
MICRO CATEGORY DRONE
DGCA
TYPE CERTIFIED
RFLY
INNOVATIONS
RFLY- MICRO
Maintenance Manual
A TRENTAR COMPANY

Using this Manual

Thank you for choosing RFLY-MICRO. Please read this maintenance manual before operating the drone.

This Manual contains:

1. Maintenance Types and Procedures
2. Maintenance Checklist
3. Drone Continuous Monitoring Process Logbook
4. Maintenance Logbook

Legends

Denotes critical safety warnings. Ignoring these warnings can lead to severe risks, equipment damage, or personal injury. Strict adherence is required.

Highlights important cautions. Paying attention to these cautions is advised to ensure safe operation and avoid potential problems.

Read the following Documents before using the drone:

1. User Manual
2. Field Checklist
3. Maintenance Manual

Maintain the following while operating the drone:

1. Drone Logs
2. Battery Charging Logs
3. Maintenance Logs

Disposal Warning

Do not dispose of this product as unsorted municipal waste.
This product requires special treatment and must be handled separately from regular household waste. Please take it to an appropriate recycling or disposal facility to ensure safe and environmentally responsible disposal.

Table of Contents

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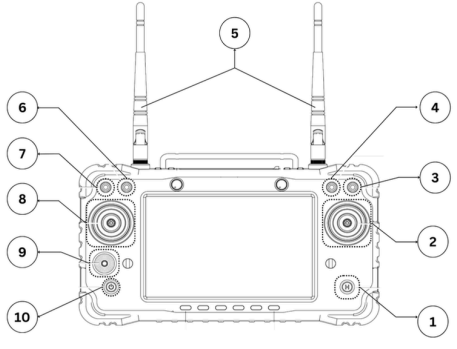
1. Introduction

RFLY-Micro is the compact powerful drone with autonomous and manual control, micro classified rotorcraft Unmanned aircraft system (UAS) with vertical take-off and landing (VTOL) capability is designed and developed for Aerial Mapping missions.

#	Component
1	RTK Antenna
2	Propeller
3	Motor
4	RF Antenna
5	Payload
6	Landing Gear

Transmitter

#	Component	#	Component
1	Picture Capture	**6**	Toggle Switch
2	Control Stick	**7**	Mode Switch
3	Toggle Switch	**8**	Control Stick
4	Zoom Function	**9**	Camera Control
5	Antenna	**10**	Power Button



2. Maintenance Procedure & Schedule

There are two kinds of maintenance schedules to ensure safe operation of the UAS.

1. Regular / Daily maintenance

2. Periodic / Scheduled maintenance

Regular/ Daily Maintenance

Daily maintenance of the RFLY-Micro UAS must be performed by the pilot, including the co-pilot, before flight operations begin. This routine is a part of mandated flight checks and is as follows:

1. **Pre-Flight**
2. **Post-Flight**

Regularly perform the required maintenance according to procedures to ensure the drone remains in optimal condition and to minimize safety risks.

Pre Flight Inspection

During operations, perform physical checks for each sub-system before flight.

Airframe Inspection

- Visually inspect the airframe for cracks, dents, or structural damage.
- Check the integrity of the GPS stand and ensure it is securely mounted.
- Inspect landing gear for any signs of deformation, wear, or cracks.
- Ensure battery connector pins are undamaged, not deformed, and free from corrosion.
- Verify tightness of RF antenna pinouts (a damaged or loose antenna can reduce connectivity and lead to control loss).
- Inspect all screws and fasteners on the airframe to ensure they are properly tightened and secure.
- Examine the arms and joints of the drone for signs of stress or fatigue, especially after heavy use or hard landings.
- Ensure there are no loose wires or cables that could interfere with other components.
- Check for any dirt, debris, or foreign objects on the airframe that may impact performance.

Propulsion System Check

Motors:

- Ensure motors rotate freely without obstruction or abnormal noise.
- Check for any signs of wear, corrosion, or debris buildup around the motor housing.
- Inspect motor wires for any signs of fraying, cuts, or damage, ensuring proper insulation.
- Verify motor mounts are securely fastened, and there is no movement or looseness in the motor assembly.
- Test motor response by running a brief system check to ensure smooth acceleration and deceleration.

