TECHNICAL MANUAL

KW-31 PROPELLER
PERFORMIG 100-HOUR INSPECTION

TN - 31

	Position	Name	Signature
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Valid from: 21.01.2014

Copy Number

A.GENERAL

1. Contens

2. Revision history

CHANGE PROCEDURE					
Revision	**Date**	**Description**	**Changed pages**	**Approved**	**Incorporation**
1					
2					
3					
4					
5					

3. List of valid pages

Page	Revision	Date	Page	Revision	Date
1	0	21.01.2014	11	0	21.01.2014
2	0	21.01.2014	12	0	21.01.2014
3	0	21.01.2014	13	0	21.01.2014
4	0	21.01.2014	14		
5	0	21.01.2014	15		
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7	0	21.01.2014	17		
8	0	21.01.2014	18		
9	0	21.01.2014	19		
10	0	21.01.2014	20		

4. Purpose of the document

This document – technology instruction (manual) defines the repair, assembly, and inspection procedures used during performing 100-hour inspection. This document is based on current version of KW-31 propeller's documentation, as well as the state of knowledge and practical experience from production and operation of the type. This document may be amended based on information newly obtained during manufacturing and operation of manufactured propellers.

The following documents were used in making of this document:

- Design documentation of KW-31 propeller, valid version as of 21.01.2014.
- Photo documentation of sample assembly and disassembly.
- Data from and experience of the technicians authorized to assemble the propeller.

5. Validity

This technology instruction applies to maintenance and inspection performed within Woodcomp Propellers s. r. o. organization with CZ.145.0082 Authorization, and within manufacturer's authorized service facilities.

6. Abbreviations used

AD	*Airworthiness Directive* Příkaz k zachování letové způsobilosti
AK	Firma Aleš Křemen, IČ: 279 52 428; Odolena Voda – Dolínek, Alšova 118, Okres Praha-východ, PSČ 250 70
AML	*Aircraft Maintenance License* Průkaz způsobilosti k údržbě letadel
AMO	*Aircraft Maintenance Organization* Oprávněná organizace údržby letadel
CAA CZ ÚCL	*Civil Aviation Authority of the Czech Republic* Úřad pro civilní letectví České republiky, Letiště RUZYNĚ; 160 08 Praha 6
EASA	*European Aviation Safety Agency* Evropská agentura pro bezpečnost civilního letectví
FM	*Flight Manual* Letová příručka
GO	*Overhaul* Generální oprava
ICA	*Instruction for Continued Airworthiness* Instrukce pro zachování letové způsobilosti
LC	*Aircraft Component* Letadlový celek
MEK	Methylethylketon-organická sloučenina s funkčním vzorcem $CH_3C(O)CH_2CH_3$
MM	*Maintenance Manual* Příručka pro údržbu
MOE	*Maintenance Organization Exposition* Výklad organizace údržby
ND	*Spare Parts* Náhradní díly
NDT	*Non Destructive Testing* Nedestruktivní zkoušení
OP	*Certifying Staff* Osvědčující personál / pracovník
PN	*Part Number* Číslo dílu
PART M PART 145 PART 66 PART 147	Annexes I to IV to the Commission Regulation (EC) No. 2042/2003 dated Nov 20th, 2003 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organizations and personnel involved in these tasks
QM	*Quality Manager* Manažer systému řízení jakosti
SB	*Service Bulletin* Servisní bulletin
SN	*Serial Number* Výrobní číslo
TC	*Type Certificate* Typové osvědčení
TSN	*Time Since New* Celková doba provozu od uvedení do provozu
TSO	*Time Since Overhaul* Celková doba provozu od poslední GO
WP Woodcomp Propellers s.r.o.	Společnost Woodcomp Propellers s.r.o. IČ 018 93 351 Vodolská 4, Dolínek, 250 70 Odolena Voda
ZZ	*Test Equipment* Zkušební zařízení

7. Propeller inspection after 100 operating hours

Periodic 100-hour inspection is performed on the propeller mounted on the aircraft every 100 operating hours. The purpose of this 100-hour inspection is to ascertain actual situation of the propeller to provide safety and trouble-free operation until next inspection.

