not be used for a long time, its required to discharge the battery to 3.6V/cell with Storage mode on the PC1080. If the voltage is >3.6V/cell, the battery will discharge while if its <3.6V/cell, the battery will charge

- **Long term Battery Storage checks**

  Regular maintenance checks of lithium-ion battery packs used in drones are of significance because:

  1. Maintaining battery health and Prolonging lifespan.
  2. Improving Operational Reliability.

- **Storage Environment Inspection**

  Make sure the environment meets the recommended conditions daily.

6.2.4 Battery Disposal Procedure:

a. Once damages are incurred to the battery pack, the nature and cause for the damages must be analyzed. Logs for the same must be maintained.
b. The damages must be intimated to the battery vendor to inquire for potential repairs. If the damages are irreparable, discussions must be held with the vendors and rest of the team, to mitigate such damages in future.
c. Isolating and Containing the Damaged Battery:
   i. Identify the Damage: Visually inspect the battery for signs of damage, such as bulging, leaking, cracks, discoloration, or excessive heat.
   ii. Isolating the Battery: Carefully remove the damaged battery from the device or storage container using non-conductive tools (Personal Protective Equipment are recommended) to prevent further contact.
   iii. Evacuate if Necessary: If the damage is significant (leaking, bulging, or extreme heat), evacuate the area immediately to minimize exposure to fumes or potential explosion.
   iv. Containment: Place the damaged battery in a fire-resistant pouch. Label the pouch as ‘Damaged Battery’ for future identification.
   v. Documentation and Recordkeeping: Maintain a log of the incident, including the type of battery, date of damage, and disposal method.
d. Important Considerations:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

i. Do Not Use Water: Use only Class A fire extinguishers if a fire breaks out. It is advisable to use fire extinguishers specifically designed to handle fires caused by Lithium Batteries.

e. Disposal:
   i. Do not dispose of damaged batteries in regular trash or recycling bins.
   ii. Damaged batteries should be stored safely in an isolated area inside fire-proof safety bags.
   iii. The information should be intimated to the battery disposal partner who arranges for safe and timely pick up for the damaged batteries and handles the disposal of the same.

6.3 Handling batteries

1. Allow bloated batteries to discharge naturally. When the battery is dead, it's safer to take it out.
2. Don't put your bloated battery in the charger.
3. Remove any combustibles from the area.
4. Wear personal protective equipment while handling damaged batteries.

a. During removal

1. Make sure to use plastic implements with proper personal protection.
2. Do not use a bladed instrument.

b. After removing

1. Keep out of the reach of youngsters.
2. Place it in a safe, noncombustible bag/pouch.
3. Notify the battery recycling partner without delay.

7. Payload Maintenance

A dedicated payload bay is also available that can carry payloads up to 2 kg.Always ensure that the payload placed inside is within the dimensions as explained in the Flight Manual.

ATVA-1 has a payload bay integral part of the airframe of 15.66 litre volumetric capacity. ATVA-1 can be loaded with variable payload carrying and should be within the capacity of 2kg inside the payload bay for logistics application . It must be within the dimensions of 230 x 199 x 124 mm (LxBxH) .The Payload must be within temperature range between -10 degree celsius to 55 degree celsius such that it does not affect the safety of the flight and the internal structure.It can be a solid,liquid or in semi liquid form and must be within the specified payload dimensions and well

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

packed so there should be no spillage during flights. ATVA-1 is not intended to carry any compressed/explosive hazardous inside the payload bay.

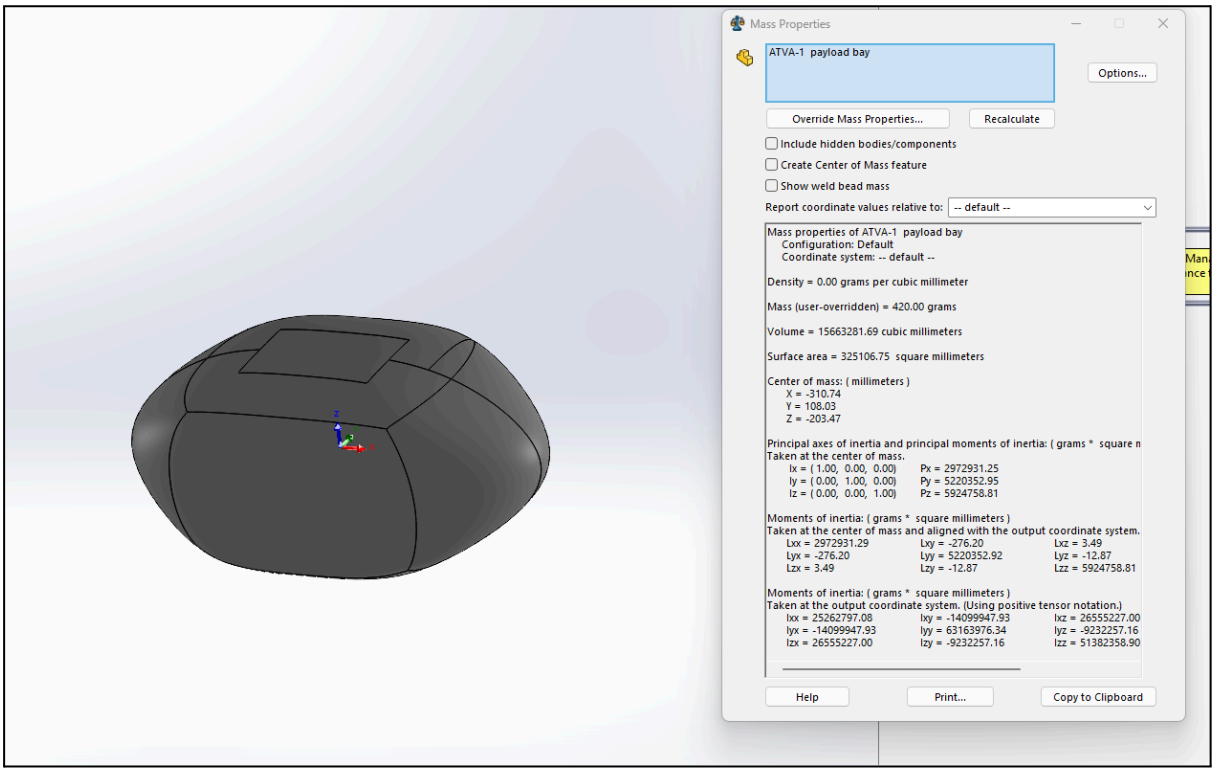


Figure 7.1(a) ATVA-1 Payload Bay Volume - 15.66 l

Table 7-1 Payload Details

Payload Description	Payload weight	Purpose of Usage
Payload	2Kg	Carrying payloads up to 2kg lor logistics application

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

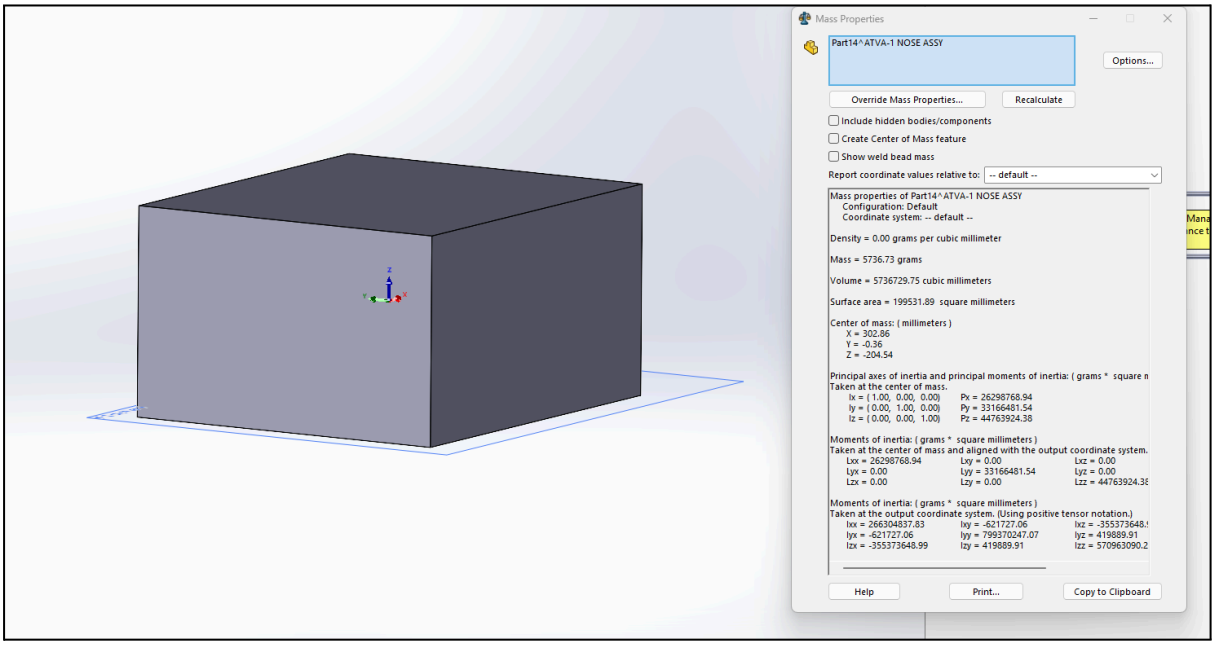


Figure 7.1(b) ATVA-1 Payload Volume - 5.74 l

The payload within the specified dimensions must be placed on the mounting plate and must be securely locked before placing it inside the payload bay.The payload mounting location is specified in the Figure 7.1(c) and the same must be followed while placing the payload.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

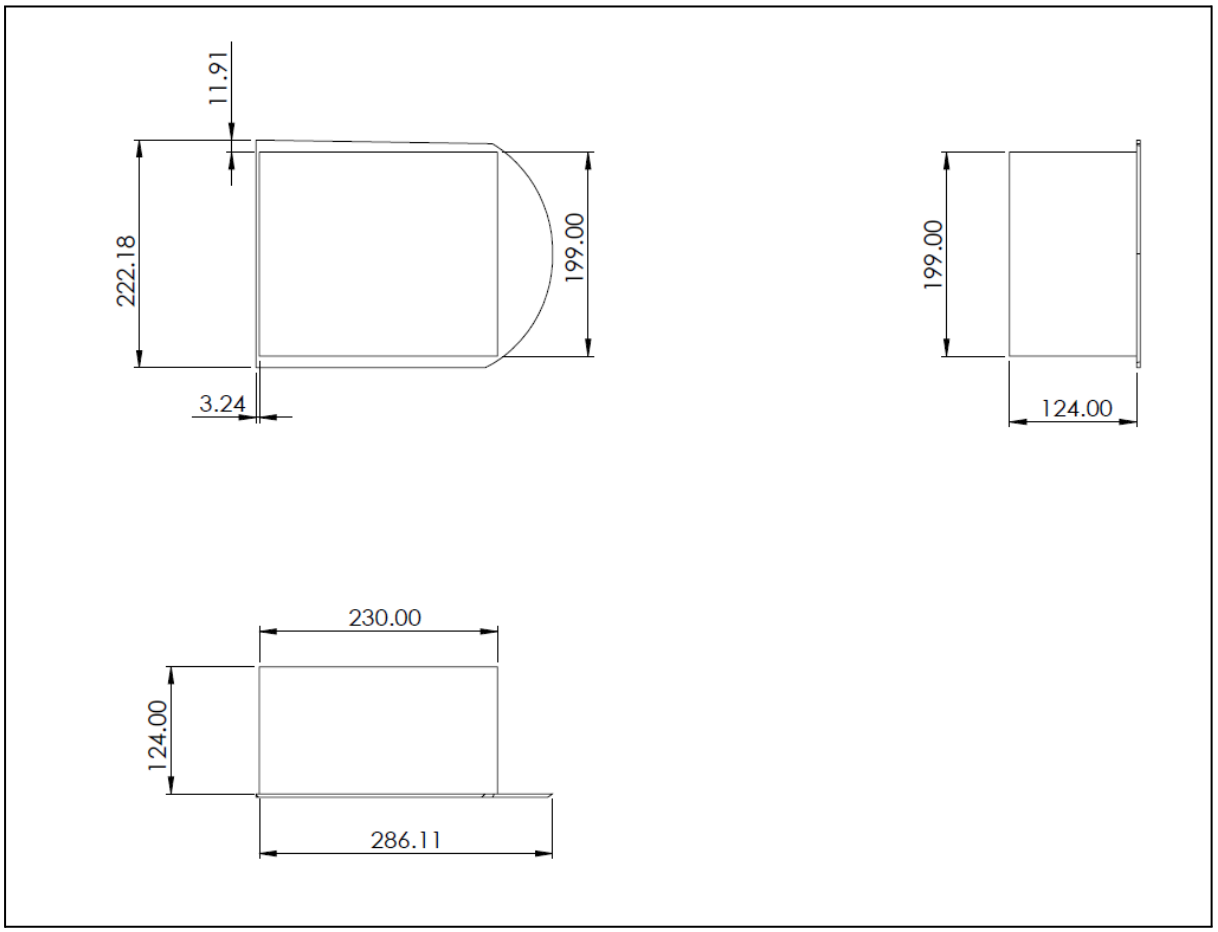


Figure 7.1(c) ATVA-1 Payload Placement on the mounting plate and location



Figure 7.1(d) ATVA-1 Payload tray placement in payload bay

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved



Figure 7.1(e) ATVA-1 Payload placement in payload bay

.

Ensure that the mounting plate is devoid of any cracks or crevices.

8. Maintenance Schedule

8.1 ATVA-1 Maintenance Checks

Regular and systematic checks are crucial to ensure the safety, performance, and longevity of VTOL Hybrid UAVs. These checks help identify potential issues early and ensure safe operation.

- Every Flight Checks
  - Pre-Flight, In-Flight and Post-Flight Checks
- Every Flight Day Checks
  - Continuous Monitoring Checks
  - Operational Logs
- Every charge Check (Battery charging logs)
- Scheduled Checks(30 days / 75 Flights) Whichever reaches first
- UnScheduled Checks (Whenever Abnormalites observed)

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Category	Description
Every Flight Checks	Log Format attached in Annexure-1
Pre-Flight	Inspect and verify all systems and components before each flight.
In-Flight	Monitor performance metrics, system health, and operational behavior during flight.
Post-Flight	Perform visual and diagnostic checks after landing to ensure system integrity.
Every Day Checks	Log Format attached in Annexure - ii and iii
Continuous Monitoring	Monitor systems for real-time alerts, anomalies, and performance data during operations.
Operational Logs	Maintain logs for flight data, incidents, system performance, and maintenance activities.
Every Charge Checks	Log battery health, charging duration, temperature, and voltage after every charge cycle.
Scheduled Checks	Log Format attached in Annexure - iv
Checks	Conduct comprehensive maintenance every 30 days or 75 flights, whichever comes first.
Unscheduled Checks	Log Format attached in Annexure - v
Checks	Perform diagnostics and necessary repairs whenever abnormalities are observed during operations.

on each every checks , Every action elements in the Check list(logs attached below in Anexures) to be inspected as per the SOP and to be filled and attested by the user Incharge



Every checks on every flight, day,charge and Scheduled Checks(30 days / 75 Flights) Whichever reaches first and UnScheduled Checks

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

(Whenever Abnormalites observed) are Mandidatory user should perform as per the SOP without fail



Every filled log should be sent to ubifly Technologies every (30 days / 75 Flights) Whichever reaches first.

All the airframe structural components must be inspected for physical damages that are crucial for the ATVA-1 vehicle.



Visually inspect the airframe, external hardware/electronics for heat or damages. Look for any cracks, dents, breakages.



Check for any cuts or loose connections in the wiring. Check the functionality of the hinges and locks. If damaged, contact Ubifly Technologies Pvt. Ltd.

The ATVA-1 flight checks focus on ensuring the UAV's safety, reliability, and operational readiness across its vertical and horizontal flight modes. Here's a brief overview of its checks: **Every Flight Check**, **Every Day Check(Everyday Logging/Check)**. Rather than the mentioned, **Scheduled** and **Unscheduled maintenance** are necessary and need to be logged in the respective log.

8.2 Every Flight Check

Before every flight, the following maintenance procedure should be followed. In case of any snag the user should not proceed for flights and inform about the snag to Ubifly Technologies Pvt. Ltd.

- Visually Inspect the airframe for any cracks, Delamination any debonds or deformations before the flight.

