



Instruction manual SWIRL-2 propeller range



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ISO 9001

BUREAU VERITAS
Certification



ISO 9001:2015 Certified Company
for its Quality System Management

Identification

Date		Delivery note n°	
Owner		Engine/Gearbox ratio	
Aircraft		1st recommended pitch blade angle	

Notes:

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Performances

PITCH (°) at 25cm from the tip of the blade	TAKE-OFF DISTANCE (m)	CLIMB RATE (ft/min or m/s)	SLOW CRUISE (km/h & rpm)	VARIOUS CRUISE (km/h & rpm)	FAST CRUISE (km/h & rpm)	FULL THROTTLE VARIO 0 (km/h & rpm)

Notes (Date, Number of people, Weight, Weather, ...):

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Notes (Date, Number of people, Weight, Weather, ...):

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Notes (Date, Number of people, Weight, Weather, ...):

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Summary

1.	Presentation of the SWIRL-2 propeller	5
1.1.	Description	5
1.2.	Characteristics.....	5
1.3.	Shielding leading edge in Inconel	6
1.4.	Accessories	6
1.1.	Sales reference	6
2.	Applications.....	7
3.	Installation precautions	7
4.	Components of the SWIRL-2 propellers	8
4.1.	Mounting configuration of the SWIRL-2 propellers	8
4.2.	Mounting screws	8
4.3.	Exploded view for propeller	9
4.4.	List of required tools	9
5.	Assembly instruction of the propeller.....	10
5.1.	Assembly of the propeller.....	10
5.2.	Installation on the aircraft	11
5.3.	Setting of the propeller & Finalization of the installation	14
6.	Precautions	17
7.	Indications for testing.....	17
8.	Installation without spinner or with spinner other than DUC.....	18
9.	Potential use & Propeller maintenance.....	18
9.1.	Potential use of the propeller: Unlimited	18
9.2.	Propeller maintenance schedule.....	19
9.1.	Regular maintenance (by the user).....	19
9.2.	General maintenance (by the user or an aeronautics workshop).....	19
9.3.	Complete maintenance (by DUC Hélices)	21
10.	General terms of sale.....	21
10.1.	Ordering procedure	21
10.2.	Delivery	21
10.3.	Price	21
10.4.	Right of withdrawal	21
10.5.	Warranties	21
10.6.	Privacy Policy.....	21
10.7.	Litigation	21
11.	Annexes	22
11.1.	Dimension of the engine propeller-shaft	22
11.2.	Airfoil	23
11.3.	Moment of inertia of the SWIRL-2 propeller.....	23
11.4.	Operating limitation of the SWIRL-2 propeller	23
11.5.	Identification marking of the propeller	23
11.6.	Declaration of conformance of the SWIRL-2 propellers.....	24

1. Presentation of the SWIRL-2 propeller

1.1. Description

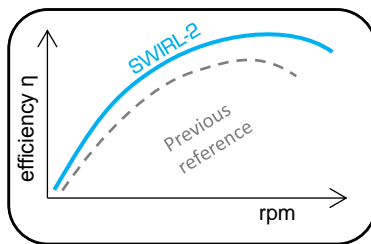
The **SWIRL-2** propeller range has a new innovative design, specific about its twisting axis and center of pressure.

Its aerodynamic design allows a "**constant speed**" effect, limiting variations in engine speed between on ground and in flight.

These propellers allow for **high efficiency** throughout the flight envelope i.e.:

- **Improved takeoff and climb rate due to higher engine speed, then higher engine efficiency**
- **Many cruise extension**
- **A high user comfort**

The blades and the hub of the **SWIRL-2** propeller range are manufactured according the DUC Hélices company technologies, from unidirectional layers of carbon fibers prepreg epoxy resin.



Their composite structures are defined to obtain the **maximum stresses in torsion and bending**. Therefore "constant speed" effect is not related to deformation of the blade but its geometry and specific profile.

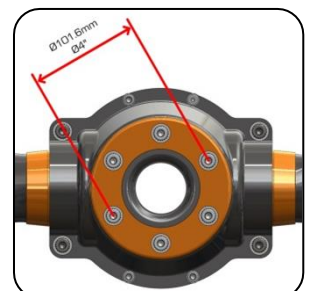
Due to its **specific geometric definition, excellent performance** is obtained in **both aerodynamic and acoustic, but also in consumption**.



1.2. Characteristics

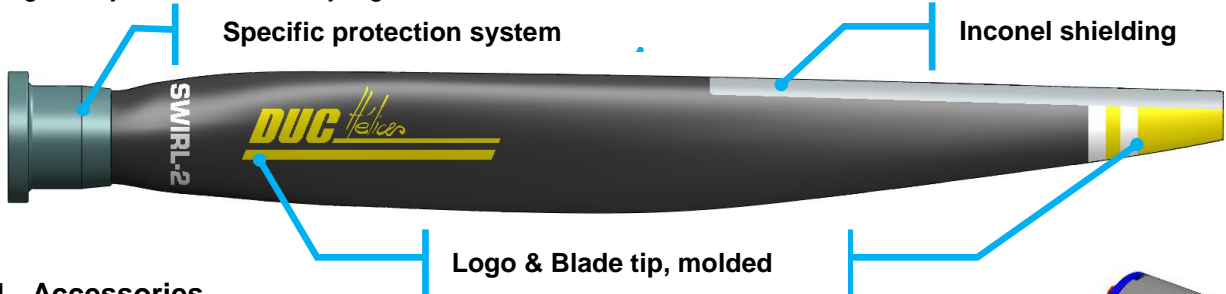
The **SWIRL-2** propeller range is available:

- **Tractor** configuration (available in right rotation)
- Diameters Ø1520 to Ø1900mm and others tailor made
Ø59.8 Ø75"
- Two-blade & Three-blade – **SWIRL-2** 3.20 & 4.17 kg (7.05 & 9.19 lb.)
SWIRL-2-R 3.30 & 4.32 kg (7.28 & 9.52 lb.)
SWIRL-2-X 3.60 & 4.77 kg (7.93 & 8.81lb)
- **Shielded leading edge in Inconel®**
- **Carbon composite hub** Ø101.6mm (Ø4") with metallic inserts or carbon composite hub Ø75mm
- 2-blade hub available in Compact version for Ø210mm spinner
- Direct assembly on the propeller-shaft Ø101.6mm (Ø4")
- Excellence version "**SWIRL-2-R**" & "**SWIRL-2-X**" for direct drive engine from 100hp to 140hp & +120hp to 160hp:
 - Longitudinal reinforced carbon structure
 - Higher bending strength
 - Titanium color finishing
 - Advanced controls



