



LAMINAR AEROTEC



BWS FLEXIWIPER Manual



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1 FOREWORD

Dear customer

we are pleased that you have chosen the original BWS Flexiwipers.

Our products are quality products and completely manufactured in the European Union.

Workmanship of lasting value and the use of high-quality materials ensure reliable operation for many years.

We recommend to use only BWS electric winches or BWS crank handles from Laminar Aerotec. These systems are matched to the BWS Flexiwipers and only in this way an adequate cleaning result can be guaranteed.

We wish you wonderful flights and better gliding with our BWS Flexiwipers!

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2 SAFETY

2.1 SYMBOLS OF THIS MANUAL



Attention:

Warns of property damage and indicates possible application errors and circumstances that could, for example, cause functional restrictions or malfunctions during operation.



Note:

Marks Additional Notes

2.2 APPROPRIATE USE

BWS flexiwipers may only operate together with an electric winch or hand cranks (we recommend the BWS drives or hand cranks from Laminar Aerotec; www.laminar-aerotec.com).

The bug wiper "Laminar BWS" is a device for gliders with composite wings, that enables the pilot to remove mosquitoes, insects and other small dirt, which attach themselves to the wings in flight, during the flight.



Pay particular attention to flying activity in your area while cleaning; do not be distracted from safe flying. Use the Laminar BWS bug wiper in flight at your own risk.

Use the Laminar BWS bug wiper only in straight flight. Flying speed approx. 120 km/h. When cleaning, do not fly below the minimum flying speed (smearing, stall, etc.). Always watch your speed.

Do not perform the cleaning procedure during a difficult flight phase (such as take-off, landing, aerobatics, slope flying, traffic pattern, etc.), over populated or developed areas and over crowds of people.

A damaged BWS Flexiwiper is not allowed to be used any more. We guarantee perfect function when used as specified in these instructions; conversions or modifications will invalidate the warranty.

Any other use or use going beyond this is not considered as intended use.



2.3 SAFETY INSTRUCTIONS



The installation is self-installation and is at your own risk. We accept no responsibility for secondary damage in the case of incorrect installation or operation of the BWS Flexiwiper.

The person who installs the BWS Flexiputzer is responsible for installation being carried out in accordance with the respective nationally effective official regulations.

Careful studying of the operating and installation instructions is required.

Familiarise yourself with the cleaning method.

Check the retrieval rope and cleaning thread before each flight. Unwind the retrieval rope in its entire length and check it for damage. If damage is found (partially cracked or similar), the rope must be replaced.



3 GUARANTEE AND LIABILITY REGULATIONS

We provide a 24-month guarantee for all components supplied by us from the date of delivery.

Excluded from the guarantee are components subject to wear and tear, careless handling, incorrect self-installation, incorrect operation as well as damage caused externally, by lightning, force majors etc..

The manufacturer is not liable for consequential damage of any kind caused by improper operation or by use of our products for other purposes. At the same time, any claim for compensation within the meaning of the Product Liability Act in the event of injury to uninvolved persons or damage to their property shall lapse. Furthermore, any claims for damages, in particular financial losses between the manufacturer and other companies, are excluded.

It is the responsibility of those who install the system or have it installed to ensure that it is approved by the responsible authority. The manufacturer accepts no liability for installations that have not been approved.

The operating and installation manual has been prepared with great care. However, no guarantee can be given that they are error-free.



4 SYSTEM OVERVIEW BWS FLEXIWIPER

The BWS Flexiwiper with its patented joint system is made of fibre-reinforced, UV-resistant plastic. The joint system means that the BWS Flexiwiper can be adjusted to almost any profile and automatically adapts to the respective profile from the wing root to the wing tip of the aircraft type during the cleaning process.

The special tensioning of the cleaning thread promises a very good cleaning result with smooth running of the BWS Flexiwiper.

We offer the BWS Flexiwipers for upper or lower rope attachment. Depending on the aircraft type the corresponding variant must be selected (for examples see chapter 10).