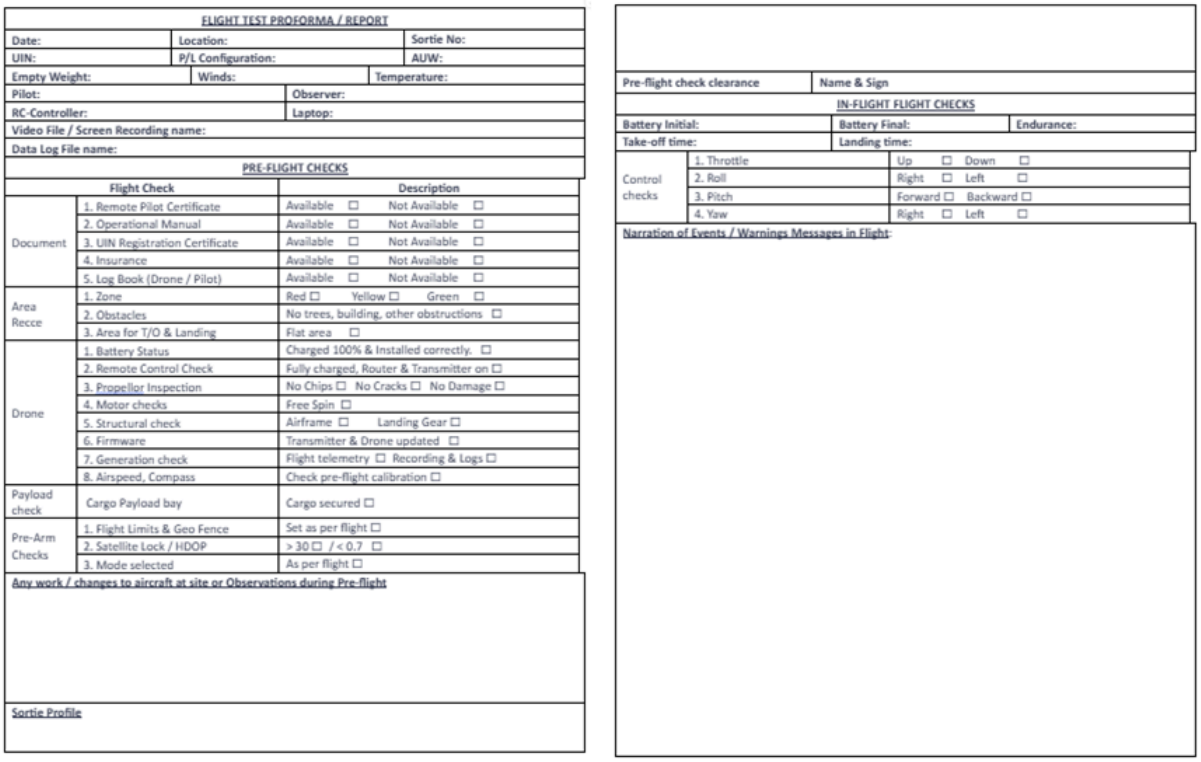
This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Ensure that all the visible fasteners are tight. In any case, if they are loosened then tighten them up to an optimal limit. Refer Figure 8.1 (a) Torque chart

Components	Torque(Nm)
Boom detach at front location	0.32
Boom detach at rear location	0.023
Vtol motor mount to boom	0.056
Cruise motor mount to composite plate	0.049

Figure 8.1 (a) Torque chart

- Ensure that the VTOL and forward propellers are mounted with respective amount of Torque as specified in the Flight manual
- Ensure that the control surfaces and the hinges are free from any debris and operating freely with any disturbance.
- Ensure that the antenna is not obstructed by any other unintended objects.
- Ensure that the ground control system is operating without any software glitches or unwanted heating.
- **Pre - Flight Checklist** & **Post - Flight checklist** needs to be carried out and recorded for Every Take-off and Landing. Refer Figure 8.1 (b) & 8.1 (c)



FLIGHT TEST PROFORMA / REPORT

Date:	Location:	Sortie No:
UIN:	P/L Configuration:	AUW:
Empty Weight:	Winds:	Temperature:
Pilot:	Observer:	
RC-Controller:	Laptop:	
Video File / Screen Recording name:		
Data Log File name:		

PRE-FLIGHT CHECKS

Flight Check		Description
Document	1. Remote Pilot Certificate	Available ☐ Not Available ☐
	2. Operational Manual	Available ☐ Not Available ☐
	3. UIN Registration Certificate	Available ☐ Not Available ☐
	4. Insurance	Available ☐ Not Available ☐
	5. Log Book (Drone / Pilot)	Available ☐ Not Available ☐
Area Recce	1. Zone	Red ☐ Yellow ☐ Green ☐
	2. Obstacles	No trees, building, other obstructions ☐
	3. Area for T/O & Landing	Flat area ☐
Drone	1. Battery Status	Charged 100% & Installed correctly. ☐
	2. Remote Control Check	Fully charged, Router & Transmitter on ☐
	3. Propellor Inspection	No Chips ☐ No Cracks ☐ No Damage ☐
	4. Motor checks	Free Spin ☐
	5. Structural check	Airframe ☐ Landing Gear ☐
	6. Firmware	Transmitter & Drone updated ☐
	7. Generation check	Flight telemetry ☐ Recording & Logs ☐
	8. Airspeed, Compass	Check pre-flight calibration ☐
Payload check	Cargo Payload bay	Cargo secured ☐
Pre-Arm Checks	1. Flight Limits & Geo Fence	Set as per flight ☐
	2. Satellite Lock / HDOP	> 30 ☐ / < 0.7 ☐
	3. Mode selected	As per flight ☐

Any work / changes to aircraft at site or Observations during Pre-flight

Sortie Profile

Pre-flight check clearance	Name & Sign	
IN-FLIGHT FLIGHT CHECKS		
Battery Initial:	Battery Final:	Endurance:
Take-off time:	Landing time:	

Control checks	1. Throttle	Up ☐	Down ☐
	2. Roll	Right ☐	Left ☐
	3. Pitch	Forward ☐	Backward ☐
	4. Yaw	Right ☐	Left ☐

Narration of Events / Warnings Messages in Flight:

Figure 8.1 (b) Pre-Flight Checklist (Annexure-1)

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

8.2.1 Pre-Flight Checklist

Flight Documentation

1. Verify the availability of the Remote Pilot Certificate, Flight Manual, UIN Registration Certificate, Insurance, and Log Book (Drone/Pilot).

Area Reconnaissance

1. Confirm the operational zone classification and identify restrictions.
2. Check for and document potential obstacles.

ATVA-1 Inspection

1. Check battery status and ensure a full charge.
2. Perform functionality checks for the remote control and motors.
3. Inspect propellers, airframe, and control surfaces (ailerons, rudder, and elevator) for integrity.
4. Conduct fastener checks and calibrate the airspeed sensor and compass.

Payload Check

1. Verify payload balance and ensure the payload bay is securely locked.

Pre-Arm Checks

1. Set flight limits and geofence parameters.
2. Confirm satellite lock and HDOP values.
3. Ensure the correct flight mode is selected.

Observations and Changes

1. Document any work, changes, or observations during pre-flight preparation.

Sortie Profile

1. Define and record the flight's objectives and parameters.

Pre-Flight Clearance

1. The Pilot and Flight Engineer must complete, tick off the checklist, and sign the log before the flight.

8.2.2 In-Flight Checklist

Battery Initial and Final:

- Record the initial battery percentage or voltage before take-off.
- Record the final battery percentage or voltage after landing.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Endurance:

- Calculate and record the total flight time (difference between landing time and take-off time).

Take-off and Landing Time:

- Note the exact take-off time and landing time in the respective fields.

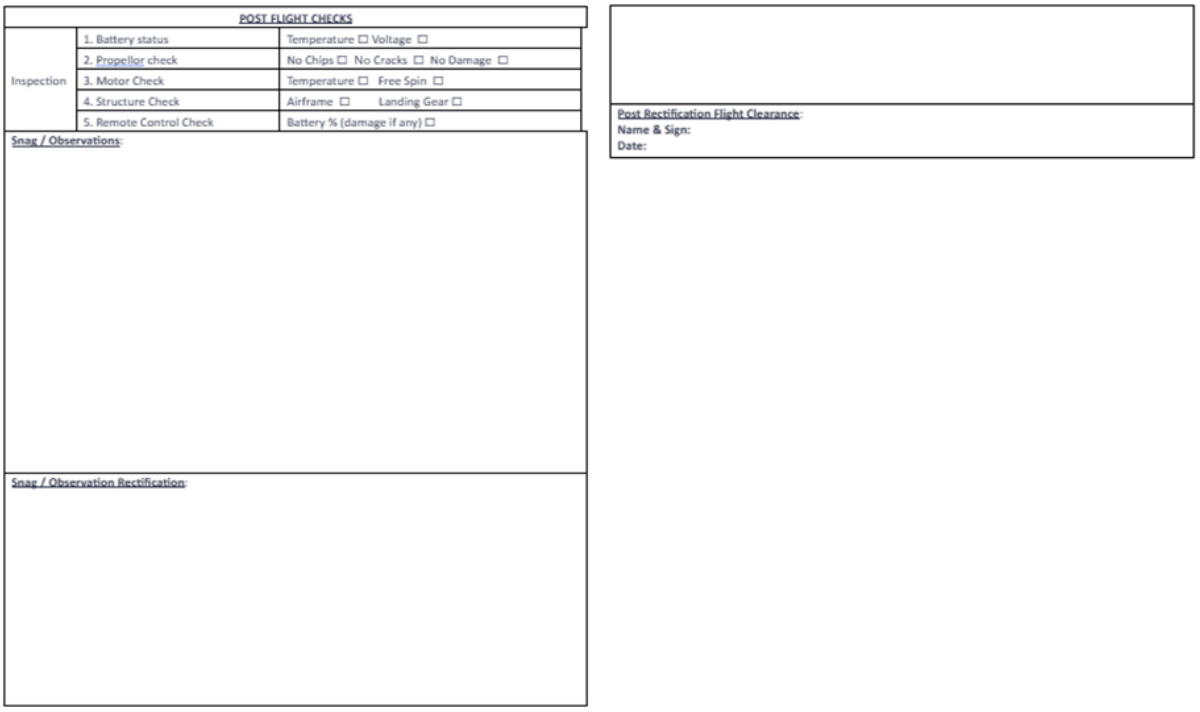
Control Checks:

- During the flight, test each control input (Throttle, Roll, Pitch, Yaw) to verify proper responsiveness.
- Tick the appropriate boxes based on the observed movement:
  - Throttle: Up/Down movement.
  - Roll: Right/Left movement.
  - Pitch: Forward/Backward movement.
  - Yaw: Right/Left movement.

Narration of Events / Warning Messages in Flight:

- Document any unusual events, system warnings, or significant observations that occurred during the flight (e.g., low battery warning, signal loss, turbulence, etc.).

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved



POST FLIGHT CHECKS		
Inspection	1. Battery status	Temperature ☐ Voltage ☐
	2. Propellor check	No Chips ☐ No Cracks ☐ No Damage ☐
	3. Motor Check	Temperature ☐ Free Spin ☐
	4. Structure Check	Airframe ☐ Landing Gear ☐
	5. Remote Control Check	Battery % (damage if any) ☐

Snag / Observations:

Snag / Observation Rectification:

Post Rectification Flight Clearance:
Name & Sign:
Date:

Figure 8.1 (c) Post-Flight Checklist (Annexure-1)

8.2.3 Post-Flight Checklist

Inspection

1. Check battery status and note any discrepancies.
2. Inspect propellers for wear or damage.
3. Perform motor functionality checks.
4. Conduct structural integrity assessments.
5. Verify proper operation of the remote control.

Snags/Observations

1. Record any identified issues during post-flight checks.

Rectification and Clearance

1. Document steps taken to address issues.
2. The Pilot and Flight Engineer must verify, tick off the checklist, and sign the log after the flight.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Observations and Changes

1. Document any work, changes, or observations during preparation or post-flight checks.

Sortie Profile

1. Define and record the flight's objectives.

Clearance

1. The Pilot and Flight Engineer must complete, verify, and sign off on all pre-flight and post-flight checks.

8.3 Everyday Logging/Check

8.3.1 Operational Log

ATVA-1 carries **Operational log** which is mandatory to be logged with respect to the Pre-Flight and Post-Flight checks on each day after reaching from the field .

OPERATIONAL LOG UIN No:

Flight No.	Date	Payload Type	Remarks (Payload)	Overall Payload Weight (kg)	Location	Class of UAS	Start Time (HH:MM)	Software/Firmware Version	Battery Serial no.	Battery Initial Voltage (V)	Battery End Voltage (V)	End Time (HH:MM)	Flight Duration (HH:MM)	Cumulative Flight Time (HH:MM)	No. of Landings	Cumulative no. of landings	Pilot Initials	Engineer Initials	Remarks
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25																			
26																			
27																			
28																			
29																			
30											Overall Cumulative Flight Time (HH:MM)			Overall cumulative no. of Landings					

Figure 8.1 (d) Operational Log (ATVA-1 Log Book)

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Brief on Operational log

Flight No.: Unique identifier for each flight.

Date: Record the flight date.

Payload Type: Specify the payload.

Payload Remarks: Note any payload issues or performance.

Payload Weight (kg): Total weight of the payload.

Location: Flight site or geographical area.

Class of UAS: UAV category (e.g., Small Class UAS).

Start Time: Time of UAV operation start.

Software/Firmware Version: Installed software version.

Battery Details:

- Initial Voltage (V).
- End Voltage (V).
- Specifications (type, capacity).

Flight Time:

- Flight Duration (mins).
- Cumulative Flight Time (mins).

Landings:

- No. of Landings.
- Cumulative Landings.

Signatures:

- **Pilot Initials**: Operator in charge.
- **Engineer Initials**: Inspector for pre- and post-flight checks.

Remarks: General observations or issues encountered.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

8.3.2 Continuous Monitoring Process for UAS components

This process is carried out to ensure the components present in **ATVA-1** are monitored on a daily basis after reaching the office to avoid unexpected conflicts during next day flights

Continuous Monitoring process for UAS components (Every Day After Flight)			**Remarks**
Inspection	1. Remote Control Check	Transmitter On ☐ Antenna Check ☐	
	2. Batteries Status	Visual ☐ Voltage ☐ Connector ☐ Charging logs ☐	
	3. Fastener Check	Torque Check ☐ No Damage ☐	
	4. Motor Check	Visual ☐ Free Spin Check ☐	
	5. Structure Check	Airframe Visual Check ☐ Landing Gear Check ☐ No Cracks ☐ No Damage ☐	
	6. Pitot Tube	Pitot Tube Check ☐	
	7. Logging Check	Flight Telemetry ☐ Recording & Logs ☐	
	8. Airspeed, Compass	Check Pre-Flight Calibration ☐ (Dashboard Summary Amber GCS)	
	9. Payload Bay	Secured ☐ No Cracks ☐ No Damage ☐	

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Propeller Check	Visual Check	No Cracks ☐ No Damage ☐
	Fastener Check	Fastener Check ☐ Torque Check ☐
Motor Check	Friction Noise Check	Noise Check ☐
	Fastener Check	Fastener Check ☐ Torque Check ☐
Control Surface Check	Visual Check	No Cracks ☐ No Damage ☐
	Hinge Check	Ensuring No Foreign ☐ Materials/Damage Are Present ☐
Electrical Check	Visual Check	Wiring Check ☐ Connector Check ☐
Flight Hours	On Day Flight Hours	
	Total Flight Hours	
Landing Cycles	On Day Landing Cycles	
	Total Landing Cycles	
Operational Log	As Per Day Preflight /Post Check List	Filled ☐

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Maintenance Cycle	No Of Days After Previous Maintenance	_____out Of 30 Days
	No Of Flights After Previous Maintenance	_____out Of 75 Flights

Remarks:

Validated by
Name & Sign:
Date:

Verified by
Name & Sign:
Date:

Figure 8.1 (e) Continuous Monitoring Process

Early Detection of Issues: Continuous monitoring helps identify potential problems (e.g., wear, corrosion, overheating) before they cause significant damage or failure, allowing for timely maintenance or replacement.

Improved Safety: In ATVA-1, continuous monitoring ensures that safety thresholds are met and maintained, reducing the risk of catastrophic failures during operation.

Optimization of Performance: Monitoring helps track the performance of components in real-time, which can inform adjustments to improve efficiency, reliability, and longevity.

Cost Efficiency: Proactive monitoring can prevent costly repairs and replacements by catching issues early, optimizing the use of resources, and reducing overall operational costs.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Data for Improvement: Monitoring provides valuable data that can be used for design improvements, process optimization, and innovation, making future iterations of components or systems more effective.

SOP for Continuous Monitoring on daily basis

1. Remote Control Check

- Transmitter On:
  Do:
  - Power on the remote control and ensure that it connects properly to the UAS. Look for any error messages or malfunctions.

  Outcome
  - This step helps identify potential issues with the remote control, which is critical for ensuring safe flight operations.
    Log Impact:
  - Logs record the status of the transmitter, and any operational failure can indicate wear over time, allowing for early intervention.
- Antenna Check:
  Do:
  - Inspect the antenna for any visible damage, wear, or loose connections. Ensure the antenna is securely attached.

  Outcome
  - This ensures the UAS has optimal signal strength, avoiding potential communication failures during flight.
    Log Impact:
  - Tracking antenna condition helps predict the lifespan of this component and ensures it is functioning properly, reducing the risk of signal issues in future flights.

2. Batteries Status

- Visual Inspection:
  Do:
  - Inspect the battery casing and connectors for damage, leaks, or signs of wear.
  - Ensure there is no visible corrosion or fluid leakage that might indicate a battery issue.

  Outcome
  - These logs are vital to track the battery's performance and identify degradation patterns. Early detection of battery issues can prevent unexpected failures during flight.
- Voltage Check:
  Do:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Check the battery's voltage to ensure it is within safe operating levels according to the manufacturer's guidelines.

Outcome

- Record the voltage to monitor whether it is consistent with the expected performance.
  Log Impact:
- Regular voltage checks help to monitor the battery's degradation over time, ensuring timely maintenance or replacement to prevent flight-time anomalies.

- Connector Check:
  Do:
  - Verify that the connectors are secure and free from any visible signs of corrosion or wear.

  Outcome
  - Connector issues, if not addressed early, could result in flight performance problems, making this check essential for identifying early electrical faults.

3. Fastener Check

- Torque Check:
  Do:
  - Use a torque wrench to confirm that all fasteners are secured according to the manufacturer's specifications.

  Outcome
  - This ensures that critical components, such as motors and airframe parts, are tightly secured to prevent mid-flight failures.
    Log Impact:
  - The torque log helps ensure that fasteners are maintained at the proper tension, extending the life of the UAS and avoiding unexpected structural failures.
- Visual Check:
  Do:
  - Inspect each fastener for signs of damage, wear, or corrosion. Replace any fastener that appears damaged.