Propeller:

- Inspect the propeller blades for cracks, dents, or warping that could affect balance or performance.
- Check for wear at the base of the propeller where it connects to the motor shaft.
- Ensure propeller hubs and adapters are properly aligned and tightened.
- Test propeller fit by manually rotating them to confirm they are securely attached but move smoothly without wobbling.
- Inspect the quick-release mechanism for the propellers, ensuring it locks in place firmly.

Battery Checks

- Inspect the battery casing for cracks, dents, or swelling, which could indicate internal damage.
- Check battery connectors for bent, corroded, or loose pins that could interfere with proper connection.
- Ensure the battery's voltage and capacity are adequate for the mission; use a voltage checker if needed.
- Verify the battery's charge level is full before flight; avoid using batteries with less than 100% charge for long missions.

- Ensure the battery is properly seated in its compartment and secured to prevent movement during flight.
- Examine the battery wiring for fraying, cuts, or other signs of damage that could lead to a short circuit.
- After extended use, monitor the battery temperature to ensure it's within safe operating limits; avoid flying with overheated batteries.
- Test battery connectors to ensure they are tight and provide a stable connection to the drone's power system.
- Store batteries at 40-60% charge if not used for more than 48 hours to prolong their life.
- Maintain Battery Charging logs.

Transmitter

- Test control sticks for proper operation.
- Ensure the UAS and GCS communication (C2 Link) is functioning properly.
- Wipe transmitter before packing.
- Ensure enough charge is present for missions (80% - 100%).

Payload Systems

- Inspect the mapping camera for proper resolution and zoom function.
- Clean the camera lens to ensure clear visibility during surveillance or mapping.
- Verify the gimbal stabilization system is functioning properly to avoid shaky footage during flight.
- Test camera's image transmission to the ground control system (GCS) to ensure real-time feed is clear and stable.
- Ensure the payload mount is secure, and there is no excessive vibration that could affect the image quality.

Post Flight checks

After completing the flight, thoroughly inspect the UAS for any visible signs of wear or damage.

- Record flight details such as duration, environmental conditions, and any anomalies encountered. Maintain Flight Logbook.
- Check for dirt, dust, or debris accumulation on the airframe, propellers, motors, and sensors. Clean as necessary.
- Inspect the landing gear for any deformation or stress after the flight.
- Verify that the battery does not show signs of swelling, overheating, or leakage. Remove and safely store it in a designated, temperature-controlled area.
- Inspect the motor mounts and propellers for tightness and any damage, such as cracks or chips.
- Ensure the RF antenna remains tightly secured and undamaged after flight, to maintain strong connectivity for future operations.
- Review data from the payload to ensure no loss or corruption occurred during data transmission or recording.
- Perform a quick check of the payload system to ensure there was no damage or misalignment of camera.
- Verify that all components, including the control systems and payload attachments, are securely in place and free from excessive vibration wear.
- Clean and inspect the propeller quick release adapters, ensuring that no dirt or material buildup could affect their function.

Periodic/ Scheduled Maintenance

MAINTENANCE TYPE	Frequency	CONTENTS
Basic Maintenance	Everyday	Regular Maintenance
1st Preventive Maintenance	250 Flight Hours	Basic Maintenance + 1st Routine
2nd Preventive Maintenance	500 Flight Hours	Basic Maintenance + 2nd Routine
3rd Preventive Maintenance	750 Flight Hours	Basic Maintenance + 3rd Routine
Breakdown Maintenance	1000 Flight Hours	Basic Maintenance + Breakdown

This is not a User Level Maintenance activity. Contact RFLY support for scheduled maintenance.

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Maintenance Procedure Matrix

Components	Basic Maintenance	Preventive Maintenance	Breakdown Maintenance
Propellers	Clean the parts using cloth and check for damages at EOD	1. Check motor shaft for damages or bend. 2. Replace after 500 Flight Hours or 2nd Routine Maintenance.	1. Check motor shaft for damages or bend. 2. Replace the propellers.
Airframe	Clean the drone using cloth/brush at EOD	Check for Cracks or Damages	Check for Cracks or Damages
Motor arms and Joints	Clean the parts using cloth and check for damages at EOD	1. Check the parts for any looseness or damage. 2. Replace any damaged/worn out parts	1. Check the parts for any looseness or damage. 2. Replace any damaged/worn out parts
Motors	Clean the parts using air blower and cloth at EOD	1. Check motors for signs of wear/damage. 2. Replace if necessary.	1. Check motor mounts for signs of wear/damage. 2. Replace the motor.
Battery	Clean the batteries at EOD. Make sure the terminals are clean.	Replace Battery after every 200 Hours.	Replace Battery after every 200 Hours.
Battery compartment	Clean the component using cloth/brush at EOD.	Check the compartment for any cracks/damages.	Check the compartment for any cracks/damages.
Battery Cables and Connectors	inspect for wear and tear	1. Check cable health. and heat sink damage. 2. Replace if necessary.	1. Check cable health. and heat sink damage. 2. Replace if necessary.
Payloads	Clean the component using cloth/brush at EOD.	Replace if damaged.	Replace if damaged
Quick Release Adapters	Inspect for any cracks and damage. Clean the component using cloth/brush at EOD.	Replace if damaged	Replace if damaged