In the case of a defect founds, the propeller must be removed from operation.

8. Basic rules

!! **The inspection must be performed according to current versions of KW-31 documentation.**

!! **All assembly, adjustment and inspection procedures must be performed by personnel with required qualification. These activities may only be performed in enclosed facilities using clean, undamaged tools and equipment approved for the purpose.**

!! **Protect propeller parts from damage during disassembly, assembly, and adjustment. Use protective pouches for propeller blades.**

!! **Use only prescribed lubricants and/or materials to lubricate and secure propeller parts, or allowed/approved equivalents.**

!! **Maintain clean and tidy workplace including its surroundings; do not smoke.**

!! **All components destined for scrapping by this procedure must be red tagged or painted red and their disposal must be documented.**

!! **Propeller hub orientation is based on pull version – i.e. front side bears blade numbers 1, 2, and 3.**
– rear side is the flange with six M8 studs.

!! **When securing screws using locking wire, the following rule applies:**
! SCREWS MUST TIGHTEN EACH OTHER AFTER SECURING !

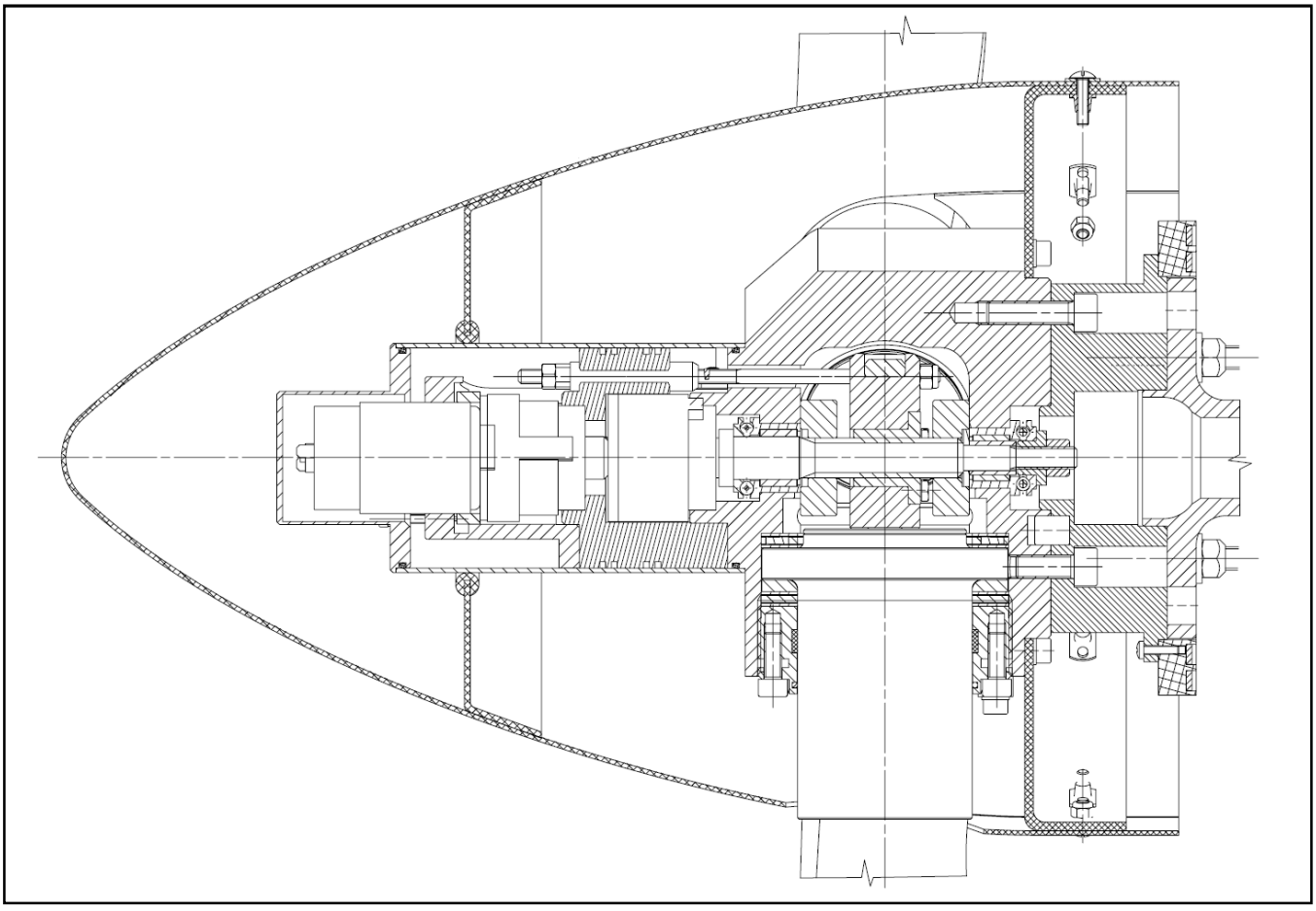
!! **Completion of every inspection shall be recorded to Propeller Logbook.**

