DUC Hélices Propellers

Instruction manual

Constant-Speed propellers

100% ELEC BLACK VP

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ISO 9001 BUREAU VERITAS Certification

ISO 9001:2015 Certified Company
for its Quality System Management

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Revision update

Date	Index	Object of modification
13/12/2023	A	Creation

BUREAU VERITAS
Certification

SOCIETE DUC

AERODROME DE VILLEFRANCHE-TARARE
289 AVENUE ODETTE ET EDOUARD DURAND
69260 FRONTENAS - FRANCE

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**

Date originale de certification : **22 février 2010**

Certificat n° : **FR044932-1**
Affaire n° : **6330690**

Date: **29 mai 2018**

Jacques Matillon - Directeur général

Adresse de l'organisme certificateur : Bureau Veritas Certification France
60, avenue du Général de Gaulle – Immeuble Le Guillaumet - 92046 Paris La Défense

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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CERTIFICATION DE SYSTEMES DE MANAGEMENT

Contents

1. 100% ELECTRIC BLACK VP propeller Description

The 100% ELECTRIC BLACK VP propellers are innovative electric variable pitch propellers of the latest generation achieving optimized performance for all phases of flight. They benefit from carbon / titanium blades and a carbon / aluminum hub manufactured using DUC Propeller technology.

The aerodynamic shape of blades uses the innovative design of the **TIGER** propeller.

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

- **High efficiency during takeoff and high climb rate**
- **High efficiency during cruise and maximum speed**
- **High user comfort**
- **High efficiency during landing**

Equipped with screws in grade 5 titanium, this technology and manufacturing level and requirement degree have never been to this advancement.
This carbon's system hub for variable pitch propeller allows a wide range of angle variation but keeps safety thanks to the mechanical safety stop.

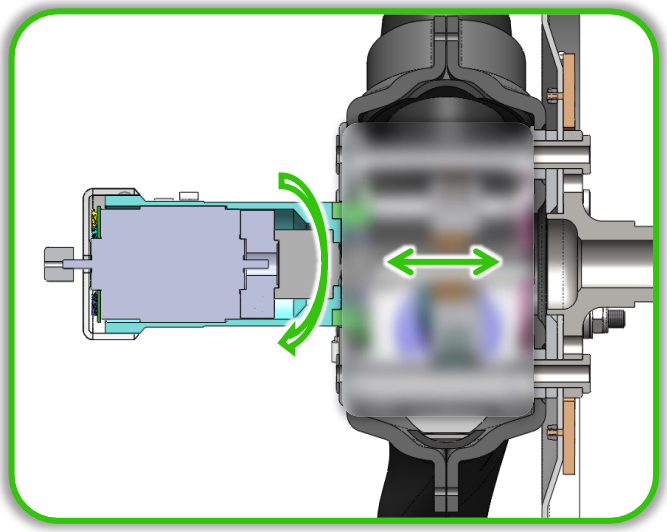
The angle pitch is adjusted manually or automatically with constant speed box. Also, a visual indicator of the pitch is provided with the propeller.

The power and the command of the variable pitch system are electric.

1.1. Characteristics

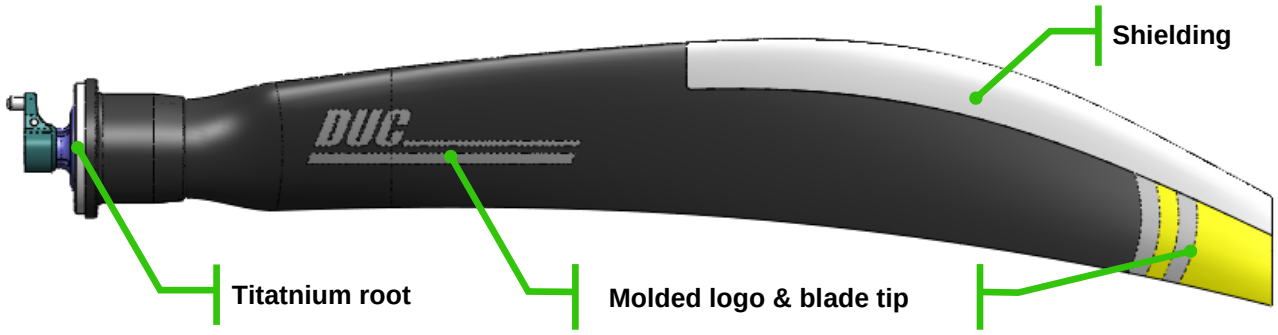
The 100% ELECTRIC BLACK VP propeller range is available:

- Constant Speed propeller
- Tractor configuration available in right rotation
- Diameters Ø1600 to Ø1770mm (Ø63 to Ø69")
- Shielded leading edge in Inconel® or Nickel-Cobalt
- Carbon composite hub with metallic inserts
- Direct assembly on the propeller-shaft Ø101.6mm
- Safety marking on the tip of the propeller



1.2. Shielding leading edge in Inconel

The leading edge of the 100% ELECTRIC BLACK VP blades is composed of a metallic shielding in Inconel or Nickel-Cobalt. This material is a superalloy including mainly nickel, with a very high hardness of the surface.



1.3. Accessories

- **Aluminum mounting spacer (Direct mounting on P.C.D Ø101.6mm/Ø4")**
  Moves the plan of the propeller to adjust the position in accordance with the engine hood
- **Spinner available in diameter Ø250mm (Ø9.8") to 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.

1.4. Sales reference

Designation	Reference	Part number	Weight (kg)
4-blades Inconel TIGERBLACK-R right prop.	01-86-002	H-TIG_4-D-PVFE_R_I	9

Note:
Specify the flight regulation aircraft (E.g.: **Ultra-light**, **LSA**…) and diameter when ordering (E.g.: ref. 01-86-002**/1730**).
For more information about the propeller marking, see section **11.3**.

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.

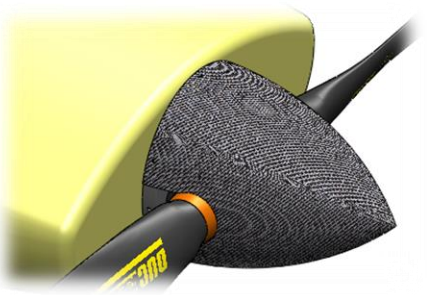
Engine	Type	Recommended propeller	Propeller diameter (inch)	Pitch angle amplitude (°)	TBO (hour)
TURBOTECH TP-R90	Turbine	4-blades 100% ELECTRIC Inconel TIGERBLACK-R, right	63'' to 69''	23°	1500h or 5 years

** 63" = 1600mm ; 69" = Ø1770mm"*

Remark
The pitch angle's value are theoretical and combined with the engine. This setting should be adjusted according to the aircraft. Thus, dependent on the type of aircraft, a pitch angle range is defined. The magnitude of this range must not exceed the specified above (see section **0.**

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

When the presence of a mark, be sure to follow the indexing of the spinner from the plate.



At this point, the small-pitch stop of your
100% ELECTRIC BLACK VP
propeller is set for the first taxi tests and then fly tests).
The user must perform the appropriate regulations procedures
to change the propeller in accordance with applicable regulations of the aircraft.

First taxi tests and then fly tests of the propeller).

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

3. Installation and using precautions

WARNING
Make sure the ignition circuit is turned off before starting any type of operation.
Do not work the engine without a 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 of sale**).

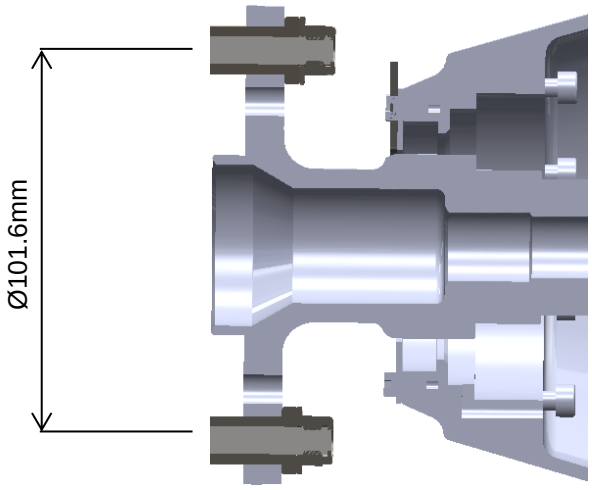
4. Technical data of 100% Electric BLACK VP propeller