4. Battery

RFLY-MICRO uses one 6S 6800 mAh Lithium based battery.

Handling and Use

- Handle batteries and battery-powered devices with care to avoid damaging the battery casing or connections.
- Keep batteries away from conductive materials, water, seawater, strong oxidizers, and strong acids.
- Store the battery in a cool, dry place, away from direct sunlight, heat sources, and moisture.
- Inspect batteries for any signs of damage before use. Never use damaged or swollen (puffy) batteries; dispose of them immediately.
- Keep all flammable materials away from areas where batteries are stored or operated.
- Allow the battery to cool before charging if it is still warm from use, and before using it if it is still warm from charging.
- Use only compatible chargers and follow manufacturer guidelines for charging.
- Avoid overcharging batteries and unplug them once fully charged.
- Do not disassemble or modify batteries

Charging

- Use the charger provided by the manufacturer for charging.
- Follow the manufacturer's instructions for charging the battery.
- Avoid overcharging or undercharging, as it can damage the battery and reduce its lifespan.
- Charge the battery in a well-ventilated area away from flammable materials and liquids.
- Never leave the battery unattended while charging.
- Keep the battery away from heat sources and direct sunlight during charging.
- Allow the battery to cool before charging. Do not charge if it is too hot.
- Check the battery and charging cables for damage before use.discharge it to the storage voltage.
- Disconnect the battery from the charger once fully charged.
- If the battery is fully charged but not used within two days,

Battery Storage

- Store batteries away from combustible materials.
- Remove batteries from devices for long-term storage.
- Keep batteries at temperatures between 5°C and 30°C.
- Always store batteries in a transit storage cabinet.
- Avoid bulk storage in non-laboratory areas like offices.
- Visually inspect battery storage areas weekly.
- Use storage mode for batteries that are idle for extended periods.
- Protect batteries with professional cases that meet military specifications to shield them from wind, rain, and impact.
- Proper storage will prevent battery deterioration.

Following these safety precautions ensures that the UAS battery is charged safely and helps avoid potential accidents or damage.

Battery Disposal Guidelines

- Avoid Incineration: Never burn LiPo batteries. Incinerating them can release toxic fumes and cause fires.
- Do Not Dispose of in Regular Trash: Never throw LiPo batteries in the regular trash, as this is unsafe and harmful to the environment.
- Proper Disposal: Take depleted batteries to a designated recycling center or household hazardous waste collection point to ensure safe and environmentally responsible disposal.

Do not attempt to poke or crush battery pack. This may result in uncontrolled chemical fire.

5. UAS Components- Life Cycle Characteristics

#	COMPONENT	LIFE	DESCRIPTION
1	Battery	200 Discharge Cycles	The User must record the battery log. When the battery has completed its 200 cycles, the user must purchase a replacement battery and send the old one back to the battery manufacturer. The lifecycle of the battery is determined through BIS battery lifecycle tests and flight test data analysis
2	Propeller	800 Hours	All flight records must be entered with start and end times, and each page will continuously update the recorded duration. The user must demount the propeller and properly dispose of it after 800 hours of continuous usage. The user contacts the manufacturer to get a new set of propellers. The OEM specifies the operational lifespan of the propeller
3	Motor	1000 Hours	The User is required to input all flight records with start and finish times and to update the recorded duration on each page. The user must submit the UAS to the manufacturer's hub for motor replacement after the total number of hours of operation reaches 1000 hours. The OEM specifies the life expectancy of the motor
4	Airframe	1000 Hours	The User is required to enter all flight records with start and finish times and to update the recorded duration on each page. The user must stop flying the drone and safely store or dispose of it after the total operating time reaches 1000 hours. The life analysis of Airframe is restricted based on the safety concerns and environmental conditions by the OEM
5	Landing Gear	1000 Landings	The User is required to enter all the flight records. The user must get in touch with the manufacturer to replace the landing gear whenever the number of landings or flying operations reaches 1000 landings. The life analysis of the Landing gears is analyzed. The number of landings is restricted based on the safety concerns and environmental conditions by the OEM