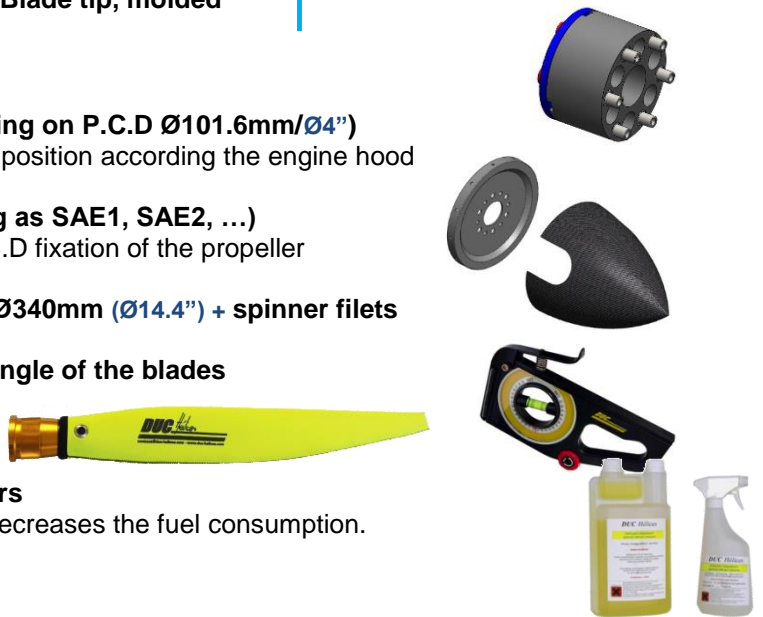
1.3. Shielding leading edge in Inconel

The leading edge of the SWIRL-2 blades is equipped with a metallic shielding in Inconel®. This material is a superalloy containing mainly nickel, with a very high hardness of surface.

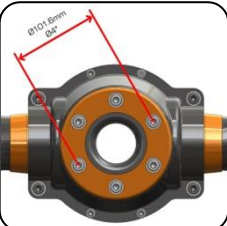
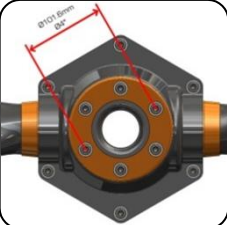


1.4. Accessories

- **Aluminum mounting spacer (Direct mounting on P.C.D Ø101.6mm/Ø4")**
Moves the plane of the propeller to adjust the position according the engine hood
- **Aluminum adaptor spacer (Other mounting as SAE1, SAE2, ...)**
Move the propeller plane and adaptor the P.C.D fixation of the propeller
- **Spinner available: Ø250mm (Ø9.8") to Ø340mm (Ø14.4") + spinner filets**
- **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.



1.1. Sales reference

Preview	Designation	Reference	Part number
	Ø101.6mm (4") Compact hub – Fixing with 6 screws CHC M8 with Ø13 or 14mm drive lug		
	Two-blade Inconel SWIRL-2 propeller, Right (Compact hub)	01-28-001	H-SW2_2-D-I
	Two-blade Inconel SWIRL-2-R propeller, Right (Compact hub)	01-37-001	H-SW2_2-D-R_I
	Ø101.6mm (4") hub – Fixing with 6 screws CHC M8 with Ø13 or 14mm drive lug		
	Two-blade Inconel SWIRL-2 propeller, Right	01-36-001	H-SW2_2-D-I
	Two-blade Inconel SWIRL-2-R propeller, Right	01-31-001	H-SW2_2-D-R_I
	Three-blade Inconel SWIRL-2 propeller, Right	01-33-001	H-SW2_3-D-I
	Three-blade Inconel SWIRL-2-R propeller, Right	01-32-001	H-SW2_3-D-R_I
	Ø101.6mm (4") hub – Fixing with 6 screws CHC M8 with Ø17mm drive lug		
Three-blade Inconel SWIRL-2-X propeller, Right	01-32-100	H-SW2_3-D-X_I	

Note:

Specify the flight regulation aircraft (E.g.: **Ultra-light, LSA...**) and diameter when ordering (E.g.: ref. 01-28-001/**1730**).

For more information about the propeller marking, see section 11.5.

2. Applications

The DUC propellers have an **unlimited** flight potential in normal operation. To keep the unlimited potential, DUC Hélices 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 (inch)	Blade angle (°)	Blade angle allowed range(°)	TBO (hour)
3 AXIS – TRACTOR							
JABIRU 2200	4 strokes	-	Two-blade Inconel SWIRL-2, right	Ø1620	18°	15° → 23°	2000h
JABIRU 3300	4 strokes	-	Two-blade Inconel SWIRL-2-R, right	Ø1660	19°	16° → 24°	
UL Power 260i/iS	4 strokes	-	Two-blade Inconel SWIRL-2, right	Ø1620	18°	15° → 23°	
UL Power 350i/iS	4 strokes	-	Two-blade Inconel SWIRL-2-R, right	Ø1660	20°	17° → 25°	
Continental O-200	4 strokes	-	Three-blade Inconel SWIRL-2-R, right	Ø1660	19°	17° → 25°	
Lycoming O-235							
Sauer S2400 UL	4 strokes	-	Three-blade Inconel SWIRL-2, right	Ø1520	18°	15° → 23°	
Lycoming O-360	4-strokes	-	Three-blade Inconel SWIRL-2-X, right	Ø1730	24°	22° → 30°	
OTHER APPLICATIONS							
For all other applications, thank you to contact the DUC Hélices company to study the possibility of adapting the SWIRL-2 propeller.							

* Ø1850mm = 72.83"; Ø1730mm = Ø68.12"; Ø1660mm = Ø65.4"; Ø1620mm = Ø63.8"; Ø1520mm = Ø59.8"

Remark

The values of the pitch angle are theoretical and associated with the engine. This setting should be adjusted according to the aircraft (see section 7. **Indications for testing**).

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

3. Installation precautions

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 blades of a propeller are part of a whole. **DO NOT INTERCHANGE** with other similar blades from propeller. The propeller 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 the manufacturers.**

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

4. Components of the SWIRL-2 propellers

The SWIRL-2 propellers are available in several versions and can be mounted on different model of engine.

4.1. Mounting configuration of the SWIRL-2 propellers

Here is a configuration table of the SWIRL-2 propeller mounting according the propeller-shaft of the engine.

