3. END USER MAINTENANCE MANUAL & SCHEDULE-VIRAJ UAS
AITMC VENTURES LIMITED

Version-5

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Contents

VERSION CONTROL

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1	17-09-2023	NA	Arun Kumar	Himanshu Sharma
2	20-12-2023	NA	Arun Kumar	Himanshu Sharma
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1. OUTLINE & PRODUCT INFROMATION

This manual outlines the following:

1. Maintenance procedures followed by end user as per maintenance schedule for critical components and others.
2. Maintenance/inspection schedule.
3. Component continuous monitoring log.

Product Identification Details:

Product Manufacturing Serial No.	
UIN	
FCM Serial No.	
GCS (RPS) Serial No. – Master GCS (RPS) Serial No. - Slave	
First Customer Name	
Second Customer Name (in case of change of ownership)	
Date of Purchase	

Life of components:

Life of propeller	1066 flight hours
Battery	300 cycles (charging & discharging)
Life of air frame	1066 flight hours
Max permissible landings	5000 landings

List of critical items:

1. Top carbon fiber plate -1
2. Bottom carbon fiber plate -1
3. Aluminum arm connectors -12
4. Landing gear tube -6
5. Foldable arm connectors-6

1.0 Maintenance schedule

The following table summarizing the overhaul schedule of all the individual components.

#S	Duration	Type	List of items

1	Daily check-in after every flight	End user	Top carbon fiber plate
2			Bottom carbon fiber plate
3			Aluminum arm connector
4			Landing gear tubes
5			Foldable arm connector
6			Carbon fiber arms
7			Battery Knob
8			Pump air block
9			Propellers
10			Propeller level
11			Motor Temperature
12			Top plate bolts
13			Bottom plate bolts
14			Landing gear & Connector
15			Battery
16			Foldable arm
17			Motor
18			Battery connector
1	Every 4 months	Manufacturer	Top carbon fiber plate
2			Bottom carbon fiber plate
3			Aluminum arm connectors
4			Landing gear tube
5			Foldable arm connectors
			Electronics

The following schedule give details on the maintenance activities performed according to the frequency listed in the above table.

2. Maintenance activities

Inspect every post flights:

This section describes the procedure to follow during inspection of VIRAJ DRONE every post flight.

2.1 Battery knob:

Battery knob helps the battery plate to lock in the sliders and it constrains the moment of the battery and battery plate. Pilot has to inspect the battery knob at each and every flight before takeoff. If pilot found the battery knob is not tightened, please contact AITMC support team for assistance.

2.2. Pump air block:

A minimum percentage of fluid has to be present in the tank to make sure pump will not be air locked. If a pilot found the pump has got air locked, then pilot has to open the air removal nozzles from the fluid pipe lines. If this problem is continuously observed, please contact AITMC support team for assistance.

Leak Checking Checklist during the Operation:

Before Starting:

Wear appropriate personal protective equipment (PPE), including gloves and goggles, for safety and position the drone on a stable and level surface for easy access.

1. Pre-Flight Check:

Inspect the drone for any visible damage or signs of wear that might affect the spraying system.

2. Visual Inspection:

Visually inspect hoses, connectors, valves, and nozzles for any signs of leakage.

3. Start Spraying System:

Start the spraying system according to the manufacturer's guidelines.

4. Observe Spraying:

Observe the spraying system in action, paying attention to any unusual behavior or visible leaks.

5. Spray Pattern Check:

Check that the spray pattern is even and consistent across the targeted area.

Note: If there is any leak, follow the trouble shooting procedures mentioned below and if the issue still persists, kindly contact AITMC Ventures Limited for further assistance.

2.3. Propellers:

Propellers are the moving parts of the drone. The pilot should Inspect the cracks, dents and Chippings on the edges of it. If pilot found cracks, please contact AITMC support team for assistance.

2.4. Propeller level:

The propellers have to be in level with respect to horizon for the drone to be stable, observe the levelling of propellers by aligning two adjacent propellers linearly. If the pilot has found that the propellers are not in same plane. Please, contact AITMC support team for assistance.

2.5. Motor temperature:

Motor temperature has to be less than 60 degree Celsius during operational conditions. If pilot observes continuously the raise in the temperature more than 60 degrees Celsius. Please, contact AITMC support team for assistance.

2.6. Top plate: (CRITICAL COMPONENT)

Top plate helps in the covering of all the electronic items and holds the foldable arm connectors to support the frame. During flying eventually, the bolts on the top plate tends to loosen for some certain flights. Pilot has to inspect the top plate and the bolts to connectors and the plate for every 50 flights. If a pilot continuously observes the loosening of bolts, please contact AITMC support team for assistance.