Along with adhering to the listed limitations, always inspect the UAS according to maintenance instructions if any issues or incidents occur. If any deformities or problems observed, contact the manufacturer immediately for necessary repairs or replacements.

6. Critical Components in RFLY- MICRO UAS

Critical components in RFLY- Micro UAS				
Assembly	**Critical Parts**	**Locking Mechanism**	**Critical Level**	**Effect of Failure**
Propeller	Propeller	Head Screw	**High**	**Entire UAS will fail**
Arm Assembly	Arm (CF)	Adhesive Bonding	**High**	**Entire UAS will fail**
	Motor and motor mount	Bolt-Nut with Thread lock	**High**	**Entire UAS will fail**
	Arm and arm side fix	Adhesive Bonding	**High**	**Entire UAS will fail**
Centre Hub Assembly	Centre Hub and arm assembly	Adhesive Bonding	**High**	**Entire UAS will fail**
	Payload assembly adaptor	Bolt-Nut with Thread lock	**Low**	**Payload performance will get affected**
	Avionics Canopy	Bolt-Nut with Thread lock	**Low**	**It will not create any damage to the UAS**
Landing Gear Assembly	Skid tube	Bolt with thread lock	**Low**	**Improper landing may occur**
Payload Assembly	Payload assembly bottom adapter	Quick Release lock mechanism	**Low**	**Payload performance will get affected**

All bolts should be carefully inspected and replaced, if needed, every 200 flights or 100 hours. This helps address issues of wear, corrosion, and abrasion, maintaining the airframe's rigidity and durability.

Level of maintenance beyond the scope of the user

Certain maintenance tasks may require professional assistance beyond the capabilities of a UAS user. These include:

- **Electronic Component Repairs:** Any damage to components like the flight controller or motor control board must be handled by a professional with the appropriate expertise and equipment.
- **Part Replacements:** Physical damage, such as broken arms or damaged propellers, requires specific replacement parts and professional installation to ensure proper fit and function.
- **Firmware and Software Updates:** Updates must be performed by a professional who has the necessary authorization and specialized knowledge to install and configure them correctly.

7. Component Performance Monitoring

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

Procedures:

1. **Pre-flight Inspection:**
- Conduct a thorough pre-flight inspection of all components including the frame, propellers, motors, batteries, flight controller, sensors and communication systems.
- Check for any signs of damage, wear, or loose connections.
- Verify that all components are securely attached and functioning properly.

2. Battery Monitoring:
- Check battery voltage and overall health before each flight.
- Monitor battery voltage before each flight.
- Use RC Transmitter to track battery performance in real-time.

3. Motor and Propeller Performance:
- Check for any abnormal vibrations or sounds indicating motor or propeller issues.
- Ensure propellers are balanced and securely attached.

4. Flight Controller and Sensors:
- Verify proper calibration of the flight controller and sensors.
- Monitor GPS accuracy, altitude, and orientation data.

5. Telemetry and Communication Systems:
- Ensure stable communication between the drone and ground control station.
- Monitor signal strength and latency of telemetry data.
- Test fail-safe systems to ensure proper operation in case of signal loss.

6. Post-flight Inspection:
- Conduct a post-flight inspection to check for any damage or abnormalities.
- Review flight logs and telemetry data for further analysis.
- Address any identified issues and perform necessary maintenance or repairs.

Regular Maintenance:
- Establish a schedule for routine maintenance tasks such as cleaning, lubrication, and component replacement.
- Keep detailed maintenance records to track the history of each component.

Continuous Improvement:
- Use feedback from monitoring activities to improve maintenance procedures and optimize component performance.
- Stay updated on advancements in drone technology and incorporate best practices for component monitoring and maintenance.

Critical Components Inspection Matrix:

A systematic examination of essential parts of the RFLY-MICRO UAS ensures that they are functioning properly and are in good condition. This inspection focuses on components vital for the safe and effective operation of the UAS. Refer to the **Maintenance Procedure Matrix** for specific inspection criteria.

