Vortex Generator Installation Addendum

1 Introduction

The Zlin Aviation, s.r.o. Vortex Generator Kit, when installed in accordance with these instructions and other applicable data, results in better handling, a lower stall speed, and more controllable flare during landing. It is important to follow the directions carefully and ensure all measurements are accurate before finally affixing the Vortex Generators. **Failure to install the Vortex Generators within the specifications of this Addendum may result in extreme and unpredictable changes in flight characteristics.**

2 Level of Certification Required

This modification requires either LSA Repairman Maintenance certification or an A&P certification. This maintenance is considered Line Maintenance.

3 Parts Listing and Tools Required

3.1 Parts Included with Vortex Generator Kit

Description	Qty
Zlin Aviation Vortex Generators	46
Epoxy Glue	1

3.2 Parts Not Included with Vortex Generator Kit

None.

3.3 Tools Required

- Tape Measure
- Masking Tape
- Dry Erase Marker
- Rubbing Alcohol

4 Mapping Vortex Generator Locations along the Wings

Along the curve from the front edge of the wing heading towards the tail on the upward facing side of the wing, measure out 6 1/8" (15.5cm), and draw a straight line along the long edge of the wing. Starting 5 ¼" (13.33cm) from the first rib of the wing, measure out marks, each 8 ¾" apart. There should be a total of 16 marks along each wing. The inside edge of the vortex generator, with the narrow front edge of the generator tight to the horizontal line, should then be affixed to wing at each of those marked points using the supplied Epoxy Glue. Be sure to clean the area with rubbing alcohol to increase adhesion. Use masking tape to securely hold down the generators until the glue dries. The flare of the vortex generator must open to the tail end. See Figure 1.