PICTURE 1: BWS FLEXIWIPER



PICTURE 2: DETAILS BWS FLEXIWIPER



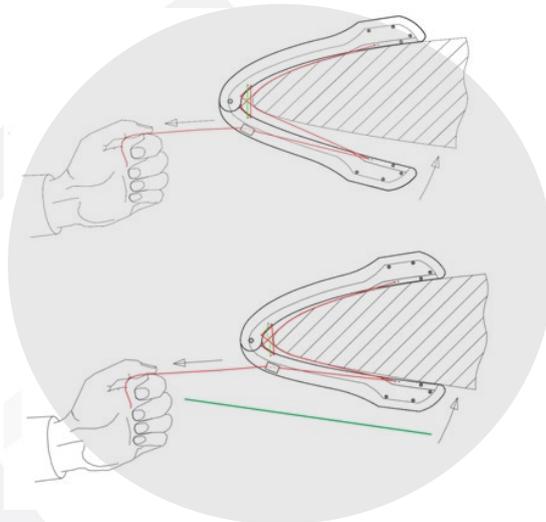
5 ADAPTING THE BWS FLEXIWIPER



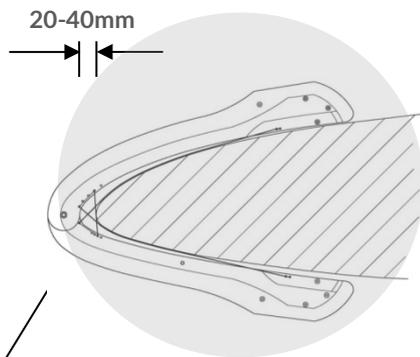
The cleaning thread is not adapted to the profile at the time of delivery.

To adjust the cleaning wire, carry out the following steps; this is done best when the aircraft is assembled:

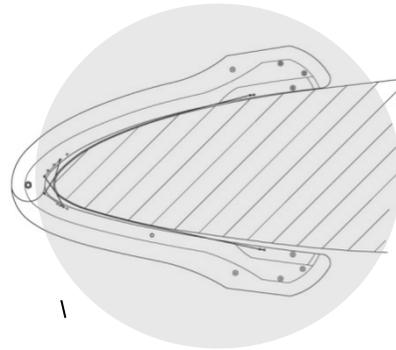
- Leave the BWS Flexiwiper closed, do not remove the cable tie/binding wire yet.
- Place at the fuselage-wing junction when folded. (see figure 5)
 - o The BWS Flexiwiper should fit tightly above and below the wing.
 - o The vertical part of the cleaning thread should not or only slightly touch the leading edge of the wing.
- The end of the cleaning thread is fixed with tape, do not remove this tape yet.
- Pull on the cleaning thread (see picture 3) until the lower part of the BWS Flexiputzer lies against the underside of the sash (jumping jack effect, contrary to the illustration, the thread can also be loose at the top). Pretension the cleaning thread slightly.
- Remove the cable tie/binding wire so that the BWS Flexiwiper opens.
- Remove the BWS Flexiwiper from the wing-fuselage junction and, when open, press it by hand against the wing tip on the outer wing.
- The cleaning thread should be short enough so that the BWS Flexiwiper rides on the cleaning threads and not on the frame. Otherwise the BWS Flexiwiper cannot clean (see picture 4).
- Then fix the end of the cleaning thread to the BWS Flexiwiper and knot it four times (see figure 6).



PICTURE 3: PULL THE CLEANING THREAD UNTIL THE LOWER PART OF THE BWS FLEXIWIPER IS IN CONTACT WITH THE UNDERSIDE OF THE WING (THE FREE END OF THE CLEANING THREAD CAN ALSO BE AT THE TOP)



PICTURE 5: BWS FLEXIWIPER FOLDED IN RESTING POSITION ON THE FUSELAGE



PICTURE 4: BWS FLEXIWIPER IN OPEN STATE DURING THE CLEANING PROCESS



PICTURE 6: KNOT THE CLEANING THREAD TIGHTLY (4 TIME; TOP OR BOTTOM POSSIBLE)



6 RETRIEVAL ROPE



We recommend replacing the retrieval rope every one to two years to prevent loss of the bug wiper!



We recommend a Dyneema rope with a breaking strength of 47kp as a retrieval rope. All Laminar BWS bug wipers are equipped with this Dyneema rope. Replacement ropes can be ordered at www.laminar-aerotec.com.



Check that the retrieval rope is not too long, otherwise the BWS flexiwiper may extend beyond the wing tip in flight and be lost.

6.1 DETERMINING THE POSITION FOR DRILLING ON THE BWS FLEXIWIPERS

The tables in chapter 9 show recommended values for the holes and position of the tilt bracket.