Ensure that Maintenance Logs are updated in a timely manner.

Monthly Reporting of Performance Data:

For the duration of the warranty, the client must provide the following information by the fifth of each month.

- Photograph of UAS Battery charging logbook containing data from 1st to last of the month.
- Photograph of UAS Flight logbook Containing data from 1st to last of the month.
- Photograph of UAS Maintenance logbook Containing data from 1st to last of the month.
- Photograph of UAS Continuous monitoring process log Containing data from 1st to last of the month. (The buyer/user of the model shall send the record of any component failure as and when it occurs within 7 days of its occurrence. The data shall be shared in the format given in “UAS LOGBOOK – CONTINUOUS MONITORING PROCESS LOG”)

Failure to provide required data to RFLY within the specified timeframe will void the warranty.

9. Support

If you encounter any issues not covered in the manual or require further assistance, please contact RFLY Innovations Technical Support.

When reaching out, please provide:

- Detailed information about the issue.
- Any error codes displayed.
- Steps you've already taken to troubleshoot.

We're here to help!

Contact Information:

Email Support: support@rfly.in

Online Support Portal: www.rfly.in

ANNEXURE

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Maintenance Checklist

Model	RFLY- MICRO	UIN	
Date of Purchase		Date of Maintenance	
Total Flight Hours		Customer ID	

Maintenance Checklist	Status
Aircraft Body External checks	
Motor Arms and Joints Fitness checks	
Arm Joints shafts and Quick Release Adaptor Fitness checks	
Propellers Wear and Tear checks	
Motors Free Rotation check	
Motors Dust Cleaning	
ESC cable Health check	
Batteries Cable Health check	
Batteries Charging and Voltage checks	
Battery Replacement	
Drone Cables Health checks	
Drone Avionics Cleaning and Dusting	
Drone Firmware Upgrade	
Payload	
Transmitter Checks	
Propeller Replacemnt	

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Maintenance Checklist

ESC Replacement	
Motor Replacement (M1, M2, M3, M4)	
Test flight status and Remarks:	
Verified by	

Drone Continuous Monitoring Process Log

No.	Name of Component	Component Life	Date of Removal	Component hours at Removal	Reason for removal	Root Cause Analysis	Corrective Measures Suggested	Corrective Measures Implemented	Signature
-	Airframe/ Propeller/ Landing Gear/ Batteries	Cumulative Operation Hours/ No. of Landings/ Cycles	DD/MM/YYY	-	-	-	-	-	-

Drone Continuous Monitoring Process Log

No.	Name of Component	Component Life	Date of Removal	Component hours at Removal	Reason for removal	Root Cause Analysis	Corrective Measures Suggested	Corrective Measures Implemented	Signature
-	Airframe/ Propeller/ Landing Gear/ Batteries	Cumulative Operation Hours/ No. of Landings/ Cycles	DD/MM/YYY	-	-	-	-	-	-

Drone Continuous Monitoring Process Log

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-	Airframe/ Propeller/ Landing Gear/ Batteries	Cumulative Operation Hours/ No. of Landings/ Cycles	DD/MM/YYY	-	-	-	-	-	-

Drone Continuous Monitoring Process Log

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-	Airframe/ Propeller/ Landing Gear/ Batteries	Cumulative Operation Hours/ No. of Landings/ Cycles	DD/MM/YYY	-	-	-	-	-	-

Drone Maintenance Logbook

UIN		Model	RFLY- MICRO	Customer ID		Serial No. : 1
No.	**Maintenance Date**	**Test Pilot Name**	**Maintenance Type**	**Engineer Name**	**Maintenance Remarks**	**Signature**