2.7. Bottom plate: (CRITICAL COMPONENT)

Bottom plate helps in the covering of all the electronic items and holds the foldable arm connectors to support the frame. During flying eventually, the bolts on the bottom plate tends to loosen for some certain flights. Pilot has to inspect the bottom plate and the bolts to connectors and the plate for every 50 flights. If a pilot continuously observes the loosening of bolts, please contact AITMC support team for assistance.

2.8. Landing gear & Connectors: (CRITICAL COMPONENT)

The Landing gear absorbs forces during the takeoff and landing of the RPA. The forces will be acting on the landing gear & Connectors. The pilot has to inspect the bolts to the landing gear and connector and every 50 flights. If pilot observes any bending in the landing gear and missing of bolts, Loosening. Please, contact AITMC support team for assistance.

2.9. Battery:

Always check for the battery voltage on telemetry screen or using a LiPo checker. Battery Voltage should lie within 43.1 Volts to 50.4 Volts. Check for 'Consumed mAh' on telemetry screen and 'Charged mAh' on Battery charger for every battery cycle. These both values should match closely and shouldn't exceed 10,800 mAh with a fully charged battery. Check the XT90 connector for any deformation or loosening for flight. If pilot found any damage and bulging of battery. Please contact AITMC support team for assistance.

2.10. Foldable arm: (CRITICAL COMPONENT)

Foldable arm helps to connect arm mount to Motor arms. It helps to folding and unfolding the arm. Pilot has to inspect the foldable arm at every flight. If pilot has found the loosening, bending, cracks of the arm. Please, contact AITMC support team for assistance.

2.11. Motor:

The motor chamber can become obstructed with debris such as grit or dirt, and even organic matter caught in the openings around the top of the armature. As well as wiping down the casing, be sure that there is nothing lodged in the negative space between the propeller and motor. Pilot should remove the propellers for direct access to the motor chamber, and clean out all foreign matter. If pilot found the free moment is not observed for motor. Please contact AITMC support team for assistance.

2.12. Battery connector:

Battery Connector XT 90 helps in the connection of battery to UAS. If pilot found and deformation, damage and loosening of the connector. Please contact AITMC support team for assistance.

2.13. Tank leakage precautions:

- If the pilot has observed the leakage of the liquid from the tank / Pipes and Pipe connectors.
- The insertion of the pipe is not made properly
- Make sure the spring is released completely at the connector phase.
- If the leakages are observed after the same procedure followed during the assembly. Please contact the customer support from VIRAJ.

Troubleshooting:

Issue	Recommended Actions
Spraying system leakage	• Check the valves and fit pipes if there is any loose connection • Check the pipes, In case of pipe damage, replace the pipe

Pump not working	• Check for air block, remove the air block by rotating the knobs on the sprayer units • Check the connector if it is properly connected
Spreader not working	• Check the connector if it is properly connected
Tank capacity not displaying correctly for spraying system	• Check if the Flow sensor connector is properly connected.

Note:

- All the pipes lock into the pneumatic valves in the spraying system when you insert them.
- To remove them press the black/blue ring of the valve inward and remove the pipe.
- All the pipes and valves are leak proof.
- Note: the design document comprehensively identifies all critical components and incorporates them into the maintenance manual to guide end-users in servicing and addressing wear issues and periodic inspection

2.14 Sop's to be followed for checking tightness of bolts and screws

To ensure the safety parameter every bolt and screw is put with loctite but due to the vibration in drone it is necessary to check the tightness of screws and bolts after 5-7 flights.

The detailed location of screws is mentioned below.