4.1. Mounting

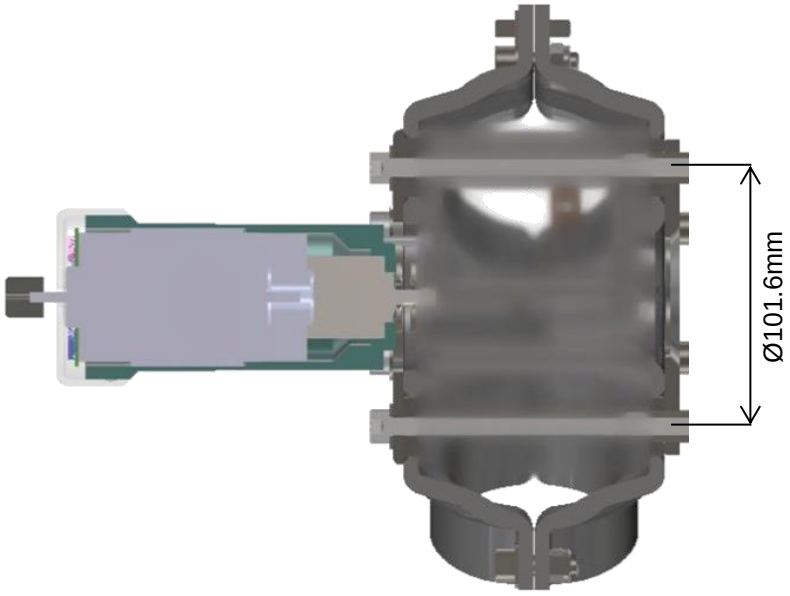
The 100% Electric BLACK Black VP propeller is designed to be installed on propeller shaft composed of:

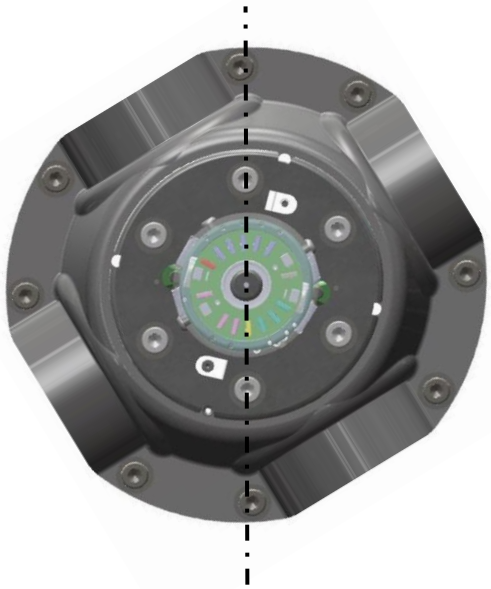
- ✓ 6 bushes Ø13 with spacing of Ø101.6mm (4").
- ✓ The hollow shaft which crossing the gear to permit the pitch command installation behind the gear.

For a different engine with a hollow shaft, a specific adaptation can be realized. Thanks to contact with DUC Propellers Company.



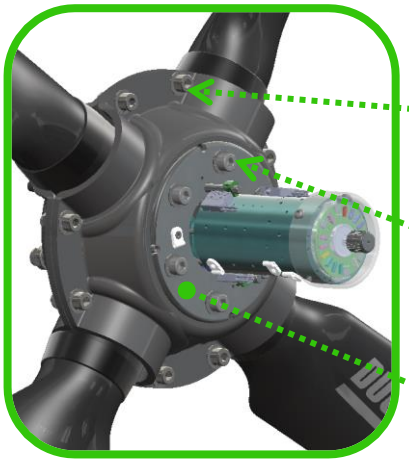
Here the carbon/aluminum hub dimensions of the propeller:





4.2. Hardware

For mounting of the propeller on engine:

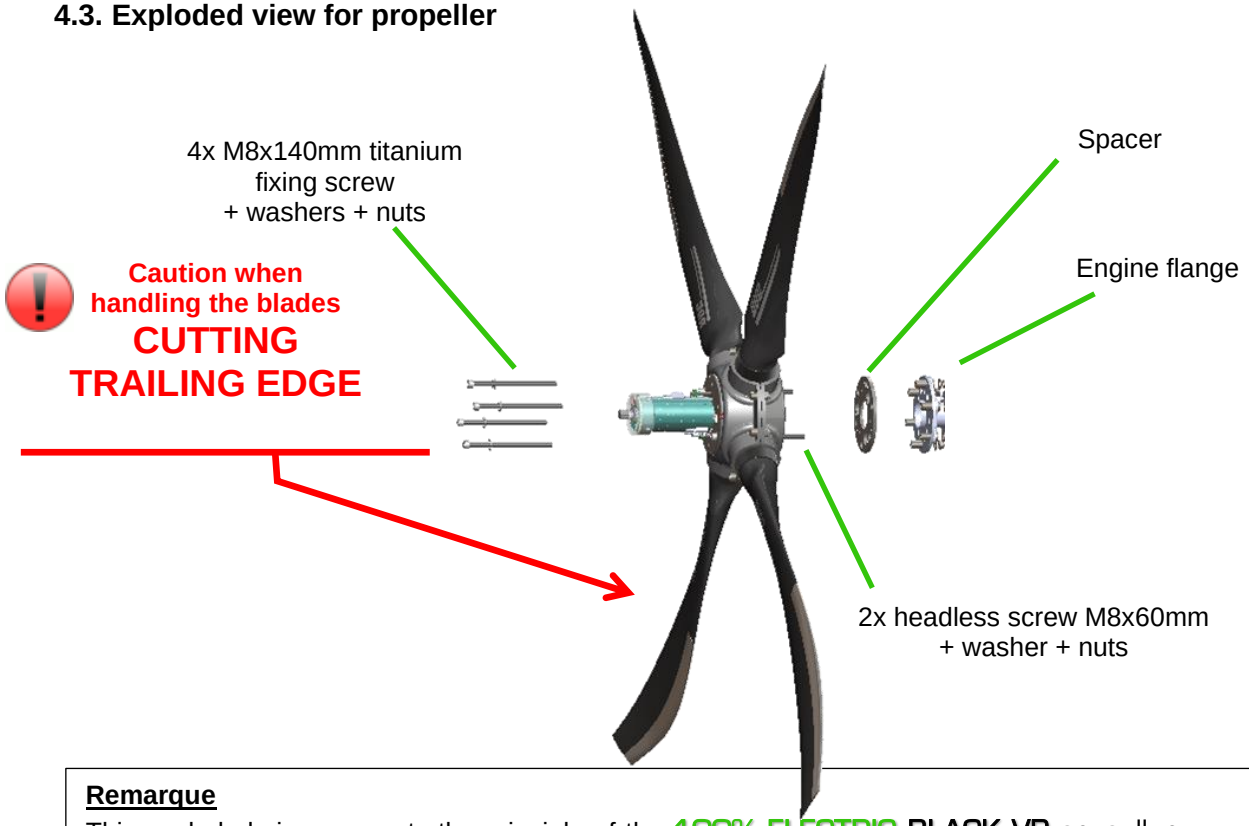


Hub assembly:
Screws/washer CHC M8x30 in grade 5 titanium
Nylstop nut in grade 5 titanium

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.