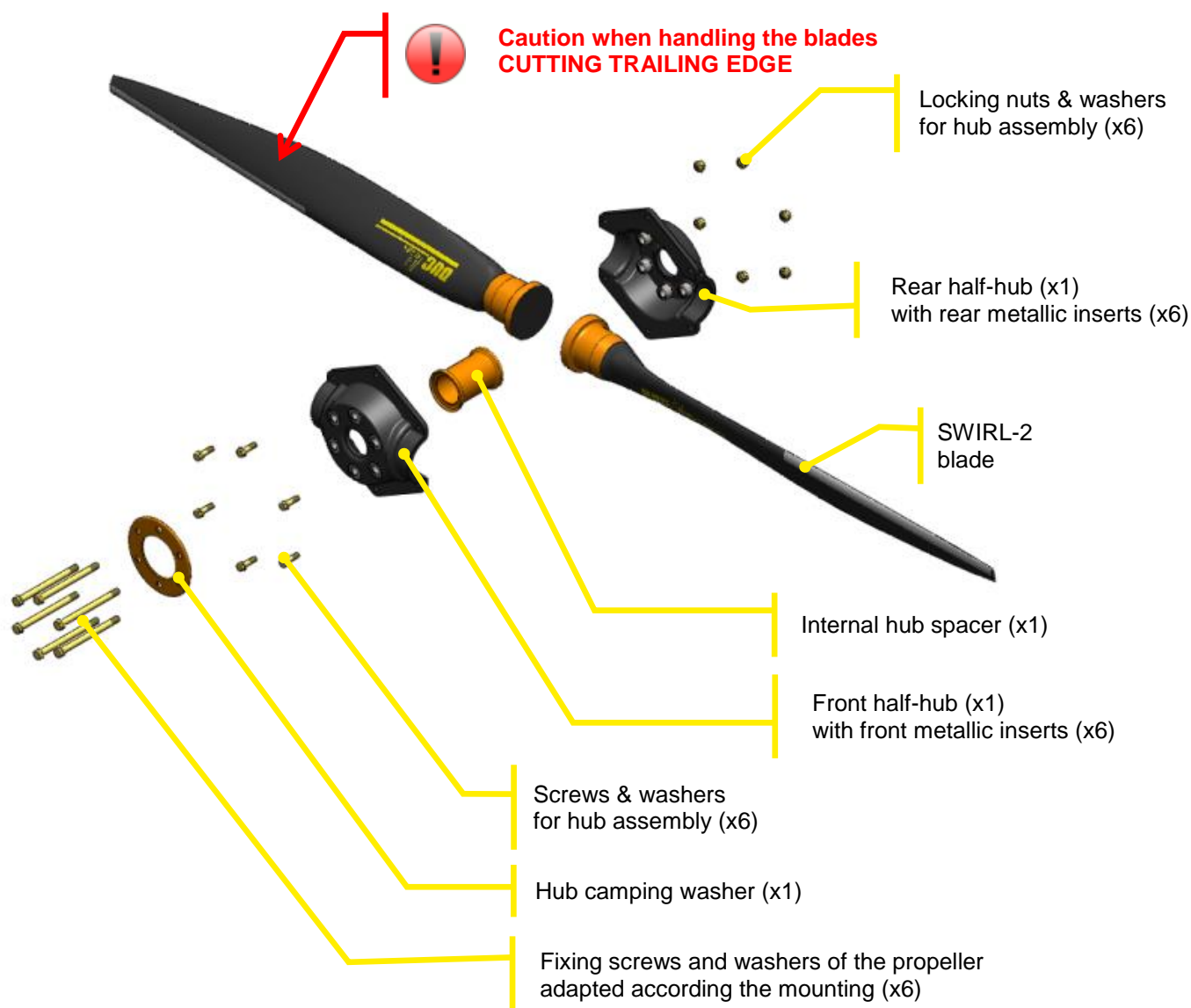
If needed, see annex 11.1. **Dimension of the engine propeller-shaft.**

MOUNTING	ENGINE PROPELLER-SHAFT				
	Ø75mm (Ex : Rotax)	Ø4" / Ø101.6mm (Ex: Jabiru)	Type SAE 1 Ø4-3/8" / Ø111.125mm (Ex: Continental O- 200)	Type SAE2 Ø4-3/4" / Ø120.65mm (Ex: Lycoming O- 360)	Other ≠ Ø101.6mm
direct on propeller-shaft (without spacer)	✓ L Version	✓			
with spacer		✓			
with adaptor spacer	✓ L Version		✓	✓	✓

4.2. Mounting screws

Coming soon.

4.3. Exploded view for propeller



Remark

This exploded view shows the principle of the SWIRL-2 propeller assembly. The size of all of these components changes depending on the configuration of the propeller (diameter hole of the metallic inserts of the half-hub, length of the screws...).

4.4. List of required tools

Jabiru mounting	SAE1/SAE2 mounting
M8 Torque Hex key (Tightening: 25 Nm)	M8 Torque Hex key (Tightening: 25 Nm)
M8 Torque Wrench (Tightening: 25 Nm)	M8 Torque Wrench (Tightening: 25 Nm)
Inclinometer (pitch adjusting tool)	3/8 or 1/2 Torque Wrench (Tightening range: 30 to 45 Nm)
Plastic mallet	Inclinometer (pitch adjusting tool)
Torque Screwdriver (Tightening: 4 Nm)	Plastic mallet
	Torque Screwdriver (Tightening: 4 Nm)

5. Assembly instruction of the propeller

The assembly of the SWIRL-2 propellers is shown below. It is recommended to assemble the propeller on a worktable before installing it on the plane. The procedure is the same for two-blade and three-blade SWIRL-2 propellers.

For further information, contact the DUC Hélices Company.

5.1. Assembly of the propeller

STEP 1.



Place the **rear half-hub** on a worktable.

Be careful not to invert with the front hub half. Depending on your installation, the rear half-hub is one mounted on the propeller-shaft of the engine or on a spacer. The holes of the metal inserts of the rear half-hub are higher than the holes of the metal inserts of the front half-hub.

STEP 2.



Place the hub spacer in the center of the rear half-hub.

STEP 3.



Positioning the blades in their hub slots by placing them outwards.

Orient the DUC Hélices logo facing you.

Note that the metal inserts of the half-hub allow a locking of the blades in their axis within the hub.

STEP 4.



Place the **front half-hub** (metal insert with small hole) on the set to fit with the blade feet.

STEP 5.



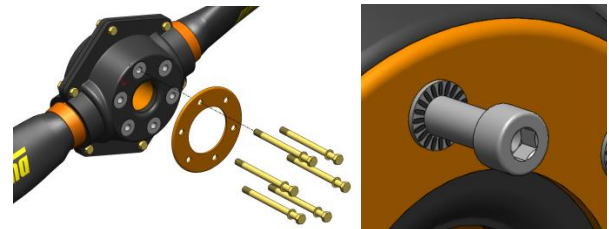
Compact Hub version



From the front hub, set up the 6 screws and washers for hub assembly. At the rear, place washers and lock nuts.

Perform initial moderate tightening.

STEP 6.



Place the hub clamping washer on the front of the propeller hub (side logo).

Be sure the direction of the clamping washer (rounded edge outwards).

Place the 6 fixing screws and their washer.

In the case of pin contact washers (Jabiru mounting), the pins are oriented towards the screw head.

