



DUC *Helices* Propellers

Instruction manual Quick Ground Adjustable Propellers

BLACK-M

FLASHBLACK-M | FLASHBLACK-2-M | SWIRLBLACK-3-M



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ISO 9001

BUREAU VERITAS
Certification



ISO 9001:2008 Certified Company
for its Quality System Management

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BUREAU VERITAS
Certification

SOCIETE DUC

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Bureau Veritas Certification France certifie que le système de management de l'organisme susmentionné a été audité et jugé conforme aux exigences de la norme :

Standard

ISO 9001:2015

Domaine d'activité

**CONCEPTION, FABRICATION D'HELICES, DE PALES
ET D'ACCESSOIRES AERONAUTIQUES.**

**DESIGN, MANUFACTURING OF AERONAUTICAL PROPELLERS,
BLADES AND ACCESSORIES.**

Date d'entrée en vigueur : **28 mai 2018**

Sous réserve du fonctionnement continu et satisfaisant du système de management de l'organisme, ce certificat est valable jusqu'au : **21 février 2019**

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Des informations supplémentaires concernant le périmètre de ce certificat ainsi que l'applicabilité des exigences du système de management peuvent être obtenues en consultant l'organisme.
Pour vérifier la validité de ce certificat, vous pouvez téléphoner au : **+ 33 (0)1 41 97 00 60**.



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This instruction manual is to be maintained throughout the life of the propeller. He may have to evolve. The owner must check with the DUC Hélices Company the latest version being valid applicable to the propeller.

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1. BLACK-M propellers presentation

1.1. Description

The **BLACK-M** propellers are the new generation innovative quick ground adjustable which have the best performances for all kind of flights. These are a blend of carbon/titanium blades and carbon/aluminum hub which are manufactured in accordance with the DUC Propellers technologies, allowing them to be the fastest ground adjustable propeller ever designed.

The aerodynamic shape of blades uses the innovative design of the **FLASH & SWIRL-3** tractor propeller, and the **FLASH-2** pusher propeller.

These propellers allow to optimize its performance according to the planned flight:

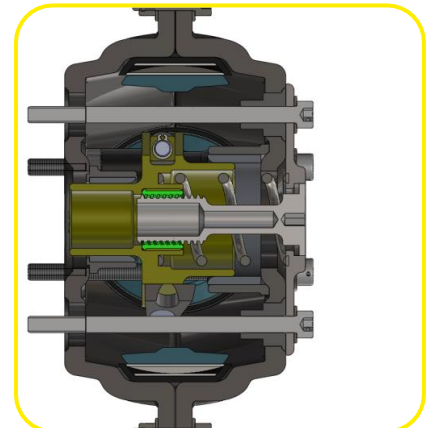
- **Fine pitch for highest takeoff and climb rate efficiency**
- **Coarse pitch for highest cruise and maximum speed efficiency**
- **Great simplicity & ease of use**

Equipped with grade 5 titanium hardware, this technology and manufacturing level and requirement degree have never been to this advancement.

Their variable pitch carbon hub system allows a wide range of angle variation, while being secured by an innovative self-locking step system.

The management of the blade pitch angle is managed manually and very quickly on the ground using an extra-long 6mm Allen key that can be used through the spinner of the aircraft.

Visual indicators of the applied angle are present at the center of the propeller as well as at the foot of the blades.



1.2. Characteristics

FLASHBLACK-M & SWIRLBLACK-3-M Tractor

- Tractor for Geared engine
- 2-blade or 3-blade
- Weights:
 - **FLASHBLACK-M** 2-blade 5.5kg & 3-blade 6.8kg
 - **SWIRLBLACK-3-M** 3-blade 6.6kg
- The range of adjustable angle (Max amplitude.: 23°)
- Diameters Ø1520 to Ø1900mm (Ø60" to Ø75")
- Shielded leading edge in Inconel®
- Carbon/aluminum composite hub for variable pitch propeller
(Mounting propeller shaft spacing Ø101.6mm)

FLASHBLACK-2-M Pusher

- Pusher for Geared engine
- 3-blade
- Weight **FLASHBLACK-2-M** 3-blade 7.0kg
- The range of adjustable angle (Max amplitude.: 23°)
- Diameters Ø1520 to Ø1900mm (Ø60" to Ø75")
- Shielded leading edge in Inconel®
- Carbon/aluminum composite hub for variable pitch propeller
(Mounting propeller shaft spacing Ø101.6mm)

1.3. Shielding leading edge in Inconel

The leading edge of the **BLACK-M** propellers type blades is composed of a metallic shielding in Inconel®. This material is a superalloy including mainly nickel, with a very high hardness of the surface.



1.4. Accessories

- **Aluminum mounting spacer (Direct mounting on P.C.D Ø101.6mm/Ø4")**
Moves the plane of the propeller to adjust the position in accordance with the engine hood
- **Spinner available in diameter Ø250mm (Ø9.8"), Ø260 (Ø10.2"), Ø300 (Ø11.8") & Ø340mm (Ø14.4")**
- **Adjusting tool for the setting of the pitch angle of the blades**
- **Neoprene cover protection of the blade**
- **Cleaning treatment for composite propellers**
Save money! A clean propeller is more efficient and decreases the fuel consumption.



1.5. Sales reference

Designation	Reference	Part number	Weight (kg)
2-blade Inconel FLASHBLACK-M Right propeller with setting key	01-41-002	H-FSH_2-D-M_I	5.50
3-blade Inconel FLASHBLACK-M Right propeller with setting key	01-41-001	H-FSH_3-D-M_I	6.80
3-blade Inconel SWIRLBLACK-3-M Right propeller with setting key	01-41-003	H-SW3_3-D-M_I	6.60
3-blade Inconel FLASHBLACK-2-M Left propeller with setting key	01-41-004	H-FSH2_3-G-M_I	7.00

Note:

Specify the flight regulation aircraft (E.g.: **Ultra-light, LSA...**) and diameter when ordering (E.g.: ref. 01-21-001/**1730**). For more information about the propeller marking, see section **11.5**.

2. Applications

The DUC Propellers Company has an **unlimited** flight potential in normal operation. To keep the unlimited potential, DUC Propellers Company defined a TBO (Time Between Overhaul) for a propeller depending on its engine. Refer to section **9. Potential use & Propeller maintenance** for more information.

Engine	Type	Gear box	Recommended propeller	Propeller diameter (mm)	Pitch angle amplitude (°)	TBO (hour)
3 AXES TRACTOR						
ROTAX 912/912S/912iS/914	4 strokes	2.273 2.43	2-blade Inconel FLASHBLACK-M Right	60" to 75"	23°	1500h or 5 years
			3-blade Inconel FLASHBLACK-M Right			
			3-blade Inconel SWIRLBLACK-3-M Right			
PROPULSIF						
ROTAX 912/912S/912iS/914	4 strokes	2.273 2.43	3-blade Inconel FLASHBLACK-2-M Left	60" to 75"	23°	1500h or 5 years
OTHERS APPLICATIONS						
For all other applications, thank you to contact the DUC Propellers Company to study the possibility of adapting the BLACK-M propellers type.						

*Ø1900mm = 74.8»; Ø1520mm = Ø59.8"

Remarque

The pitch angle values must be adjusted according to the airplane. Thus, depending on the type of aircraft, a pitch angle range must be defined by the user. See the section **6. Initials Settings & Testing of the propeller [MANDATORY]**.

For proper use of the propeller, refer to section **9. Potential use & Propeller maintenance**.

3. Installation and using precautions



RECOMMENDATION

As recommended by the BRP manufacturer of Rotax engine, it's strongly recommended to use the Quick Ground Adjustable **BLACK-M** propeller with an aircraft equipped with a vacuum indicator on engine intake manifold (**Pressure of the engine intake - MAP**) to know the engine load. Refer to your engine manual or the section **11.3. Engine performance data's**.

WARNING

Make sure the ignition is turned off before starting any type of operation on the propeller.
Do not run the engine without propeller, engine damage will result.

IMPORTANT

- The propeller's blades are part of a package. **DO NOT EXCHANGE IT** with other similar blades from the propeller. The propeller's blades are manufactured to their application. Their structure, weight, and balance are different from a propeller to another.

- The spinner is an important element for cooling the engine. The aircraft must not fly without a spinner. Fitting a different spinner will be an addendum to this manual approved by the DUC to confirm its compatibility with the mounting of the propeller.

- The propeller is delivered with the appropriate screws. **The change of the screws is contrary to our recommendations unless validated by manufacturers.**

WARRANTY CONDITIONS

The user is still flying under his full responsibility (see **10. General terms sale**).