Tightening washer:
Perforated carbon Ø8mm on Ø101.6mm

4.3. Exploded view for propeller



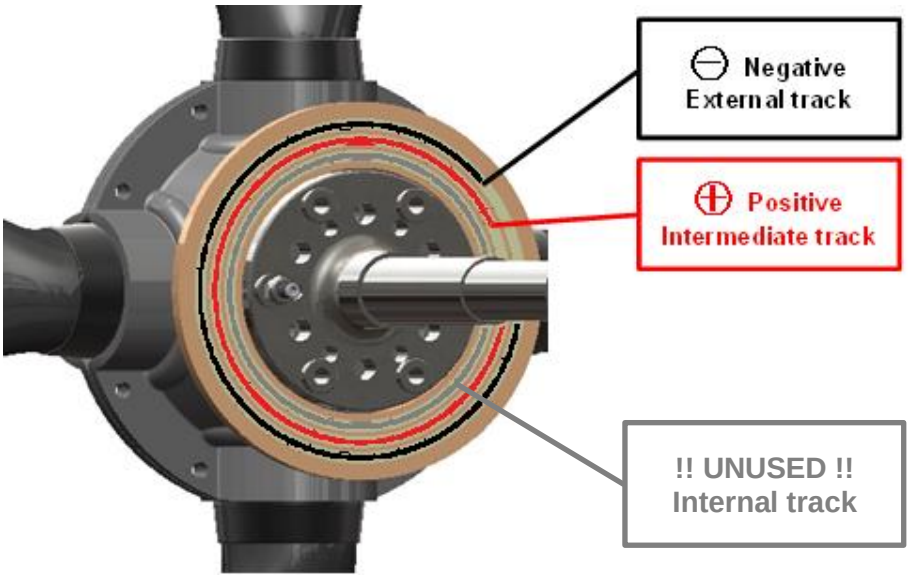
Remarque

This exploded view presents the principle of the 100% ELECTRIC BLACK VP propeller assembly. The size of all of these components or number can vary according to the configurations (blade Number, length of the screw …).

4.4. Electrical wiring

DC Gearmotor specifications:

- Nominal tension: 12V | Maximum tension until 24V *Increase the tension increases the speed of movement of the propeller*
- Nominal current: 1A | Maximum current in operation 2.5A | In-rush acceptable current: 5A *Increase the current increases the power of the variable pitch mechanism*



5. Mounting instruction of the 100% ELECTRIC BLACK PV

The final mounting of the 100% ELECTRIC BLACK VP propeller is showed hereafter. The main assembly of the propeller was done in the factory.

for further help, please contact DUC Propellers Company.

5.1. Package contents

The 100% ELECTRIC BLACK VP propeller is sent in kit, composed of subsets. Thanks to perform the verification by checking the good package content:

View	Article	Quantity	Customer Verification
	**Fixing screws + Washer + Nuts** Screws CHC M8 with drilled head Adapted length according to the mounting	4	
	**Headless screw + washer + nuts** Screws STHC M8x60mm	2	
	**Ø13-L30 lugs**	6	
	Spacer		
	**Assembled propeller** Composed by : - Blades - Hub	1	
	**Blade neoprene cover protection**	4	
	**Instruction manual**	1	

5.2. Operator & List of required tools

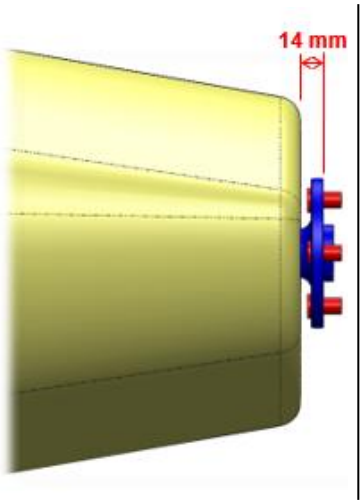
For the mounting of the propeller, it's recommended to be 2 operators for certain operations.

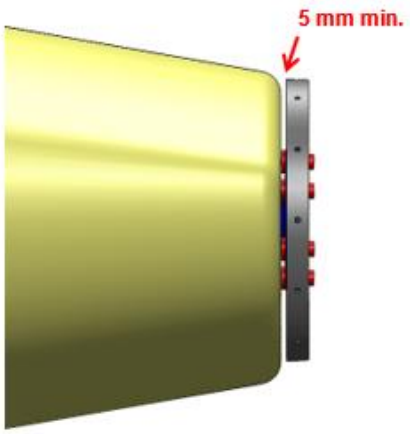
Here, the list of required tools:

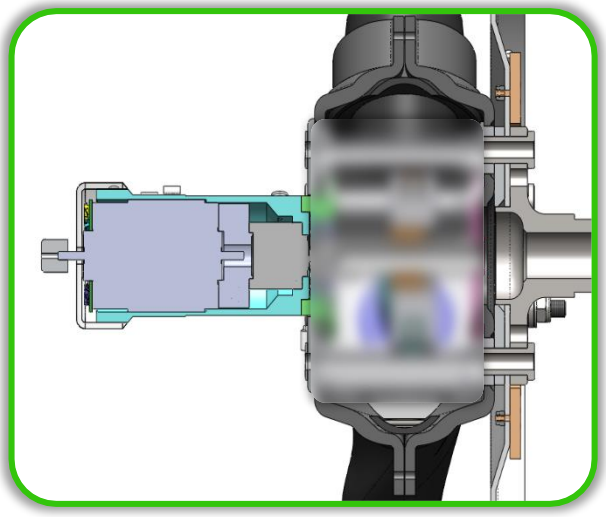
- Dynamometric Allen key 6 (Torque: 25 Nm)
- Dynamometric flathead screwdriver (Torque: 4 Nm)

5.3. Installation on the aircraft

5.3.1.Direct installation on the aircraft





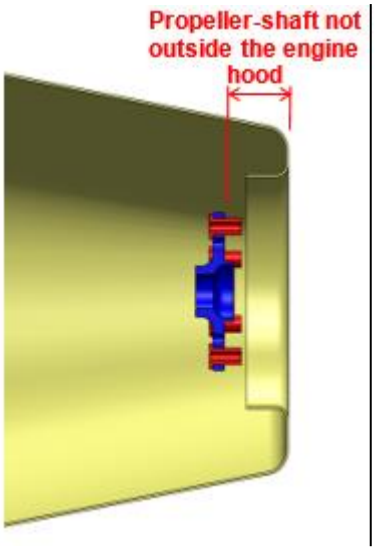


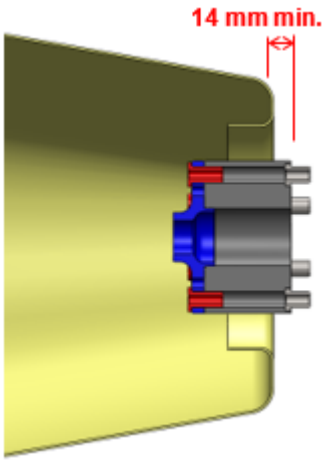
In this case, the 100% ELECTRIC BLACK VP propeller hub is suitable for this type of mounting

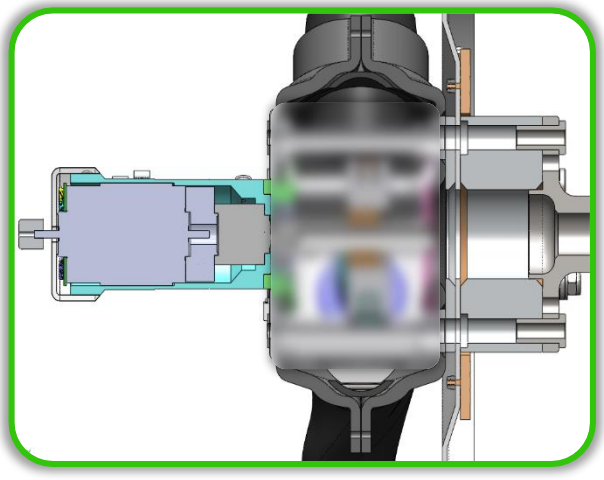
5.3.2.Use of a spacer

Determination of the spacer length:

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







In this case, the 100% ELECTRIC BLACK VP propeller hub is suitable for this type of mounting

Available spacer:

Model	Length
912H spacer	3, 6, 10, 15, 20, 25, 30, 40, 45, 50, 60, 70, 75, 80, 90, 100, 120mm