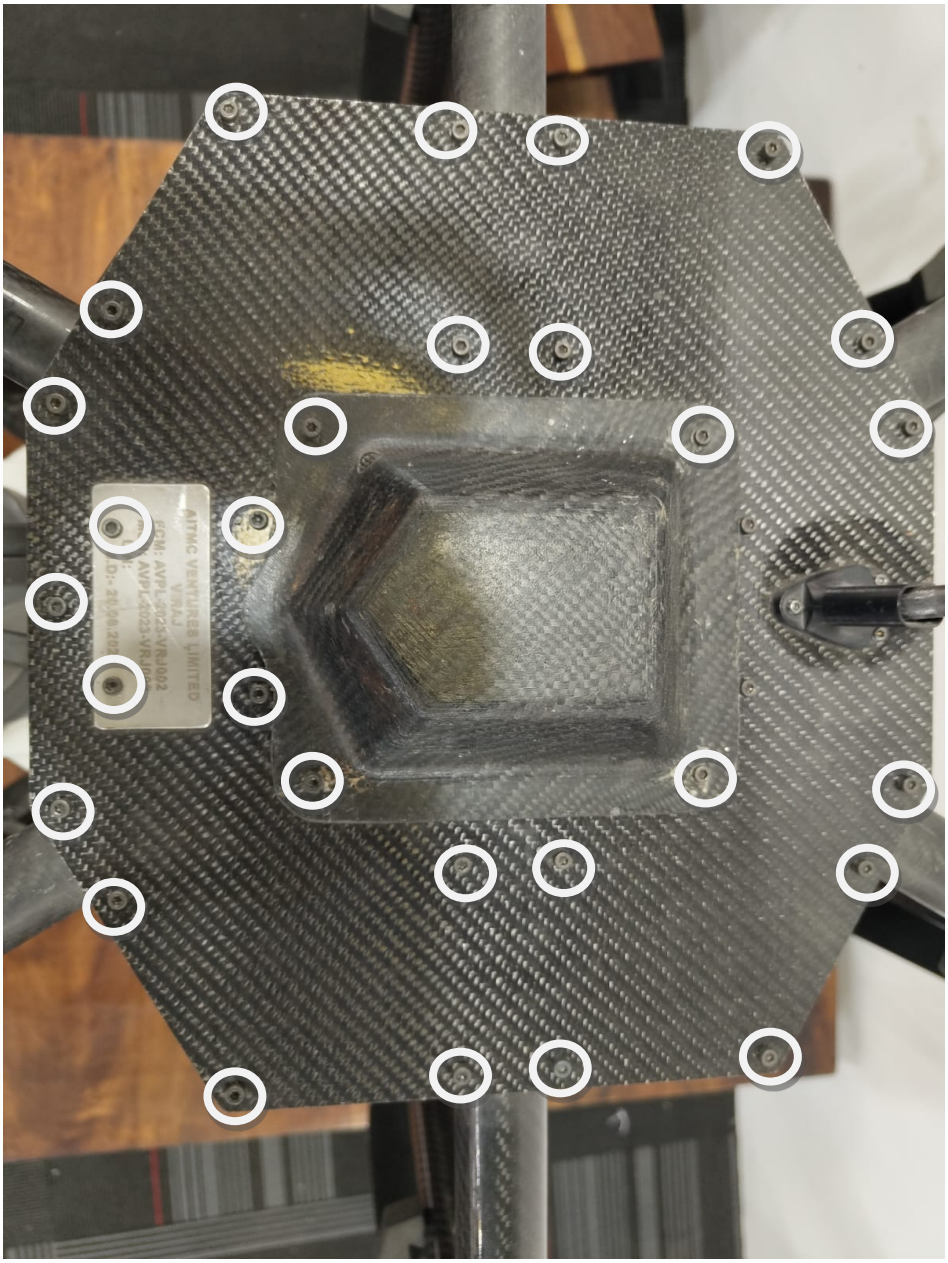

Figure 1: M3 Allen bolts on the top plate need to be tighten after every 100 flights.