If there are no cable grommets in the fuselage, make them according to the installation instructions of the bug wiper system, recommended: Laminar BWS bug wiper systems.

Check that the BWS flexi wiper is correctly positioned at the wing-fuselage junction as described in chapter 5. With the BWS Flexiwiper in place, transfer the hole from the board wall grommet to the nearest hole of the stabilising bracket (narrow) of the BWS Flexiwiper.

6.2 DRILLING FOR THE RETRIEVAL ROPE ON THE BWS FLEXIWIPER

- Fold up the BWS Flexiputzer and drill through both brackets at the same time, hole diameter 2.5mm (the 2,5mm drill is included).
- Deburr the drilled hole on both sides.



6.3 ADJUSTING THE TILT BRACKET

The tilt bracket causes the BWS Flexiwiper to be applied to the fuselage in the park position (not necessary for all aircraft types).

Depending on whether the cleaning wing is hinged at the bottom or at the top, the tilt bracket is also attached at the bottom or at the top.

- The centre hole of the tilt bracket corresponds to the hole for the return cable.
- Screw the tilt bracket to the stabilisation bracket (narrow) with the two mounting screws supplied.
- See Picture 7.

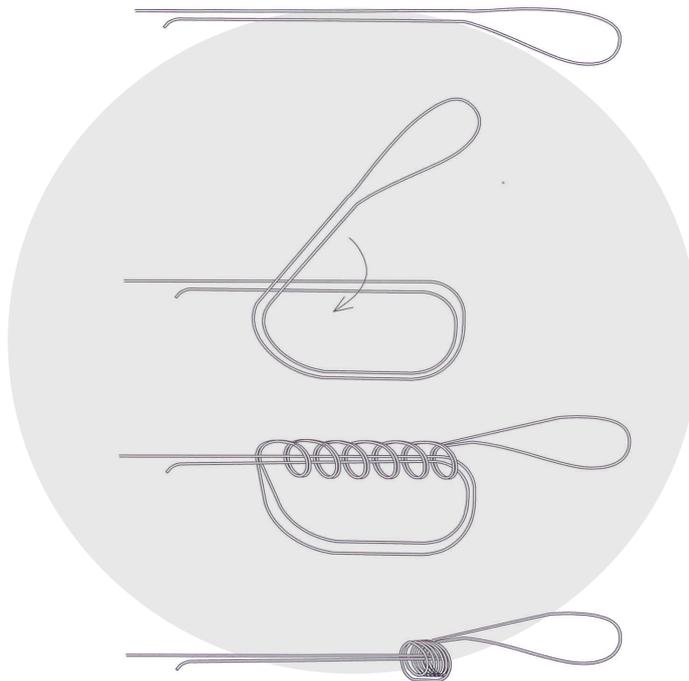


PICTURE 7: TILT BRACKET, MOUNTED



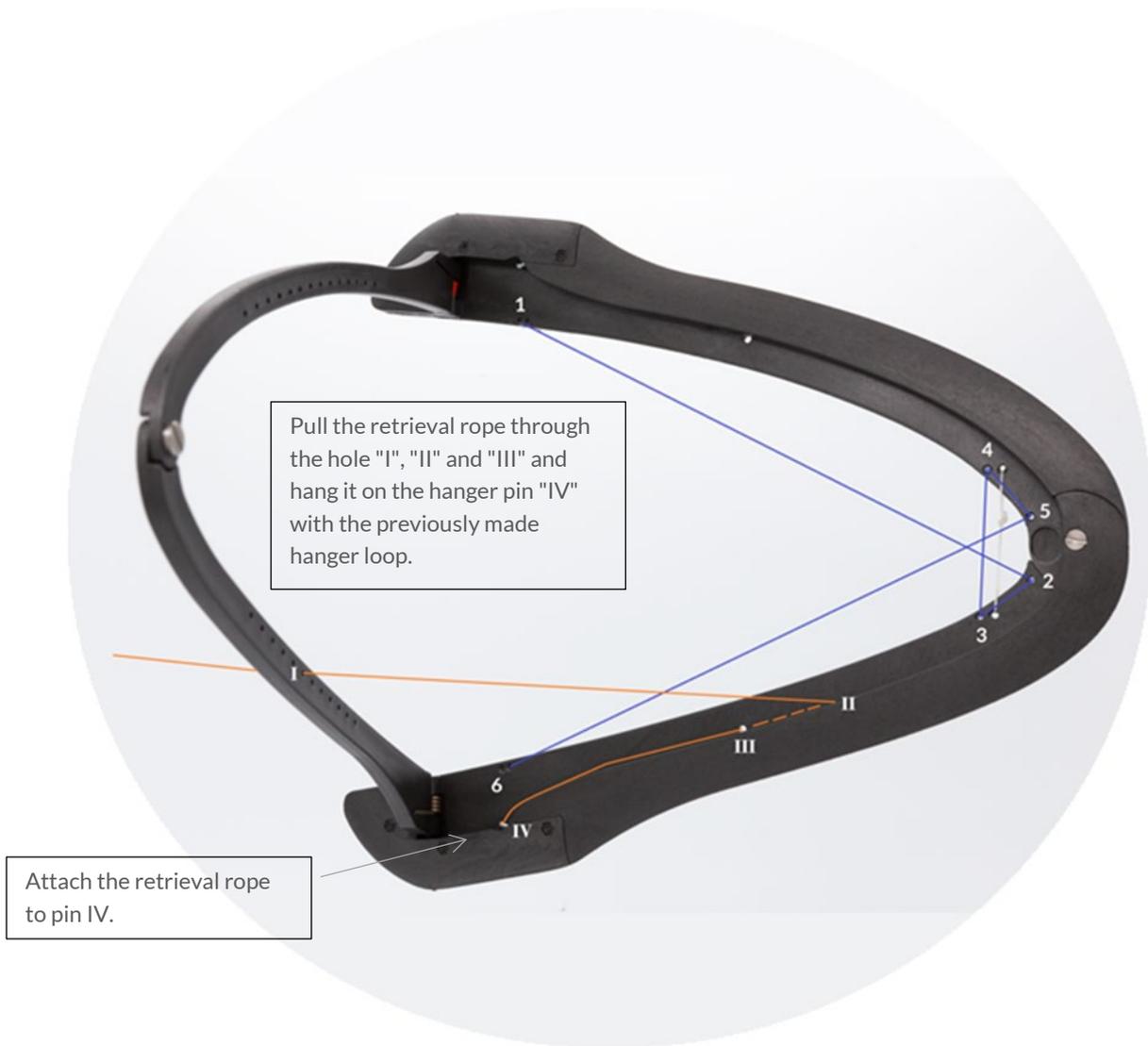
6.4 ATTACHING THE RETRIEVAL ROPE TO THE BWS FLEXIWIPER

Attach the retrieval rope with the loop (loop see figure 8). With this loop, the retrieval rope can be connected to the BWS Flexiwiper without tools and can also be detached or hooked in again, e.g. rigging or derigging the glider