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

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

At this point, the propeller is preinstalled on the

5.4. Execution of electrical wiring

Thank you to refer to section **4.4. Electrical wiring**

PRECAUTIONS

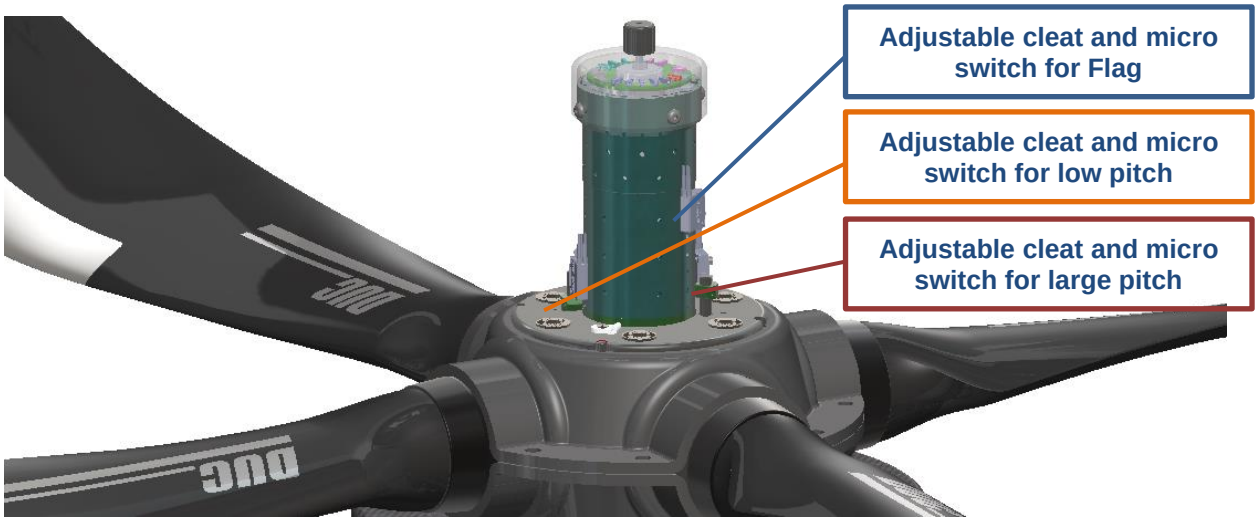
If you notice any abnormal installation or operation, do not undertake the flight and immediately contact DUC Propellers Company.

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 Erreur ! Source du renvoi introuvable.. Erreur ! Source du renvoi introuvable.).

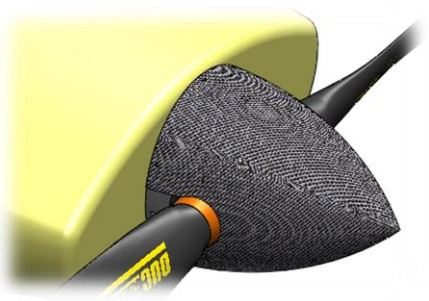
6. Setting the fine and coarse pitch stops and finalization of the mounting

Standard settings are defines during the assembly. But these settings can be changed.
There are 2 cleats to stop each direction with 3 micro switches 1 per extreme position (Flag, low pitch, large pitch)



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

When the presence of a mark, be sure to follow the indexing of the spinner from the plate.



At this point, the small-pitch stop of your
100% ELECTRIC BLACK VP
propeller is set for the first taxi tests and then fly tests).
The user must perform the appropriate regulations procedures to change the propeller in accordance with applicable regulations of the aircraft.

7. First taxi tests and then fly tests of the propeller

During the Vital Action (A-C-H-E-V-E-R) before each flight, it is recommended to check the proper functioning of the pitch variation of the propeller.
Before the first flights, do a run-up to get 5600-5700 rpm. If not, change the setting of the small-pitch stop.
During take-off or landing, it is imperative to return the propeller to small-pitch.
In flight, changing the pitch angle by continuously monitoring the Manifold Pressure (MAP).

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 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 **6. General terms of sale**).

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 1500 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 1500 hours of flight on Rotax is 800 € excl. tax, in other words, 0.54€ 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 FLASH 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