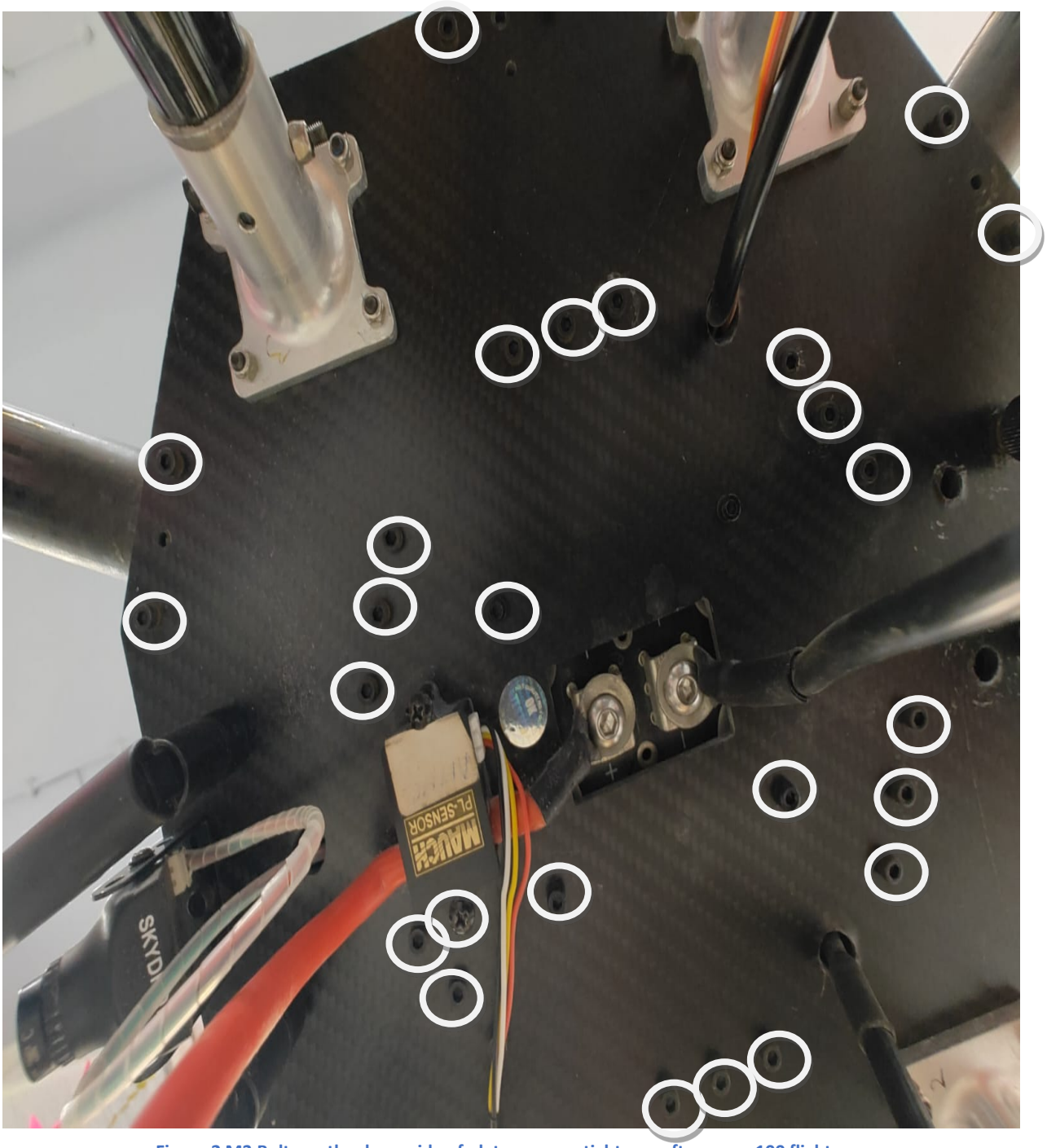

Figure 2 M3 Bolts on the down side of plate , ensure tightness after every 100 flights