4. Technical data of the BLACK-M propellers type

4.1. Mounting configuration of the BLACK-M propellers

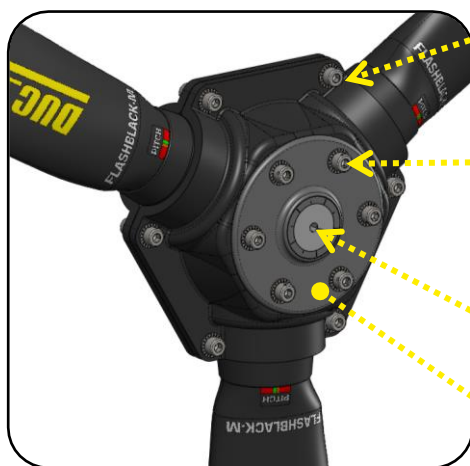
Here is a configuration table of the **BLACK-M** propellers mounting according the propeller-shaft of the engine.

If needed, see annex **11.1 The dimension of the ROTAX 912/912S/914**.

MOUNTING	ENGINE PROPELLER-SHAFT	
	Ø4" / Ø101.6mm (Ex: Rotax)	Other
direct on propeller-shaft (without spacer)	X	
with spacer	X	
with adaptor spacer		<i>Contact DUC Hélices Propellers</i>

4.2. Hardware

For mounting of the propeller on Rotax engine:



Hub assembly:

Screws/washer CHC M8x30 in grade 5 titanium
Nylstop nut in grade 5 titanium

Propeller fixation:

Screws CHC M8 in grade 5 titanium with a drilled head for a stop with safety wire (adapted screw length according to the direct mounting of the propeller shaft or spacer) / pin contact washer.

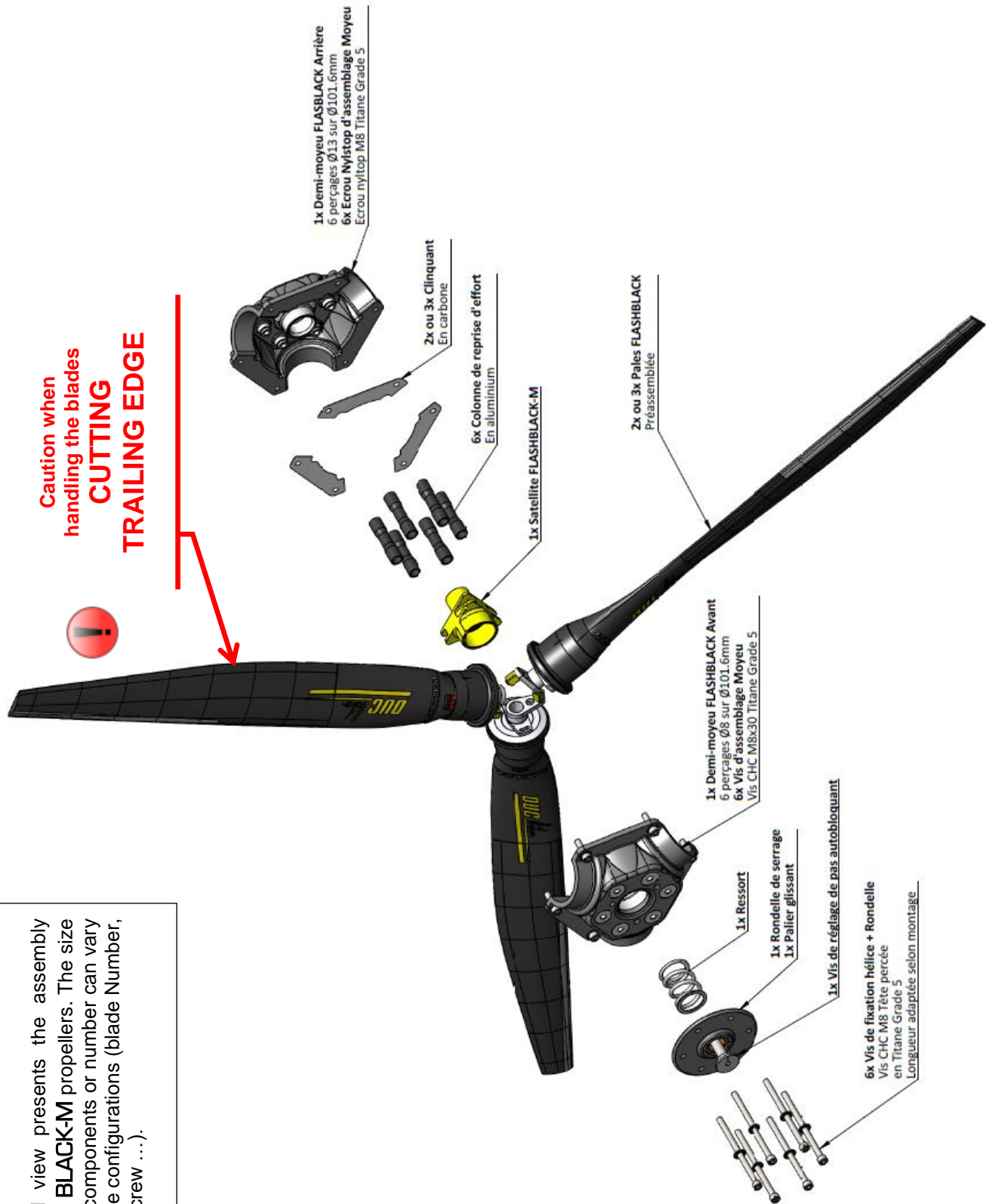
Adjustable low pitch stop:

Nylstop nut in grade 5 titanium

Tightening washer:

Perforated carbon Ø8mm on Ø101.6mm

4.3. Exploded view for propeller



Remark

This exploded view presents the assembly principle of the **BLACK-M** propellers. The size of all of these components or number can vary according to the configurations (blade Number, length of the screw ...).












5. Mounting instruction of the BLACK-M propellers

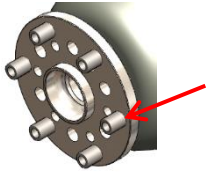


The mounting of the **BLACK-M** propellers is showed hereafter. It's recommended to assembly the propeller on a table before to install it on the aircraft. The process is the same for the 2-blade or 3-blade propeller.

For further help, please contact DUC Propellers Company.

5.1. Package contents

The **BLACK-M** propellers are sent in kit, composed of subsets. Thanks to perform the verification by checking the good package content:

View	Article	Quantity	DUC checkpoint	Customer checkpoint
	Fixation bolts of the propeller + Washer Screws CHC M8 with drilled head Adapted length according to the mounting	6		
	Self-lock Pitch Setting screw	1		
	Sliding bearing + Tightening washer	1		
	Spring	1		
	Front FLASHBLACK half-hub 6 Drilling Ø8mm on Ø101.6mm Central bore Ø55mm	1		
	Assembly hub bolts + Washer CHC M8x30 bolts	6		
	Blade FLASHBLACK/-2 or SWIRLBLACK-3 Preassembled	2 or 3		
	Central Satellite BLACK-M Preassembled	1		
	Tightening foil In carbon	2 or 3		
	Tightening recovery column In aluminum	6		
	Rear FLASHBLACK half-hub 6 Drilling Ø13mm on Ø101.6mm Central bore Ø35mm	1		

View	Article	Quantity	DUC checkpoint	Customer checkpoint
	Additional content but necessary for the installation: ROTAX bushes Ø13mm threaded M8 or DUC bushes Ø13mm drilled Ø8mm + Nylstop nut M8 + Washer	6		
	Extra-long 6mm Allen key	1		
	Adhesive visual indicator To be placed on the blade root following the calibration tests	2 or 3		

5.2. Operator & List of required tools

For the mounting of the propeller, here is the list of required tools:

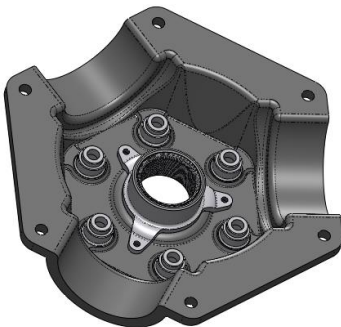
- Dynamometric Allen key 6 (Torque: 20 and 25 Nm)
- Spanner 13
- Dynamometric flathead screwdriver (Torque: 4 Nm)

5.3. Assembly of the propeller on table

These steps are applicable only in the case when the propeller is delivered in kit, not assembled in workshop.

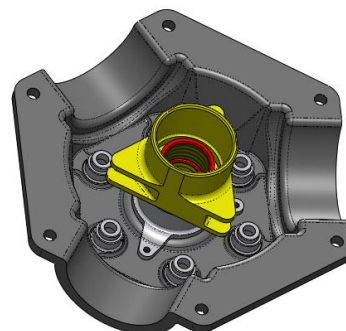
↓ Check the steps gradually:

STEP 1.



Place the “engine back half-hub” (Central hole Ø55mm) on a table.
Be careful not reverse with the “propeller front” half-hub.

STEP 2.



