






Pracovní postup / Work Instruction

Název / Name:	Propeller Maintenance and Repair Manual of Mejzlik Fixed Pitch Propellers
Číslo dokumentu / Document Number:	QW-B200032.01EN
Revize / Revision:	01

	Jméno	Funkce	Datum	Podpis
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1 Introduction

The propeller is made of high-quality carbon fiber, providing a very good strength-to-weight ratio. Attention is given to every single propeller that is manufactured which helps us to deliver the best quality propellers. Thousands of propellers are currently in service worldwide in many fixed-wing and multi-rotor/multicopter UAVs.

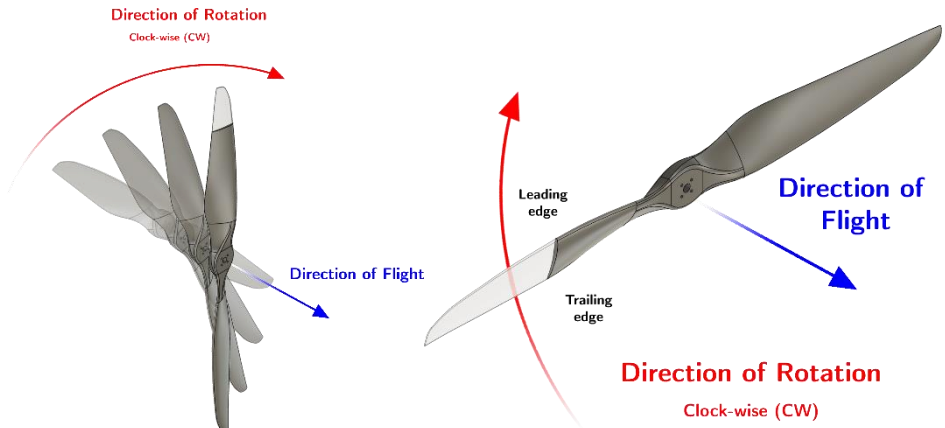
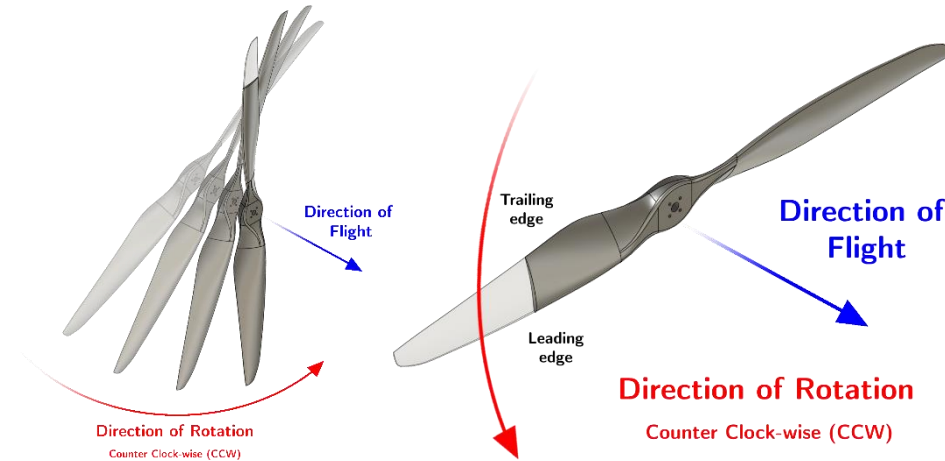
Please read this user manual carefully before putting the product into service to get basic information on operational safety.

Always contact the manufacturer if you do not understand the contents or if in doubt.



Thank you for choosing Mejzlik propellers. We are always working to help you better.