5.2. Installation on the aircraft

As presented in section 4.1. **Mounting configuration of the SWIRL-2 propeller**, several mounting are possible:

1. Installing **directly on propeller-shaft** of the engine
2. Use a **spacer** for spacing propeller from the propeller-shaft
3. Use an **adaptor spacer** to adjust the diameter fixing of the propeller and for spacing the propeller from the propeller-shaft

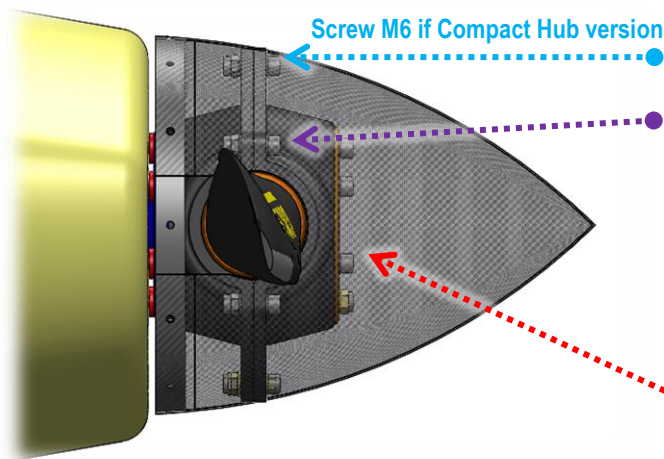
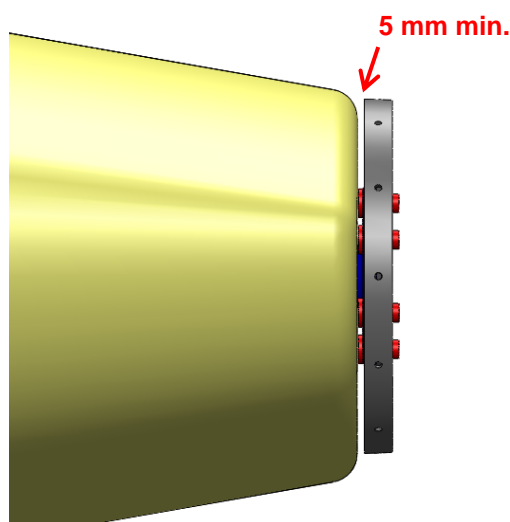
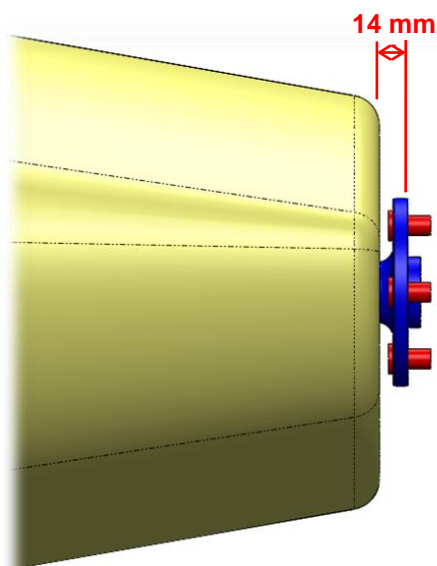
5.2.1. Direct installation on the aircraft

The direct installation of the SWIRL-2 propeller is possible only with the following conditions:

- ✓ Engine propeller-shaft type Jabiru (6 indexing paws $\varnothing 14\text{mm}$ on P.C.D. $\varnothing 101.6\text{mm}/\varnothing 4''$)
- ✓ Engine propeller-shaft out of the engine hood of 14mm for the mounting of the DUC spinner

If needed, see in annex 11.1. **Dimension of the engine propeller-shaft.**

Remark: All engines having a propeller-shaft with a P.C.D. $\varnothing 101.6\text{mm}/\varnothing 4''$ can install the SWIRL-2 propeller directly. **The holes of the metal inserts of the rear half-hub must be adapted to suit with the indexing paws of the propeller-shaft.** For further information, contact the DUC Propellers.



Assembly of the two-blade or three-blade hub:

- TIGHTENING TORQUE Screw M6: 1,1Kg/m; 11N.m**
- TIGHTENING TORQUE Screw M6: 1,1Kg/m; 11N.m**

Propeller fixing:

Screws CHC M8 & pin contact washer (length adapted according the indexing paws of the propeller-shaft)

$\varnothing 8$ hole paws (Ex: JABIRU): **Screw CHC M8x140mm**

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

5.2.2. Use of a spacer

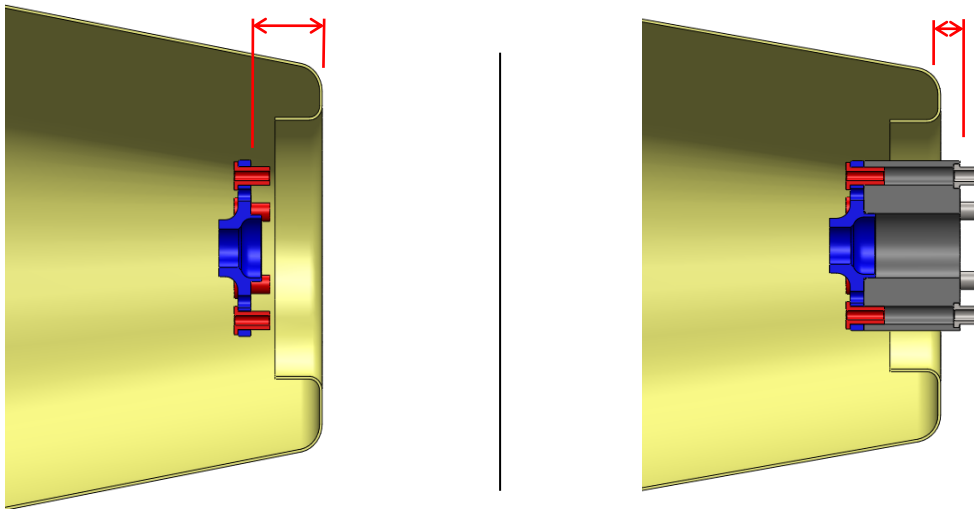
A spacer is necessary in the following case:

- ✓ Engine propeller-shaft type Jabiru (6 indexing paws Ø14mm on P.C.D. Ø101.6mm/Ø4")
- ✓ Engine propeller-shaft placed inside the engine hood or not place at more than 14mm

Determination of the spacer length:

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

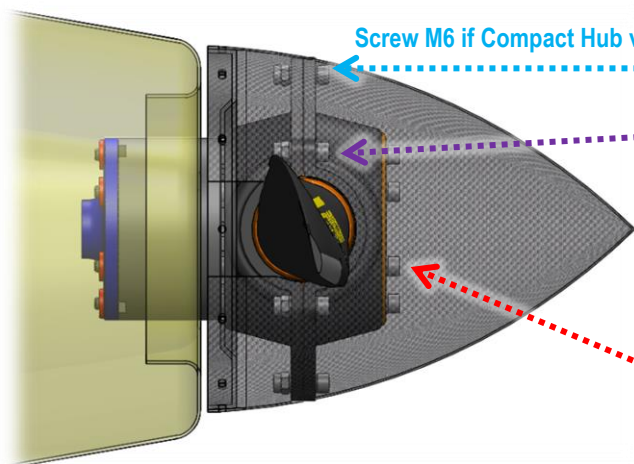
Propeller-shaft not outside the engine hood



Available spacer:

Engine	Model	Length
JABIRU	JABIRU spacer	3, 6, 10, 20, 30, 45, 50, 70mm

Presentation of the installation



Assembly of the two-blade or three-blade hub

TIGHTENING TORQUE Screw M6: 1,1Kg/m; 11N.m

TIGHTENING TORQUE Screw M6: 1,1Kg/m; 11N.m

Propeller fixing:

Screw CHC M8 & pin contact washer (screw length adapted according the length of the spacer)

Consult the installation instructions of the spacer for more information.