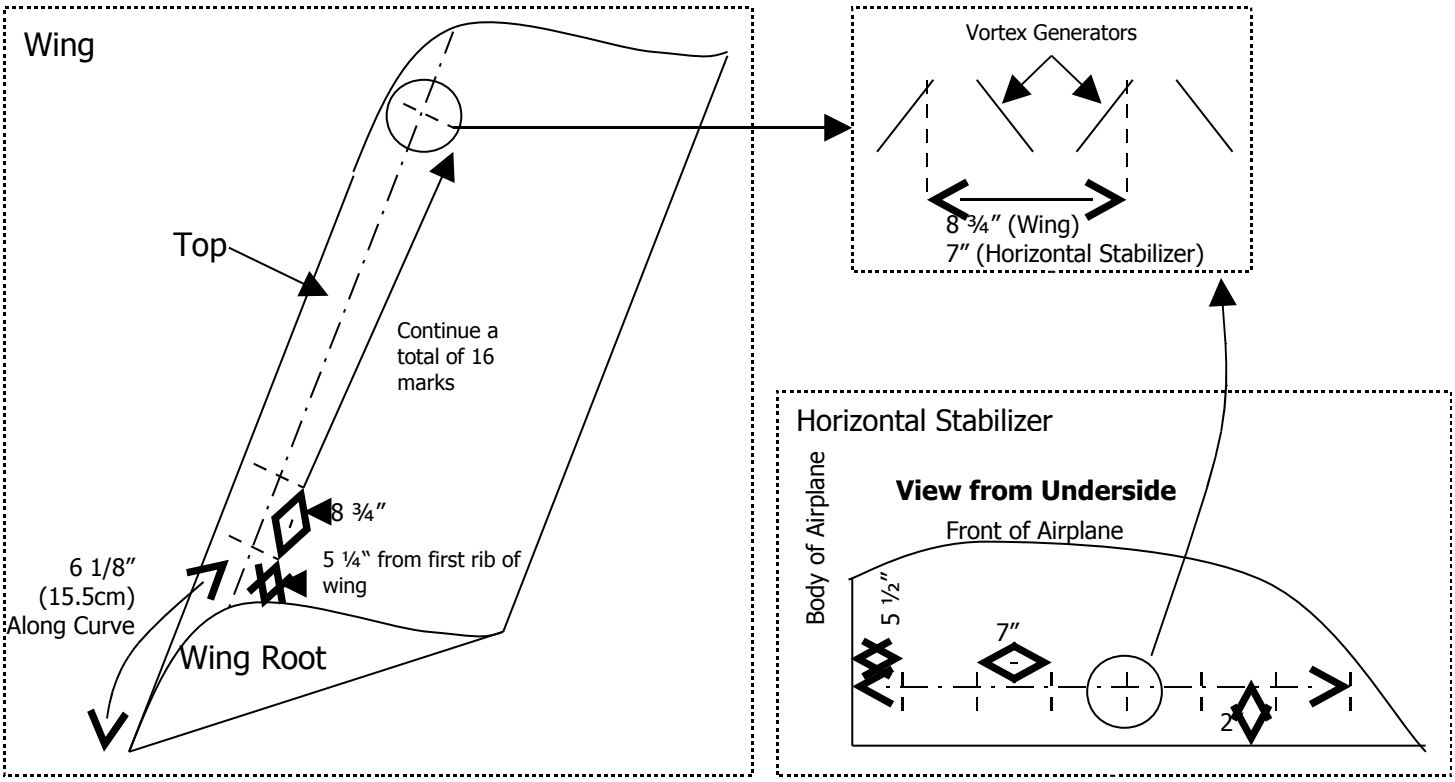

Figure 1: Vortex Installation Diagram

5 Mapping Vortex Generator Locations along the Horizontal Stabilizer

Measure out 2" (5cm) from the tail end of the Horizontal Stabilizer along the bottom face and draw a straight line along the long edge. Starting 5 ½" (10cm) from where the horizontal stabilizer meets the tail of the airplane, measure out marks, each 7" apart. There should be a total of 7 marks along each horizontal stabilizer. The inside edge of each vortex generator should then be aligned to each mark, the flared edge of the vortex generator tight to the straight line, affixed to the stabilizer using the supplied Epoxy Glue. Be sure to clean the area using rubbing alcohol to increase adhesion. Use masking tape to secure the vortex generators until the glue dries. The flare of the vortex generator must open to the tail end.

6 Items for Continued Airworthiness

During every pre-flight inspection, ensure that the vortex generators are still securely affixed to the wings. Check for damaged generators, cracks, or missing fins. Replace damaged or destroyed generators as necessary.

Perform the same check as a necessary part of every 100-hour inspection.

7 Changes in Flight Characteristics

7.1 Zlin Aviation, s.r.o. Test Flight Results

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Date: 30 October 2005
Locality: Holesov Airport

Savage - vortex test flight -

At the beginning we have tested the Savage only with the vortex fitted on the wings, and only later we added them also on the stabilizers to feel the differences.

I° test :
Weight : take off at 450 Kg (european rules for Ultralights)

We had a standard ASI installed with an average error of about 5% respect to Gps (also installed).
Below the IAS of 80 Km/h the speed decrease more rapidaly than in reality (expecially due to the angle of attack), so for example an IAS of 60 km/h is less than in reality.
The first sensaction that we felt during low speed test is that the airplane remains coupled to the air.
As the airspeed was decreasing, the pitch was increasing above the usual but with as total control of roll and pitch controls.
The test,looking for a full first stall was continuing with more increasing attitude over the horizont and it happeared really unnutural due to the big angle of attack, and with an IAS that was decreasing under 30 Km/h and was going near the zero.
Pratically with zero flap,no engine power (first test of stall with vortex installed) during the approach to the stall we were flying in a similar condition (attitude) like a Savage with no vortex , with full flap, and almost the maximum power , is able to perform.
The stall (Gps airspeed <60 Km/h) was more sharp than the usual , without notice of buffetting.
The autorithy of the controls on the pitch incresed when we installed the vortex also under the stabilizer.
The rudder efficiency is the same like the Savage with no vortex installed.
The stall with full flaps , no engine power (second test of stall with vortex installed) was like the stall without flaps (previous test) and without notice of buffetting.We noticed some minor possibilty of wing drop, but still well controllable.
The stall arrives at very high attitude and at very low speed.
The major part of the stall, happened after long time that the IAS was near to zero indicated.
The speeds that we registered were only with Gps and with an average of 53 Km/h with full flap at 450kg
The IAS, as told was zero on the instrument.
With the help of the engine we registered indicated air speed of less than 48 Km/h (Zero wind) before to stall. Really close to 42-45 km-h. But this is only an internal test for our company and this tecnique will not be mentioned into the flight manual.
Also the manouvering capacity of the plane is superior with the vortex installed.
The roll control is always under control and uniform.
During high step turn, also at 80 Km/h you feel like if you can pull back the stich a lot without to have an easy G – stall. Really difficult to obtain a G-stall in this configuration.
We registered a good 36°/sec of rate of turn (that means 360° of turn in 10 sec).
The cruise speed will not decrease with the vortex installed.