1.1 Basic Terms

1.	CW	Clockwise rotation of the propeller viewed in terms of flight direction.				
 <p style="text-align: center;"><i>Figure 1 Clock-wise rotation definition.</i></p>						
2.	CCW	Counterclockwise rotation of the propeller viewed in terms of flight direction.				
 <p style="text-align: center;"><i>Figure 2 Counterclockwise rotation definition.</i></p>						
3.	Pusher	Propeller thrust pushing into a motor/engine. i.e. propeller is “behind” or under the motor.				
4.	Puller (or Tractor)	Propeller thrust pulling on a motor/engine, i.e. propeller is in front of or above the motor.				
5.	Correct motor propeller combination	Motor rot.dir. CCW	+	Motor config. Puller	=	CCW propeller
		Motor rot.dir. CCW	+	Motor config. Pusher	=	CW Propeller



		Motor CW	rot.dir.	+	Motor Puller	config.	=	CW Propeller
		Motor CW	rot.dir.	+	Motor Pusher	config.	=	CCW Propeller
		Note: Motor rotation direction is defined when the observer is facing the output shaft.						
6.	Balancing hole							
7.	Vent hole							

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2 Safety Information

2.1 General safety precautions

Keep the surroundings clear when the propeller is rotating. As the propeller rotates at a very high RPM, it is a dangerous hazard and may cause severe damage if not operated safely.

Do not use the propeller as a handle to move the aircraft.

Starting the internal combustion engine manually using the propeller is not allowed.

Keep the RPM range of the propeller within specified limits. The limit for each propeller is specified in its Product Sheet.

Do not operate the propeller in the natural frequency region for extended periods of time. A quick pass through the natural frequency region is allowed.

2.2 Specific Safety Warnings

Avoid running the propeller in abrasive environments, such as rain, small rocks, or heavy dust. These particles have a deteriorating influence on the propeller.


Exposure of the propeller to chemicals is prohibited, except for short-term contact with isopropyl alcohol and denatured alcohol. Engine fuel is considered safe.

3 Product Description

3.1 Basic Propeller Data

Basic propeller data can be found in the Propeller product sheet. This document includes information about propeller dimensions (diameter, pitch), maximal RPM, working temperature, materials, weight, and standard QA procedure.

All available datasheets can be found at <https://www.mejzlik.eu/technical-data>

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4 Model and Serial number

A propeller is identified with the following identifications

- **Product number** (e.g. shown in Product Sheet, invoice, etc.)
- **Serial Number** (DataMatrix code)

Specify the product number and the serial number (i.e. DataMatrix code) of the propeller whenever you contact the manufacturer for doubts or clarification.

Please note that Diameter x Pitch is not a unique identification and should not be used as a main ID parameter.

4.1 Airworthiness

Mejzlik Propellers has ISO 9001 Quality management certification. All propellers come with a Certificate of Conformance (CoC) after passing various levels of quality checks by our quality assurance officer.


4.2 Standard Quality Control

Inspection operations are performed by quality personnel independently of the production department.

The production workflow is defined by the control operations. For each operation, the acceptance criteria for the given product are defined in the technological card of that operation. Acceptance criteria are based on production documentation and design data.

The standard quality control contains:

- Visual inspection
- Balancing control
- Basic dimension control (weight, drilling, ...)
- Functional control – folding propellers after assembly

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5 Installation

Due to the sheer variety of possible propeller installations, this manual shows good practice. Please combine these good practices in the Operation Manual of your platform.

1. Deactivate the engine starter power supply or ESC before the installation.
2. Visually inspect the propeller for any damage (see Special inspection section)
3. Make sure the motor shaft is clean and dry from any liquids. If needed clean the engine/motor hub flange/shaft and let dry. Oil or lubricants on the surface must be avoided. Check bolts for cracks, thread, and corrosion.
4. Install the propeller on the engine/motor shaft and align the propeller drilling pattern to the engine/motor drilling pattern.
5. Double-check the propeller orientation (puller/pusher) and direction of rotation (CW/CCW). If in doubt consult the section Basic Terms.
6. Tighten the bolts to the prescribed torque. It's recommended to use a propeller washer or at least washers under the bolt's heads.
7. Check tightening torque by 0.5h, 2.5h, and 10h, every consecutive 50h.