Laid the **satellite** in the back half-hub without fitted into the carbon hole Ø35.
Check if you respect the right direction of the satellite’s mounting.

□ STEP 3.



While keeping the satellite laid on the back half-hub, slot the **FLASHBLACK/-2** or **SWIRLBLACK-3** blades one after the others into the satellite groove and into the back half-hub.

Place the DUC sticker in front of you.

Caution, the snap ring (circlip) should be facing out of the assembly.

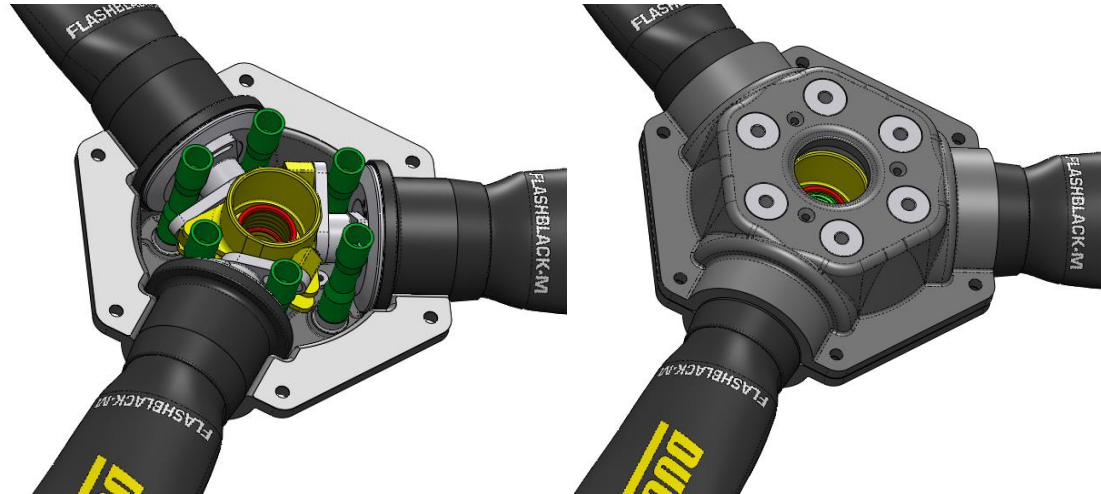
□ STEP 4.



Place the 2 (2-blade) or 3 (3-blade) carbon foils on the flat of the back half-hub.

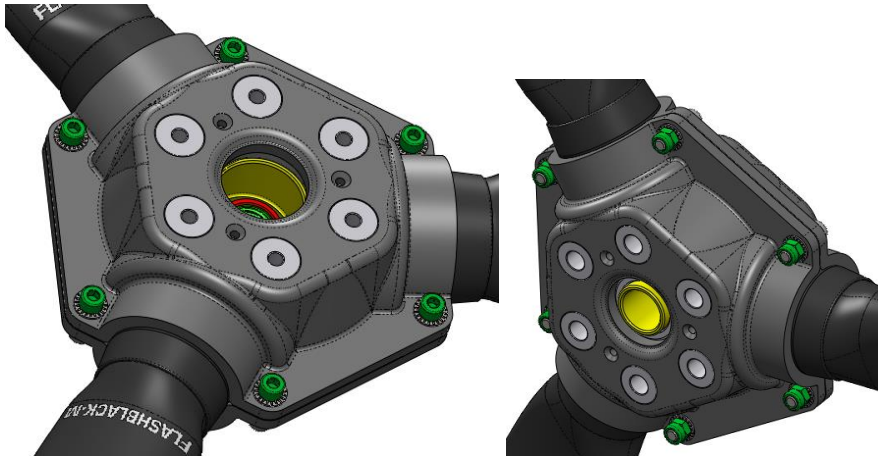
Be careful with the manipulation, fragile parts.

□ STEP 5.



Ensure the good introduction of the blades in their place.
Place the **6 tightening recovery columns**. Then place the **Front Half-hub**.
Watch if the parts are aligned for the assembly.

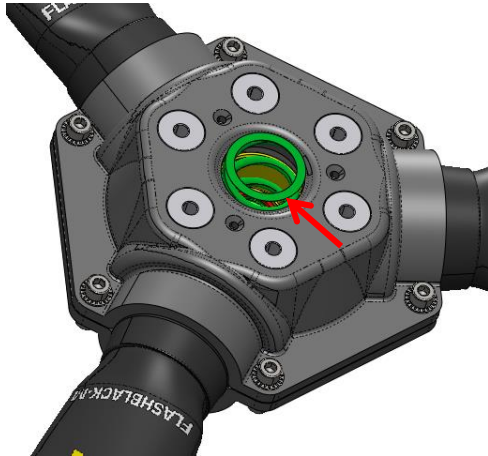
□ STEP 6.



Place the **Screws CHC M8x30 + Washer** over the top and the **Nylstop nut** behind for the assembly of the 2 half-hubs.
Make a first tightening to approach the screws.

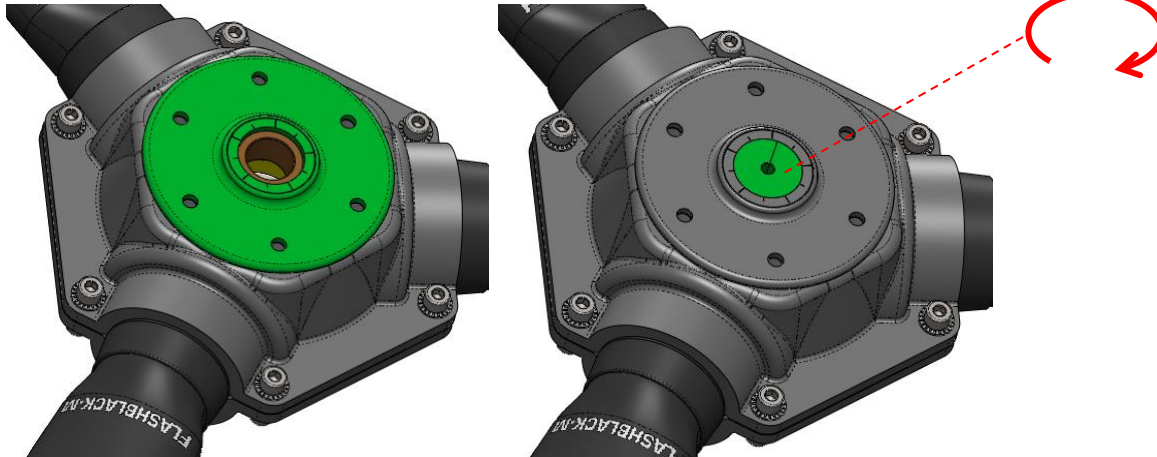
Check if the blades are well placed in their place.
Pull slightly the blades outwards for a good placement of the blades.

□ STEP 7.



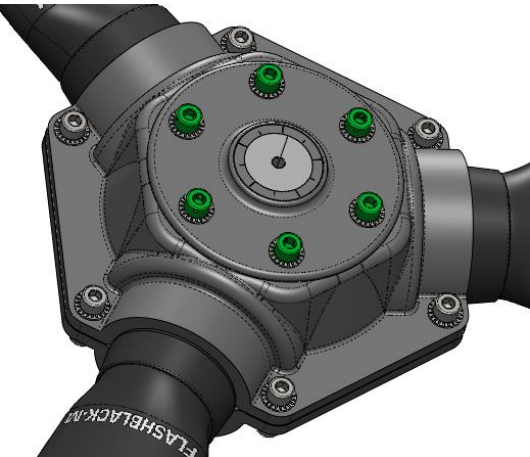
Add the **safety return spring** in low pitch.

□ STEP 8.



Place the **Aluminum tightening washer** with the **Sliding bearing** in the center.
Then assemble the **Self-lock Pitch Setting Screw** by tightening it in the **BLACK-M Satellite**.

□ STEP 9.

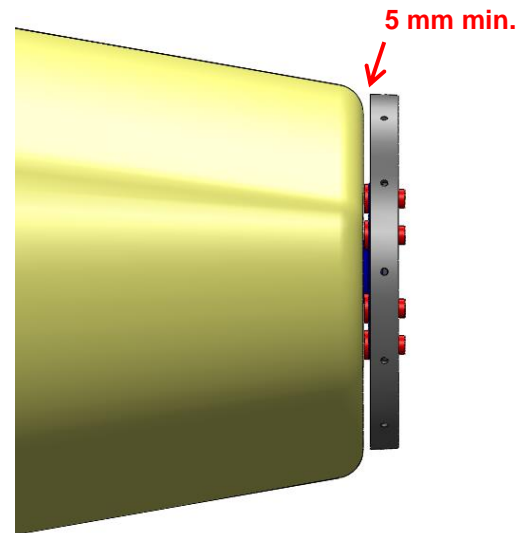
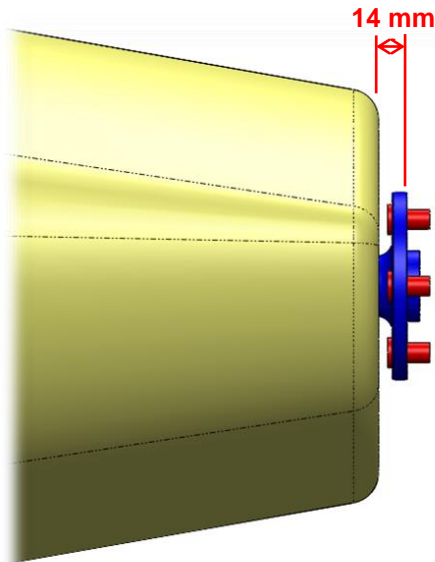


Put the **6 Fixation screws CHC M8 + Washer** in the fixations drillings of the propeller.