PICTURE 8: ROPE LOOP FOR THE RETRIEVAL ROPE TO HANG ON THE BWS FLEXIWIPER

- Through the hole "I" in the stabilisation bracket as shown in the following picture.
- Pull the retrieval rope through the opposite, corresponding hole "II" in the drive bracket (wide bracket).
- Then pass it through the adjacent hole "III".
- Finally hook the 2 loop into the hook "IV" and retighten.



PICTURE 9: HOOKING IN THE RETURN ROPE



7 RENEWING THE CLEANING THREAD

We recommend a nylon cord with 6-7 kg tear strength

- Tie the cleaning thread in the hole at position (1) four times, then thread it into the holes (2), (3), (4), (5) and (6).
- Thread back again in the opposite direction into the holes from position (6), (5), (4), (3), (2) to (1). Now knot the cleaning thread four times at hole (1). Before knotting, however, tighten the cleaning thread and pull the BWS Flexiwiper together until it lies against the root profile above and below the wing. See also chapter 5.





8 SAFETY SLING



ABBILDUNG 10: SAFTEY SLING

The safety sling prevents the BWS Flexiwiper from opening and jumping over if the cleaning thread should break. If (on older models) the hole for the safety sling does not yet exist, it can simply be drilled with a small drill (~2mm). See picture for position. Pass a Dyneema rope through the holes and knot it (see picture). Knot the Dyneema rope at least 2 times and secure the knot with superglue.



9 LIST OF MEASUREMENTS FOR DRILLING AND TILT ANGLES

The tables are only recommended values.