Drone Maintenance Logbook

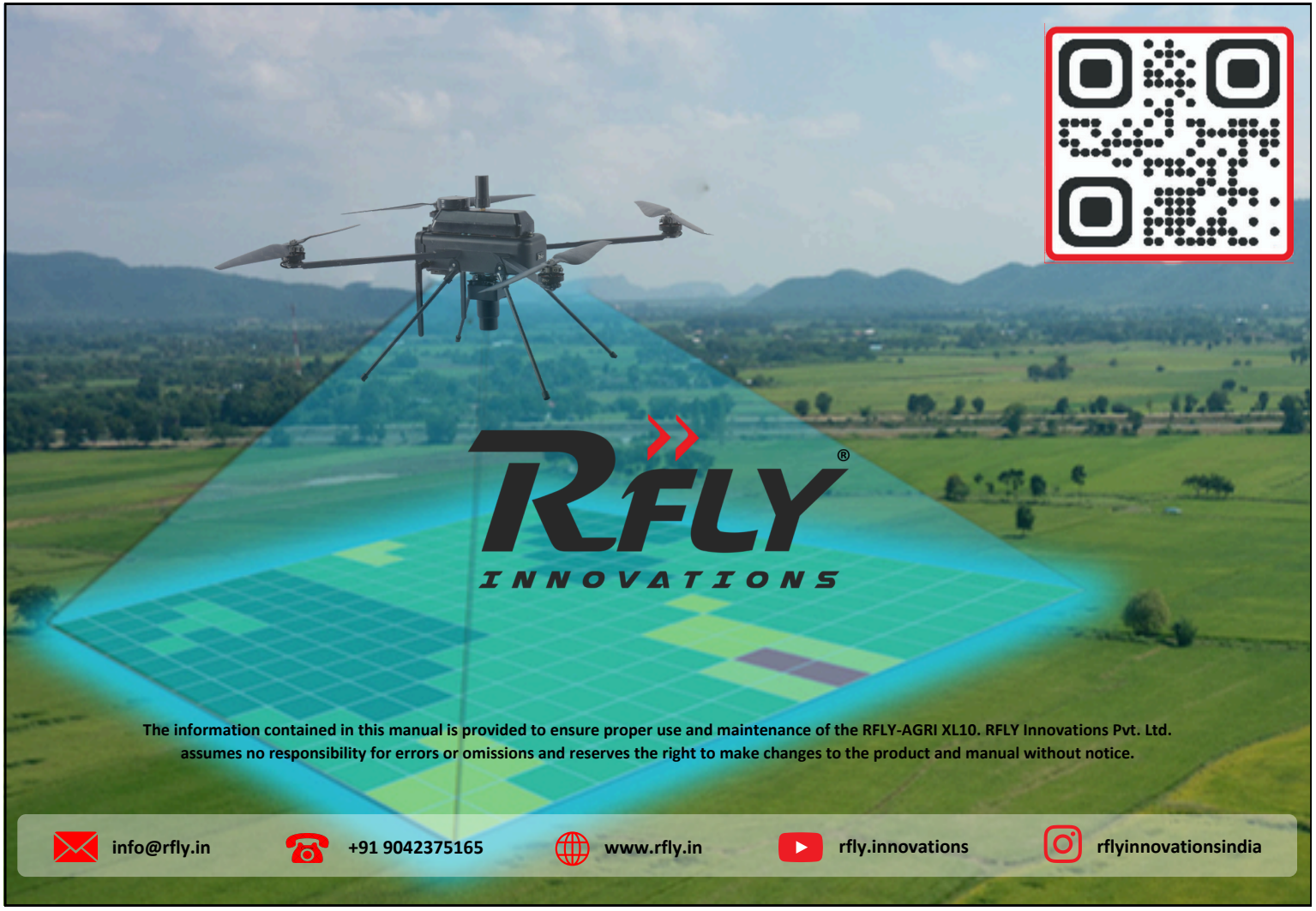
UIN		Model	RFLY- MICRO	Customer ID		Serial No. : 2
No.	Maintenance Date	Test Pilot Name	Maintenance Type	Engineer Name	Maintenance Remarks	Signature

Drone Maintenance Logbook

UIN		Model	RFLY- MICRO	Customer ID		Serial No. : 3
No.	Maintenance Date	Test Pilot Name	Maintenance Type	Engineer Name	Maintenance Remarks	Signature

Drone Maintenance Logbook

UIN		Model	RFLY- MICRO	Customer ID		Serial No. : 4
No.	**Maintenance Date**	**Test Pilot Name**	**Maintenance Type**	**Engineer Name**	**Maintenance Remarks**	**Signature**



The information contained in this manual is provided to ensure proper use and maintenance of the RFLY-AGRI XL10. RFLY Innovations Pvt. Ltd. assumes no responsibility for errors or omissions and reserves the right to make changes to the product and manual without notice.

info@rfly.in
+91 9042375165
www.rfly.in
rfly.innovations
rflyinnovationsindia