  Outcome
  - Detailed records of fastener conditions help track the performance of fasteners, guiding their maintenance and replacement schedules.

4. Motor Check

- Visual Inspection:
  Do:
  - Inspect the motor for physical damage, wear, or contamination (e.g., dirt or moisture).

  Outcome

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Ensure that there are no signs of overheating, such as discoloration or burn marks.
  Log Impact:
- Regular motor condition logs are crucial for tracking motor performance over time, helping to prevent motor failure and extend its operational life.

- Free Spin Check:
  Do:
  - Manually rotate the motor to ensure it spins freely and smoothly without resistance.
  - Listen for any abnormal noises, which could indicate internal issues.

  Outcome

  - Recording motor spin check results helps track any wear or friction buildup, potentially signaling the need for maintenance before a failure occurs.

5. Structure Check

- Airframe Visual Inspection:
  Do:
  - Perform a thorough visual inspection of the airframe to check for any cracks, dents, or signs of stress.
  - Ensure the airframe remains structurally sound to handle the forces during flight.

  Outcome

  - The airframe's structural health is vital to flight safety. Keeping logs of any damage detected can predict airframe wear, informing when it might require replacement or repair.
- Landing Gear Check:
  Do:
  - Inspect the landing gear for cracks or deformities. Ensure the landing gear is firmly attached and operational.
  - This ensures safe takeoffs and landings, reducing the risk of damage during ground contact.

  Outcome

  - Consistent logging of landing gear condition is important to anticipate wear patterns and plan timely maintenance to avoid failure during critical phases of flight.

6. Pitot Tube Check

- Pitot Tube Condition:
  Do:
  - Ensure the pitot tube is free of blockages, debris, or any other obstructions. Confirm it is securely attached.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- This is crucial for accurate airspeed readings and flight performance.

Outcome

- Regular pitot tube checks ensure that data logging equipment provides accurate readings, which is essential for safe flight operation and component health tracking.

7. Logging Check

- Flight Telemetry:
  Do:
  - Ensure that all flight telemetry data (e.g., altitude, speed, position) is recorded correctly.
  - Review the telemetry logs to identify any anomalies that could indicate underlying issues.

  Outcome
  - Logs are instrumental in tracking overall flight performance and identifying areas where components may be underperforming or showing signs of wear.
- Recording & Logs:
  Do:
  - Ensure that all flight logs are accurately filled out and stored for future review. This includes operational logs, flight hours, and any maintenance notes.
  -

  Outcome
  - Maintaining accurate flight logs helps monitor the health of components, track flight hours, and determine when maintenance or replacement is necessary based on operational data.

8. Airspeed & Compass Check

- Pre-Flight Calibration:
  Do:
  - Ensure that the airspeed and compass are calibrated prior to flight. Log any deviations from the standard calibration values.
  -

  Outcome
  - Logging these calibrations ensures that all readings during flight are accurate. Tracking deviations allows for early identification of sensor malfunctions or drift.

9. Payload Bay Check

- Secured:
  Do:
  - Confirm that the payload is securely mounted and that no damage has occurred to the payload bay.

  Outcome

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Regular monitoring ensures that payload security is maintained, preventing damage to sensitive equipment and ensuring consistent performance.

10. Propeller Check

- Visual Inspection:
  Do:
  - Inspect propellers for cracks, chips, or damage.
  - Check the balance and ensure they are correctly fitted to the motors.

  Outcome
  - Regular logging of propeller conditions helps in identifying wear patterns, which can be critical in maintaining the safety and efficiency of the UAS.

11. Control Surface Check

- Visual Inspection & Hinge Check:
  Do:
  - Check for cracks or damage to the control surfaces and ensure the hinges move freely.

  Outcome
  - Tracking control surface condition ensures that movement is smooth and unhindered, critical for flight stability and longevity.

12. Electrical Check

- Visual & Connector Check:
  Do:
  - Inspect wiring for visible damage and ensure connectors are secure and free from corrosion.

  Outcome
  - Electrical system logs help to monitor the integrity of wiring and connectors, ensuring that electrical issues are detected before they cause failure.

13. Flight Hours & Landing Cycles

- Log Flight Hours & Cycles:
  Do:
  - Record the total flight hours and landing cycles after each mission. Compare with the manufacturer’s recommended service intervals.
    Log Impact:
  - Accurate tracking of flight hours and cycles helps to plan maintenance intervals, reducing the likelihood of unexpected failures and ensuring compliance with the manufacturer's maintenance guidelines.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Conclusion:

Every inspection and log entry plays a crucial role in ensuring the UAS's long-term performance, safety, and reliability. The detailed logs serve as a crucial data set for monitoring the health and life cycle of components, scheduling maintenance, and identifying early warning signs of component failure. Keeping up-to-date logs not only prevents unscheduled maintenance but also extends the operational life of the UAS by providing a historical record that guides timely interventions.

8.4 Every Charge Cycle Check (Battery)

Battery maintenance is critically important for ATVA-1 for several reasons. The battery is the primary power source for operations, and any issues with it can directly affect the performance, safety, and operational efficiency of the system.

1. Ensuring Safety

Batteries, especially lithium-ion type used in ATVA-1, can pose safety risks if they are not properly maintained. Overcharging, deep discharging, or physical damage can lead to overheating, fire, or even explosions. Proper maintenance and monitoring of battery health ensure these risks are minimized and the UAS operates safely.

2. Maximizing Battery Life

Batteries degrade over time, and their performance (such as flight duration and charging capacity) deteriorates with use. Regular maintenance, such as checking the battery's charge cycles, temperature, and voltage, helps extend its operational life. Maintaining batteries properly ensures ATVA-1 to operate at peak performance throughout their lifespan.

3. Optimizing Flight Time

Battery maintenance directly affects the endurance of ATVA-1. If the battery is not maintained well, it may not hold a sufficient charge, leading to shorter flight times and potential mission failure. Regular monitoring helps detect performance degradation early, allowing for timely replacement or recalibration, ensuring that the ATVA-1 can achieve its required operational range and flight duration.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

4. Reducing Downtime

Unplanned battery failures during flight or before missions can cause delays and reduce the operational efficiency of ATVA-1.

5. Preventing Overheating and Damage

Batteries can overheat during use, particularly if they are not properly maintained or monitored. Overheating can lead to permanent damage to the battery or, in worst cases, cause safety hazards such as fire. Regular inspection and proper temperature management (e.g., keeping batteries in a controlled environment and avoiding extreme temperatures) are critical for preventing these issues.

6. Battery maintenance

Keep the battery contacts clean, as dirty or corroded contacts can lead to poor connections and reduced battery performance
Visually inspect the battery for any signs of physical damage, swelling, or leakage. If you notice any issues, discontinue use immediately

Procedure to add entries to the Log Book

The batteries A and B for each set of AT00x, will be used in pairs at all times - during flight tests and while charging. By tracking the charging cycles for battery AT00x, we can track the life cycles for both batteries AT00xA and AT00xB (Here, x = 1/2/3/4/5).

Battery Log:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Battery Log Data Book

Model name: ATVA-1				UIN Number:					Battery ID:					
Cycle no	Room Temperature (During Charging)°C	Voltage before charge(V)		Date	Charging Start time (MM:SS)		Charging Current(A)		Type of charge	Charger ID	Charging Time durations (MM:SS)		Voltage After Charge(V)	
		Battery A	Battery B		Battery A	Battery B	Battery A	Battery B			Battery A	Battery B	Battery A	Battery B

Figure 8.1 (f) Battery Log Book (ATVA-1 Log Book)

After each flight:

- Equip yourself with necessary PPE.
- Carefully disconnect the positive terminal first, and then the negative terminal of the battery pack from the plane.
- Remove the battery pack from the plane.
- Place them in the fire safe battery pouch / bag, and bring them back indoors.
- The Battery pack is ready to charge once it reaches a temperature which is lesser than 30^{0} C.,

After reaching to the indoors:

- In the charging area, remove the battery packs from the fire safe battery pouch / bag.
- Identify the right charging log, for example, for batteries **AT001A** and **AT001B**, use the log corresponding to the **AT001** batteries. (The Battery ID can be identified from the labels on each battery).
- Measure and record the room temperature from the Temperature & Humidity monitoring device kept in the charging area.
- Measure and record individual 6S battery voltages using a multimeter.
- Connect the batteries to the charger. Do not initiate charging.
- Record the following information:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Date and Time of start of charging
- Charging Current
- Type of Charging Mode (Storage / Balance / Fast)
- Charger ID (The Charger ID can be identified from the labels on each charger)

- Now initiate charging.
- Once charging is completed, monitor the time of completion of charging and record the total charging duration.
- Using a multimeter, measure the individual 6S battery voltages and record the same.



Please charge the Battery only with the PC1080 charger provided with the Drone and follow the instructions mentioned below carefully.

Handling swollen batteries

- Allow bloated batteries to discharge naturally. When the battery is dead, it's safer to take it out.

- Don't put your bloated battery in the charger.
- Remove any combustibles from the area.
- Wear personal protective equipment while handling damaged batteries.

❖ During removal

- Make sure to use plastic implements with proper personal protection.
- Do not use a bladed instrument.

❖ After removing

- Keep out of the reach of youngsters.
- Place it in a safe, noncombustible bag/pouch.
- Notify the battery recycling partner without delay.

8.5 Scheduled Maintenance of ATVA-1

Scheduled maintenance is an essential practice in ATVA-1, ensuring the systems, components, and equipment remain in optimal condition and function reliably throughout their lifecycle. It involves pre-planned maintenance tasks carried out at

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

regular intervals or based on specific flight hours or usage metrics, rather than waiting for components to fail.

> Check the operational Life of ATVA-1 from the operational flight logs for airframe, Battery, Propulsions and landing gear based on usage metrics(Cycle, flight hours etc) .if it exceeds the declared limits section 15. Kindly contact Ubifly Technologies Pvt. Ltd. .

The Maintenance carried out for ATVA-1 is scheduled in an interval of either 30 days or 75 flights which is accomplished earlier.(Refer Figure 8.1(g))

MAINTENANCE LOG

Doc No	ATVA/ITD/12
Page no.	-
Issue Date	-

Model Name	ATVA-1	UIN Number		MAINTENANCE LOG BOOK - (TO BE CARRIED OUT EVERY 30 DAYS OR 75 FLIGHTS)

		Airframe					Propulsion				Battery Wiring			Electronics	Communication	Flight Control				Equipment Check		Payload							
S.No	Date	Airframe Cleaning	Airframe Visual Check	Screws Torque check	Landing Gear Visual Check	Propeller Visual Check	Clean Motor	Motor Spinning Check	Motor Visual Check	Wiring Visual Check	Battery harness Check	Connectors Lock Check	Electronics Components Functional Check	RF Antennae Check	Flight Control Check	Sensor Calibration	Battery Bulge	Battery Fuse check	Servo Functional and Travel Check	Pitot Tube Functional Check	Payload Mount check	Payload Visual Check	Payload operation Check/Balance Check	Number of Landings	Total number of Flight hours (HH:MM)	Remarks	Engineer Name/Signature	Inspector Name/Signature
1																													
2																													
3																													
4																													
5																													
6																													

Figure 8.1 (g)Maintenance Log (ATVA-1 Log Book)

Here's a brief on Maintenance log filling;

8.5.1 Airframe:

- **Explained in-detail in the above section 5.**
- Check the operational Life of ATVA-1 from the operational flight logs for airframe and **landing** gear cycles . if it exceeds the declared limits in section 15. Kindly contact Ubifly Technologies Pvt. Ltd. .

8.5.2 Propulsion:

- **Motor and Propeller maintenance**

Rotate the motor by hand. Make sure it turns smoothly and listen for any screeching or scraping sounds which would indicate anything foreign objects inside the motor shaft. If so, check with Ubifly Technologies Pvt. Ltd. to visually inspect the propeller for any cracks or damages in the tip. if the fasteners are loosen kindly fasten the

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

propeller mount firmly with Loctite 222. If any Delamination and damage approaches the Ubifly Technologies Pvt. Ltd.



All the motors and propellers must be inspected for any physical damages or abnormalities that are crucial for the flight condition of the ATVA-1 vehicle.

Propulsion System Inspection and Maintenance

Propeller Visual Check

- Inspect the propellers for cracks, chips, or warping. Replace any damaged propellers immediately.

Motor Cleaning

- Clean the motors of any dirt, dust, or particles that could affect performance.

Motor Spinning Check

- Manually spin the motors to ensure they rotate smoothly without resistance or abnormal sounds.

Motor Visual Check

- Conduct a visual inspection of the motors for signs of wear, damage, or overheating.

Propulsion Life Check

- Check the operational Life of ATVA-1 from the operational flight logs. if if it exceeds the declared limits in section 15. Kindly contact Ubifly Technologies Pvt. Ltd. .

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

8.5.3 Battery Wiring:

a. Battery maintenance



Inspect the battery for any physical damages or leaks. Monitor the heat generated from the battery.

Inspect the battery thoroughly. Measure battery heat after flight and observe any sudden rise in temperature. Check for any bulges, leaks, or any damage to the cell casings.



Handle with care. If damaged, contact Ubifly Technologies Pvt. Ltd..

8.5.3.1 Battery and Wiring Inspection and Maintenance

Wiring Visual Check

- Inspect all visible wiring for fraying, loose connections, or signs of wear. Ensure insulation is intact.

Battery Harness Check

- Check the battery harness for secure connections and any visible damage.

Connectors Lock Check

- Ensure that all connectors (battery, electronics, etc.) are securely locked and there are no loose fittings.

Battery Bulge Check

- Inspect the battery for bulging or swelling, which can indicate internal damage or degradation. Replace if necessary.

Battery Life Check

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Check the operational Life of ATVA-1 from the operational flight logs. if it exceeds the declared flights section 15. Kindly contact Ubifly Technologies Pvt. Ltd. .

8.5.3.2 Battery Maintenance Procedure

1. Battery Maintenance Procedure - Storage Conditions

- Avoid direct contact between the terminals and metal objects, as this can lead to short-circuiting, resulting in the generation of heat and electrical discharge.
- Never expose batteries to extreme temperatures or direct sunlight during storage. If batteries need to be stored for an extended period (over three months), adhere to the following environmental conditions:
- Always disconnect batteries when not in use, refrain from altering, puncturing, or impacting batteries or related components, and place batteries in storage if they will not be actively used for more than three days to prevent damage and ensure safety.
- Ensure that the storage area is free from dust, dry, and protected from moisture, and avoid storing batteries with fire-accelerating products.
- Maintain a safe distance of up to five meters from flammable materials, and never leave batteries unattended where they could be damaged by unauthorized individuals.



It is advisable to have a class ABC or CO2 fire extinguisher nearby the storage area for added safety measures.

2. Battery Maintenance Procedure - Before Charging

- Before commencing each charging session, it is imperative to verify the voltage of batteries to ensure they meet or fall below the minimum safe starting threshold (2.8V). If the starting voltage falls below the recommended levels, it indicates either over-discharge or a potential failure, and in such cases, charging should be avoided.
- Prior to initiating the charging process, meticulously inspect the battery for any signs of damage. Examine the battery packaging, wires, and connectors for

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

any defects that could potentially lead to a short circuit and subsequent battery failure.

- Ensure that the charger leads utilized are compatible with the battery connectors to prevent any compatibility issues or damage during the charging process.
- Users must carefully scrutinize the polarity of both the battery cable and charger lead before establishing the connection to prevent any inadvertent short circuits.
- The responsibility lies solely with the user to ensure the proper functionality of the charger being utilized.



It is imperative to continuously monitor the charging procedure to guarantee that the batteries are being charged correctly, as failure to do so could result in a fire hazard.

3. Battery Maintenance Procedure - Charging

- Utilize only chargers provided by Ubifly Technologies Pvt. Ltd.
- It is essential to charge batteries in an open area, away from flammable materials, liquids, and surfaces at all times.
- Avoid charging batteries inside the UAV.
- Refrain from charging batteries when the temperature falls below freezing (0°C, 32°F).
- Never attempt to charge batteries that feel hot to the touch (exceeding 100°F). Wait until they have cooled down before handling.
- Always ensure that the charger is set to the appropriate cell count and/or voltage as indicated on the battery labels.
- Set the charger to the recommended amp charge rate specified by Ubifly Technologies Pvt. Ltd. at all times.
- Avoid overcharging batteries beyond their listed capacity stated on the battery labels.
- Never exceed the rated maximum voltage during charging (4.2V/cell for LiPo batteries).
- During charging, maintain a clean surrounding area free from debris, and ensure continuous monitoring.
- Promptly ensure stop of charging once the battery reaches full capacity.
- Avoid leaving the charger connected to the battery for an extended period after it's fully charged.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved



Check the battery temperature immediately after it's fully charged and maintain a log of battery charging activities.

4. Battery Maintenance Procedure - Discharging

- Never allow the battery temperature to surpass 55°C during discharge.
- Avoid discharging batteries below the rated voltage under load conditions. Doing so may damage the battery, lead to over discharge, and pose fire hazards during subsequent charging.
- Do not discharge the battery under load to a level below 3V per cell.
- In case of an emergency, immediately cease the discharging process, disconnect the battery, and place it in a safe area for observation for at least one hour. This precaution is necessary to prevent potential leaks and ignition that could lead to a fire. The designated safe area should be outdoors, away from buildings, vehicles, and combustible materials.
- Before use or discharging, carefully inspect the battery for signs of imbalance, puffiness, or leaking cells. Discontinue use if any abnormalities are detected. If there is a risk to nearby structures or property, contact emergency services immediately. After the fire has subsided, then disconnect the charger and move the battery carefully to a safe location.