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

5.2.3. Use of adaptor spacer

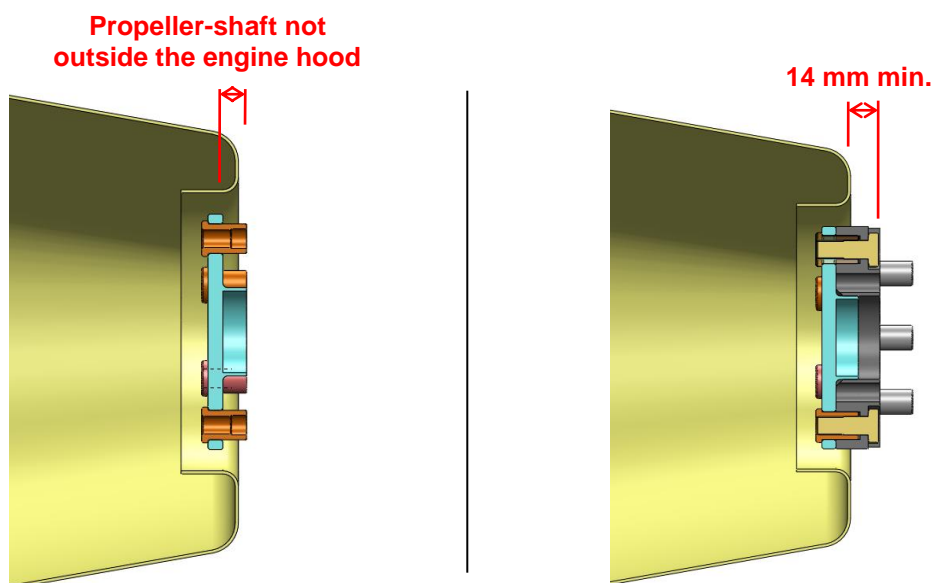
An adaptor spacer is necessary in the following case:

- ✓ Engine propeller-shaft different than the type Jabiru (other than P.C.D. Ø101.6mm/Ø4")

If needed, see in annex 11.1 **Dimension of the engine propeller-shaft.**

Determination of the adaptor spacer length:

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



Available adaptor spacer:

Engine	Model	Length
Continental O-200 / Lycoming O-233/235	SAE1 adaptor spacer	30, 70, 80, 100mm
Lycoming O-320 (3/8" / 7/16")	SAE2-AN6 / AN7 adaptor spacer	30, 70, 100mm
Lycoming O-360 (1/2")	SAE2-AN8 adaptor spacer	90, 100mm

Presentation of the installation

Assembly of the two-blade or three-blade hub
TIGHTENING TORQUE 2.5 Kg/m 25 N.m

Fixation of the adaptor spacer
 SAE1: Screw AN6 / SAE2: Screw AN8
 (screw length adapted according the adaptor spacer length and the starter flange on the propeller-shaft)

Propeller fixing:
 SAE1: Screw AN6-51 / SAE2: Screw AN8-51

Consult the installation instructions of the adaptor spacer for more information.

TIGHTENING TORQUE ADAPTOR SPACER
 AN6 (3/8"): 3.0 Kg/m 30 N.m
 AN7 (7/16"): 3.5 Kg/m 35 N.m
 AN8 (1/2"): 4.5 Kg/m 45 N.m

TIGHTENING TORQUE PROPELLER FIXING
 AN6 (3/8"): 3.0 Kg/m 30 N.m
 AN8 (1/2"): 4.5 Kg/m 45 N.m

Remark: It is imperative to use a spinner when using propeller SWIRL-2. The mounting plate of the spinner can be placed before or after the spacer

adaptation. It is necessary to adapt the mounting in function of its position.

5.3. Setting of the propeller & Finalization of the installation



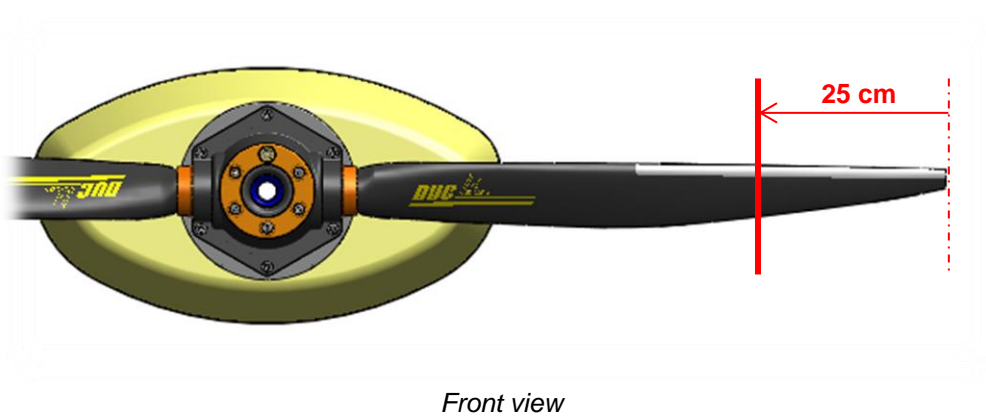
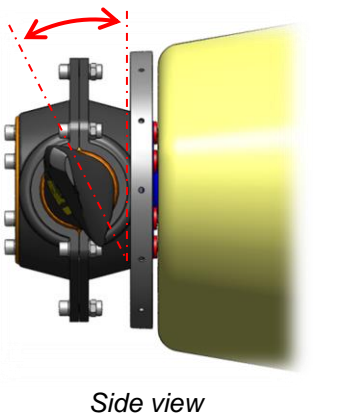
At this point, the propeller is installed on your aircraft with the spinner mounting plate.

If the propeller is already **assembled and the blades angle set**, pass directly **STEP 7**.

Otherwise, follow all the steps below to **adjust the pitch angle** before the final tightening of the screw.

A reminder of the definition of the airfoil and its vocabulary is presented in annex **11.2. Airfoil**.

STEP 1.