At this point, the propeller is pre-assembled on the table but not tight.

5.4. Installation on aircraft

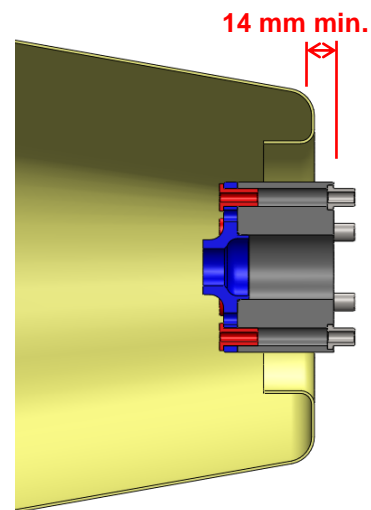
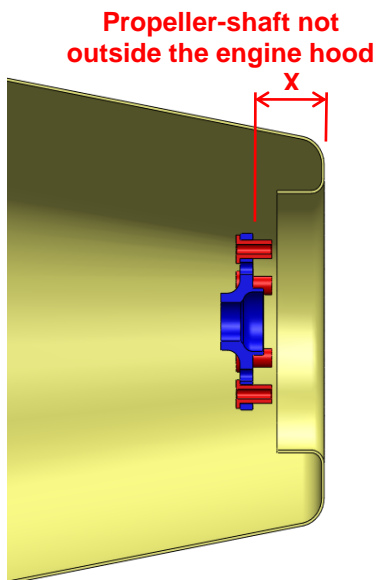
5.4.1. Direct installation on the engine



5.4.2. Use a spacer

Determination of the spacer length:

Measure the **distance X** between the propeller-shaft and the engine hood limit, then add **14mm**.



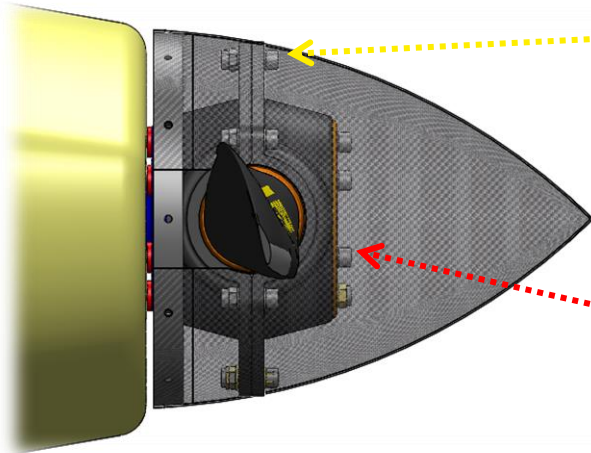
Available spacer:

Engine	Model	Length
ROTAX	912H spacer	3, 6, 10, 15, 20, 30, 45, 50, 60, 70, 80, 100, 120mm

5.5. Installation of the BLACK-M propellers type on the aircraft

□ **STEP 10.**

Fix the propeller to the propeller shaft (with optional spacer).

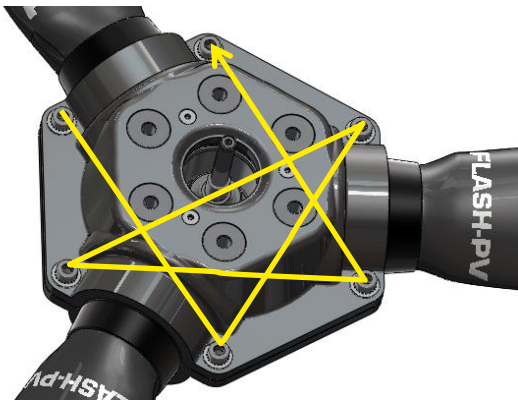


● **Assembly of the 2-blade or 3-blade hub:**

TIGHTENING TORQUE
2,5 Kg/m 25 N.m

● **Propeller fixing:** Screw CHC M8 & pin contact washer (screw length adapted according the length of the spacer)

TIGHTENING TORQUE
2,0 Kg/m 20 N.m



Now, make a **progressive tightening in cross** in 2 or 3 times to reach the **tightening torque 25 N.m**.



Gradually tighten in 2 or 3 times the 6 CHC M8 propeller fixing screws at 20 Nm.

□ **STEP 11.**

When everything is set, set up the **safety wire Ø0.8mm (Ø0.03")** over the screw heads for safe installation.



At this point, the propeller is assembled, tightened, secured but not settled

PRECAUTIONS

If you notice any abnormal installation or operation, do not undertake the flight and immediately contact DUC Propellers Company.



Being aware of potential risks during assembly and initial testing of the propeller. Stay focused, attentive and vigilant to your environment. Recheck several times points to be observed. Maintaining high safety clearance during the set operation.

The products of the DUC Propellers Company must be installed and used according to the instruction manuals provided. No modification can be made without the agreement of DUC Propellers Company. The non-compliance of these data assumes no responsibility for the DUC Propellers Company and makes out the warranty of the considered products (See section 10. **General terms sale**).

6. Initial Settings & Testing of the propeller [MANDATORY]



RECOMMENDATION

As recommended by the BRP manufacturer of Rotax engine, it's strongly recommended to use the Quick Ground Adjustable **BLACK-M** propeller with an aircraft equipped with a vacuum indicator on engine intake manifold (**Pressure of the engine intake - MAP**) to know the engine load. Refer to your engine manual or the section 11.3. **Engine performance data's** .

Initial Settings & Tests are important.

6.1. Setting of the Reference Pitch Angle on the propeller

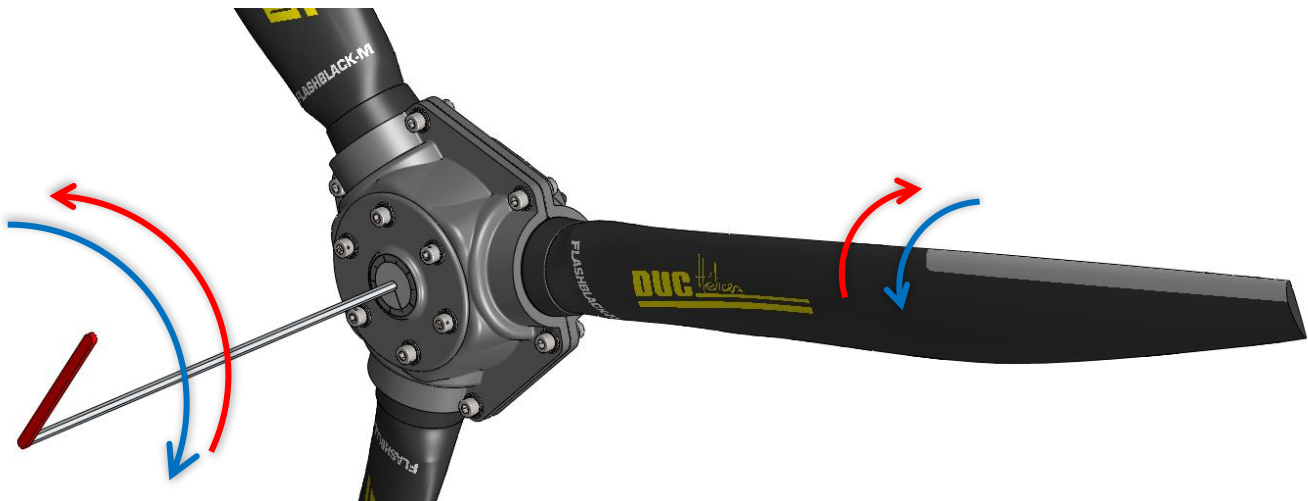
Make the 1st setting of the reference pitch angle of the blades to the recommended target value (see indication in the back cover of this manual). If in doubt, contact DUC Propellers for recommendations.

Use the supplied 6mm Allen key to rotate in either direction.