B. BASIC TECHNICAL PARAMETRES OF KW-31

1. Propeller description

The propeller is intended for aircraft MTOM up to 2000kg (ELA 2), with piston engines equipped with reduction gear.

KW-31 is three-bladed, electro mechanical, double-acting, in-flight adjustable propeller, working as constant speed propeller with fitted electric governor. It is intended for piston engines up to 85kW (115HP) with maximum operating speed 2550rpm. Its design and functional solution is shown in the picture below. The propeller is intended for CS 3-5 (CS 4-6).electric governor.



Propeller hub is made of aluminium alloy, and incorporates hydraulic mechanism for adjustment of blade pitch, and blade root pockets. Blades have mixed composition. Precisely machined wooden cores are covered in composite material, and their leading edges are protected by cast polyurethane or stainless steel inserts. Blade roots are set in aluminum alloy ferrules transferring the rotation and centrifugal forces into propeller hub.

Propeller is manufactured with three possible blade types. “C” blades are classical, “W” blades are wide, and “B” are shorter, scimitar blades.

Four alternative versions of spinners are manufactured in different color design.

Electrical mechanism is manufactured in two different versions.

2. Basic performance data

Propeller model	**KW-31**		
Number of blades installed	3		
Blade type	- 031 („W“)	- 033 („C“)	- 034 („B“)
Diameter	Right: 1738 ± 4 mm Left: 1714 ± 4 mm	1726 ± 4 mm	1642 ± 4 mm
Min. angle setting	5°		
Max. angle setting	50°		
Max. engine power output-N_{max}	115 HP		
Max. propeller RPM - n_{max}	2550 rpm		
Mass moment of inertia	0,51 kgm^2		
Mass of complete propeller	cca 11,5 kg acc. to the type of blades and type of spinner		
Mass of CS 3-5 governor	0,23 kg		
Time between end positions	cca 6 sec.		
Max. continuous current of servomotor	4 A		

C.PERFORMING 100-HOUR INSPECTION

Before commencing inspection, it is necessary to clean the propeller completely, and to remove all surface dirt.

! CAUTION !

Make sure that engine magnetos have been grounded prior to start of inspection

1. Removal of propeller spinner and engine cowling

1.1 Remove 9 screws **pos.59** with washers and remove spinner **pos.57.** Save removed screws and washers for reassembly.

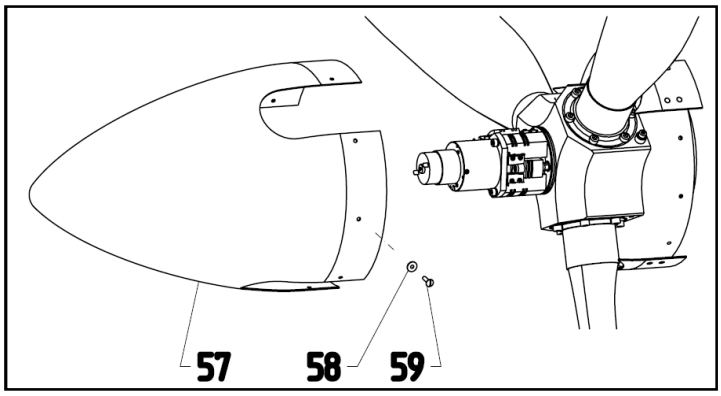


Fig.1 Spinner removal

1.2 Remove engine cowlings to gain access to engine flange and brush rings. Remove engine cowlings according to respective A/C manual. Protect removed cowlings from damage.