Always monitor the battery during the discharging process and react promptly to any potential issues that may arise.

8.5.3.3 Emergency Operation Procedure for Battery

1. Battery Ignition While Charging

- Lithium batteries can catch fire if charged improperly or if they suffer physical damage. Ensure the availability of a fire extinguisher near the battery charging rack.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Improper charging can lead to battery fires. In case of such fires, do not immediately approach the battery pack. Allow the intensity of the battery fire to recede.
- Do not inhale the toxic smoke emanating from the ignited battery pack.
- In case of fires, immediately turn off the main supply to the charger and use the fire extinguisher to extinguish the fire.
- Check whether the extinguisher is fit to be used for electrical fires. Ensure that the fire **extinguisher** is specifically made for Lithium-Ion batteries fires.
- Move away all critical components from the vicinity of the battery pack to prevent the spread of damages.
- Contact emergency services immediately.
- Wait for at least 1 hour after the situation has been brought under control. Contact the battery disposal partner immediately who would assist in the safe removal process of the battery pack from the site.

2. Storage

- Li-ion batteries generally do not show a significant inclination to ignite during storage.
- In case a lithium-ion battery catches fire in storage, evacuate the area immediately.
- Assess the magnitude of damages:
    - If the intensity of damages is very minimal, try to extinguish the fire with a fire extinguisher for electrical and battery fires.
    - Keep in mind that this should be done only when there is a very small fire. If the magnitude of damages is severe, do not attempt to put out the fire. Call emergency services and immediately evacuate the area.
- Distance yourself from the harmful fumes emitted by the damaged battery pack.
- If the storage area contains multiple battery packs, then the fire might spread to other cells and lead to catastrophic damage. In such cases, do not enter the area even after the fire has receded. Only after appropriate actions have been taken by emergency services personnel, and the area has been cleared of toxic waste, entry must be permitted.



Contact the battery disposal partner immediately who would assist in the safe removal of the harmful waste from the site.

3. Aircraft Crash (Battery Ignition)

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Though infrequent, Li-ion batteries can ignite solely as a direct and immediate consequence of physical damage. In the event of battery ignition following an aircraft crash, the following procedure should be adhered to:
    - Evacuate the area immediately.
    - Take cover behind a solid barrier if possible.
    - Call emergency services.
    - If safe to do so, use a Lith-EX fire extinguisher to extinguish small fires.

4. Aircraft Crash (no ignition)

- Leave the aircraft aside for at least 1 hour to ensure that an ignition is not going to occur.
- After the waiting period is over, slowly approach the plane and disconnect the loads from the battery pack.
- Remove the battery pack safely and place them inside the fire-resistant safety bags and carry them to the facility.
- Equip yourself with the appropriate Protective Equipment and inspect the battery pack for potential damages or leaks.
- If no damages are found, perform a normal functional test on the battery pack with a static load and observe its behavior. If the pack exhibits normal behavior, the pack must be charged and moved into storage safely.
- In case of any damages, consult the vendor regarding the possibilities of repairing the battery pack.



If the damages are irreparable, contact the battery disposal partner to initiate safe disposal of the battery pack.
Note : Inform to Local Police Officials and **Ubifly Technologies Pvt. Ltd.** incase of incident / accident occurs.

5. Battery charger maintenance

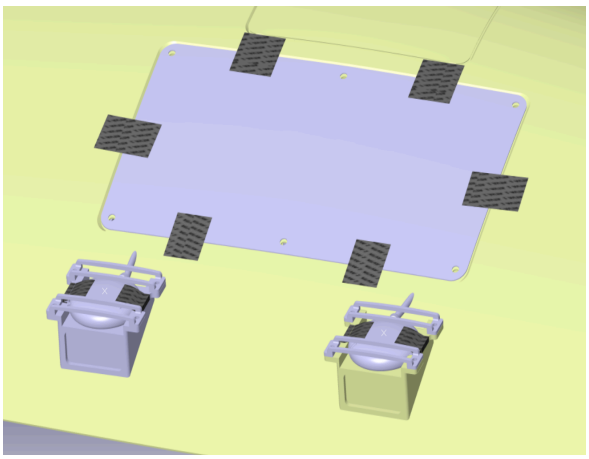
- Inspect the battery charger for any potential damages.
- Use the charging procedure as Balance charge method only. See if it can charge at 0.5C without causing any power surge.
- If any damages or anomalies are observed, contact the manufacturer.

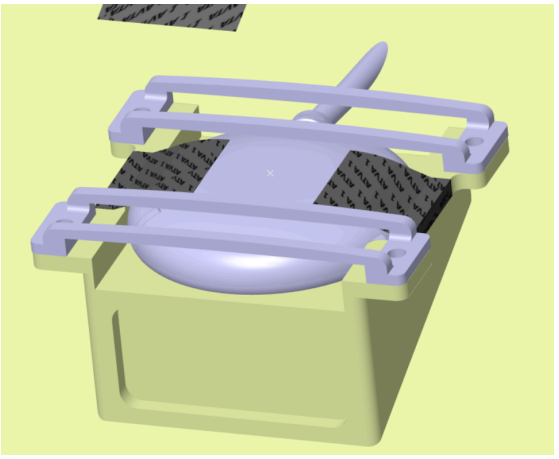


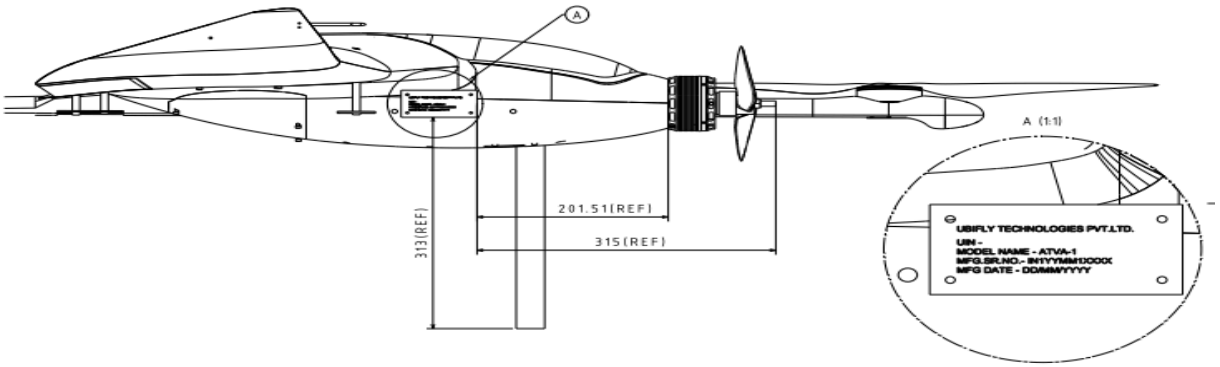
Check if the battery charger is comfortably charging 2 batteries without any overheating.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

8.4.6 UIN plate and Void Stickers:







Check the UIN plate and Void Stickers are firmly stuck in the UAS .

In case of wear and tear inform **Ubifly Technologies Pvt. Ltd.** immediately.

9.Un-Scheduled Maintenance

Regular upkeep ensures your ATVA-1 remains in safe operating condition, enhances safety, and prolongs its lifespan, minimizing the risk of unexpected issues during

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

flights of the ATVA-1.The following checklist must be adhered to for everyday checks.

Unscheduled maintenance in UAVs is essential to address unexpected issues that arise during reported previous flights. These include:

1. **Equipment Failures**: Unexpected malfunctions in motors, sensors, or avionics.
2. **Software/Hardware Issues**: Bugs, glitches, or system incompatibilities.
3. **Environmental Factors**: Damage from extreme weather, dust, or wildlife.
4. **Human Error**: Operational mistakes or mishaps leading to system failure.
5. **Wear and Tear**: Unexpected degradation of components.
6. **Communication Failures**: Loss of signal or interference disrupting operations.
7. **Security Threats**: Cybersecurity breaches requiring urgent fixes.
8. **Post-Mission Problems**: Issues noticed after a mission, like battery or overheating problems.
9. **Compliance**: Changes in regulations requiring immediate adjustments.
10. **Upgrades**: Installation of new parts or technologies to improve performance based on future regulations .

In short, unscheduled maintenance ensures the UAV stays safe, functional, and ready for future missions.



Irrespective of the maintenance schedule, some components should be checked every day for effectiveness and ATVA-1 maintenance is essential for safe and efficient operations

9.2 Unscheduled Monitoring Checks

The Unscheduled check logs are attached in Annexure V. The Parameters are detailed in the table below

S. No	Component	Monitoring Detail
1	**Overall, ATVA-1**	1. Inspect the Primary and critical components 2. Visually, Check for any defects on the airframe and control surfaces.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

		3. Check for any Loose screws on the UAS. 4. Check the Endurance as per specifications. 5. Check the Visual Defects/ Cracks on the landing gear.
2	**Motors**	1. Check for the Sound of the ATVA-1. Note if there are any abnormal sounds during operations. 2. Check if Motor is spinning without obstruction. 3. Check if the heat of the motor is normal as per the specification
3	**Propellers**	1. Check for any Visual Defects 2. Check the Propeller Mounts for any Wear and Tear due to rough use.
4	**Battery**	1. Check the Charging Time 2. Check the Endurance as per Specification 3. Check for any Battery Geometrical Shape Change 4. Check for any sparks while powering on
5	**GCS – Ground Control Station**	1. Check for the Signal Strength in GCS 2. Check the Fasteners that hold the Antenna. 3. Check for any damages on the GCS. 4. Check GCS Battery Back-up as per the specification
6	**Payloads**	1. Check for any Visual Damage 2. Check the Payload Attachment connectors for any damage. 3. Check for the flow sensor and pump connections. 4. Check for the liquid flow tubes.
7	**Equipment Check**	Battery BulgeCheck for bulging, indicating a safety hazard.Battery Fuse CheckInspect for damage or corrosion.Servo Functional and Travel CheckTest servos for proper function and travel range.Pitot Tube Functional CheckEnsure it's clear and unobstructed.
8	**Additional**	Number of Landings, Record total landings. Total Number of Flight Hours, Record total flight time.

9.2.1 Payload maintenance:

A dedicated payload bay can be attached that can carry payloads up to 2 kgs and contact the Ubifly Technologies Pvt. Ltd. if any anomalies are found.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved



Inspect the vibration dampener rubber for any potential damages or wear tear, check the payload bay for any damages

9.2.2 Equipment and Payload Check

Payload Mount Check

- Ensure that the payload is securely mounted, with no loose parts or connections.

Payload Visual Check

- Inspect the payload for physical damage or signs of wear.

Payload Operation and Balance Check

- Test the payload's functionality and ensure that the weight distribution is balanced correctly for flight. (Place the payload in proper orientation and secure it with Velcro present)

9.2.3 GCS software maintenance:

GCS software is Amber GCS. Avoid running multiple applications on the Devices which might lead to hangs or crashes of the software. In case of any issues contact Ubifly Technologies Pvt. Ltd.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

10.Component Performance and Reliability based on Continuous Monitoring Plan

The critical components that need to be continuously tracked are given below. For every flight checks , daily checks and logs , scheduled check lists need to be Filled on timely as mentioned and to be submitted during mentioned maintenance schedule to the Ubifly technologies Pvt. Ltd. are as follows in Annexure IV:



ATVA-1 users/operators must report any snag or malfunction immediately via the designated phone or email with details such as issue description, date/time, photos/videos, and attempted corrective actions. Operations must not continue without acknowledgment if the issue is critical. Logs,



Continuous Monitoring, Pre- and Post-Flight, Operational, Maintenance, and Battery Charging Logs, must be submitted monthly or after every 75 flights, whichever comes first, either email (***drones.info@eplane.ai***.). Logs must be complete, accurate, signed, and retained for records. Ubifly will review and provide feedback post-submission.

ATVA-1 users/operators must report any snag or malfunction immediately via the designated phone or email with details such as issue description, date/time, photos/videos, and attempted corrective actions. Operations must not continue without acknowledgment if the issue is critical. Logs, including Continuous Monitoring, Pre- and Post-Flight, Operational, Maintenance, and Battery Charging Logs, must be submitted monthly or after every 75 flights, whichever comes first, either via email (***drones.info@eplane.ai***.). Logs must be complete, accurate, signed, and retained for records. Ubifly will review and provide feedback post-submission. For queries, contact via phone ([9551395526]) or email (***drones.info@eplane.ai***.). This SOP is subject to periodic updates.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Log the cumulative flight hours for the UAV. Regular intervals should trigger thorough inspections and maintenance checks.

If the Monitoring Sheet is not filled by the user at the time of Maintenance, it will Void the Warranty

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

10.1 Continuous Monitoring of Component performance and reliability – To be Filled by User

Objective: This procedure ensures the effective and comprehensive monitoring of Unmanned Aircraft System (UAS) components post-flight. It includes instructions on how to conduct detailed inspections and why these logs are crucial in tracking component health, flight hours, and maintenance cycles. Consider annexure A for Continuous monitoring logs and fill on each day of flights and Section 15.Life of Components

1. Remote Control Check

- Transmitter On:
  Do:
  - Power on the remote control and ensure that it connects properly to the UAS. Look for any error messages or malfunctions.
  - This step helps identify potential issues with the remote control, which is critical for ensuring safe flight operations.
    Log Impact:
  - Logs record the status of the transmitter, and any operational failure can indicate wear over time, allowing for early intervention.
- Antenna Check:
  Do:
  - Inspect the antenna for any visible damage, wear, or loose connections. Ensure the antenna is securely attached.
  - This ensures the UAS has optimal signal strength, avoiding potential communication failures during flight.
    Log Impact:
  - Tracking antenna condition helps predict the lifespan of this component and ensures it is functioning properly, reducing the risk of signal issues in future flights.

2. Batteries Status

- Visual Inspection:
  Do:
  - Inspect the battery casing and connectors for damage, leaks, or signs of wear.
  - Ensure there is no visible corrosion or fluid leakage that might indicate a battery issue.
    Log Impact:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- These logs are vital to track the battery's performance and identify degradation patterns. Early detection of battery issues can prevent unexpected failures during flight.

- Voltage Check:
  Do:
  - Check the battery's voltage to ensure it is within safe operating levels according to the manufacturer's guidelines.
  - Record the voltage to monitor whether it is consistent with the expected performance.
    Log Impact:
  - Regular voltage checks help to monitor the battery's degradation over time, ensuring timely maintenance or replacement to prevent flight-time anomalies.

- Connector Check:
  Do:
  - Verify that the connectors are secure and free from any visible signs of corrosion or wear.
    Log Impact:
  - Connector issues, if not addressed early, could result in flight performance problems, making this check essential for identifying early electrical faults.

3. Fastener Check

- Torque Check:
  Do:
  - Use a torque wrench to confirm that all fasteners are secured according to the manufacturer's specifications.
  - This ensures that critical components, such as motors and airframe parts, are tightly secured to prevent mid-flight failures.
    Log Impact:
  - The torque log helps ensure that fasteners are maintained at the proper tension, extending the life of the UAS and avoiding unexpected structural failures.
- No Damage:
  Do:
  - Inspect each fastener for signs of damage, wear, or corrosion. Replace any fastener that appears damaged.
    Log Impact:
  - Detailed records of fastener conditions help track the performance of fasteners, guiding their maintenance and replacement schedules.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

4. Motor Check

- Visual Inspection:
  Do:
  - Inspect the motor for physical damage, wear, or contamination (e.g., dirt or moisture).
  - Ensure that there are no signs of overheating, such as discoloration or burn marks.
    Log Impact:
  - Regular motor condition logs are crucial for tracking motor performance over time, helping to prevent motor failure and extend its operational life.
- Free Spin Check:
  Do:
  - Manually rotate the motor to ensure it spins freely and smoothly without resistance.
  - Listen for any abnormal noises, which could indicate internal issues.
    Log Impact:
  - Recording motor spin check results helps track any wear or friction buildup, potentially signaling the need for maintenance before a failure occurs.

5. Structure Check

- Airframe Visual Inspection:
  Do:
  - Perform a thorough visual inspection of the airframe to check for any cracks, dents, or signs of stress.
  - Ensure the airframe remains structurally sound to handle the forces during flight.
    Log Impact:
  - The airframe’s structural health is vital to flight safety. Keeping logs of any damage detected can predict airframe wear, informing when it might require replacement or repair.
- Landing Gear Check:
  Do:
  - Inspect the landing gear for cracks or deformities. Ensure the landing gear is firmly attached and operational.
  - This ensures safe takeoffs and landings, reducing the risk of damage during ground contact.
    Log Impact:
  - Consistent logging of landing gear condition is important to anticipate wear patterns and plan timely maintenance to avoid failure during critical phases of flight.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

6. Pitot Tube Check

- Pitot Tube Condition:
  Do:
  - Ensure the pitot tube is free of blockages, debris, or any other obstructions. Confirm it is securely attached.
  - This is crucial for accurate airspeed readings and flight performance.
    Log Impact:
  - Regular pitot tube checks ensure that data logging equipment provides accurate readings, which is essential for safe flight operation and component health tracking.

7. Logging Check

- Flight Telemetry:
  Do:
  - Ensure that all flight telemetry data (e.g., altitude, speed, position) is recorded correctly.
  - Review the telemetry logs to identify any anomalies that could indicate underlying issues.
    Log Impact:
  - Logs are instrumental in tracking overall flight performance and identifying areas where components may be underperforming or showing signs of wear.
- Recording & Logs:
  Do:
  - Ensure that all flight logs are accurately filled out and stored for future review. This includes operational logs, flight hours, and any maintenance notes.
    Log Impact:
  - Maintaining accurate flight logs helps monitor the health of components, track flight hours, and determine when maintenance or replacement is necessary based on operational data.