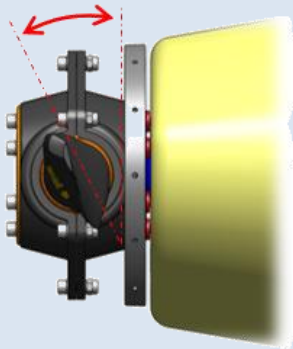
Clockwise = Increase Pitch
Anti-clockwise = Reduce Pitch

Apply the pitching procedure specified below.

1 turn Hub (360°) = 5° on the Blade



Method for measuring the pitch angle of the propeller



Side view



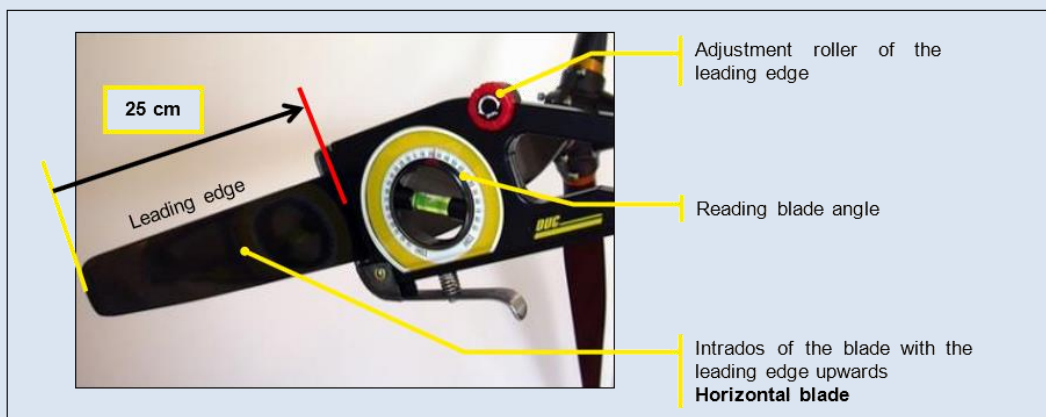
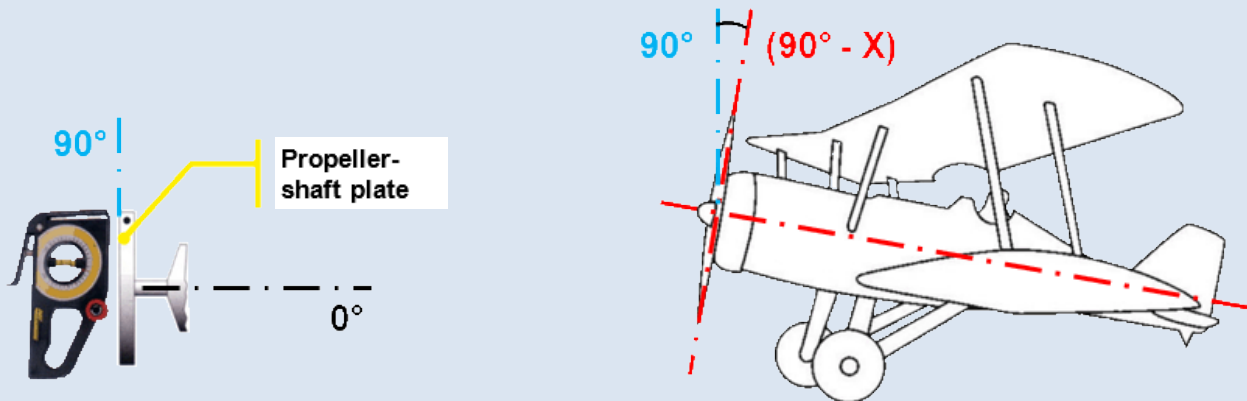
Front view

For the setting, the concerned blade must be **place in horizontal position**.

The setting is done with the adjusting tool flatten against the intrados (leading edge up) at **25 cm from the blade tip**. The attack angle is formed by the **vertical and the intrados of the blade**.

To do this, place your aircraft horizontally, so that the propeller shaft is perfectly vertical.

Check with the level of the adjustment tool (measured value = 90°). **If unable to change the longitudinal axis of the aircraft, raising the value of the X angle propeller shaft plate to subtract the value of the blade angle to be resolved.**

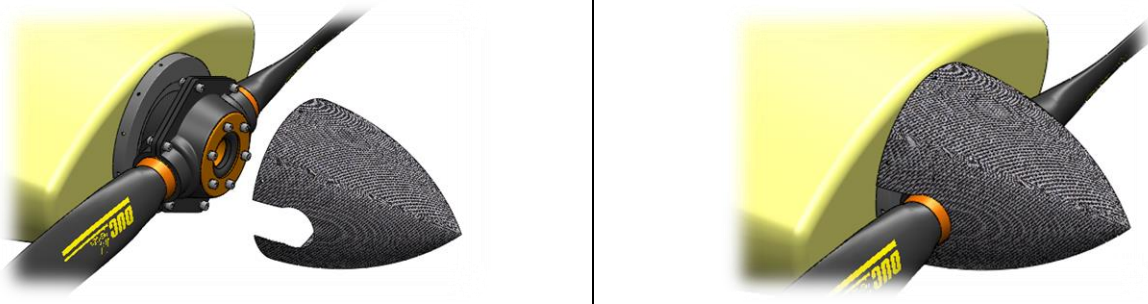


Horizontal blade, leading edge upward, place the adjustment tool at 25 cm from the tip of the blade, intrados side (flat), handle down.

Using the method described above, set the reference value to only 1 of the propeller blades. It is not necessary to make this setting on all the blades.

Caution to apply the value X if a correction of the aircraft plan was needed.

Remove the adjusting tool and the **Setting Allen key**. The blade pitching is now frozen thanks to the **BLACK-M** self-locking propellers system.



After a final verification (position and orientation of parts, tightening...), mount the spinner on the mounting plate **by tightening the spinner screws to a torque of 4Nm (0.4kg/m)** with the appropriate tools.

In the presence of a marking, please respect the indexing of the spinner from its plate.



At this point, the BLACK-M propeller is settled for first ground tests then flight tests.

The user must perform the appropriate regulations procedures to change the propeller in accordance with applicable regulations of the aircraft.



The tests are important. It is normal to make several adjustments successive alternating ground and flight tests.

6.2. Static Ground Tests Indications: **Secure the 1st flight**

- Immobilized your aircraft, brakes locked. Apply the manufacturer's recommendations for safety.
- Turn the engine on, warm it up.
- **Full throttle**, the engine must be at least 85% of maximum engine speed recommended by the manufacturer in flight. **If this is not the case, adjust the blade pitch angle.**

Static Engine RPM must be between 4800 rpm to 5700 rpm

CAUTION

In the case of too coarse pitch adjustment, there may be a risk at takeoff of not obtaining sufficient engine power and speed for the aircraft.

In the case of too fine pitch adjustment, there may be a risk of overspeeding when the aircraft is gaining speed. It is therefore imperative to reduce the throttle but ensure that the pitch angle is not too fine to maintain sufficient aircraft speed for takeoff and flight.

Tips

- ✓ Increase pitch angle to reduce engine speed (and vice versa).
- ✓ 1° of pitch angle affects approximately 200 rpm engine speed.

6.3. Flight Tests Indications: Confirm the pitch setting

- Check all tightening. Take off and place the aircraft in stabilized flight, vario zero.
- To take off, it is not recommended to throttle, brake applied and then releases the brakes. You must put the throttle gradually, brake released. This 2nd way avoids cavitation takeoff. Furthermore, this method allows shorter takeoffs.
- Full throttle, the maximum engine speed recommended by the manufacturer must be reached but not exceeded. If this is not the case, adjust the blade pitch angle.

Full Throttle in Flight must be between 5200 rpm and 5800 rpm

CAUTION

Always follow the recommendations of the engine manufacturer.

If the setting is too coarse, overloading the motor may cause abnormal wear.

If the setting is too fine, an engine overspeed will cause abnormal wear.