When installing a cleaning system, make sure that there are no obstacles inside the fuselage (cables, pipes, controls, etc.).

9.1 BOTTOM HINGED BWS FLEXIWIPERS

List of holes in fuselage			Holes in the BWS FLEXIWIPER
Sailplane	A	B	for the retrieval rope and tilt angle
[-]	[mm]	[mm]	[-]
Arcus	-	255	approx. 6th hole from front bottom, tilt angle not required
ASW 15	70	-	approx. 10 hole from the front below
Cirrus	70	-	approx. 7 hole from the front below
DG100			Adjust according to the manual
DG200			Adjust according to the manual
DG300	50	-	approx. 5 hole from the front below
DG400	50	-	approx. 5 hole from the front below
DG600	50	-	approx. 5 hole from the front below
DG80x	50	-	approx. 5 hole from the front below
DG1000	80	-	approx. 9 hole from the front below
Discus a/b/CS	70	-	approx. 7 hole from the front below
Discus 2a/b/c	70	-	approx. 7 hole from the front below
Duo-Discus	70	-	approx. 7 hole from the front below
Duo-Discus X/XL	70	-	approx. 7 hole from the front below
Jantar	60-80	-	approx. 7 hole from the front below
Janus b/c	70	-	approx. 7 hole from the front below
Libelle H201	60-80	-	Adjust according to the manual
Libelle H301	60-80	-	Adjust according to the manual
LS1	50	-	approx. 5 hole from the front below
LS3	50	-	approx. 5 hole from the front below
LS4	65	-	approx. 7 hole from the front below
LS6	65	-	approx. 7 hole from the front below
LS7	65	-	approx. 7 hole from the front below
LS8	65	-	approx. 7 hole from the front below
Nimbus3	105	170	approx. 12 hole from the front below
Nimbus4	70	-	Adjust according to the manual
Pik20 b/d	60-80	-	Adjust according to the manual
Ventus a/b/c	70	-	approx. 7th hole from front bottom, tilt angle not required
Ventus2 a/b/c/cx	70	-	approx. 7th hole from front bottom, tilt angle not required



RECOMMENDED HOLE IN THE FUSELAGE	RECOMMENDED HOLE IN FLEXIWIPER
Position for the hole of the outlet tube in the fuselage.	Attaching the tilt angle and the hole on the BWS-FLEXIWIPER for the retrieval rope. See picture as an example: e.g. here 5 th hole (counted from the front).



Hole in FLEXIWIPER



9.2 TOP HINGED BWS FLEXIWIPERS

List of holes in fuselage			Holes in the BWS FLEXIWIPER
Sailplane	A	B	for the retrieval rope and tilt angle
[-]	[mm]	[mm]	[-]
Antares 18/20/23	65	-	Adjust according to the manual
ASW 19	-	180	approx. 12th hole from the top front
ASW 20	85	-	approx. 12th hole from the top front
ASW 22	85	-	approx. 12th hole from the top front
ASW 24	60	-	approx. 7th hole from the top front
ASH 25	65	-	approx. 12th hole from the top front
ASH 26E	65	-	approx. 8th hole from the top front
ASW 27	110	-	approx. 14th hole from the top front
ASW 28	60	-	approx. 7th hole from the top front
ASG 29	90 (oder 35)	-	8 approx. 14th hole from the top front
ASH 31	55	-	approx. 7th hole from the top front
EB 28	85	-	Adjust according to the manual
EB 29	85	-	Adjust according to the manual

RECOMMENDED HOLE IN THE FUSELAGE	RECOMMENDED HOLE IN FLEXIWIPER
Position for the hole of the outlet tube in the fuselage.	Attaching the tilt angle and the hole on the BWS-FLEXIWIPER for the retrieval rope. See picture as an example: e.g. here 5 th hole at the bottom (counted from the front)