5.1 Tightening torque

The hubs of all OTS propellers are designed to withstand 50 MPa of clamping pressure. This allows for a good transfer of torque from the motor/engine to the propeller.

The magnitude of the torquing moment for each bolt is governed by multiple parameters. For example, hub diameter, number of bolts, bolts diameter, drilling pattern diameter, and use of one or multiple washers.

You can calculate the torquing moment with the following procedure or use our Tightening torque calculator on the www.mejzlik.eu website.

5.1.1 Tightening torque calculation for a single washer

Calculation for single washer:

1. Hub pressure surface:

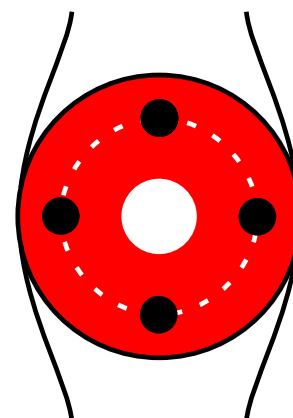
$$S = \frac{\pi(D^2 - d^2 - D_b^2 \cdot n)}{4} \quad [\text{mm}^2]$$


- D ... washer diameter [mm]
- d ... centering hole diameter [mm]
- D_b ... bolt diameter [mm]
- n ... number of bolts

2. Pretension force per bolt:

$$F = \frac{S \cdot \sigma}{n} \quad [\text{N}]$$

- σ ... hub bearing stress limit (50 MPa)



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3. Maximal tightening torque:

$$M_{max} = \frac{F \cdot k \cdot D_b}{1000} \quad [\text{Nm}]$$

k ... tightening torque coefficient for threads (0.2)

$$M = M_{max} \cdot 0.7 \div 0.8 \quad [\text{Nm}]$$

M is the maximal tightening torque at which the propeller core will fail. Use 70-80% of maximal tightening torque.

5.1.2 Tightening torque calculation for multiple washers

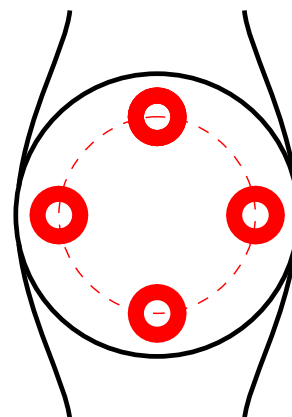
1. Hub pressure surface:

$$S = n \cdot \pi \left(\frac{D_w^2 - D_h^2}{4} \right) \quad [\text{mm}^2]$$

n ... number of washers

D_w ... washer diameter [mm]

D_h ... washer hole diameter [mm]



2. Pretension force per bolt:

$$F = \frac{S \cdot \sigma}{n} \quad [\text{N}]$$

σ ... hub bearing stress limit (50 MPa)

3. Maximal tightening torque:

$$M = \frac{F \cdot k \cdot D_h}{1000} \quad [\text{Nm}]$$

k ... tightening torque coefficient for threads (0.2)


$$M = M_{max} \cdot 0.7 \div 0.8 \quad [\text{Nm}]$$

M is the maximal tightening torque at which the propeller core will fail. Use 70-80% of maximal tightening torque.

5.2 Preflight Inspection

Perform visual inspection before every flight.

- Check if the propeller is clean from dust and debris.
- Check if the propeller is fixed tightly and is not loose in any direction. Check if the bolts and propeller hub/washer are intact. Check for slip marks.
- Check the condition of the leading and trailing edges of the blade. Check the condition of blade roots at the connection to the propeller hub. See the Special Inspections section
- Check the condition of blade roots at the connection to the propeller hub.