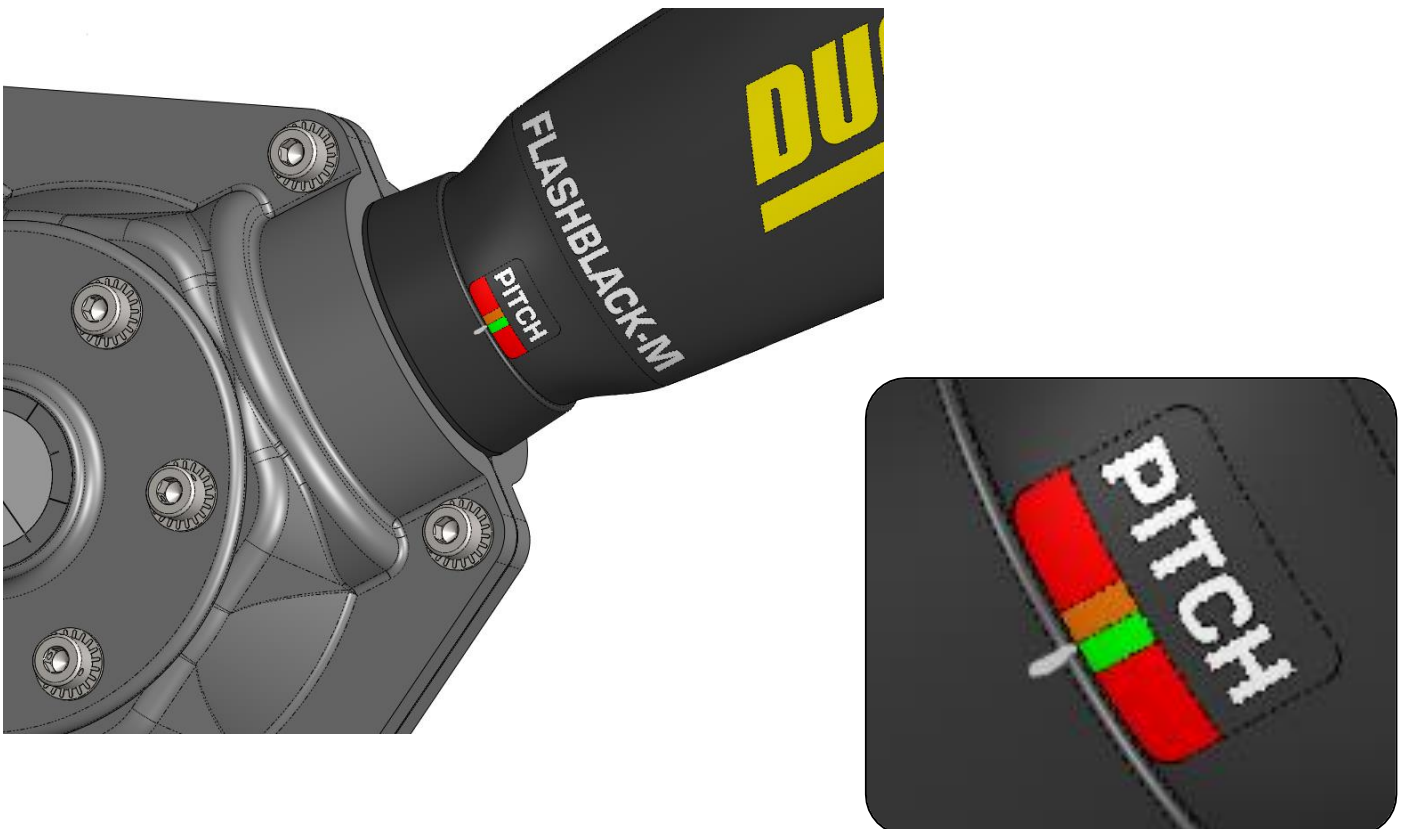
Tips

- ✓ Increase pitch angle to reduce engine speed (and vice versa).
- ✓ 1° of pitch angle affects approximately 200 rpm engine speed.

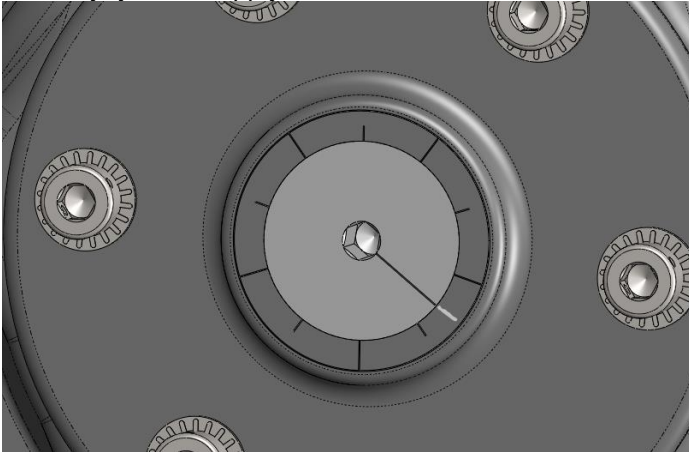
6.4. Finalization of initial settings and tests

When the tests have validated the correct target pitch setting, degrease and apply the adhesive label on each blade. These labels allow to have a visual indicator directly on each of the blades.

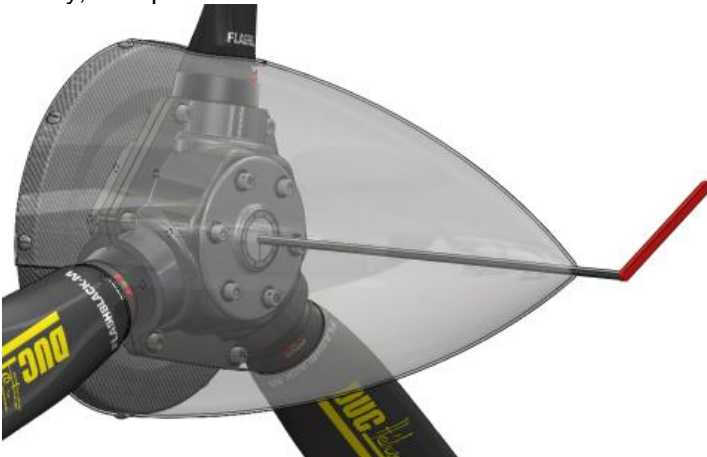
- Disassemble the spinner to have full access, do not change the setting angle set.
- Make a permanent and indelible mark on the aluminum ring then degrease and apply the label by aligning the mark of the ring and the separation line of the Orange and Green zone.



Similarly, you can apply a mark on the central indicator:



Finally, the tip of the cone can be drilled to access the setting directly.



7. Installation without spinner or with spinner other than DUC



In the case of installation of the propeller **without spinner mounting plate** or **other spinner mounting plate**, be careful to check the following points:

- ✓ **Length of the fixing screws of the propeller:** Must be adapted according to the thickness of the spinner mounting plate.
- ✓ **Mechanical resistance of the plate when tightening:** For a similar assembly of the DUC spinner, the plate takes the tightening of the propeller fixing screws. It is, therefore, necessary to ensure that the used plate can withstand the clamping and resist of the propeller operate efforts (crushing of the plate).

IMPORTANT

The spinner is an important element for engine cooling.

The aircraft must not fly without propeller spinner. Mounting a different cone will be an amendment to this instruction manual approved by the DUC in order to confirm its compatibility mounting the propeller.

WARRANTY CONDITIONS

The user is still flying under its full responsibility (see section **10. General terms sale**).

8. Recommendation for use of BLACK-M propellers type

The user always flies under his full responsibility.

The principle of **BLACK-M** type propellers is that the user can at any time decide to quickly change the pitch angle of the blades of his propeller.

This rapid change is a definite advantage but involves significant risks if it is not properly controlled.

Thus, here are the recommendations to follow when using **BLACK-M** propellers:

10 CHECKPOINTS TO APPLY

1. Make **small changes**, 0.5 to 1 ° maximum.
2. Always check the **full throttle rpm in static on ground** before starting to taxi.
Static Engine RPM be between **4800 rpm and 5700 rpm**.
3. Always check the **full throttle rpm during take-off**.
Take-off Engine RPM must be between **4800 rpm and 5700 rpm**.
4. Always check the **full throttle rpm during flat flight in the air**.
Full Throttle Engine RPM in the air must be between **5200 rpm and 5800 rpm**.
5. Always monitor the engine RPM **to avoid overspeeding**.
6. Always monitor the aircraft speed **to stay within its flight range**.
7. The Orange and Green zones of the label are indicative for the user when setting.
8. The propeller adjustment must be **validated by a reading of the 2 indicators**:
 - 1) Adjustment dial on the front of the propeller
 - 2) Visual tag at the foot of the blades
9. **Respect the engine manifold pressure (MAP)** as recommended by the manufacturer.
10. **If in doubt, contact DUC Propellers.**

9. Potential use & Propeller maintenance

9.1. The potential use of the propeller: **Unlimited**

The propellers DUC have an unlimited flight potential in normal operation conditions.

To keep the unlimited potential, DUC Propellers Company has defined a TBO (Time Between Overhaul) for a propeller depending on its engine.

This TBO according to the engine is indicated in this manual (see **2. Applications**). **For ROTAX engine TBO is set at 800 flight hours.** In all cases, it may not exceed 5 years.

To achieve this, the propeller must be returned to the DUC Propellers Company to perform a full control, verify its proper use and change the wearing parts if necessary.

Following this inspection and maintenance of the propeller, the propeller is credited again with the same TBO and is returned to you.

The cost of maintenance when you reach 800 hours of flight on Rotax is 800 € excl. tax, in other words, 1€ per hour of flight. The deliveries costs of sending and returning will be payable by the customer.