2. External inspection with spinner removed

2.1 Clean propeller hub and electrical collector, especially the carbon debris; if very dirty, use cloth dipped with benzine.

2.2 Check intactness of propeller hub and the cover of electrical installation - focus on developing corrosion, deformations or cracks. If any unusual damage found contact manufacturer or authorized service facility.

2.3 Check for grease leakage at blade roots. Negligible leakage may be found especially after first 100 hours of operation and this condition may not be considered as defect. If excessive grease leakage is found contact manufacturer or authorized service facility.

2.4 Using torque wrench set to 22Nm, fitted with 13mm bit, perform check-tightening of six self-locking nuts **pos.66** (M8) at engine flange. If nuts are loose, re-tighten using this torque.
If hexagonal parts of self-locking nuts are visibly damaged (dented) and can be re-tightened using 22Nm torque, it is a sign of repeated use. Repeated use results in degraded locking performance. In this case, remove all nuts by gradual loosening, install new nuts, and tighten alternately using 22Nm torque.

2.5 Check intactness of locking wires and red paint marks on six screws **pos.63** on rear side of spinner backplate.

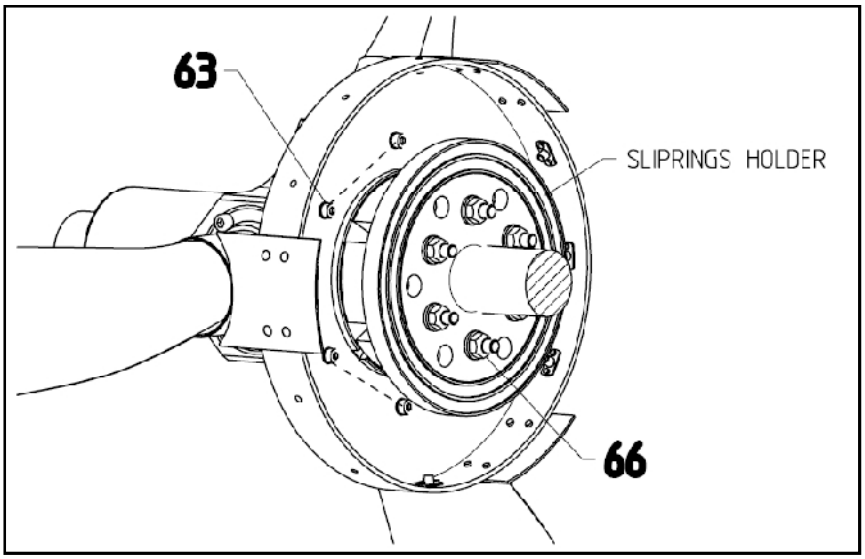


Fig.2 Rear side of propeller installaed on engine

2.6 Check intactness of locking wire and red marks on blade retention nuts securing bolts.

2.7 Check attachment of balance weights on propeller hub and on spinner backplate. Parts must not be loose.

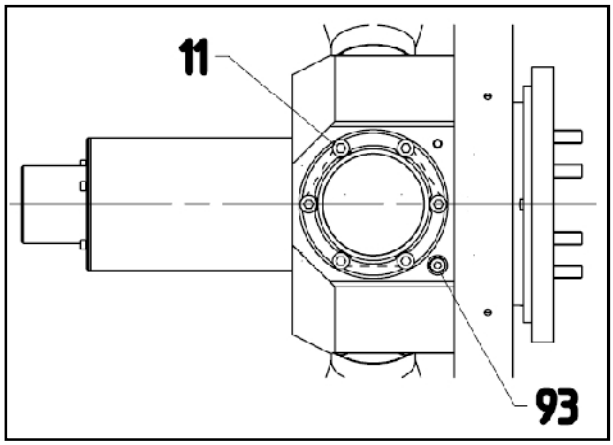


Fig.3 Securing bolts on retention nuts and balance weights