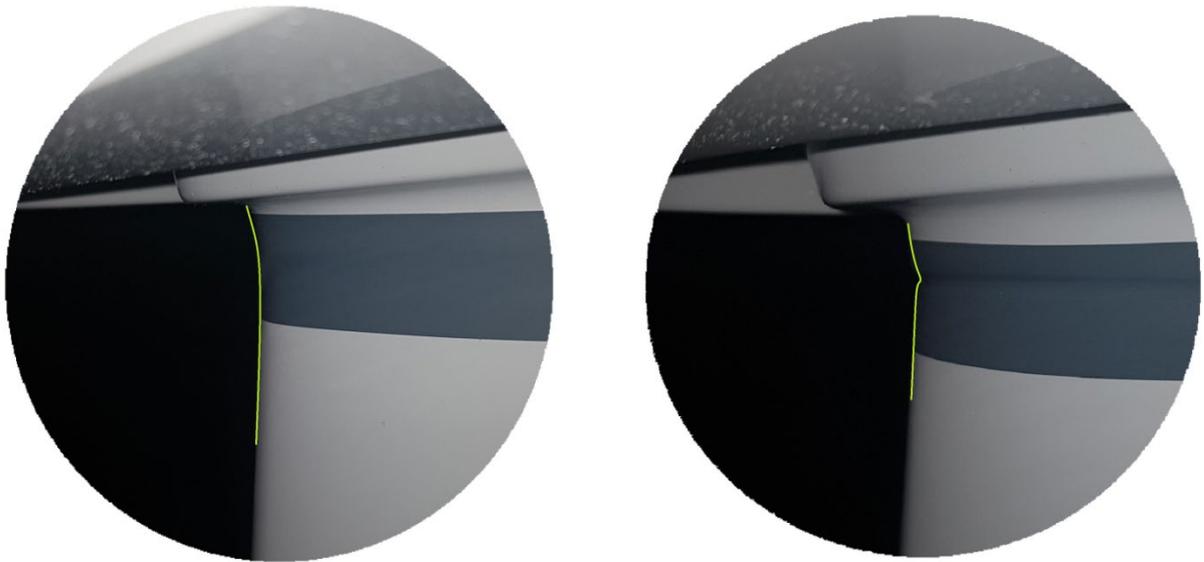


Hole in the FELXIWIPIER (in the picture the the hole and tilt angle is attached at the bottom)



10 TAPING THE WING-FUSELAGE JUNCTION – OUTERWING SEPARATION

Make sure that the gap is taped very well and, if possible, that there is no fold in which the cleaning thread can get caught. We recommend using an underlay (e.g. film strip, stiffer foil, etc.).



PICTURE 11: EXAMPLE OF WELL TAPED WING-FUSELAGE JUNCTION (LEFT) AND POORLY TAPED WING-FUSELAGE JUNCTION (RIGHT)

11 MAINTENANCE



We recommend changing the retrieval rope every one to two years to prevent the loss of the BWS Flexiwiper.

The BWS-Flexiwiper itself is maintenance-free.

If spare parts are needed, they can be ordered at <https://laminar-aerotec.com/en/accessories/>



12 SOME HINTS

If the cleaning process does not work as hoped, check the following points:

- When changing the Dyneema rope: always use the suggested rope knot (see figure 8). Other knots can cause the rope to break!
- The rope guides for the retrieval rope should be as short and as straight as possible, otherwise they can create excessive resistance and cause unsteady running.
- Do not fly too slowly. The BWS Flexiwiper needs a certain amount of airflow to run steadily. Never cause a stall during the cleaning process! The BWS Flexiwiper can then fall off the wing!
- Be careful even in turbulence. It is essential to avoid abrupt control movements during the cleaning process of the aileron and rudder! A deflected rudder can accelerate or decelerate the BWS Flexiwiper, depending on whether the aircraft is pushing outwards or inwards.
- Check that the unwound retrieval rope is not too long, otherwise the BWS flexiwiper will extend beyond the wing tip in flight and thus be lost.
- Check that there are no other obstacles on which the retrieval rope can get caught (e.g. poorly bonded zick-zack-tape, wing skid or wing tip wheel, suction pipe for the exhaust, etc. see e.g. picture 11).
- If the BWS flexiwiper does not move out when starting the cleaning process, check that the BWS flexiwiper does not get caught in the gap between the fuselage and the wing: Cover the gap with a thin plastic strip before taping.
- If the retrieval rope is attached to the BWS flexi wiper above the wing: When the BWS flexi-wiper is folded up on the fuselage, the lower brackets of the BWS flexi-wiper - due to the front joint - can sometimes hang down too much. In this case, if not already in place, attach a safety loop of Dyneema rope in such a way that the opening angle is limited accordingly. See chapter 9.



PICTURE 12: RETRIEVAL ROPE CAUGHT ON HITCHING SCOOP