Remember, there is no imperative of logbook in light aviation. But know that this control is highly recommended for the continuing airworthiness and safety.

9.2. Propeller maintenance schedule

Type	Actor	Frequency
Regular	User	Each pre-flight
General	the user or an aeronautics workshop	Every 100 hours or annually
Complete	DUC Propellers Company	Each TBO

9.3. Regular maintenance (by the user)

For a safety use of the **BLACK-M** propellers, it is necessary that the user performs regular maintenance to detect any abnormalities. This maintenance is usually just a simple check.

The frequency of checking: Each pre-flight

Control methods: Visual inspection & Manual handling

Checkpoints:

- Fixation of the propeller: Manually maintaining the tip of a blade of the propeller, shake it firmly to feel if a too much clearance appears in the setting of the propeller.
- Degradation of material: Check visually the entire propeller without dismantling (blade root, Inconel leading edge, the surface of the blade, spinner, hub, etc.)
- Fixation of the spinner: Check visually the fixation screws of the spinner. A marking paint can be made between each screw and spinner to have a means of visual inspection of proper tightening the screws.

Possible problems:

- Too much clearance in the propeller fixation
- Surface degradation due to dirt or impact / Crack apparent

Corrective actions (depending on the importance):

1. Clean the propeller with the DUC cleaning treatment DUC (ref. 01-80-003)
2. Perform a repair with the DUC repair kit (ref. 01-80-004)
3. Tighten the screws to proper torque with a wrench
4. Replace(s) damage component(s)
5. Contact DUC Propellers Company to define a solution

9.4. General maintenance (by the user or an aeronautics workshop)

A general maintenance by the user or an aeronautics workshop must be made at a lower frequency.

The frequency of checking: Every 100 hours or annually

Control methods: Visual inspection & Torque wrench

Checkpoints:

Fixation of the propeller: By removing the spinner of the propeller, check the proper tightening of the screws to the wrench. These screws of the hub should be tightened to proper torque, defined in the installation instructions attached.

A marking paint of all the screw/washer/hub after tightening can be done to help make a visual check outside of the general maintenance.

- Degradation of material: Check visually the entire propeller (blade root, Inconel leading edge, the surface of the blade, spinner, hub, etc.)

Possible problems:

- Too much clearance in the propeller fixation
- Surface degradation due to dirt or impact / Crack apparent

Corrective actions (depending on the importance):

1. Clean the propeller with the DUC cleaning treatment DUC (ref. 01-80-003)
2. Perform a repair with the DUC repair kit (ref. 01-80-004)
3. Tighten the screws to proper torque with a wrench
4. Replace(s) damage component(s)
5. Contact DUC Propellers Company to define a solution

9.5. Complete maintenance (by DUC Propellers Company)

Upon reaching the TBO (potential flight time between overhaul) defined by DUC Propellers Company, the propeller must be returned to the corporation for a full inspection of all components of the propeller.

See section **2. Applications** for the potential value of an hour's flight engine.

The possible degradation of the propeller components may vary depending on the location of use.

10. General terms sale

10.1. Ordering procedure

Orders placed by fax, by phone or mail server engage the customer upon receipt by our Customer Service Order and the Regulations.

10.2. Delivery

DUC Propellers Company agrees to make every effort to deliver the order within the shortest time, and the receipt of the order together with the Regulation. The delivery times indicated on the order are only indicative and the possible delays do not entitle the buyer to cancel the sale, to refuse the goods or claim damages. Any claim for non-compliance or failure will be sent within one week following the date of receipt of order.

The DUC Propellers Company is released from its obligation to deliver for all fortuitous events or force majeure. As an indication, the total or partial strikes, floods, fires are cases of force majeure. The transfer of ownership of goods supplied or delivered is suspended until full payment of the price by the customer and without affecting the transfer of risk.

10.3. Price

The DUC Propellers Company may change its prices at any time.

The customer agrees to pay the purchase price in effect at the time of order entry. Regulation Order is payable in advance in one payment when sending the DUC Propellers Company purchase order.

10.4. Right of withdrawal

Under Article L121-16 of the Consumer Code, the customer shall have seven clear days after the delivery of his order to return the products to the DUC Propellers Company for exchange or refund, without penalties except for the return costs. Returned products must not have suffered modification, damage consequence of shock or improper use and be packaged in original packaging. Goods shipped with postage due will not be accepted.

10.5. Warranties

The DUC Propellers Company's products must be installed and used in accordance with instruction manuals provided. No changes can be made without the prior approval of the DUC Propellers Company. The failure of these data releases any liability of the DUC Propellers Company and makes non-warranty the considered products.

The user is still flying under its sole responsibility.

The legal guarantee of industrial products is six months or for the potential duration of the helix (depends on which engine it is installed) against defects and hidden defects. See the section **2. Applications** to determine the potential value of an hour's flight engine.

DUC Propellers Company guarantees its product defect under normal use in the manner described below: If the customer finds a defect, he must report it immediately to the DUC Propellers Company and features of one month after its purchase to return to Company DUC Helices, all structural defects will snuff into account (except for damage result of incorrect operation, shock, injury, impairment or neglect, water or generally inappropriate use by the engine type, power, speed, and gear). To qualify for this warranty, the customer must send at its expense within one month after its purchase to be returned to Company with DUC Propellers Company delivery order attached to the product. In return, the DUC Propellers Company takes no responsibility for damage or loss during transit due to improper or inadequate packaging. The Company DUC Propellers Company then returned at his expense to the customer at the address on the delivery note, an identical or equivalent.

In addition to these guarantees, the Company DUC Propellers Company provides no other warranties.

10.6. Privacy Policy

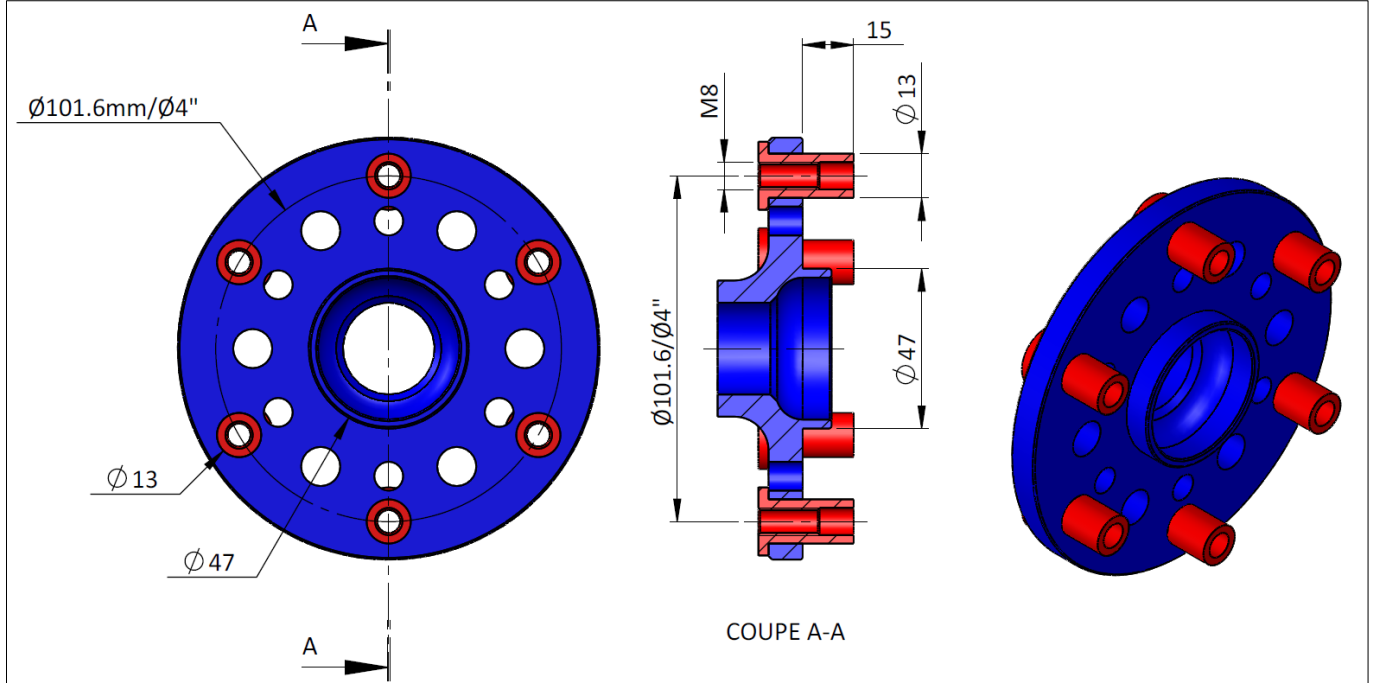
All the data you entrust to us are able to process your orders. Under Law No. 78-17 of January 6, 1978, relating to data, files and freedoms you have with the customer service Company DUC Propellers Company right to access, review, correct, correct and delete data you have provided.