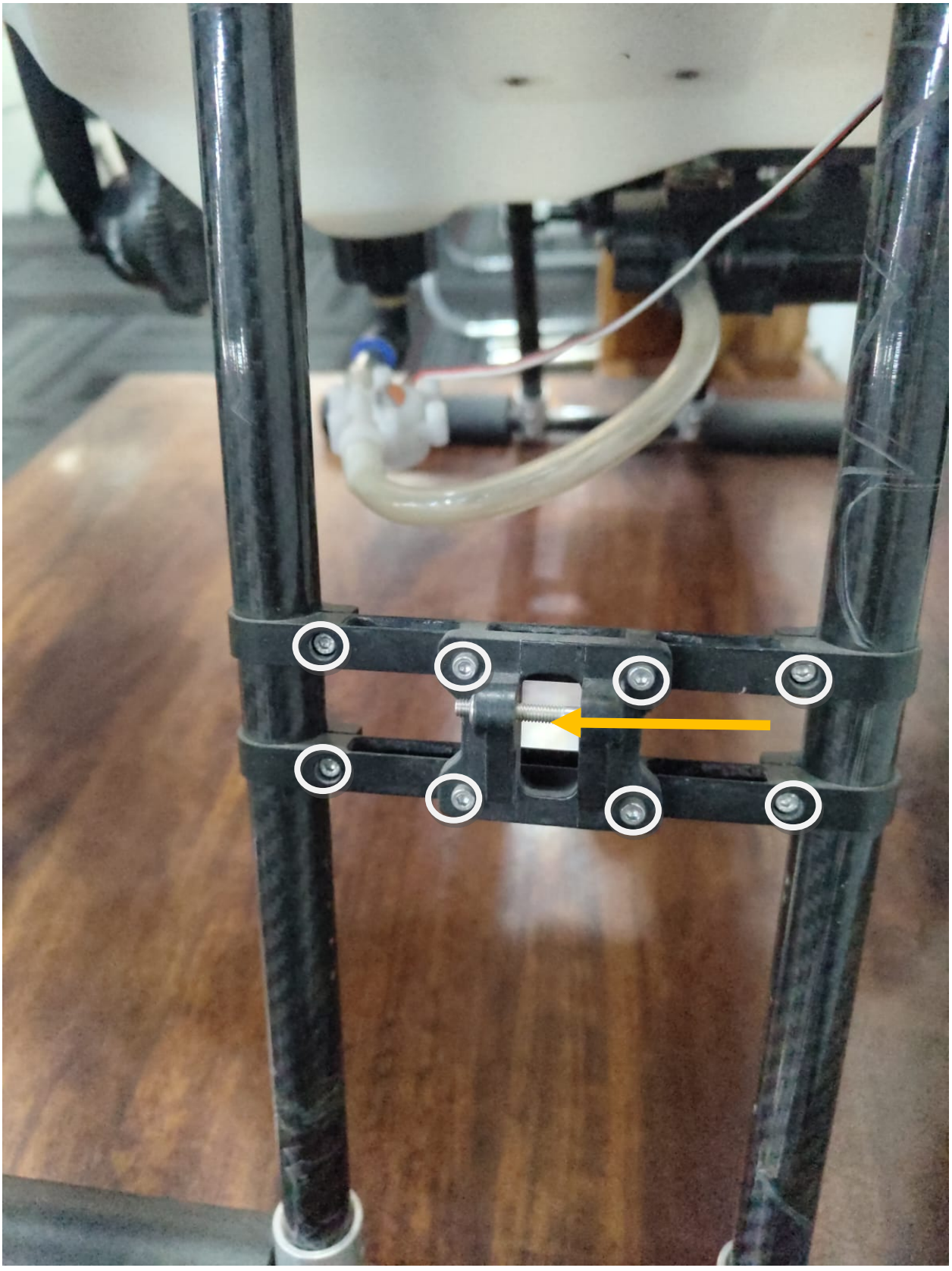

Figure 3: M3 Allen bolts in the between the landing gears, tightness to be ensured at regular interval, after every 100 flight

Figure 4: M3 Allen bolts for motor mounting, tightness to be ensured after every 100 flights

Figure 5: M3 propeller mount bolts, tightness to be ensured after every 2 flights

Figure 6: M5 Allen bolt to hold the tank, ensure tightness of the bolts after every 50 flights