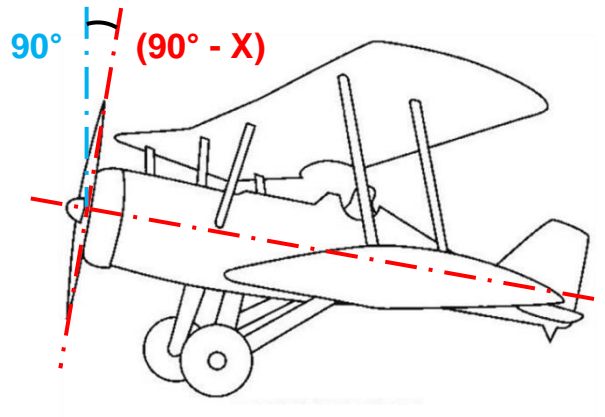
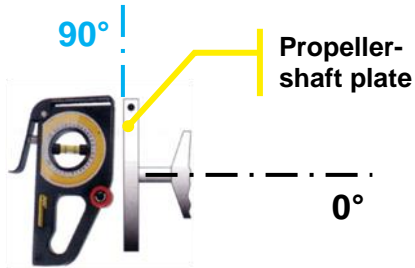


For the setting, the concerned blade must be **place in horizontal position**.

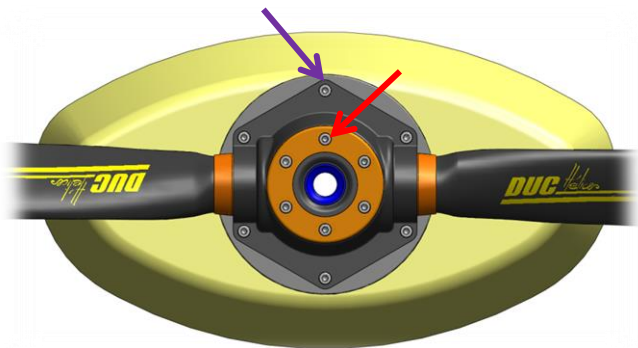
The setting is done with the adjusting tool flatten against the intrados (leading edge up) at **25 cm from the blade tip**. The attack angle is formed by the **vertical and the intrados of the blade**.

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.**



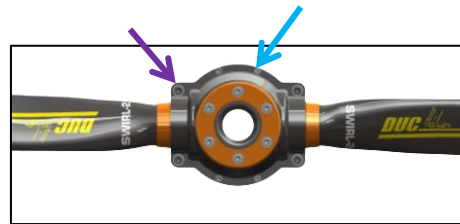
STEP 2.



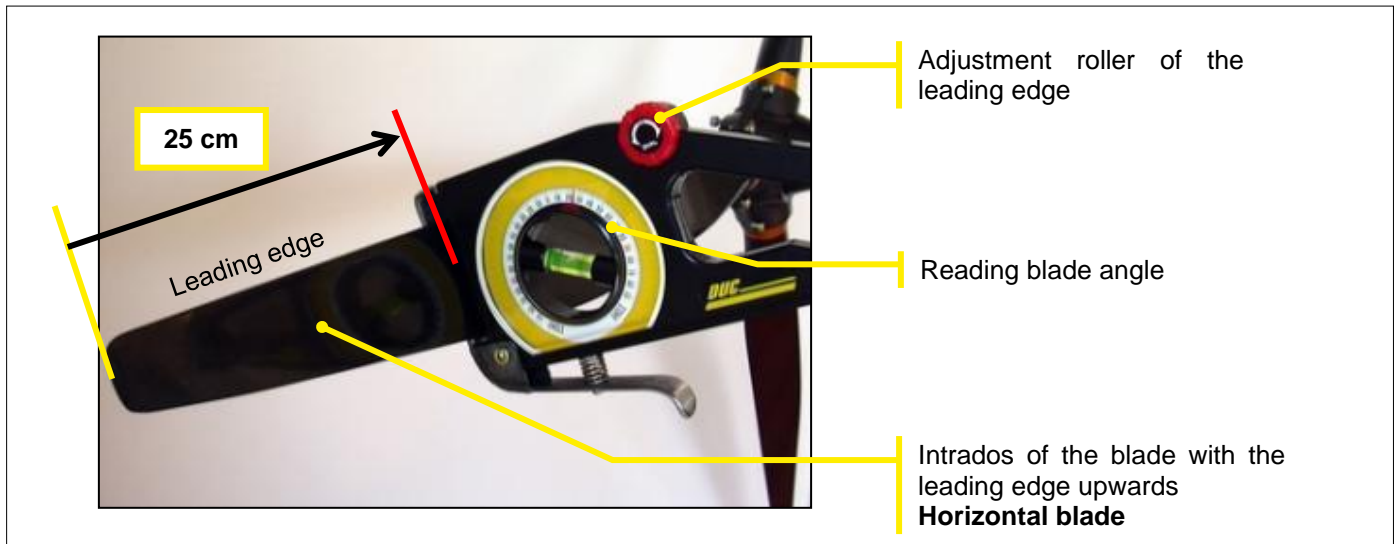
Slightly untighten the **propeller fixing screws** and the **M8 hub assembly screw**.

Note :

M6 screw presence in the case of the Compact Hub version.



STEP 3.



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

STEP 4.

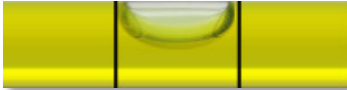
Set the desired value of the adjustment tool.

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

STEP 5.

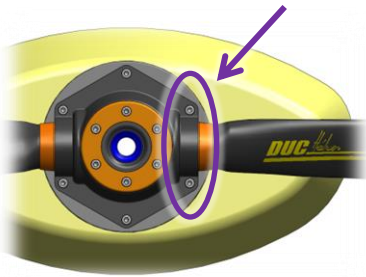
Correct the position of the bubble on the adjustment tool by rotating the blade in the hub. To do this, using a mallet, lightly tap on the foot of the blade in the desired direction.

Do not apply pressure near the trailing edge, thinner area.



The accuracy of the adjustment tool is 0.2°. This is defined by the tolerance of the visual position of the bubble between the two lines.

STEP 6. A



Once the desired pitch angle obtained, slightly tighten the **M8 assembly screws of the hub**, those around the foot blade and then perform the same operation on each of the other blades.

STEP 7.

Remove the adjusting tool from the propeller then perform a **first tightening of the bolts manually**.

Then, carry out a **progressive tightening** of all the screws by **applying the correct torque** with a torque wrench:

TIGHTENING TORQUE

M8 screw for hub assembly = 25 Nm (2.5 kg/m)
M6 screw for hub assembly = 11 Nm (1.1 kg/m)

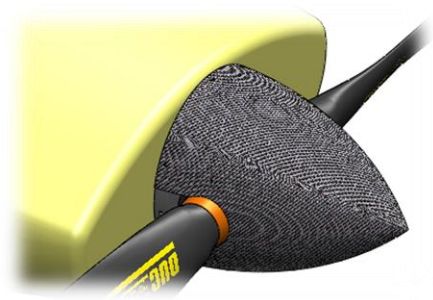
Propeller fixing screws	
Direct mounting/Spacer	Adaptor spacer mounting
Screw CHC M8 = 25 Nm (2.5 kg/m)	Screw AN6 (3/8") = 30 Nm (3 kg/m) Screw AN8 (1/2") = 45 Nm (4.5 kg/m)



IMPORTANT

After a 1 hour operation following the installation or modification of the assembly, recheck the assembly of your propeller according the instructions manual using appropriate tools (tightening torque, pitch angle...).