8. Airspeed & Compass Check

- Pre-Flight Calibration:
  Do:
  - Ensure that the airspeed and compass are calibrated prior to flight. Log any deviations from the standard calibration values.
    Log Impact:
  - Logging these calibrations ensures that all readings during flight are accurate. Tracking deviations allows for early identification of sensor malfunctions or drift.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

9. Payload Bay Check

- Secured:
  Do:
  - Confirm that the payload is securely mounted and that no damage has occurred to the payload bay.
    Log Impact:
  - Regular monitoring ensures that payload security is maintained, preventing damage to sensitive equipment and ensuring consistent performance.

10. Propeller Check

- Visual Inspection:
  Do:
  - Inspect propellers for cracks, chips, or damage.
  - Check the balance and ensure they are correctly fitted to the motors.
    Log Impact:
  - Regular logging of propeller conditions helps in identifying wear patterns, which can be critical in maintaining the safety and efficiency of the UAS.

11. Control Surface Check

- Visual Inspection & Hinge Check:
  Do:
  - Check for cracks or damage to the control surfaces and ensure the hinges move freely.
    Log Impact:
  - Tracking control surface condition ensures that movement is smooth and unhindered, critical for flight stability and longevity.

12. Electrical Check

- Visual & Connector Check:
  Do:
  - Inspect wiring for visible damage and ensure connectors are secure and free from corrosion.
    Log Impact:
  - Electrical system logs help to monitor the integrity of wiring and connectors, ensuring that electrical issues are detected before they cause failure.

13. Flight Hours & Landing Cycles

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Log Flight Hours & Cycles:
  Do:
  - Record the total flight hours and landing cycles after each mission. Compare with the manufacturer's recommended service intervals.
    Log Impact:
  - Accurate tracking of flight hours and cycles helps to plan maintenance intervals, reducing the likelihood of unexpected failures and ensuring compliance with the manufacturer's maintenance guidelines.

Conclusion:

Every inspection and log entry plays a crucial role in ensuring the UAS's long-term performance, safety, and reliability. The detailed logs serve as a crucial data set for monitoring the health and life cycle of components, scheduling maintenance, and identifying early warning signs of component failure. Keeping up-to-date logs not only prevents unscheduled maintenance but also extends the operational life of the UAS by providing a historical record that guides timely interventions.

10.1.1 MAINTENANCE LOG & DOCUMENTATION

Log Each Maintenance Event

- Every inspection, maintenance action, or repair must be logged with the date, time, and technician's signature.

Snag/Observation Reporting

- Any issues or potential failures noticed during the checks should be documented in detail.

Rectification and Follow-up

- Record the corrective actions taken to address any snags. Obtain clearance for flight only after rectification.

This structured approach ensures that all critical components of the UAV are maintained in optimal working condition, enhancing the overall safety and longevity of the system. Regular logging of these checks allows for better tracking of component wear and tear and helps plan preventive maintenance.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Attached in the Annexure IV, The User should mail the scanned copy of the previous continuous monitoring report per 75 flights to the below mail address ***drones.info@eplane.ai***. The same will be verified during the maintenance service checkup. This step should be strictly followed to prevent warranty void.



The above mentioned steps should be strictly followed to prevent warranty void.

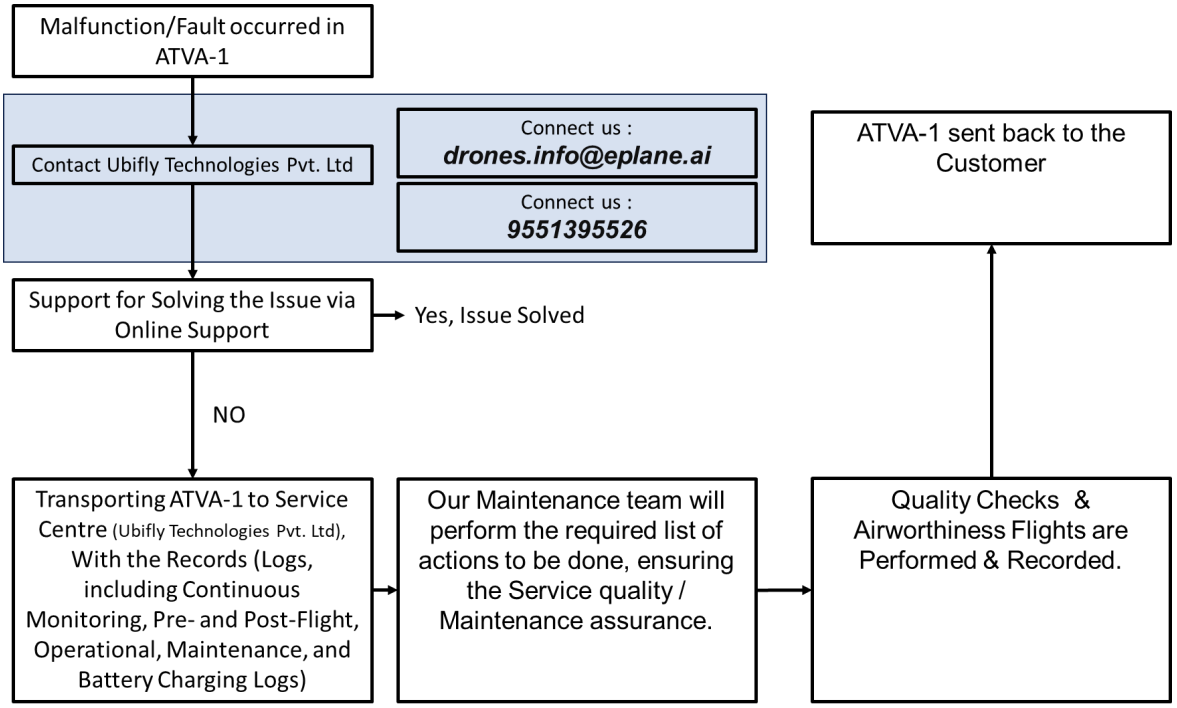
10.2 In-service difficulties (post sales)

As of now, the primary service centre is located in the below locations.

Ubifly Technologies Private Limited, Department of Aerospace Engineering, Machine Design Section Rd, Indian Institute of Technology, Chennai, Tamil Nadu 600036

Contact Mail ID: drones.info@eplane.ai

10.2.1 ATVA-1 Contingency Servicing Procedure



This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Step 1: Identify the Issue

If your ATVA-1 experiences a malfunction or fault, follow these steps:

- Check basic functionality and logs.
- If the issue persists, proceed to Step 2.

Step 2: Contact Support

Reach out to our support team for assistance:

📧 **Email:** drones.info@eplane.ai
📞 **Phone:** 9551395526

We will guide you through the next steps to solve online or send to Ubifly Technologies Pvt. Ltd .

Step 3: Transport the ATVA-1

- Ship the ATVA-1 to our **Service Center**.
- Include all relevant **Flight and Maintenance logs** (Continuous Monitoring, Pre/Post-Flight, Operational, Maintenance, and Battery Charging Logs).

Step 4: Inspection & Repair

- Our expert team will **diagnose the issue** and perform the necessary maintenance.
- We ensure **high service quality** and maintenance assurance.

Step 5: Quality & Airworthiness Checks

- Before returning your ATVA-1, we conduct thorough **Quality and Airworthiness inspections**.
- All findings and fixes are recorded for transparency.

Step 6: Return to Customer

- Once cleared, your ATVA-1 will be shipped back **ready for operation**.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

10.2.2 Service Centre Procedure carried out for ATVA-1.

a. ATVA-1 comes to Service Station,
b. Receiving feedback from the user,
c. Technician will go thru the aircraft (Ensuring the VOID stickering & ensure its capability to flight (Visual cracks , damages, etc) and confirms with the user,
d. Filling Job Card i.e., Inward QC checklist,
e. Majority Checks - Battery, FC Controller, C2C unit (Herelink), Powertrain (Motor & Propellers),
f. The maintenance team will perform the required list of actions to be done, ensuring the service quality/ maintenance assurance. Here comes in the Records of Replacement,
g. Functional check-II will be held with respect to the replaced components,
h. Aircraft will be handed over to Flight test team for Testing,(observations are recorded)
i. Rather than the sorted issue, If any new observations recorded, the aircraft again goes back to the Maintenance team. The team will perform the required list of actions to be done, ensuring the service quality/ maintenance assurance.
j. After a successful flight, the aircraft is now serviceable . The maintenance team will start the post maintenance procedure,(Includes the VOID stickering),
k. Will record an acknowledgement from the user(Current status, Serviced invoices),
l. Deliver the aircraft to the user.
m. The maintenance log will be updated in parallel.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

n. Inventory and The Management(Ubifly Technologies Pvt. Ltd.,) will be informed vice-versa.

11.Factory maintenance

Sending the ATVA-1 (UAS) to Ubifly Technologies for factory maintenance every 6 months involves a clear, organized procedure to ensure compliance, safety, and efficient handling of the UAV. Below is a step-by-step guide specific to UbiFly Technologies (or any similar UAV manufacturer/service provider) for factory maintenance.

Step-by-Step Procedure for Sending ATVA-1 to Ubifly Technologies for Factory Maintenance

11.1 Pre-Maintenance Preparation

- Review UbiFly Guidelines: Refer to Ubifly Technologies' maintenance schedule and service recommendations for the ATVA-1 UAS. Ensure that 6-month maintenance is required based on their recommendations.
- Check Warranty and Service Agreement: Verify the UAV’s warranty status to confirm the maintenance is covered or if there are any costs involved.
- Document UAV Condition: Inspect the UAV and note any visible wear, performance issues, or specific concerns (e.g., battery, motors, sensors, etc.). Record any issues to mention during the maintenance request.
- Backup Data: Ensure that all flight logs, system data, and settings are backed up from the UAV before sending it in for maintenance.
- Prepare Service Request: Write a maintenance request detailing any issues, symptoms, or specific service needs (e.g., hardware checks, software updates, part replacements).

11.2 Contact Ubifly Technologies

- Reach Out to Ubifly: Contact Ubifly Technologies (via their website, support portal, or customer service number) to schedule maintenance for the ATVA-1.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Provide UAV Details: Provide the UAV's serial number, model, and maintenance history to help UbiFly assess the service requirements.
- Obtain RMA (Return Merchandise Authorization): Request an RMA number from UbiFly. This is often required for tracking, warranty processing, and service documentation.
- Confirm Service Scope: Discuss with UbiFly what specific checks, repairs, or updates will be done. If there are any parts to be replaced, confirm them with UbiFly.
- Request Estimated Turnaround Time: Ask for an estimated timeline for the completion of maintenance (typically 1-2 weeks depending on service load).

11.3 Prepare the UAV for Shipment

- Power Down the UAV: Ensure the UAV is fully powered off to avoid electrical issues during shipping.
- Remove the Battery: If required by UbiFly, remove the battery from the UAV for safety during shipping. Some manufacturers prefer batteries to be sent separately.
- Secure Sensitive Components: Detach any removable components such as cameras, antennas, or payloads to avoid damage during transport. Keep track of all parts removed.
- Clean the UAV: Gently clean the UAV to remove dirt, dust, or debris, especially around sensitive parts like sensors, cameras, or motors.
- Inspect for Damage: Before shipping, check the UAV for any visible damage that may have occurred during operation. Take photos of the UAV from different angles for record-keeping.
- Package the UAV: Use UbiFly's recommended packaging (e.g., original shipping box or a strong, well-padded box with foam or bubble wrap). Ensure all components are securely cushioned to prevent damage during transit.
- Label the Package: Write the RMA number, your contact details, and any special instructions (such as parts to be replaced or specific checks to be done) on the shipping label.

11.4 Ship the UAV to Ubifly Technologies

- Choose a Reliable Courier: Use a reputable courier to ship the UAV. Ensure the courier can handle packages that are fragile and need tracking and insurance.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Ensure Insurance: If the UAV is expensive or valuable, purchase insurance for the shipment to protect against potential loss or damage during transport.
- Track the Shipment: Keep the shipment tracking number handy to monitor the status of the delivery to UbiFly.

11.5 Factory Maintenance Process at UbiFly Technologies

- Inspection and Diagnostics: UbiFly will receive the UAV and conduct an initial inspection to identify any damage or issues. They will run diagnostics to check the functionality of key components such as motors, sensors, battery, and avionics.
- Ubifly Technologies will check whether the void stickers are intact in positions. on critical components .
- Ubifly Technologies will check for the log details from the user for better performance and technical evaluation.
- Software/Firmware Updates: UbiFly will update the UAV's software and firmware to the versions, on any regulatory requirement or performance improvements
- Parts Replacement: If any parts (such as motors, sensors, or batteries) are found to be worn out or defective, UbiFly will replace them as necessary.
- Calibrations and Tests: UbiFly will calibrate sensors and flight control systems, and perform flight tests or other functional checks to ensure the UAV is performing to standard.
- Maintenance Report: After completing the maintenance, UbiFly will provide a detailed maintenance report outlining the work performed, any parts replaced, software/firmware versions installed, and any tests completed.

11.6 Post-Maintenance Steps

- Review the Maintenance Report: Upon receiving the UAV, review the factory maintenance report to ensure the work has been completed as requested and that the UAV is ready for use.
- Conduct Test Flights: Perform test flights to verify that the UAV is functioning properly and that all systems (e.g., GPS, sensors, motors, flight controls) are operating as expected.
- Reinstall Components: Reinstall any components that were removed for shipment, such as payloads or antennas, and ensure everything is properly connected.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Recalibrate Sensors: If necessary, recalibrate any sensors or components that were adjusted during the maintenance.

11.7 Update Records

- Update Maintenance Logs: Document the details of the maintenance, including the date, work completed, parts replaced, and any performance improvements.
- Set Future Maintenance Reminder: Based on the manufacturer's recommendation, set a reminder for the next factory maintenance in 6 months.
- The User need to arrange pickup transportation of UAS

Summary Checklist:

1. Pre-Maintenance Prep: Review UbiFly guidelines, check warranty, backup data, document condition.
2. Contact UbiFly: Schedule maintenance, request RMA, confirm scope of work.
3. Prepare UAV for Shipment: Power down, remove battery, secure components, package, and label.
4. Ship the UAV: Use a reliable courier, insure the shipment, track delivery.
5. Factory Maintenance at UbiFly: Inspection, diagnostics, software updates, parts replacement, testing, and reporting.
6. Post-Maintenance: Review reports, test the UAV, reinstall components, and recalibrate sensors.
7. Update Records: Log maintenance details and set future maintenance reminders.

By following these steps, you will ensure that your ATVA-1 UAS is properly maintained and returned to optimal performance every 6 months, keeping it in top condition for your operations.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

12.Crash of UAS

If a UAS **(Unmanned Aircraft System)** crashes, prompt and systematic actions are required to ensure safety, gather data for analysis, and mitigate further risks. Here's a concise step-by-step guide on what to do after a UAS crash:

1. Ensure Safety First

- **Check for Hazards**: Before approaching the crash site, assess for immediate dangers, such as fire, smoke, electrical hazards, or leaking fuel.
- **Evacuate Personnel**: Keep people at a safe distance (at least 50 feet or more depending on the situation) to avoid harm, especially if there's risk of fire or other dangerous conditions.
- **Call Emergency Services**: If there are injuries or significant hazards (e.g., fire or damage to property), contact emergency services immediately.

2. Secure the Area

- **Establish a Perimeter**: Secure the crash site to prevent unauthorized access, contamination of evidence, or further risks.
- **Mark the Crash Site**: Use barriers or caution tape to clearly mark the area.

3. Power Down

- **Turn Off Power**: If possible and safe to do so, turn off the UAV's power system to prevent any additional electrical issues or risk of fire.
- **Disconnect Batteries**: If accessible and safe, disconnect or remove the UAV's battery, especially if the battery is damaged or at risk of catching fire.

4. Document the Crash Site

- **Take Photos and Notes**: Record the position, orientation, and state of the UAV and its components. This will help in crash analysis and understanding the cause.
- **Capture Environmental Conditions**: Document weather conditions, time of day, and any other factors that might have contributed to the crash.

5. Recover the UAV

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- **Assess Damage**: Carefully retrieve the UAV and its components if they are safe to handle. Avoid further damage during recovery.
- **Avoid Tampering**: Do not alter or tamper with the wreckage, as this could hinder the investigation.

6. Analyze the Data (if possible)

- **Retrieve Flight Logs**: If the UAV stores flight data (e.g., GPS logs, sensor data), download and preserve these records for later analysis.
- **Check Remote Communication Logs**: If communication was lost or interrupted, review logs to identify any potential communication failure.

7. Notify Ubifly technologies

- **Notify us**:we will trigger our operations team, supervisor, or relevant personnel about the crash and act on it..
- **File an Incident Report**: Depending on the severity, file an official report and include all relevant data and findings.

8. Investigate the Cause

- **Conduct a Root Cause Analysis**: Review the data, conditions, and flight patterns leading up to the crash. Look for issues like hardware failure, software malfunction, battery issues, or operator error.
- **Review Maintenance Logs**: Check if the UAV had any recent maintenance or if there were any indications of wear and tear that could have contributed to the crash.

9. Implement Corrective Actions

- **Fix Identified Problems**: Address any issues uncovered during the investigation, such as hardware flaws, software bugs, or procedural errors.
- **Update Procedures**: If human error or operational mistakes were involved, revise training or operational protocols to prevent future occurrences.