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- If a spinner is installed, inspect it for damage or cracks. Repair or replace components as required before further flight.
- If you notice a sudden change of propeller stiffness in either bending or torsion stop using the propeller immediately.
- If there is a sign of defect, the propeller must be rectified, if possible. On discovering unacceptable defects, stop using the propeller immediately and install a new propeller.

5.3 Special Inspections

Perform an additional preflight inspection when the following occurs:

- In case of a blade and foreign object (stone, bird, hail, etc.) collision.
- In the case of hard handling.
- In case of overspeeding the propeller by more than 110% of the maximum defined RPM.
- In all cases of operating the propeller outside the conditions/ranges stated in this manual and product sheet.

5.4 Mandatory Inspection Interval and Replacement Time

The propeller must be checked after every flight.


Defects, if discovered, must be rectified. On discovering unacceptable defects, stop using the propeller immediately and install a new propeller.

Without mandatory inspections being regularly performed, the propeller is not airworthy and must not be used.

5.5 Cleaning

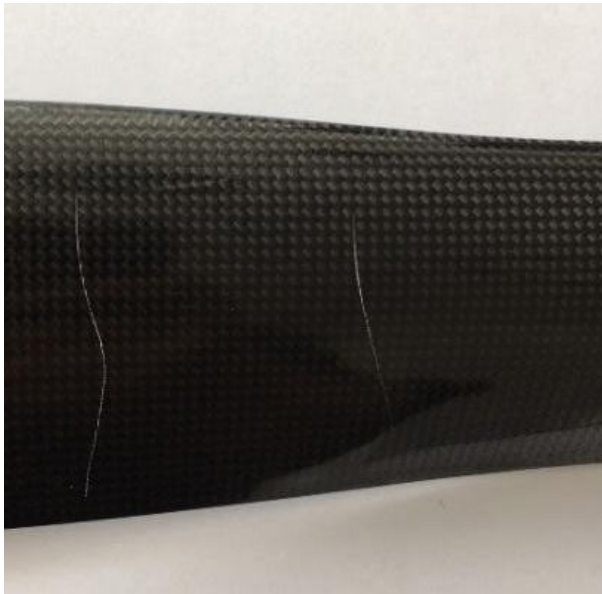
Cleaning the propeller regularly is important as dust and debris can build up over time. Just use a mild wet cloth to clean the propeller blades. While cleaning the blade be careful that the water does not enter the propeller hub as it may reduce the friction that holds the shaft and the propeller.

Do not expose the propeller to chemicals. Short-term use of isopropyl alcohol for cleaning is allowed. Long-term exposure to engine fuel is considered safe.

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5.6 Acceptable damage

Small scratches on the surface of the propeller are considered an acceptable damage limit. See a sample of acceptable scratches in Figure 3.



Acceptable visual scratches




Acceptable paint scratches

Figure 3 Acceptable damage.

5.6.1 UV Damage

Propeller is considered UV-safe, and its properties do not change with UV exposure. A yellowish haze can appear in the epoxy. It is caused by a minor reaction of the epoxy to UV which is happening in the uppermost surface. UV does not penetrate carbon fibers. Therefore, the overall properties of multilayer laminate do not change.

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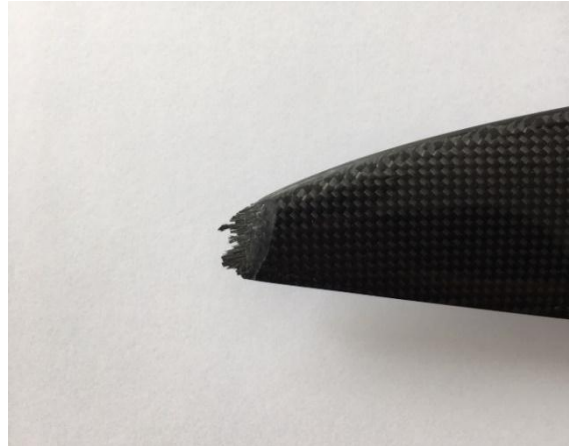
5.7 Unacceptable damage

In Figure 4 you can see examples of unacceptable damage – Broken propeller tip, damage to the leading edge, and cracked trailing edge.