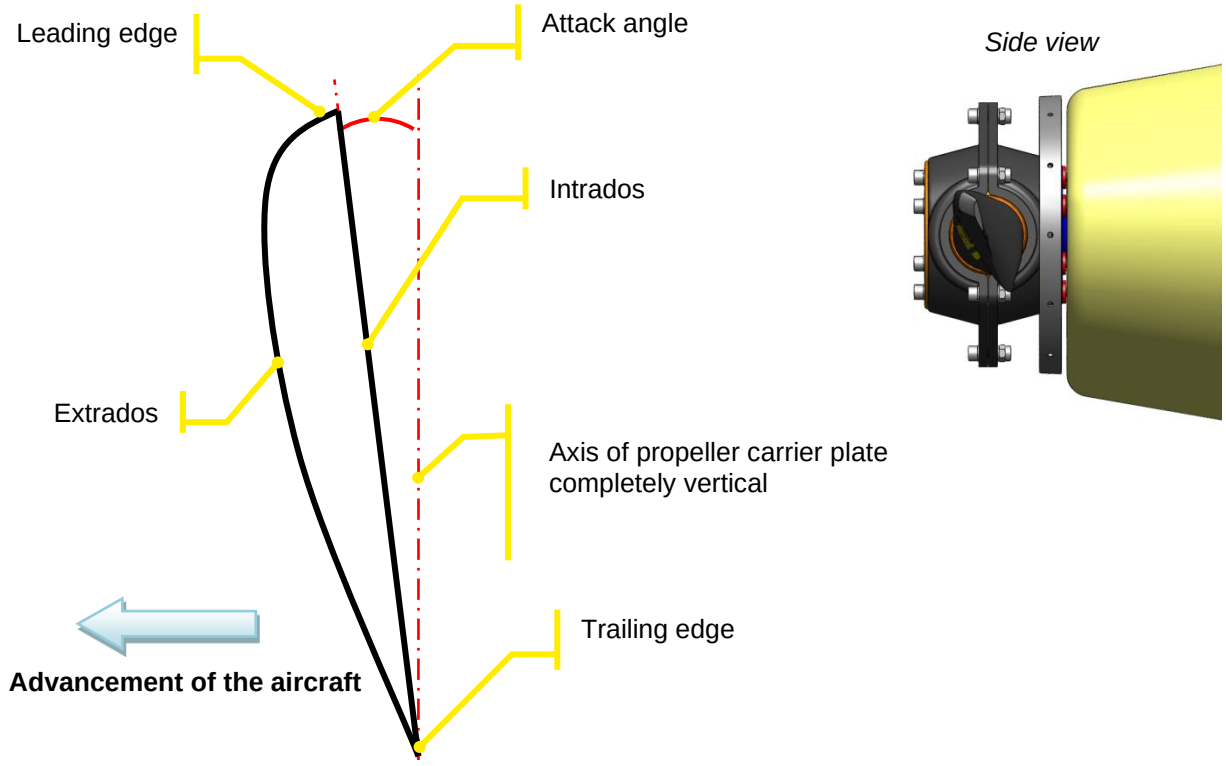
All the data you entrust to us are able to process your orders. Under Law No. 78-17 of January 6, 1978, relating to data, files and freedoms you have with the customer service Company DUC Propellers Company right to access, review, correct, correct and delete data you have provided.

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. Airfoil



11.2. Operating limitation of the TIGERBLACK-R propeller

Designation	Maximum engine power	Maximum rotational speed
4-blades Inconel TIGERBLACK-R propeller, Right	160 hp	2800 rpm

11.3. Identification marking of the propeller

11.3.1. 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:

TIGER-PVR Right Blade
DUC helices www.duc-helices.com TIG-PV-D S/N: 1234

11.4. Declaration of conformance of the 100% ELECTRIC BLACK VP propellers

11.4.1. Design and Construction

The propellers were designed to be adapted to the applications described in section 2. All design features are reliable and mastered by DUC Propellers 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.

Definition propeller conforms to withstand the stresses of operation on all its lifetime.

11.4.2. Tests and Inspections

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

Strength Testing:
This test was done in a static pull test.

Endurance Testing:
The propeller conforms to endurance test.

Teardown Inspection:
After completion of each test described above, the tested 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.

11.4.3. Design Control

The propeller was design on CAD software. All the CAD files and 2D drawings are stored in the Design Office of DUC Propellers Company. 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.

11.4.4. Quality Assurance

DUC Propellers Company is ISO 9001:2015 certified for its management of the quality system, which ensures manufactured propellers maintain conformity to the established design. Refer to page 2.

11.4.5. 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 Propellers Company declares that the propeller complies with the ASTM F2506-13 standard and after verification, it responds every requirement."

M. Vincent Duqueine
Manager
13/12/2023

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ISO 9001 BUREAU VERITAS Certification

ISO 9001:2015
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