10. Follow-Up and Documentation

- **Maintain a Record**: Keep a detailed log of the incident for future reference, including corrective actions, insurance claims, and any regulatory requirements.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Summary Checklist:

Ensure Safety: Secure the area, evacuate personnel.
Power Down: Turn off and disconnect batteries.
Document: Take photos, note conditions, and capture flight data.
Recover the UAV: Safely retrieve the wreckage.
Investigate: Conduct a root cause analysis.
Corrective Actions: Implement fixes and update protocols.
Follow-Up: Repair or replace the UAV and document the incident

Typical inspection points after an accident may include, but not be limited to, the following.

- Propeller blade and hub damage
- Control surface damage
- Motor alignment
- Payload Damage
- Airframe Damage or Cracks

on any incidence kindly inform Ubifly Technologies Pvt. Ltd. and local authorities immediately . RCA for the cause will be investigated

13.Troubleshooting of UAS

13.1 General Warnings or error

S.NO	Symptom	Potential Cause	Potential Action
1	Compass Error	External Interference due to mobile, watches, or other metallic items very close to ATVA-1	Change location or check the surrounding for any metallic obstacles.
2		Compass not calibrated	Calibrate Compass and check again
3	GPS Warning	The location's GPS signal is very Weak	Try changing the take-off location

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

S.NO	Symptom	Potential Cause	Potential Action
4		The GPS unit has been damaged	Contact *Manufacturer
5	ATVA-1 not powering on	The battery has no charge or less charge	Charge again or check voltage using a multimeter
6		Battery damaged	Replace Battery
7		The issue in the ATVA-1 internal systems	Contact *Manufacturer
8	Accelerometer Warning	ATVA-1 has been disturbed while powering on	Switch off and repower the ATVA-1 again.

13.2 Flight Controller Warnings

S.NO	Symptom	Potential Cause	Potential Action
1	ATVA-1 not Arming	The safety Switch is not pressed	Press the safety switch and try to arm
2		The mode is not manual	Move mode to manual
3		Radio Not calibrated	Follow Radio Calibration
4		No power to the Flight controller – No beep sound while turning on	Contact *Manufacturer
5	Checksum errors	Files are not placed into the right folder	Always check Security folder for the files, checksum.txt and criticals.param
6		Chance of checksum calculation change	Power cycle ATVA-1 which triggers recalculation
7		criticals.param is edited	Always have a backup of criticals.param for replacement

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

8		checksums.txt is edited	Always have a backup of checksums.txt for replacement
9		persistence of checksum error	Check POST logs
10			Contact *Manufacturer

13.3 Flight Behavior

S.NO	Symptom	Potential Cause	Potential Action
1	Unexpected Flight Behaviour	The ATVA-1 alignment or any other parameters might have changed due to a hard landing or crash	Returning to *Manufacturer
2	Vibration during Flight	Propeller Damage	Change Propeller
3		Unbalanced Propeller blades	Use only authorized propeller blades.
4		Motor Misalignment	Align motors with a spirit level or contact *Manufacturer
5		Control surface Error	Check control surface hinges and ensure proper and smooth travel
6	Sluggish Flight	The climb rate is set too low	Change in the GCS software
7	Position lock not achieved	GPS Signal not strong	Retry Flying in a different environment
8	Compass Calibration Error	Ferrous objects or strong electromagnetic HIRF environment	Flying in a HIRF environment is not safe.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

S.NO	Symptom	Potential Cause	Potential Action
9	Home Point Not set	Poor GPS signal	Change location or remove any signal interference devices.

*Ubifly Technologies Pvt. Ltd.

14.Best Practices for Operating and Maintaining ATVA-1

- Always use original or authentic spare from trusted supplier
- Always clean the ATVA-1 and prevent dust accumulation in any parts of the ATVA-1.
- ATVA-1 should be operated in an environment free from high EMI interferences.
- Sensors should be free from any obstruction or dust. Clean with soft cloth.
- Check for security files - checksums.txt and criticals.param - exists in the Security folder before takeoff
- Frequent checks on POST logs
- Having a backup of the Security folder
- Do not add any extra weight to the ATVA-1 other than the intended payloads. Addition of additional components to the ATVA-1 will nullify the warranty of the buyer.
- Follow Digital Sky interactive map to know if you are flying in the green zone or necessary approval is required.

15.Life of Components

- The expected life of the ATVA-1 UAS is 3920.81 hours, with periodical inspection to be carried out as per the Maintenance manual.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

- Change the batteries once after 359 cycles used , Only use batteries provided by Ubifly Technologies Pvt. Ltd., Do not use any other batteries

- Propulsion life - Max operational Hours are denoted in table below

Component	Motor Name	OEM Total run operational Hours Declared	Manufacturer(Ubifly Technologies Pvt. Ltd.) Operational Hours Declared
Lift (VTOL) Motor	V605 KV210	500	500
Cruise Motor	AT7215 KV220	600	600

- The Life of Cruise Motor is equivalent to 600 Flight hours of the ATVA-1 since it spends most time during cruise after transition with can be observed from cumulative flight hours from operational logs
- The Life of Lift Motor is equivalent to 500 (500 x 3 = 1500) Flight hours . since it operates ⅓ of the endurance only during take off and landing of the ATVA-1

Contact Ubifly technologies once the life of the components is depleted

Note : Contact Ubifly Technologies Pvt. Ltd. In case of any visual damage, deformation (or) misalignment present in ATVA-1, Especially with the Primary Structural Elements and send the UAS along with the transportation Box for components change . Replacement of components by the User is strictly prohibited.

16. Packing and Unpacking of ATVA-1

Proper packing and unpacking of ATVA-1 are essential for ensuring the safety of the drone and its components during transport and storage. Follow these detailed steps to avoid damage and maintain operational readiness.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

16.1 Unboxing ATVA-1

Package Box Dimensions

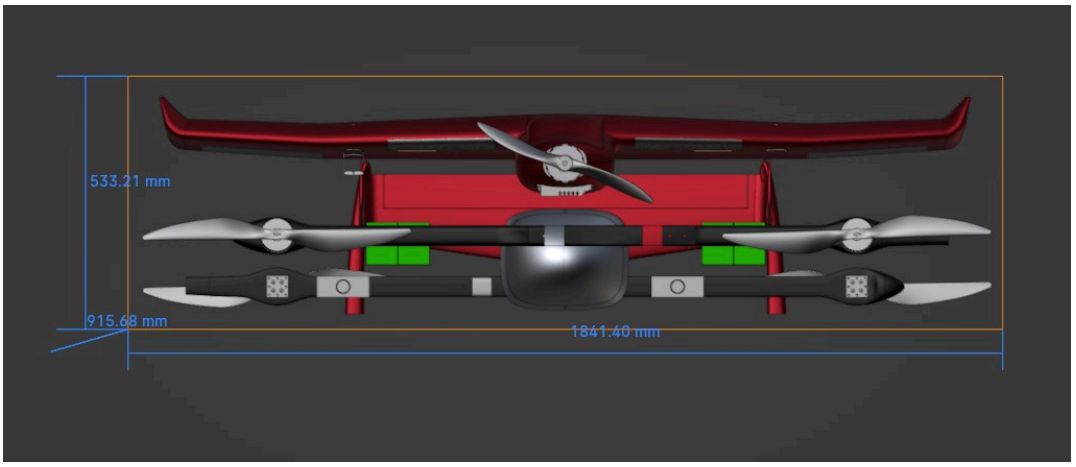


Figure 16.1(a) ATVA-1 Package Box (Front View)

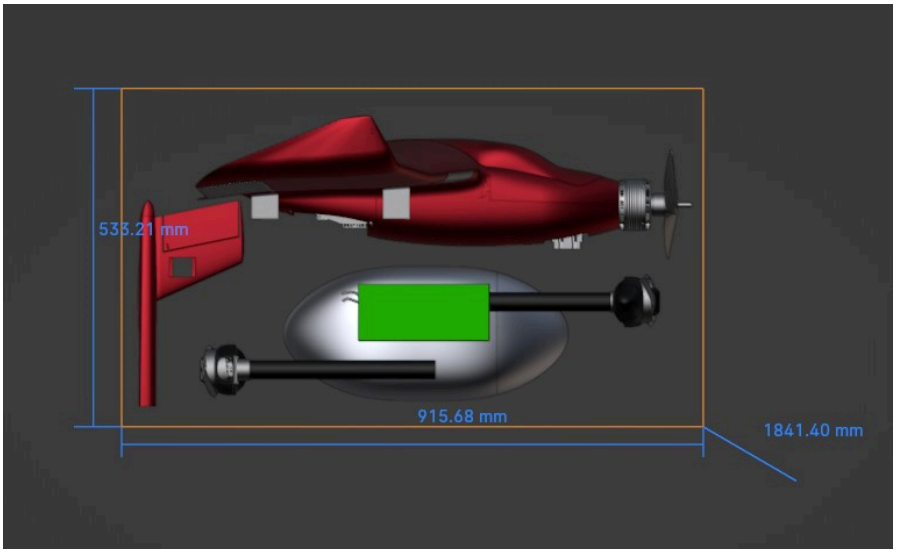


Figure 16.1(b) ATVA-1 Package Box (Side View)

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

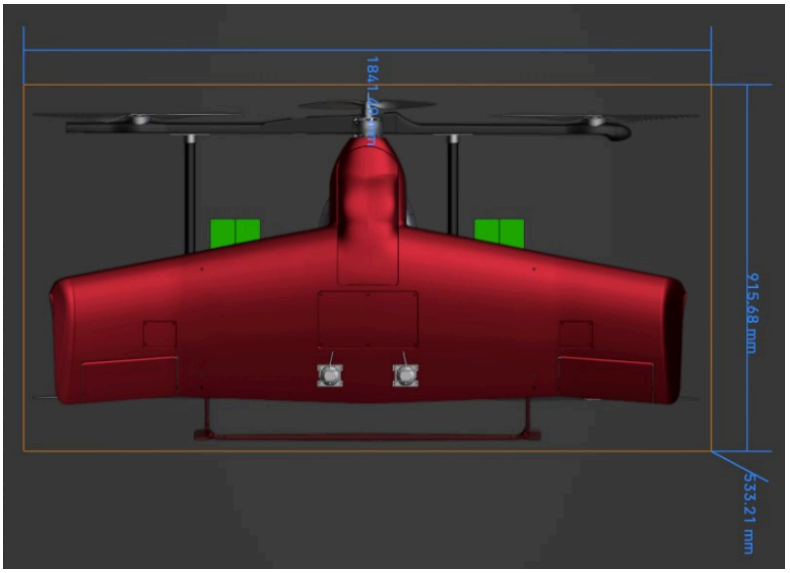


Figure 16.1(c) ATVA-1 Package Box (Top View)

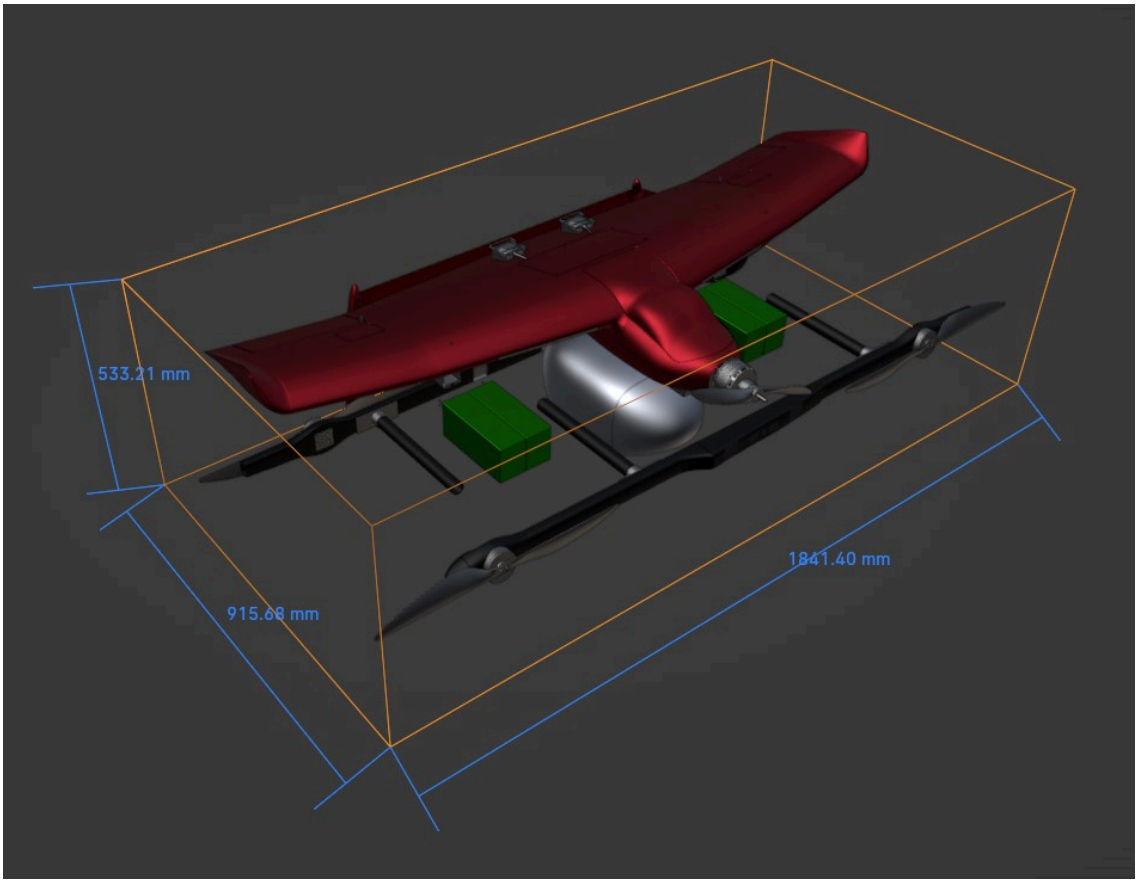


Figure 16.1(d) ATVA-1 Package Box (Isometric View)

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

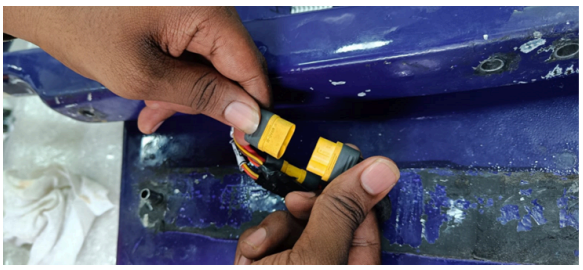
On each and every flight Pre- Flight Checks have to be carried out and the flight should be cleared to take off only all the checks in Pre- Flight Checks are cleared .

16.1.1 Structure Of Process of Boom Attachment

Process for ATVA-1 Boom Attachment with Wing

- **Preparation**
  - Mark the attachment points on the boom and lower skin.
  - Prepare the surfaces by sanding and cleaning.





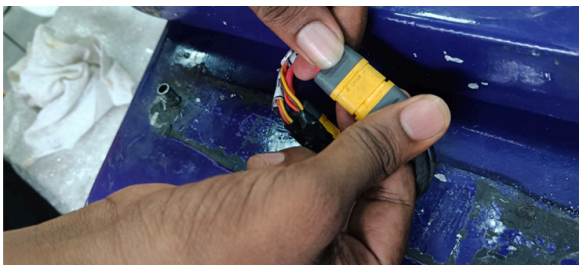


Figure 16.2(a) Structure to Boom attachment

- **Alignment and Positioning**
  - Verify the alignment of the boom.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

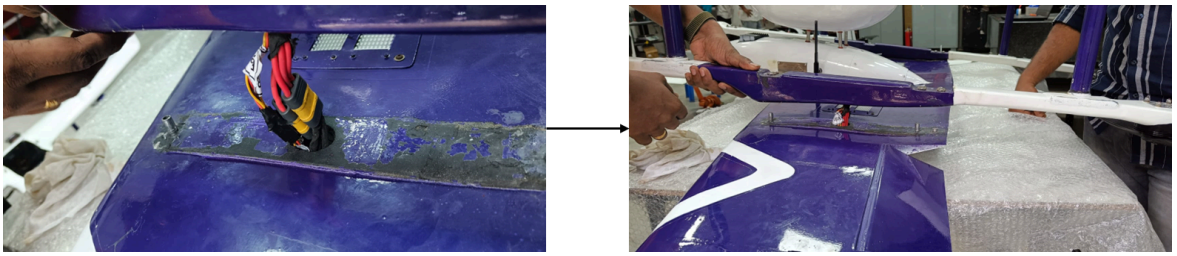


Figure 16.2(b) Structure to Boom attachment (Placing)

- Place the wing (Male part) over the boom (Female part) and verify its position.
- Insert the hollow tube with 8mm OD in Male part and 10mm tube in Female part

- **Fastener Preparation**
  - Prepare the fasteners (bolts, nuts, washers) according to specifications.

    Required Fasteners : M6*110 - 2 , M6*65 - 2 , M6*55 - 2
  - Check for any defects or damage

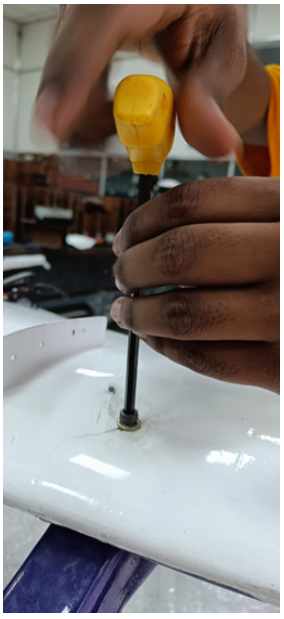


Figure 16.2(c) Fastening Wing-Boom

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Applying Torque

Select the appropriate torque setting based on fastener size and material.

Fastener size	Torque (ft.lb)	Torque (Nm)
M6	0.7376	1

- Slowly and evenly apply torque to the fastener until the specified value is reached.
- If tightening multiple fasteners, apply torque in a crisscross or star pattern to evenly distribute the load (for assemblies like flanges or wheels).