Propeller blades cannot be repaired if they are cracked or damaged.



Unacceptable propeller crack



Unacceptable propeller crack



Unacceptable propeller crack




Unacceptable propeller crack

Figure 4 Unacceptable damage.

The propeller must be changed if there is anything more than scratches.

Propeller blade tips are more susceptible to damage, and cracks generally start from the propeller Hub. During the visual inspection, these areas must be checked properly to maintain the smooth operation of the aircraft.

The technician must be able to differentiate cracks and scratches. Cracks in the propellers are very dangerous and such damaged propellers must be replaced immediately. An example of a propeller crack can be found in Figure 4.


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All the inspections and maintenance must be logged properly in the Serviceability tag. Please see the Appendix for the serviceability tag form example.

If you are unsure about the level of damage on the propeller do not hesitate to contact our Quality department at kvalita@mejzlik.eu for further assistance of our quality department in assessing the damage level.

5.8 Repair Guidelines

The propeller cannot be repaired when it is damaged. The Propeller must be replaced for the continuation of the safe operation of the aircraft.

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6 Handling, Shipping, and Storage

6.1 Handling

Handle the propeller with care. Carbon fiber laminate is a strong but fragile material. Do not make the propeller stand on its tip (when stored or transported). Put the propeller on a padded support that supports the entire length of the propeller when stored or transported. When outside of the padded support, put the propeller in a way that Leading edge is touching a desk surface. Do not place any objects on top of the propeller. Do not lift the propeller from the blade tip. Always lift it from the hub.

Be careful with the propeller tip, store it safely. Preferably with propeller tip covers.

6.2 Shipping

For any shipment of the propeller use the original container. If this is impossible it will be very important to fix the propeller at the blade tips and the hub, in a manner that avoids damage.

In case of returning the propeller, it is furthermore recommended to return all accessories and parts together with the propeller. They will also be inspected and not considered to be missing.


Examine the exterior of the shipping container for signs of shipping damage, especially at the box ends around each blade. A hole, tear, or crushed appearance at the end of the box (at the propeller tips) may indicate the box was dropped during shipment, possibly damaging the blades. After removing the propeller from the shipping container, examine the propeller components for shipping damage.

6.3 Storage

Before long-term storage, we recommend cleaning the propeller body and blades with lukewarm water. The propeller must be stored in a horizontal position with the hub supported. Either tape over the drilled holes with duct tape to prevent humidity from entering the hub (e.g.K766 tape). Or store it in a sealed plastic bag. Storage condition: temperature -20° to $+60^{\circ}\text{C}$, relative humidity up to 80% (with taped-over holes).



Figure 5 Long-term storage, preventative humidity seal made with tape.

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7 Warranty Information

7.1 Terms and Conditions:

For detailed information about Mejzliks Terms and Conditions please see the document placed on the Mejzlik website or follow this link:

https://www.mejzlik.eu/MEJZLIK%20PROPELLERS%20SALES%20TERMS%20AND%20CONDITIONS_rev_22082023%201.docx

7.2 Warranty

For detailed information about Warranty please see Terms and Conditions document placed on the Mejzlik website or follow this link:

https://www.mejzlik.eu/MEJZLIK%20PROPELLERS%20SALES%20TERMS%20AND%20CONDITIONS_rev_22082023%201.docx

7.3 Claim Procedures

Please contact kvalita@mejzlik.eu to start the Claim process.



Appendix

Serviceability tag

Customer Name		Propeller P.N.	
Platform name		Propeller S.N.	
		Purchase Date	

Propeller Service log					
Log No.	Date	Inspection description	Number of hours worked (spun)	Comments	Technician Signature
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					



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Historie dokumentu

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00	03.09.2024	Default document
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