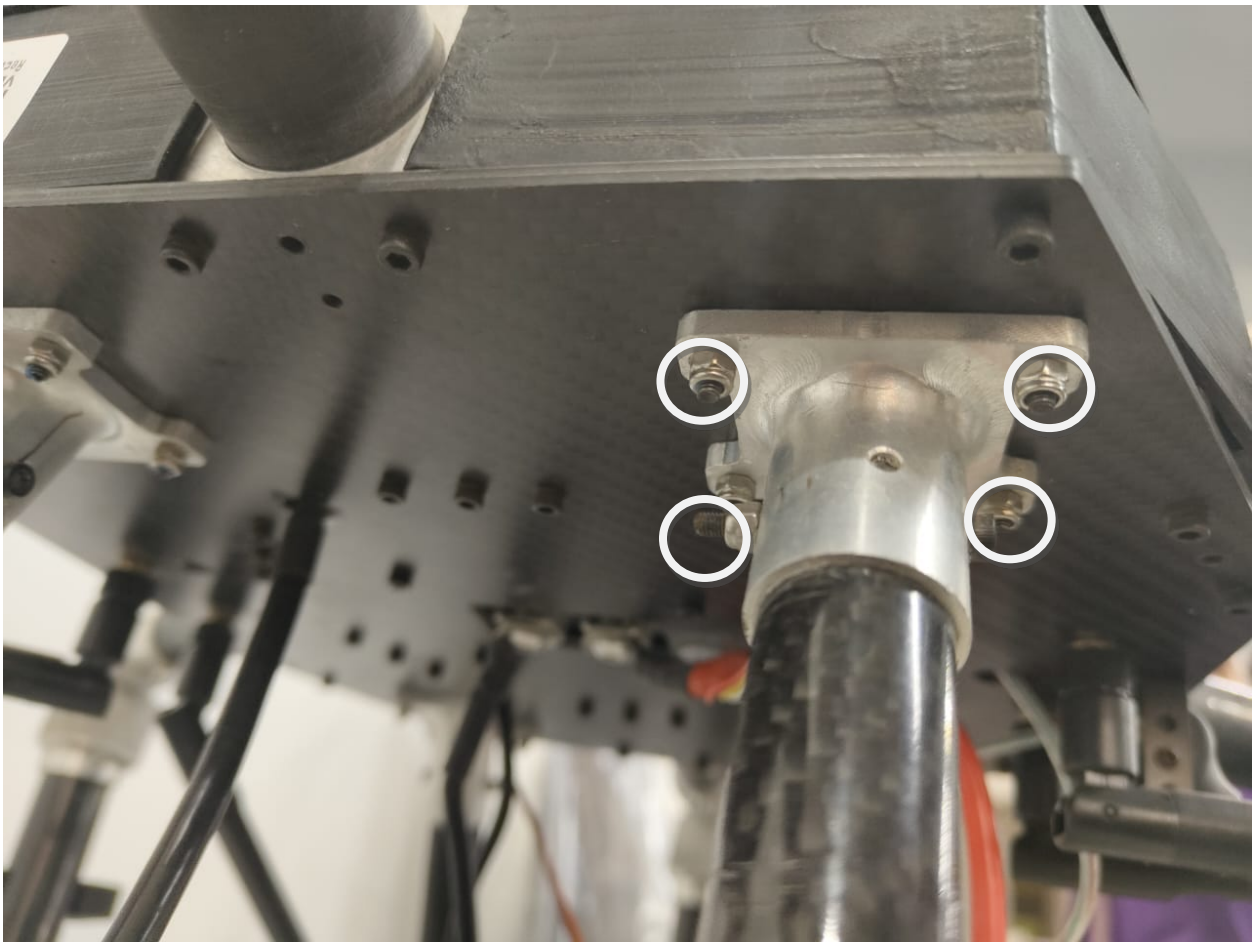

Figure 7 every landing gear have 5 M3 Allen bolts and 5 nut, ensure the tightness of these after every 50 flights

Figure 8: M3 Allen bolt and nut to hold the clamp holding the tank, Ensure tightness at all 4 sides after every 50 flights

Figure 9 M3 Allen bolts to hold the pump, ensure tightness after every 50 flights

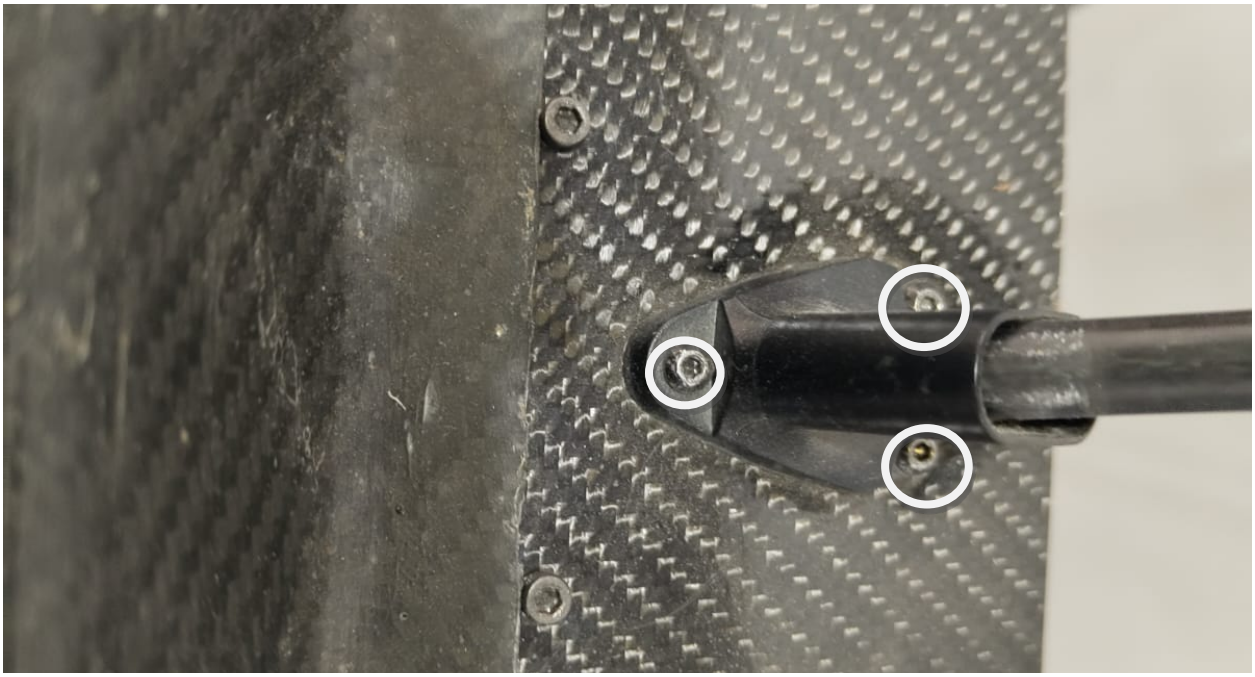

Figure 10 M3 Bolts for holding GPS mount , ensure tightness after 100 flights

Figure 11 M3 bolts to hold the landing gear , ensure tightness after every 50 flights

There are few parameter mentioned below to ensure the tightness of screws and bolts.