2.8 Remove the brushes holder assembly (two Allen screws **pos.210**) and check minimum brush length (section protruding from the brushes housing); 10 mm is allowed minimum. If brushes are worn under limit, replace them with new ones (Brush assembly - part number C-1095-00). Reinstall the brushes holder assembly, apply Loctite 243 on the screws, and tighten them using 22Nm torque. Check correct centering of the brushes and their contact with collector rings. Check condition of brushes housing attachment; loosened screws **pos.207** secure using Loctite 243 and tighten carefully. Check collector rings-they must not be scratched.

If necessary, move the brushes housing to correct position - loose screws **pos.207** which are holding the housing and after correct positioning, secure the screws using Loctite 243 screws and tighten them carefully.

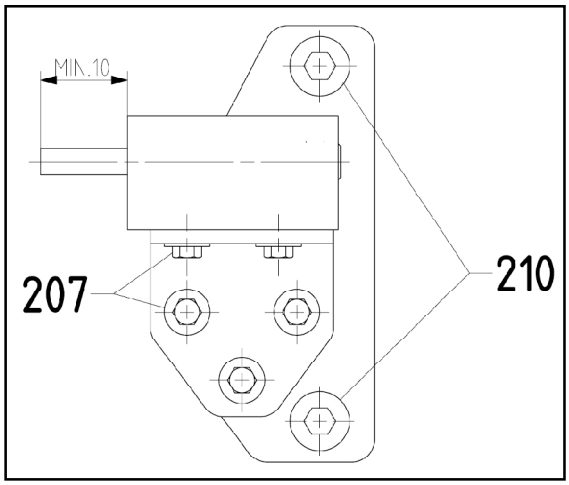


Fig.4 Brushes holder assembly

2.9 Check intactness of brush wires and wires between rings and propeller hub, including their attachment.

2.10 Clean propeller spinner and check for cracks. Check that frontplate inside the spinner is not loose. Check condition of rubber edge tape in the center of this plate. Small surface hair-cracks and cuts on spinner are acceptable and could be repaired according to propeller User manual. Spinners with cracks in fiberglass layers or with loosened frontplate must be repaired by manufacturer or authorized service facility.

3. Inspection of electro-mechanical parts

3.1 Using 2.5mm Allen key, remove four screws **pos.1** (M3). Pull in direction of flight to remove cap **pos.3** and tubular part of cover **pos.5**.

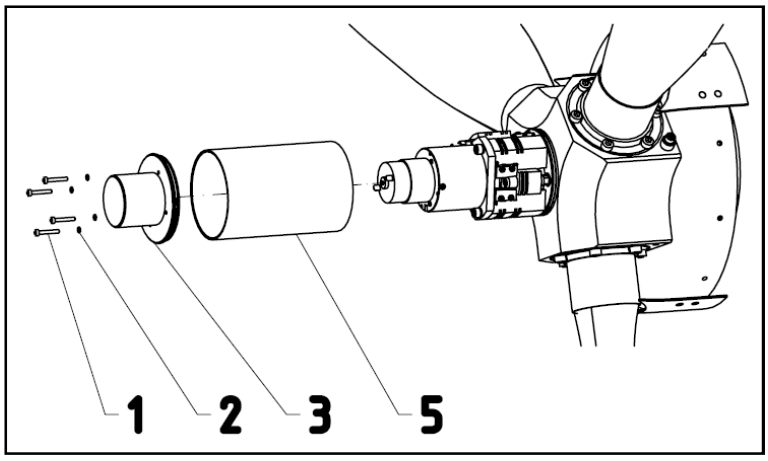


Fig.5 Removal of covers of electro-mechanics

3.2 Check attachment of electric wires-if silicone sealant has peeled from the body, carefully remove the sealant. Degrease attachment location and wire using methylethylketone (MEK) or acetone. Use neutral silicone to reattach wire to surface.