- **Fastener Installation**
  - Insert the bolts through the top of the wing, ensuring they pass completely through to secure the boom.
  - Add washers as needed.
- **Inspection**
  - Visually inspect the fastener connections for proper alignment and tightness.
  - Check for any gaps or misalignment between the boom and lower skin.

Safety Considerations

- Wear appropriate protective equipment during the attachment process.
- Handle tools and machinery with care.
- Follow safety guidelines for drilling and working with fasteners.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

16.1.2 Structure of Process of Tail wing Attachment

Process for ATVA-1 Boom Attachment with Tail wing

- **Preparation**
  - Mark the attachment points on the boom and Tail wing.
  - Prepare the surfaces by sanding and cleaning.

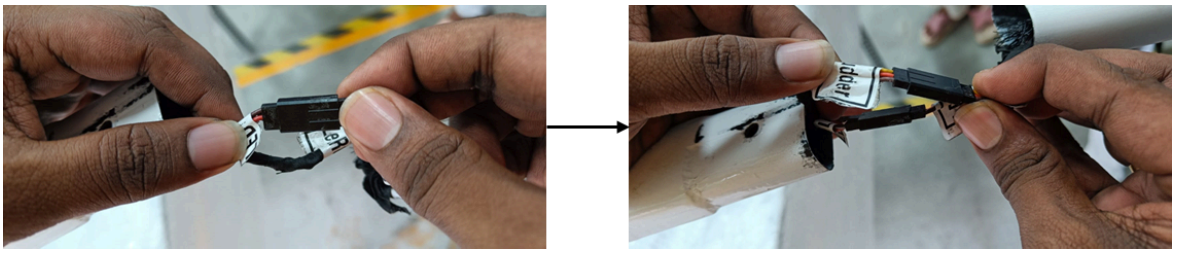


Figure 16.3(a) Fastening Wing-Boom

- **Drilling (if necessary)**
  - If pre-drilled holes are not present, drill holes at the marked attachment points.
  - Ensure proper hole size and alignment as per given drawing.
- **Alignment and Positioning**
  - Secure the boom on the assembly jig.
  - Verify the alignment of the boom.
  - Place the Tail wing (Female part) over the boom (Male part) and verify its position.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

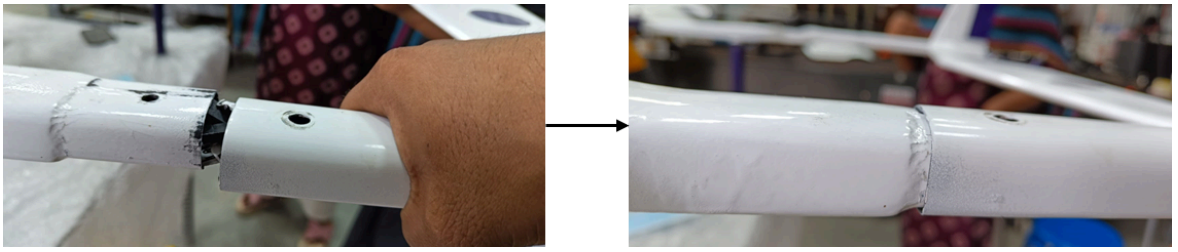


Figure 16.3(b) Attaching tail part

- **Fastener Preparation**
  - Prepare the fasteners (bolts, nuts, washers) according to specifications.
  - Required Fasteners : M6*35 - 2
  - Check for any defects or damage.

- **Fastener Installation**
  - Insert the bolts into the holes, ensuring they pass completely through from the boom to the tail.
  - Add washers as needed.
  - Secure the nuts onto the bolts.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

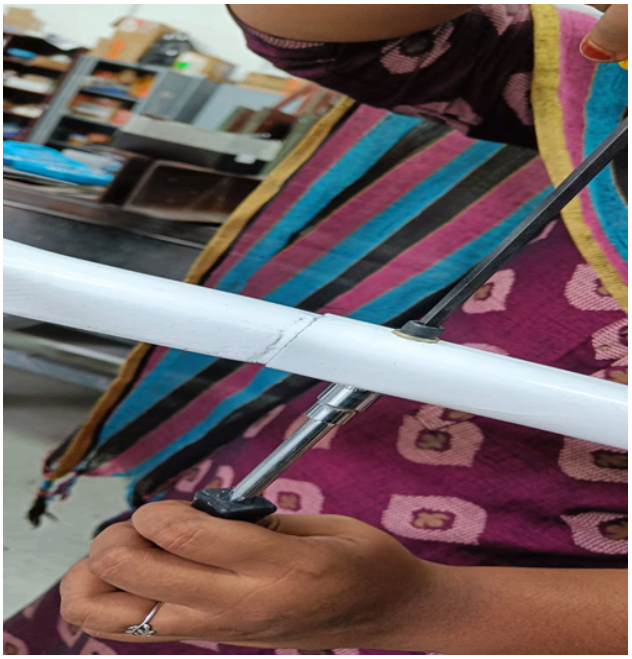


Figure 16.3(c) Fastening tail part

Applying Torque

Select the appropriate torque setting based on fastener size and material.

Fastener size	Torque (ft.lb)	Torque (Nm)
M6	0.7376	1

- Slowly and evenly apply torque to the fastener until the specified value is reached.
- If tightening multiple fasteners, apply torque in a crisscross or star pattern to evenly distribute the load (for assemblies like flanges or wheels).

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Inspection

- Visually inspect the fastener connections for proper alignment and tightness.
- Check for any gaps or misalignment between the boom and tail wing.

16.2 Drone Inspection and Setup

Kindly do the Pre-Flight Check as per the checklist. Ensure these below points are covered

1. **Battery Status**
   - Verify that the UAV's battery is fully charged (100%) and installed correctly.
2. **Remote Control Check**
   - Ensure that the remote controller (RC) is fully charged.
   - Turn on the router and transmitter to confirm functionality.
3. **Propeller Inspection**
   - Inspect the propellers for chips, cracks, or other damage.
4. **Motor Checks**
   - Confirm that all motors spin freely without obstruction.
5. **Structural Integrity**
   - Inspect the airframe for any damage.
   - Ensure the landing gear is intact and functional.
6. **Firmware Updates**
   - Confirm that the firmware on both the transmitter and the UAV has been updated to the latest version.
7. **Telemetry and Log Checks**
   - Ensure flight telemetry is functional, and all recording and data logging systems are operational.
8. **Airspeed and Compass Calibration**
   - Perform a pre-flight calibration of the airspeed sensor and compass.
9. **Payload Inspection**
   - Ensure the payload is properly secured in the cargo bay.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

16.2.1 Key Notes

- Always transport the ATVA-1 in its designated case to minimize wear and tear.
- Store the drone in a clean, dry environment when not in use.



Note that improper handling of electronic components can cause static discharge.

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

DECLARATION

Applicant's Name: Dr. Satya Chakravarthy
UAS Manufacturer: Ubifly Technologies Private Limited
UAS Model Name: ATVA -1

I , Satya Chakravarthy - Director of Ubifly Technologies Private Limited do hereby declare the Maintenance manual of UAS Model of ATVA -1.

I have read the guidelines, terms and conditions governing the certification scheme and undertake to abide by them on behalf of our organization and we hereby confirm that the Maintenance Manual meets the compliance requirements.

Applicant/Authorized/Signatory with Seal

Ubifly Technologies Private Limited Chennai

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Annexure I – Pre/Post Flight Checklist

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

FLIGHT TEST PROFORMA / REPORT					
Date:		Location:		Sortie No:	
UIN:		P/L Configuration:		AUW:	
Empty Weight:		Winds:		Temperature:	
Pilot:		Co-Pilot:			
RC-Controller:		Mission:			
Video File / Screen Recording name(optional):					
Data Log File name:					

PRE-FLIGHT CHECKS

Flight Check		Description
Document	1. Remote Pilot Certificate	Available ☐ Not Available ☐
	2. Operational Manual	Available ☐ Not Available ☐
	3. UIN Registration Certificate	Available ☐ Not Available ☐
	4. Insurance	Available ☐ Not Available ☐
	5. Log Book (Drone / Pilot)	Available ☐ Not Available ☐
Area Recce	1. Zone	Red ☐ Yellow ☐ Green ☐
	2. Obstacles	No trees, building, other obstructions ☐
	3. Area for T/O & Landing	Flat area ☐
Drone	1. Battery Status	Charged 100% & Installed correctly. ☐
	2. Remote Control Check	Fully charged, Router & Transmitter on ☐
	3. Propeller Inspection	No Chips ☐ No Cracks ☐ No Damage ☐
	4. Motor checks	Free Spin ☐
	5. Structural check	Airframe ☐ Landing Gear ☐
	6. Control surface Check	No Chips ☐ No Cracks ☐ No Damage ☐
	7. Logging check	Flight telemetry ☐ Recording & Logs ☐
	8. Airspeed, Compass,Accelerometer and Level Horizon	Check pre-flight calibration ☐
Payload check	Cargo Payload bay	Cargo secured ☐
Pre-Arm Checks	1. Flight Limits & Geo Fence	Set as per flight ☐
	2. Satellite Lock / HDOP	> 18 ☐ / < 0.9 ☐
	3. Mode selected	As per flight ☐

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Any work / changes to aircraft at site or Observations during Pre-flight		
Sortie Profile		
Pre-flight check clearance	Name & Sign	
IN-FLIGHT FLIGHT CHECKS		
Battery Initial:	Battery Final:	Endurance:
Take-off time:	Landing time:	

Control checks	1. Throttle	Up ☐ Down ☐
	2. Roll	Right ☐ Left ☐
	3. Pitch	Forward ☐ Backward ☐
	4. Yaw	Right ☐ Left ☐

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Narration of Events / Warnings Messages in Flight:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

POST FLIGHT CHECKS		
Inspection	1. Battery status	Temperature ☐ Voltage ☐
	2. Propeller check	No Chips ☐ No Cracks ☐ No Damage ☐
	3. Motor Check	Temperature ☐ Free Spin ☐
	4. Structure Check	Airframe ☐ Landing Gear ☐
	5. Remote Control Check	Battery % (damage if any) ☐

Snag / Observations:

Snag / Observation Rectification:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Post Rectification Flight Clearance: Name & Sign: Date:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Annexure II – Continuous Monitoring process for UAS components

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Checklist for Continuous Monitoring process for UAS components

Continuous Monitoring process for UAS components(Every Day After Flight)			Remarks
Inspection	1. Remote Control Check	Transmitter On ☐ Antenna Check ☐	
	2. Batteries Status	Visual ☐ Voltage ☐ Connector ☐ Charging logs ☐	
	3. Fastener Check	Torque Check ☐ No Damage ☐	
	4. Motor Check	Visual ☐ Free Spin Check ☐	
	5. Structure Check	Airframe Visual Check ☐ Landing Gear Check ☐ No Cracks ☐ No Damage ☐	
	6. Pitot Tube	Pitot Tube Check ☐	
	7. Logging Check	Flight Telemetry ☐ Recording & Logs ☐	
	8. Airspeed, Compass	Check Pre-Flight Calibration ☐ (Dashboard Summary Amber GCS)	
	9. Payload Bay	Secured ☐ No Cracks ☐ No Damage ☐	

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Propeller Check	Visual Check	No Cracks ☐ No Damage ☐
	Fastener Check	Fastener Check ☐ Torque Check ☐
Motor Check	Friction Noise Check	Noise Check ☐
	Fastener Check	Fastener Check ☐ Torque Check ☐
Control Surface Check	Visual Check	No Cracks ☐ No Damage ☐
	Hinge Check	Ensuring No Foreign ☐ Materials/Damage Are Present ☐
Electrical Check	Visual Check	Wiring Check ☐ Connector Check ☐
Flight Hours	On Day Flight Hours	
	Total Flight Hours	
Landing Cycles	On Day Landing Cycles	
	Total Landing Cycles	
Operational Log	As Per Day Preflight /Post Check List	Filled ☐
Maintenance Cycle	No Of Days After Previous Maintenance	_____out Of 30 Days
	No Of Flights After Previous Maintenance	_____out Of 75 Flights

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Remarks:

Flight Engineer :

Name & Sign:
Date:

Lead of Flight Operations :

Name & Sign:
Date:

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

Annexure III – Operational Flight log

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

OPERATIONAL LOG

UIN NO :

Flight No.	Date	Payload Type	Remarks (Payload)	Overall Payload Weight (kg)	Location	Class of UAS	Start Time (HH:MM)	Software/Firmware Version	Battery Serial no.	Battery Initial Voltage (V)	Battery End Voltage (V)	End Time (HH:MM)	Flight Duration (HH:MM)	Cumulative Flight Time (HH:MM)	No. of Landings	Cumulative no. of landings	Pilot Initials	Engineer Initials	Remarks
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25																			
26																			
27																			
28																			
29																			
30																			
											Overall Cumulative Flight Time (HH:MM)				Overall cumulative no. of Landings				

Annexure IV – Maintenance Log

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

MAINTENANCE LOG

Doc No	ATVA/FTD/12
Page no.	-
Issue Date	-

Model Name	ATVA-1	UIN Number		MAINTENANCE LOG BOOK - (TO BE CARRIED OUT EVERY 30 DAYS OR 75 FLIGHTS)

		Airframe				Propulsion				Battery Wiring			Electronics	Communication	Flight Control				Equipment Check		Payload							
S.No	Date	Airframe Cleaning	Airframe Visual Check	Screws Torque check	Landing Gear Visual Check	Propeller Visual Check	Clean Motor	Motor Spinning Check	Motor Visual Check	Wiring Visual Check	Battery harness Check	Connectors Lock Check	Electronics Components Functional Check	RF Antennae Check	Flight Control Check	Sensor Calibration	Battery Bulge	Battery Fuse check	Servo Functional and Travel Check	Pitot Tube Functional Check	Payload Mount check	Payload Visual Check	Payload operation Check/Balance Check	Number of Landings	Total number of Flight hours (HH:MM)	Remarks	Engineer Name/Signature	Inspector Name/Signature

Annexure V – Unscheduled Maintenance log

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

SPECIAL MAINTENANCE LOG

Doc No	ATVA/FTD/12
Page no.	-
Issue Date	-

Model Name	ATVA-1	UIN Number		SPECIAL/ UNPLANNED MAINTENANCE LOG BOOK - (TO BE CARRIED OUT IF ABNORMAL ACTIONS OBSERVED)

		Airframe				Propulsion				Battery Wiring			Electronics	Communication	Flight Control				Equipment Check		Payload							
S.No	Date	Airframe Cleaning	Airframe Visual Check	Screws Torque check	Landing Gear Visual Check	Propeller Visual Check	Clean Motor	Motor Spinning Check	Motor Visual Check	Wiring Visual Check	Battery harness Check	Connectors Lock Check	Electronics Components Functional Check	RF Antennae Check	Flight Control Check	Sensor Calibration	Battery Bulge	Battery Fuse check	Servo Functional and Travel Check	Pitot Tube Functional Check	Payload Mount check	Payload Visual Check	Payload operation Check/Balance Check	Number of Landings	Total number of Flight hours (HH:MM)	Remarks	Engineer Name/Signature	Inspector Name/Signature

Annexure VI – Loctite SOP

This document is a property of Ubifly Technologies Pvt. Ltd. This is a controlled copy and cannot be reproduced without proper authorization
©2024 All rights reserved

LOCTITE® 222

January 2009

PRODUCT DESCRIPTION

LOCTITE® 222 provides the following product characteristics:

Technology	Acrylic
Chemical Type	Dimethacrylate ester
Appearance (uncured)	Purple liquid[LMS]
Fluorescence	Positive under UV light[LMS]
Components	One component - requires no mixing
Viscosity	Low, thixotropic
Cure	Anaerobic
Secondary Cure	Activator
Application	Threadlocking
Strength	Low

LOCTITE® 222 is designed for the locking and sealing of threaded fasteners which require easy disassembly with standard hand tools. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. Particularly suitable for applications such as adjustment of set screws, small diameter or long engagement length fasteners, where easy disassembly is required without shearing the screw. The thixotropic nature of LOCTITE® 222 reduces the migration of liquid product after application to the substrate.

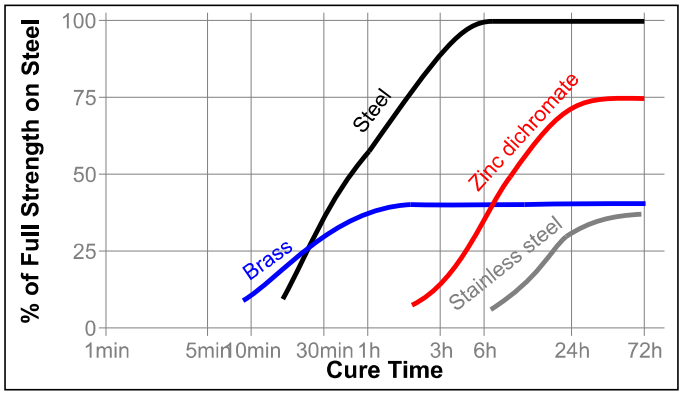
TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.05
Flash Point - See MSDS	
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):	
Spindle 3, speed 2.5 rpm	≥3,500
Spindle 3, speed 20 rpm	900 to 1,500[LMS]
Viscosity, EN 12092 - MV, 25 °C, after 180 s, mPa·s (cP):	
Shear rate 277 s^{-1}	135

TYPICAL CURING PERFORMANCE

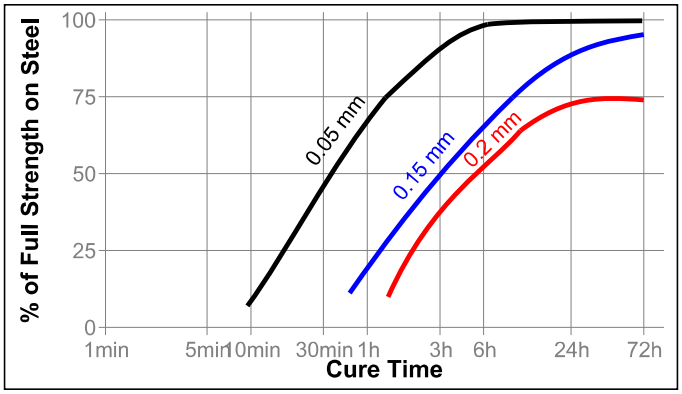
Cure Speed vs. Substrate

The rate of cure will depend on the substrate used. The graph below shows the breakaway strength developed with time on M10 steel nuts and bolts compared to different materials and tested according to ISO 10964.