STEP 8.



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 SWIRL-2 propeller is ready for first tests.
The user must perform the appropriate regulations procedures to change the propeller in accordance with applicable regulations of the aircraft.

6. Precautions

PRECAUTIONS

If you notice any abnormal installation or operation, do not undertake the flight and immediately contact the DUC Hélices 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 Hélices company must be installed and used according to the instruction manuals provided. No modification can be made without the agreement of DUC Hélices company. The non-compliance of these data assumes no responsibility for the DUC Hélices company and makes out the warranty of the considered products (See section 10. **General terms of sale**).

7. Indications for testing

INDICATIONS FOR TESTING



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

PRELIMINARY TEST to secure the 1st flight (Ground Test)

- 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.**

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

VALIDATION TEST of the pitch angle setting (Flight Test)

- 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. The propeller has a constant speed effect, so this second 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.**

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



IMPORTANT

After a 1 hour operation following the installation or modification of the assembly, recheck the assembly of your propeller according the instructions manual using appropriate tools (tightening torque, pitch angle...).

8. 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 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 of sale**).

9. Potential use & Propeller maintenance

9.1. Potential use of the propeller: **Unlimited**

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

To keep the unlimited potential, DUC Hélices has defined a TBO (Time Between Overhaul) for a propeller depending on its engine. This TBO according the engine is indicated in this manual (see 2. **Applications**). In all cases, it may not exceed 5 years.

When more intensive use (flight school...), the value of the TBO can be doubled maintaining control at least every 2 years.

To achieve this, we propose to return the propeller to make a full control and ensure its proper use. If no critical anomaly is detected, it is again credited with the same TBO and is returned to you.

As a reminder, there is no imperative logbook. But know that this control is offered as a service to our customers for continuing airworthiness and there is no obligation. In fact, security will not be affected. The deliveries costs of sending and returning will be payable by the customer.

9.2. Propeller maintenance schedule

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

9.1. Regular maintenance (by the user)

For a safety use of the SWIRL-2 propellers, it is necessary that the user performs regular maintenance to detect any abnormalities. This maintenance is usually just a simple check.

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, 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 wrench
4. Replace(s) damage component(s)
5. Contact DUC Hélices to define a solution

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

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

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, 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 wrench
4. Replace(s) damage component(s)
5. Contact DUC Hélices to define a solution

9.3. Complete maintenance (by DUC Hélices)

Upon reaching the TBO (potential flight time between overhaul) defined by DUC Hélices, 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 of 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 Hélices 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 Hélices 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 price by the customer and without affecting the transfer of risk.

10.3. Price

The DUC Hélices 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 Hélices 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 Hélices 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 Hélices 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 Hélices Company. The failure of these data releases any liability of the DUC Hélices 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 Hélices 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 Hélices and features of one months after its purchase to return to society DUC Hélices, 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 society with DUC Hélices delivery order attached to the product. In return, the DUC Hélices Company takes no responsibility for damage or loss during transit due to improper or inadequate packaging. The company DUC Propellers 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 Hélices 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 Hélices right to access, review, correct, correct and delete data you have provided.

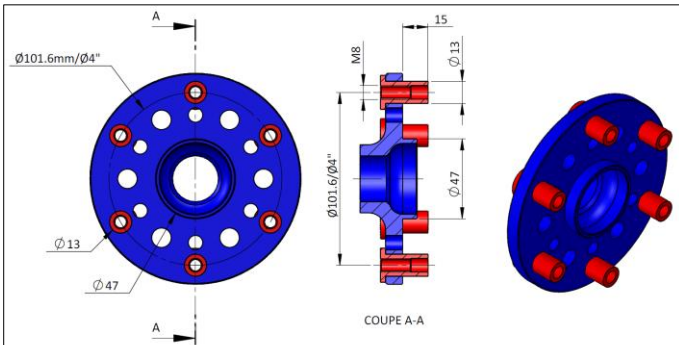
10.7. Litigation

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

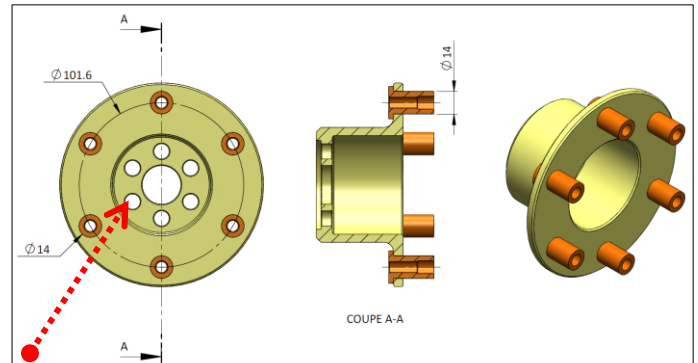
11. Annexes

11.1. Dimension of the engine propeller-shaft

ROTAX 912S engine propeller-shaft

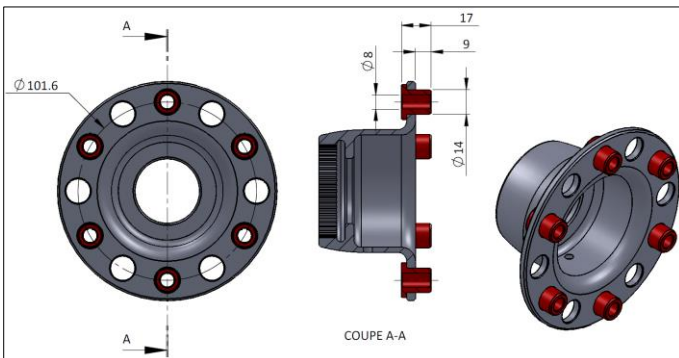


JABIRU 2200 engine propeller-shaft

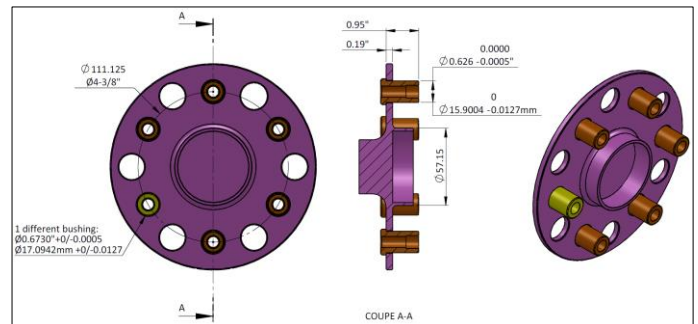


Tightening torque 6 central screw = 4,0 Kg/m ; 40 N.m
Note: Drilling holes for optional pin