3.3 Check soldered wires at micro-switches, electric motor face, and eight-pole terminal-check for loosened wires, check around connection for signs of corrosion.

3.4 Check-tightening of micro-switches. Remove loosened screws **pos.43** apply Loctite 243 and re-tighten.

3.5 Clean out debris and dust around micro-switch levers using very small brush. Visually check condition of micro-switches; check on wear, damage to levers.

3.6 Check intactness of red marks on three Allen-head screws **pos.6** on electric motor cover. Damaged marks are sign of unauthorized manipulation.

3.7 Check tightening and intactness of red marks on two nuts **pos.14** on microswitch stops (**pos.15, 25**).

3.8 Connect 5-10A ammeter with valid calibration into supply wires on suitable place (according to particular A/C schematic). With ammeter connected, perform at least 5 complete cycles between blade angle end stops. Maximum allowed current draw when testing on ground is 1,6A. Observe whether blade movement is smooth and microswitches works correctly (el. motor has to cease motion immediately when microswitch is activated by the stop). If excessive current draw, jerky blade movement or defective microswitch is found, propeller must be repaired by manufacturer or authorized service facility.

3.9 When work is complete, reinstall all covers of electro-mechanics. Be careful not to damage sealing O-rings. Reinstall and tighten screws **pos. 1** with washers **pos.2**, with Loctite 243 applied. Apply red marks onto heads of screws **pos.1**.

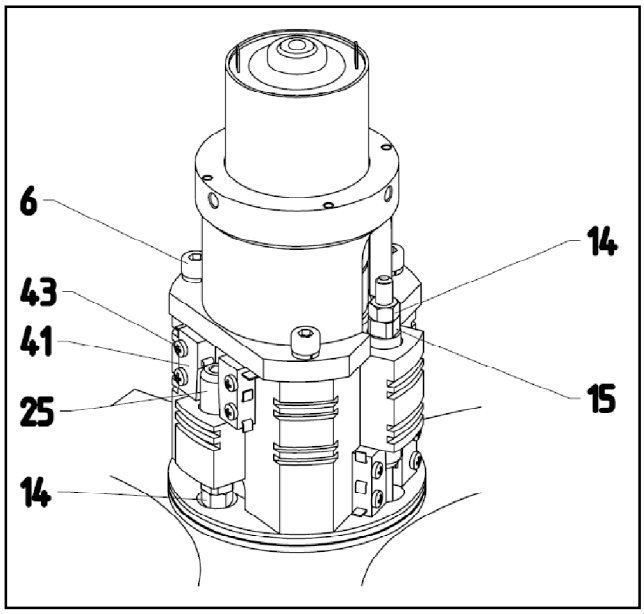


Fig.6 Uncovered electro-mechanics

4. Inspection of propeller blades

Inspect propeller blade carefully. Propeller blade must not show signs of damage, cracks, nor deformation exceeding the limits listed below.

If bigger damage, cracks or deformation is found**,** propeller must be repaired by manufacturer or authorized service facility.

Pay special attention on leading edge or trailing edge damage. Such damage may cause penetrating of moisture to wooden core and must be repaired as soon as possible.

Common wear and tear from operation (by friction, operation, washing, etc.) is not considered blade damage.

4.1 Check of blade surface:

Maximum permitted depth of damage to suction or pressure side of blade is 0.7mm. Surface area of single repaired spot must not exceed 0,5cm2

Maximum permitted depth of damage to trailing edge is 2mm, repaired locations must be farther than 80mm away from each other, and must not be longer than 15mm.

Repair procedure:

1. Clean and dry the location.
2. Use fine file or sandpaper to prepare the location.
3. Fill the location with epoxide.
4. Let cure and grind to blend with the surroundings.
5. Apply polyurethane paint to repaired location.