- Every drone kit is provided with the set of Allen key.

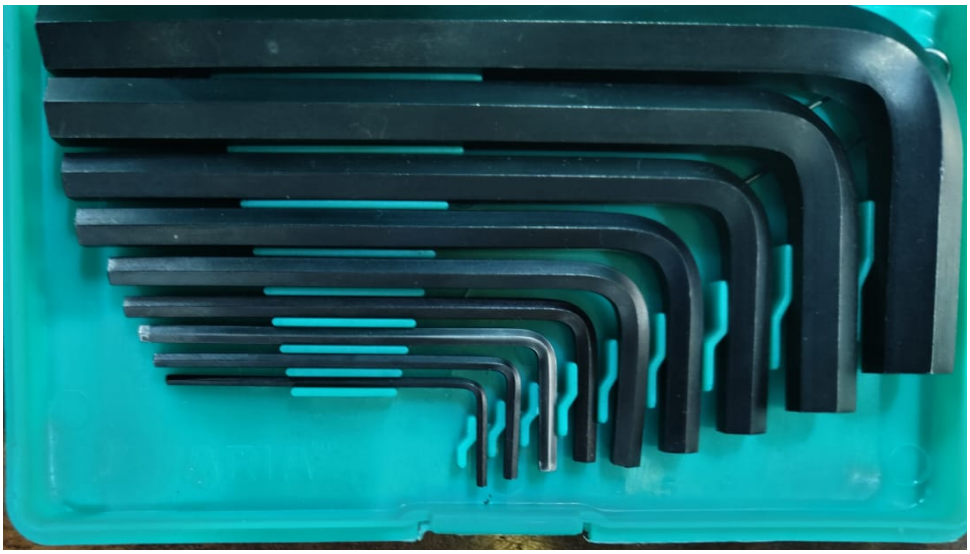

Figure 12: Allen key box

- Take out the 2.5mm Allen key from the box (3rd one from bottom) for all the bolts in the frame except the nuts used to hold the tank , for tightening the screw holding tank (for reference please check image 6)please use 4mm Allen key(5th one from bottom)

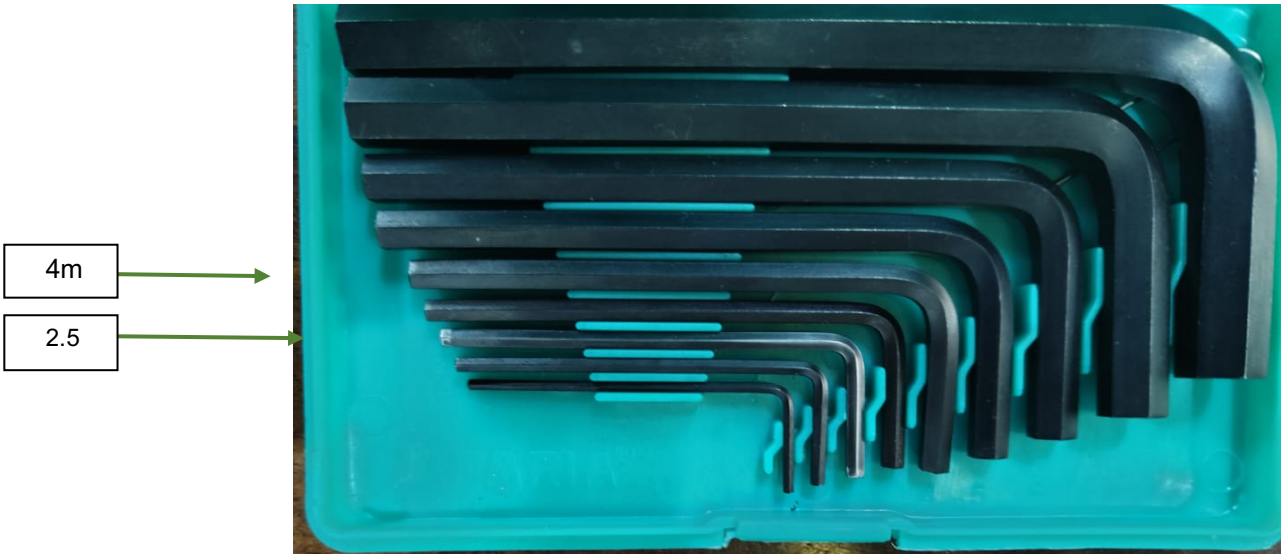

Figure 13: Allen keys size for reference

- Make sure to horizontally align the Allen key with the bolt.