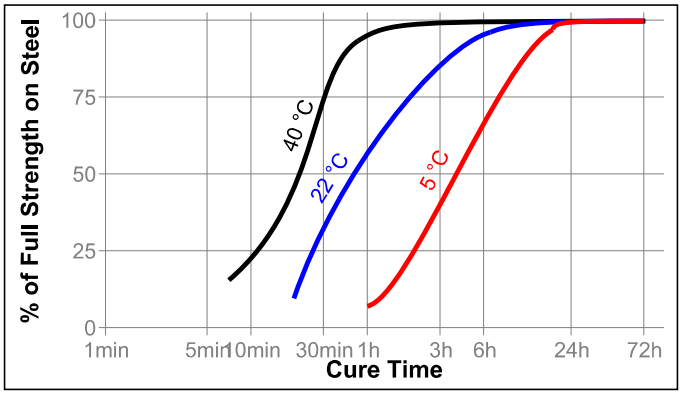
Cure Speed vs. Bond Gap

The rate of cure will depend on the bondline gap. Gaps in threaded fasteners depends on thread type, quality and size. The following graph shows shear strength developed with time on steel pins and collars at different controlled gaps and tested according to ISO 10123.



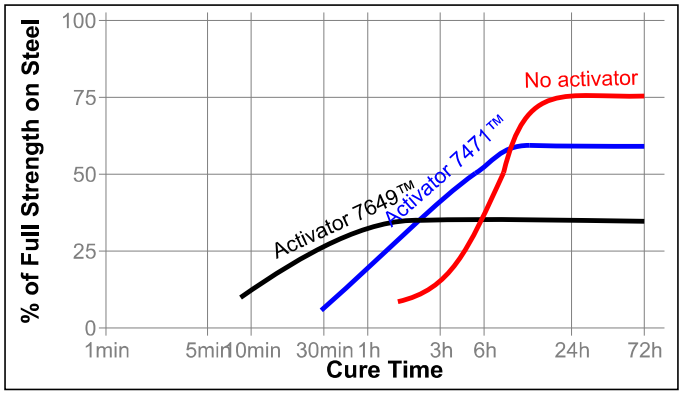
Cure Speed vs. Temperature

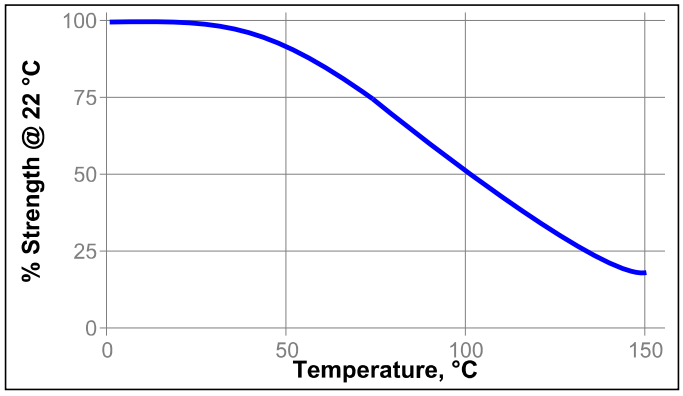
The rate of cure will depend on the temperature. The graph below shows the breakaway strength developed with time at different temperatures on M10 steel nuts and bolts and tested according to ISO 10964.



Cure Speed vs. Activator

Where cure speed is unacceptably long, or large gaps are present, applying activator to the surface will improve cure speed. The graph below shows the breakaway strength developed with time on M10 zinc dichromate steel nuts and bolts using Activator 7471™ and 7649™ and tested according to ISO 10964.





TYPICAL PROPERTIES OF CURED MATERIAL

Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}	80×10^{-6}
Coefficient of Thermal Conductivity, ISO 8302, W/(m·K)	0.1
Specific Heat, kJ/(kg·K)	0.3

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

After 24 hours @ 22 °C

Breakaway Torque, ISO 10964:

M10 steel nuts and bolts	N·m	6
	(lb.in.)	(50)

Prevail Torque, ISO 10964:

M10 steel nuts and bolts	N·m	4
	(lb.in.)	(35)

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

M10 steel nuts and bolts	N·m	14
	(lb.in.)	(120)

Max. Prevail Torque, ISO 10964, Pre-torqued to 5 N·m:

M10 steel nuts and bolts	N·m	14
	(lb.in.)	(120)

Compressive Shear Strength, ISO 10123:

Steel pins and collars	N/mm^2	≥2.5[LMS]
	(psi)	(≥360)

TYPICAL ENVIRONMENTAL RESISTANCE

Cured for 1 week @ 22 °C

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

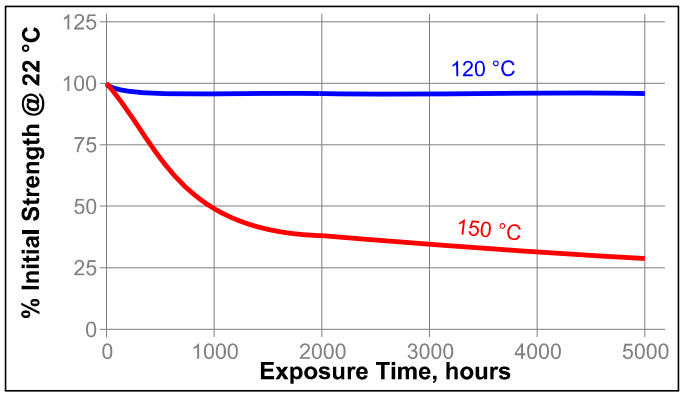
M10 zinc phosphate steel nuts and bolts

Hot Strength

Tested at temperature

Heat Aging

Aged at temperature indicated and tested @ 22 °C



Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

		% of initial strength			
Environment	**°C**	**100 h**	**500 h**	**1000 h**	**5000 h**
Motor oil (MIL-L-46152)	125	100	95	90	85
Leaded Petrol	22	95	95	95	95
Brake fluid	22	95	95	95	90
Water/glycol 50/50	87	80	80	80	80
Acetone	22	100	90	90	90
Ethanol	22	95	95	90	90

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials

For safe handling information on this product, consult the Material Safety Data Sheet (MSDS).

Where aqueous washing systems are used to clean the surfaces before bonding, it is important to check for compatibility of the washing solution with the adhesive. In some cases these aqueous washes can affect the cure and performance of the adhesive.

This product is not normally recommended for use on plastics (particularly thermoplastic materials where stress cracking of the plastic could result). Users are recommended to confirm compatibility of the product with such substrates.

Directions for use:

Henkel Americas
+860.571.5100

Henkel Europe
+49.89.320800.1800

Henkel Asia Pacific
+86.21.2891.8863

For Assembly

1. For best results, clean all surfaces (external and internal) with a LOCTITE® cleaning solvent and allow to dry.
2. If the material is an inactive metal or the cure speed is too slow, spray all threads with and allow to dry.
3. Shake the product thoroughly before use.
4. To prevent the product from clogging in the nozzle, do not allow the tip to touch metal surfaces during application.
5. **For Thru Holes**, apply several drops of the product onto the bolt at the nut engagement area.
6. **For Blind Holes**, apply several drops of the product down the internal threads to the bottom of the hole.
7. Assemble and tighten as required.
8. **For Sealing Applications**, apply a 360° bead of product to the leading threads of the male fitting, leaving the first thread free. Force the material into the threads to thouroughly fill the voids. For bigger threads and voids, adjust product amount accordingly and apply a 360° bead of product on the female threads also.

For Disassembly

1. Remove with standard hand tools.
2. In rare instances where hand tools do not work because of excessive engagement length, apply localized heat to nut or bolt to approximately 250 °C. Disassemble while hot.

For Cleanup

1. Cured product can be removed with a combination of soaking in a Loctite solvent and mechanical abrasion such as a wire brush.

Loctite Material Specification[LMS]

LMS dated May 18, 1999. Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Quality.

Storage

Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

Optimal Storage: 8 °C to 21 °C. Storage below 8 °C or greater than 28 °C can adversely affect product properties. Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Conversions

(°C x 1.8) + 32 = °F
kV/mm x 25.4 = V/mil
mm / 25.4 = inches
µm / 25.4 = mil
N x 0.225 = lb
N/mm x 5.71 = lb/in
N/mm² x 145 = psi
MPa x 145 = psi
N·m x 8.851 = lb·in
N·m x 0.738 = lb·ft
N·mm x 0.142 = oz·in
mPa·s = cP

Note

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Henkel Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.

Trademark usage

Except as otherwise noted, all trademarks in this document are trademarks of Henkel Corporation in the U.S. and elsewhere. ® denotes a trademark registered in the U.S. Patent and Trademark Office.

Reference 0.4

Technical Data Sheet

LOCTITE® 270™

(TDS for new formulation of Loctite® 270™) December 2013

PRODUCT DESCRIPTION

LOCTITE® 270™ provides the following product characteristics:

Technology	Acrylic
Chemical Type	Dimethacrylate ester
Appearance (uncured)	Green liquid[LMS]
Fluorescence	Positive under UV light[LMS]
Components	One component - requires no mixing
Viscosity	Low
Cure	Anaerobic
Secondary Cure	Activator
Application	Threadlocking
Strength	High

LOCTITE® 270™ is designed for the permanent locking and sealing of threaded fasteners. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. LOCTITE® 270™ is particularly suited for heavy duty applications such as studs into motor housings, nuts onto studs in pump housings and other fasteners where high strength is required. LOCTITE® 270™ provides robust curing performance. It not only works on active metals (e.g. brass, copper) but also on passive substrates such as stainless steel and plated surfaces. The product offers high temperature performance and oil tolerance. It tolerates minor surface contaminations from various oils, such as cutting, lubrication, anti-corrosion and protection fluids.

NSF International

Registered to NSF Category P1 for use as a sealant where there is no possibilty of food contact in and around food processing areas. **Note:** This is a regional approval. Please contact your local Technical Service Center for more information and clarification.

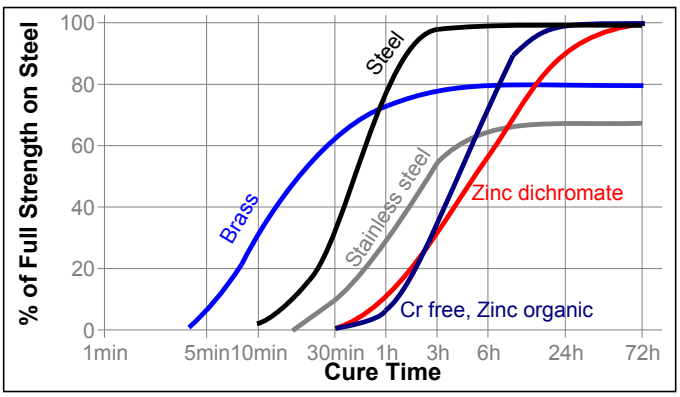
TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.1
Flash Point - See SDS	
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):	
Spindle 2, speed 20 rpm,	400 to 600[LMS]
Viscosity, Cone & Plate, 25 °C, mPa·s (cP):	
Cone C60/1°Ti @ shear rate 129 s^{-1}	450

TYPICAL CURING PERFORMANCE

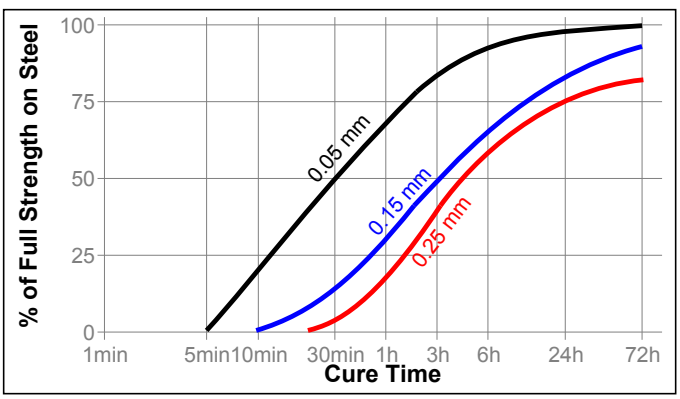
Cure Speed vs. Substrate

The rate of cure will depend on the substrate used. The graph below shows the breakaway strength developed with time on M10 steel nuts and bolts. compared to different materials and tested according to ISO 10964.

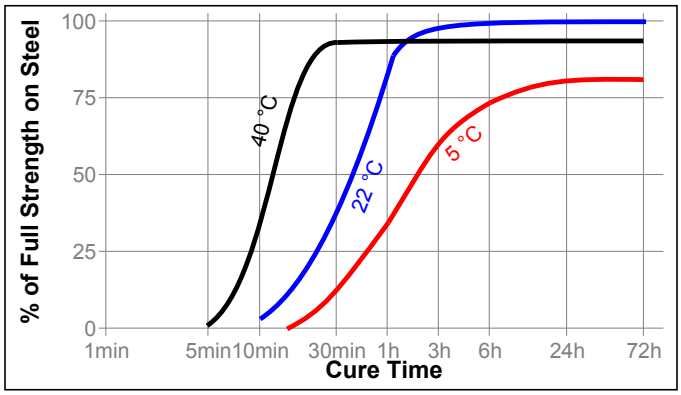


Cure Speed vs. Bond Gap

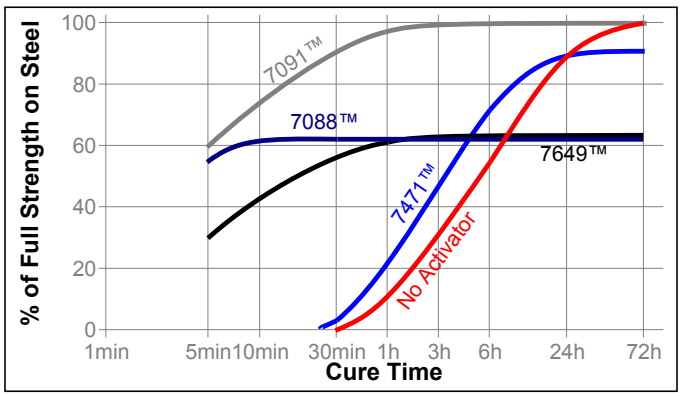
The rate of cure will depend on the bondline gap. Gaps in threaded fasteners depends on thread type, quality and size. The following graph shows shear strength developed with time on steel pins and collars at different controlled gaps and tested according to ISO 10123.



Cure Speed vs. Temperature
The rate of cure will depend on the temperature. The graph below shows the breakaway strength developed with time at different temperatures on M10 steel nuts and bolts and tested according to ISO 10964.



Cure Speed vs. Activator
Where cure speed is unacceptably long, or large gaps are present, applying activator to the surface will improve cure speed. The graph below shows the breakaway strength developed with time on M10 zinc dichromate steel nuts and bolts using Activator 7471™, 7649™, 7088™ and 7091™ and tested according to ISO 10964.



TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 24 hours @ 22 °C

Breakaway Torque, ISO 10964, Unseated:

M10 steel nuts and bolts	N·m	33
	(lb.in.)	(290)
M6 steel nuts and bolts	N·m	5
	(lb.in.)	(45)
M16 steel nuts and bolts	N·m	90
	(lb.in.)	(800)
3/8 x 16 steel nuts (grade 2) and bolts (grade 5)	N·m	31
	(lb.in.)	(275)

Prevail Torque @ 180°, ISO 10964, Unseated:

M10 steel nuts and bolts	N·m	33
	(lb.in.)	(290)
M6 steel nuts and bolts	N·m	3
	(lb.in.)	(26)
M16 steel nuts and bolts	N·m	125
	(lb.in.)	(1,100)
3/8 x 16 steel nuts (grade 2) and bolts (grade 5)	N·m	33
	(lb.in.)	(290)

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

M10 steel nuts and bolts	N·m	39
	(lb.in.)	(345)
3/8 x 16 steel nuts (grade 2) and bolts (grade 5)	N·m	35
	(lb.in.)	(310)

Prevail Torque @ 180°, ISO 10964, Pre-torqued to 5 N·m:

M10 steel nuts and bolts	N·m	25
	(lb.in.)	(220)
3/8 x 16 steel nuts (grade 2) and bolts (grade 5)	N·m	31
	(lb.in.)	(275)

Compressive Shear Strength, ISO 10123:

Steel pins and collars	N/mm²	≥9.0[LMS]
	(psi)	(≥1,305)

Cured for 1 week @ 22ºC,

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

M10 zinc phosphate nuts and bolts	N·m	46
	(lb.in.)	(400)
M10 stainless steel nuts and bolts	N·m	30
	(lb.in.)	(265)

TYPICAL ENVIRONMENTAL RESISTANCE

Cured for 1 week @ 22 °C

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

M10 zinc phosphate steel nuts and bolts

Hot Strength
Tested at temperature