Hair-cracks on the blade surface are permitted if they are only in outer gelcoat layer. If they start growing quickly and penetrating into the fiberglass (or carbon) layers, stop using the propeller immediately and contact the manufacturer or authorized service station

4.2 Check of leading edge:

Check that plastic protective tape is intact and check its adhesion. Replace tape if damaged.

Replacement procedure:

1. Carefully remove old tape (slightly heat the tape using hairdryer).
2. Clean the surface from dust and oil. Carefully remove remnants of old glue using acetone or MEK.
3. Carefully remove backing tape from new tape, taking care not to touch/soil the glue surface.
4. Apply tape to prepared blade surface.
5. Use plastic spatula to force out air bubbles, or puncture the tape by a pin, and press out air using a roller or finger pressure. Do not use a blade or razor to cut the tape!!
6. Return the propeller into operation no sooner than after 24 hours from applying the tape, when the glue fully cures.

Polyurethane leading edge:

Maximum permitted depth of damage to PU leading edge is 2mm, repaired locations must be farther than 80mm away from each other, and must not be longer than 15mm. No cracks on the leading edge are permitted. The leading edge must always fully adhere to blade along the entire length.

The repair may be done only by filling and sanding, to achieve smooth shape. Don't try to add any material to damaged areas.

Stainless steel leading edge:

Maximum permitted depth of damage to stainless leading edge is 1mm, damaged locations must be farther than 80mm away from each other and must not be longer than 5mm. Only deformations with blunt edges are permitted; any sharp edges could be starting points of growing defects. No punctures or cracks are permitted, on entire length of leading edge. The leading edge must fully adhere to blade, and no gap between stainless strip edge and blade surface is permitted. Any sign of separation of stainless leading edge from blade surface is not permitted.

No repairs of stainless leading edge are permitted.

4.3 Check axial play of individual blades in propeller hub – blades must not move (when pressed into and/or pulled off the hub).

4.4 Check angular play of individual blades in propeller hub (Fig. 7) – blades must not move by more than 1,5°.
Measure play with blade in horizontal position, using digital protractor attached approximately in 75% of propeller diameter. Turn blade between end positions around its longitudinal axis.

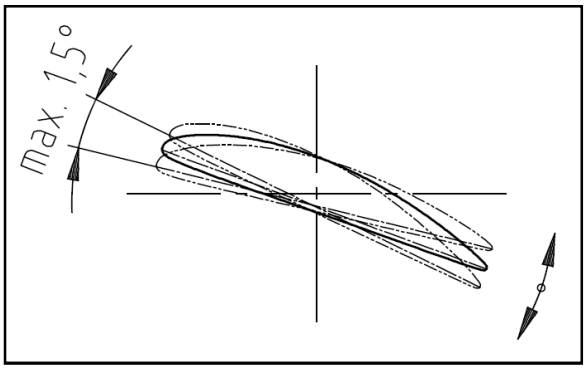


Fig.7 Blade angular play

! CAUTION!

If excessive axial or angular play is discovered, propeller must be repaired by manufacturer or authorized service facility.

5. Completion of inspection

5.1 Apply thin layer of Aeroshell 5 grease to the center of grommet in propeller spinner. Thread propeller spinner onto propeller hub. Orient the spinner with its red mark on external surface towards blade 1. Blade numbers 1-3 are marked on front part of propeller hub. Press spinner to bottom on propeller hub, while also setting 9 holes for screws against nuts riveted on the carrier. Thread plastic washers onto screws, apply few drops of (blue) Loctite 243 onto screw tips, and tighten the screws.

5.2 Reinstall engine cowlings according to respective A/C operating manual.

5.3 Turn the engine by hand with ignition switched off. If everything is OK, start the engine, let it run and check that installation of propeller spinner and engine cowlings is OK. Check that blade angle adjustment works normally; blade movement must be smooth. If movement is jerky, propeller must be repaired by manufacturer or authorized service facility.

5.4 Record performed inspection into propeller log. Record any faults discovered, including the method of correction, as well as the date/place of inspection, and who has performed it.