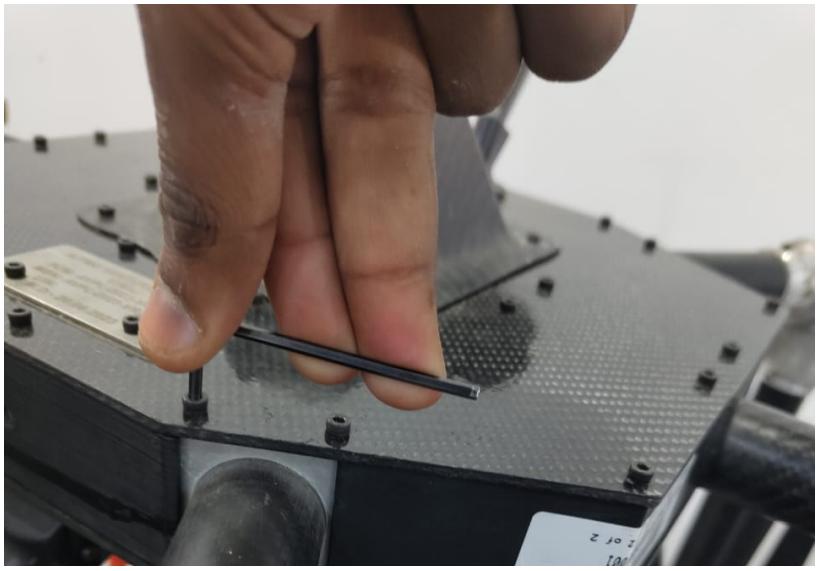

Figure 14: position of Allen key with respect to Allen bolt

- Now tight the screw by applying 2 finger torque as recommended for M3 bolts and make sure that Allen key must not slip while tightening
- Do not apply force from more than 2 fingers, otherwise the screw or bolt may get chipped.
- To tighten the nuts please hold the nut with a 5.5mm spanner, wrench or T- socket.

Figure 15 5.5MM spanner for M3 nut

- In case any screw and bolt is getting loose again and again very frequently please contact the AITMC service center.

2.15 List of bolts and Nuts (FASTENERS)

S.NO	SPECIFICATION OF FASTENER	QUANTITY
1	M3 x 12	150
2	M3 x 16	60
3	M5 x 30	6
4	M5 washers	6
5	M3 Nuts	50

Chapter 3: Continues components monitoring:

3.1 Objective

A component performance monitoring system, identifying root causes of component failures, and deficiencies and implementing corrective measures is considered essential to improve product safety and reliability in Aviation. A component performance monitoring system is designed to meet the objective mentioned above.

3.2 Procedure

- Proper collection of data, accurate analysis and interpretation of data are key elements in this procedure.
- Every failure, replacement of, prematurely withdrawal of component, and damage is a data point, hence it is to be recorded meticulously.
- Associated information regarding drone life, component life, name, specs, etc. of affected components, date/hours since installed are recorded.
- Repeated failure within 10 sorties is considered repetitive failure & the component/part is considered critical from a failure point of view.
- Root causes analysis of the cause of failure/ premature withdrawal will be addressed by the manufacturer if not sorted out by the user.
- Based on root cause the causes of failures are bucketed into different categories.
- The same measures are adopted for the next highest cause factors. Once these measures are adopted, continually, over some time the product, safety and reliability would be considerably improved.
- In case of no defect observed during the components lifetime the same component can be used ● Once the life of the component expires the old component will be replaced with a new one.

Instructions to fill the table:

1. If a pilot finds any kind of issues during flight, they can enter the issue in the table by entering a cross (X) mark, else they shall enter a tick mark.
2. Pilot has to make sure that the maintenance record has to be shared with the manufacturer as per section 4.

The table here is a reference table only and actual table is provided in maintenance log book.

#S	Date	UIN	Flight No.	Incident No.	Top carbon fiber plate	Bottom carbon fiber plate	Aluminum arm connector	carbon fiber arms	Carbon fiber landing gear tubes	Foldable arm connector	Battery knob	Propeller damage	Landing gear racks	Tank damage	Landing gear connector	Motor damage	Motor over heating	Arms damage	Railing damage	GPS stand damage	Spraying system/Seed broadcaster	Buddy system	Tank leakage	Remarks	sign
1																									
2																									
3																									

Chapter 4. Information needs to be shared with manufacturer:

-This section describes the information needs to be shared with manufacturer on a periodic basis.

1. The end user shall share the components monitoring sheet with manufacturer through email 5th of every month to manufacturer. The same shall also be verified during maintenance of the UA
2. A scanner copy of document has to be shared with email subject as COMPONENTS MONITORING RECORD, SR No.: AVPL-2023-VRJ001, UIN: ABCDEF.
3. Information shall be shared over email: support@avpldrones.com.

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