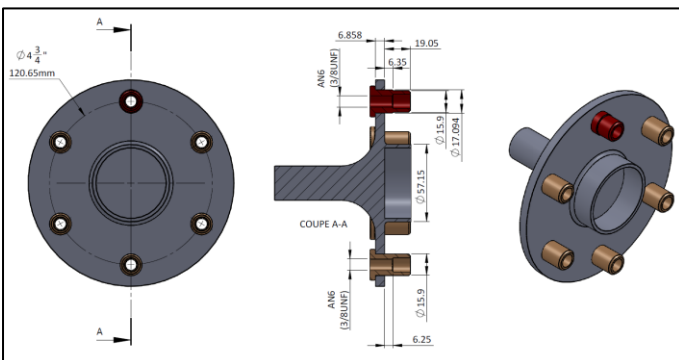
UL Power engine propeller-shaft



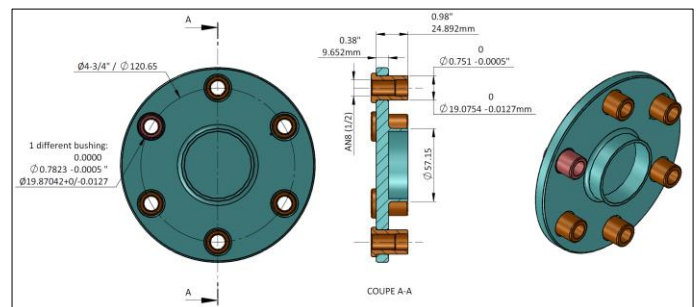
Lycoming O-235-H2C engine prop-shaft, type SAE 1



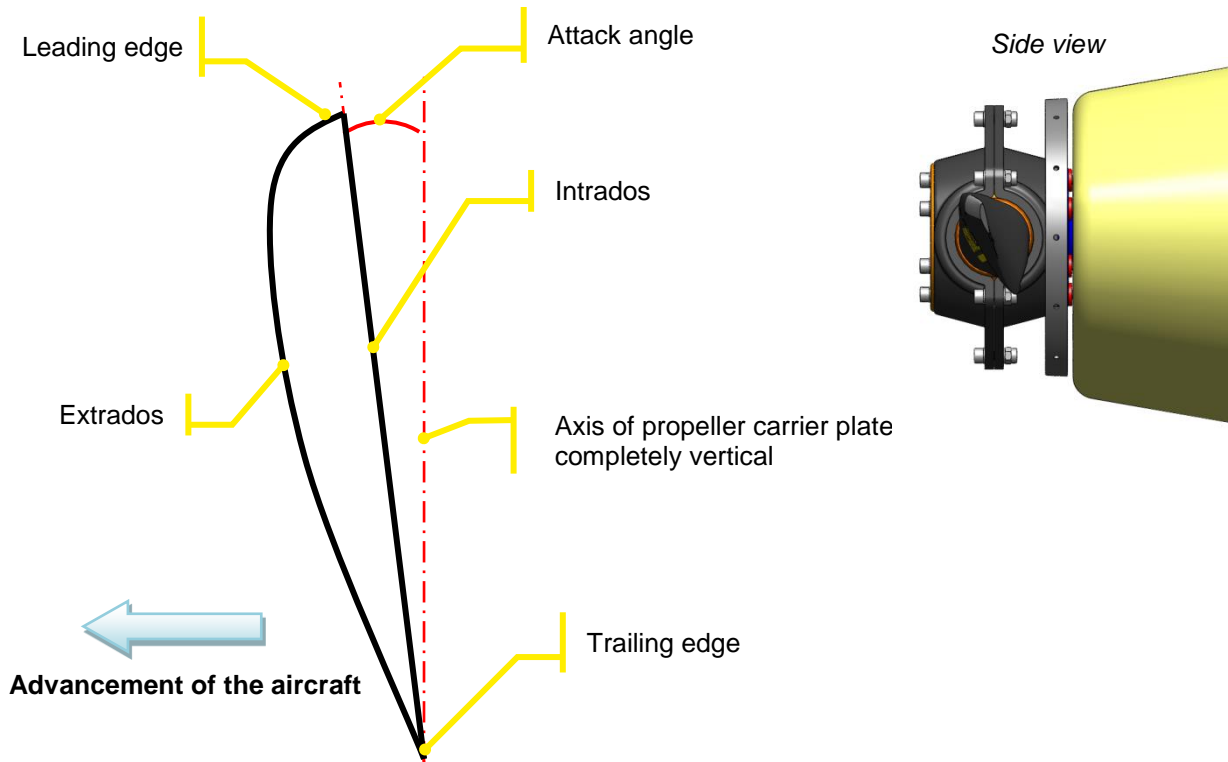
Lycoming O-320-A2A engine prop-shaft, type SAE 2



Lycoming O-360-A3A engine prop-shaft, type SAE 2



11.2. Airfoil



11.3. Moment of inertia of the SWIRL-2 propeller

Coming soon.

11.4. Operating limitation of the SWIRL-2 propeller

Designation	Reference	Maximum engine power	Maximum rotational speed
Two-blade Inconel SWIRL-2 propeller, Right	01-28-001	100 cv direct drive engine	3400 rpm
Two-blade Inconel SWIRL-2-R propeller, Right	01-31-001	140 cv direct drive engine	3400 rpm
Three-blade Inconel SWIRL-2 propeller, Right	01-33-001	100 cv with gear box engine or direct drive engine	3400 rpm
Three-blade Inconel SWIRL-2 propeller, Right	01-33-001	140 cv with gear box engine	3400 rpm
Three-blade Inconel SWIRL-2-R propeller, Right	01-32-001	140 cv direct drive engine	3000 rpm
Three-blade Inconel SWIRL-2-X propeller, Right	01-32-100	160 cv direct drive engine	3000 rpm

11.5. Identification marking of the propeller

Coming soon.

11.6. Declaration of conformance of the SWIRL-2 propellers

11.6.1. Design and Construction

The propellers SWIRL-2 were designed to be adapted to the applications described in section 0. 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 SWIRL-2 propeller conforms to withstand the stresses of operation on all its lifetime.

11.6.2. Tests and Inspections

The SWIRL-2 propeller completes the tests and inspections described below, without failure or malfunction.

Strength Testing:

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 SWIRL-2 propeller conforms to endurance test of each application exposed in section 0.

Teardown Inspection:

After completion of each test described above, the tested SWIRL-2 propeller was 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.

11.6.3. Design Control

The SWIRL-2 propeller was 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 SWIRL-2 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.

11.6.4. 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.

11.6.5. Certification of Conformity for ASTM F2506-10

“ASTM F2506-10 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 SWIRL-2 propeller complies with the ASTM F2506-10 standard and after verification, it responds every requirement.”

Mr. Vincent Duqueine
Manager
27/07/2021



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