10.7. Litigation

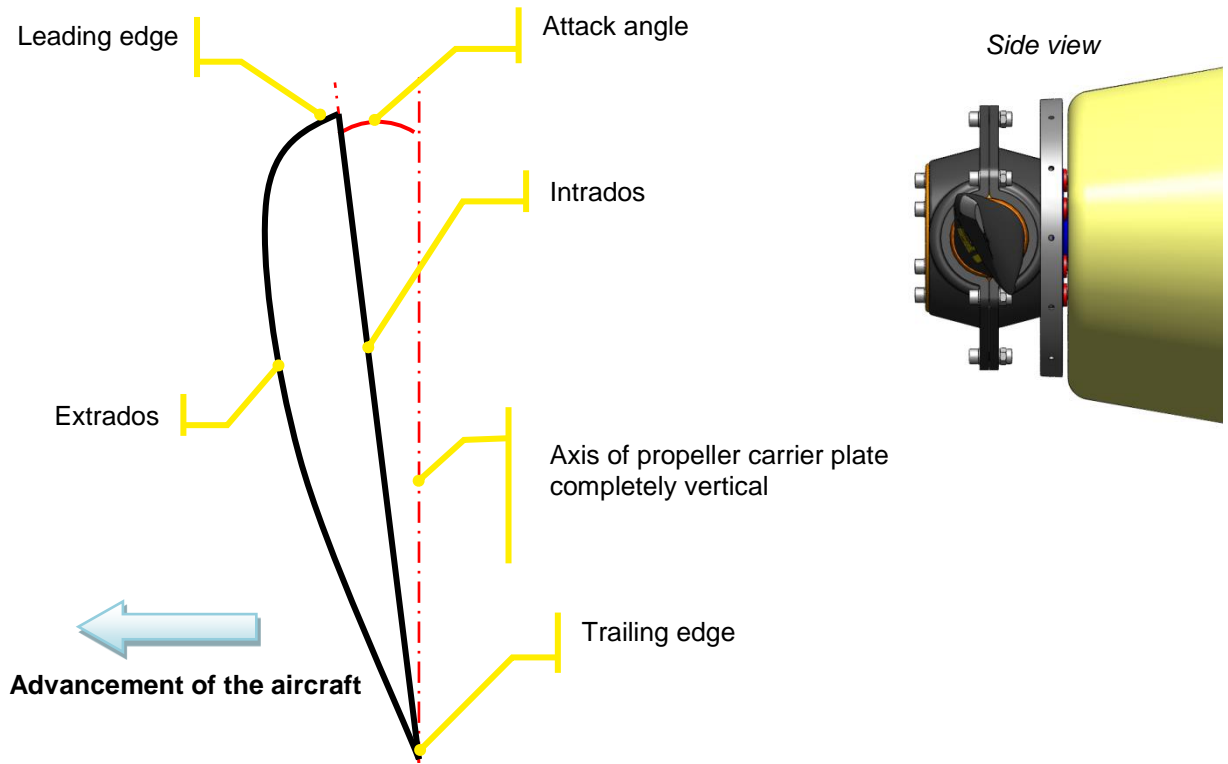
Any order placed convincing the customer, without any restriction, the General Conditions of the sale of the DUC Propellers Company. Any dispute concerning the sale (price, GTS, product ...) will be subject to French law before the Tribunal de Commerce de Lyon.

11. Annexes

11.1. The dimension of the ROTAX 912/912S/914 propeller-shaft



11.2. Airfoil



11.3. Engine performance data's



PERFORMANCE DATA – ROTAX 912 (80hp)				
Step	Engine rpm	Power HP	Torque Nm	MAP in.HG
Take-off 5 min max	5800	80	98.1	Full power
Cruise	5500	78	100.7	Full power
75 %	5000	58	83.1	27.2
65 %	4800	50	75	26.5
55 %	4300	43	70.8	26.3



PERFORMANCE DATAS – ROTAX 912S (100hp)				
Step	Engine rpm	Power HP	Torque Nm	MAP in.HG
Take-off 5 min max	5800	100	121.0	27.5
Cruise	5500	90	119.8	27
75 %	5000	68	97.4	26
65 %	4800	60	88.7	26
55 %	4300	50	84.3	24



PERFORMANCE DATAS – ROTAX 914 (115hp)				
Step	Engine rpm	Power HP	Torque Nm	MAP in.HG
Take-off 5 min max	5800	115	139	39
Cruise	5500	100	128	35
75 %	5000	74	105	31
65 %	4800	64	95	29
55 %	4300	54	90	28





11.4. Operating limitation of the BLACK-M propeller

Designation	Maximum engine power	Maximum rotational speed
2-blade Inconel FLASHBLACK-M propeller, Right	120 hp	2800 rpm
3-blade Inconel FLASHBLACK-M propeller, Right	120 hp	2800 rpm
3-blade Inconel SWIRLBLACK-3-M propeller, Right	120 hp	2800 rpm
3-blade Inconel FLASHBLACK-2-M propeller, Left	120 hp	2800 rpm

11.5. Identification marking of the propeller

11.5.1. Manufacturing label

As the propeller is dismountable, each component (blade and half-hub) has a manufacturing traceability label which identifies the component and specifies its own serial number:

FLASH-PV Right Blade	FLASH-2-PV Left Blade	SWIRL-3-PV Right Blade	Half-hub FLASH (2-blade & 3-blade)
			

11.5.2. Propeller label (for LSA certified version)

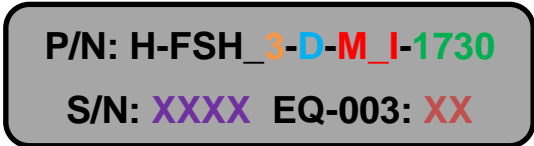
At the end of the manufacturing, a 2nd label - the propeller label - is placed on each component of the propeller (blade and half-hub) with the following information:

1st line: Part number of the propeller model





- Two-blade (2) or Three-blade (3)
- Left (G) or Right (D)
- Reinforced structure (R) and/or Inconel leading edge (I)
- Diameter in mm

2nd line: Propeller data

- Serial number of the propeller (not only the component)
- Value of the static balancing of each blade of the prop



Here is an example for each of the 4 possible propeller versions:

Propeller version	Label
2-blade Inconel FLASHBLACK-M Right propeller	
3-blade Inconel FLASHBLACK-M Right propeller	
3-blade Inconel SWIRLBLACK-3-M Right propeller	
3-blade Inconel FLASHBLACK-2-M Right propeller	

11.1. Declaration of conformance of the BLACK-M propellers

11.1.1. Design and Construction

The propellers BLACK-M were designed to be adapted to the applications described in section 2. Every design features are reliable and mastered by DUC Hélices company.

The materials used in the propeller were selected for their technical properties to be conforms to the definition of the propeller and durable during the propeller life.

About the ground adjustable system, the design allows a fine and careful setting of the propeller blade pitch. Also, the system is robust to not change during normal and emergency operation of the propeller and also after many settings.

Definition **BLACK-M** propeller conforms to withstand the stresses of operation on all its lifetime.

11.1.2. Tests and Inspections

The **BLACK-M** propellers complete the tests and inspections described below, without failure or malfunction.

Strength Testing:

A strength test was conducted according to the EASA CS-P350 specification. The blade root and blade retention system were tested for 1 hour at a load level equal to two times the centrifugal load that would be generated by the blade weight at maximum rated rotational speed. This test was done in a static pull test.

Endurance Testing:

The **BLACK-M** propellers conform to endurance test of each application exposed in section 2.

Teardown Inspection:

After completion of each test described above, the tested **BLACK-M** propellers were completely disassembled and each propeller parts were inspected. No failure or crack was found.

Propeller Adjustments and Parts Replacements:

During the tests and inspections carried out, no parts have to be repaired or replaced. All propeller parts resisted the tests and were conform after inspections.

11.1.3. Design Control

The **BLACK-M** propellers were design on CAD software. All the CAD files and 2D drawings are stored in the Design Office of DUC Hélices Company, as the definition of the **BLACK-M** configurations. All the technical data (dimensions, materials and processes) are saved in manufacturing procedure. Also, a copy all these data are archived out of the company.

11.1.4. Quality Assurance

DUC Hélices Company is ISO 9001:2008 certified for its management of the quality system, which ensures manufactured propellers maintain conformity to the established design. Refer to page 2.

11.1.5. Certification of Conformity for ASTM F2506-13

"ASTM F2506-13 is the standard specification for design and testing of fixed-pitch or ground adjustable for Light Sport Aircraft propellers.

*DUC Hélices Company declares that the **BLACK-M** propellers comply with the ASTM F2506-13 standard and after verification, it responds every requirement."*

Mr. Vincent DUQUEINE
Manager
29/05/2018



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