We tested the same plane with a MTOW of 560 kg.

Here the final reports:

The stall speed (no engine power applied) full flaps decreases of about 5 Km/h with a Mtow of 560 kg (full flap and vortex installed) .The plane stalls at an IAS of about 56km-h (35 mph).
The stall speed with no flaps and in the same configuration decreases of about 4 km-h with an IAS of 65km-h (40,5 mph).
The cruise speed has not changes.
The controls on different axis are better than without vortex installed and have not contra-indications.
The stall due to higher nose attitude is sharper and we reccomended to pay attention to stalls at very low altitude above ground.
The recovering tecnique of the stall is the same like the Savage without vortex installed.
We recommend to use full power and to reduce immediately the high nose attitude to recover from the stall.
During the stall has to paid attention to the possibility to have an asymmetric stall.
The flare with no engine is easier with the vortex installed due to a better control on the pitch axle.

TEST PILOT: Date: 30 October 2005

Ivo Cervinka

Signature

ZKUŠEBNÍ PILOT LAA ČR č. 27 JJA-

8 Revisions to Flight Manual

Upon installation, the Flight Manual will be revised to include the following changes:

1. Section 9.3.1 Pre-Flight Checklist
   - Tables 5 Left Wing and 7 Right Wing will have one row added to each that states: " Ensure that the vortex generators are still securely affixed to the wings and horizontal stabilizer."
2. Addition of Annex 1: Vortex Generator Statement
   At the end of the manual, an Annex will be added, titled "Vortex Generator Statement." This Annex will read: "With the installation of Vortex Generators, expect the following changes to the aircraft's flight characteristics:
   - The stall speed decreases about 3 mph (2.5 kts) with an MTOW of 1235 lbs.
   - The stall speed with no flaps and in the same configuration decreases about 2.5 mph (2 kts) with an IAS of 40.5 mph (35 kts).
   - The cruise speed does not change.
   - The controls on the different axes are better than without Vortex Generators installed and have no contra-indications.
   - The stall due to higher nose attitude is sharper and it is recommended that care be taken with stalls at a low altitude above the ground.
   - There is no change to the stall recovery method with Vortex Generators installed.
   - Section 4.3.1 Specification Table
     The table will have an annotation added to it, indicating that for aircraft equipped with Vortex Generators, to refer to Annex 1.
3. Section 6.4 Equipment List
   The list will include the following information:
   - Description: Vortex Generators
   - Manufacturer: Zlin Aviation, s.r.o.
   - Model: VORTEX

The manual will be given a proper remark in Section 2, Amendment Record Sheet.

9 Revisions to Maintenance Manual

Upon installation, the Maintenance Manual will be revised to include the following changes:

1. Section 11.4.2 Fuselage
   The section will include an additional paragraph stating: "Ensure that the vortex generators are still securely affixed to the wings and horizontal stabilizer. Check for damaged generators, cracks, or missing fins. Replace damaged or destroyed generators as necessary."

The manual will be given a proper remark in Section 2, Amendment Record Sheet.

10 Additional Reference Photos

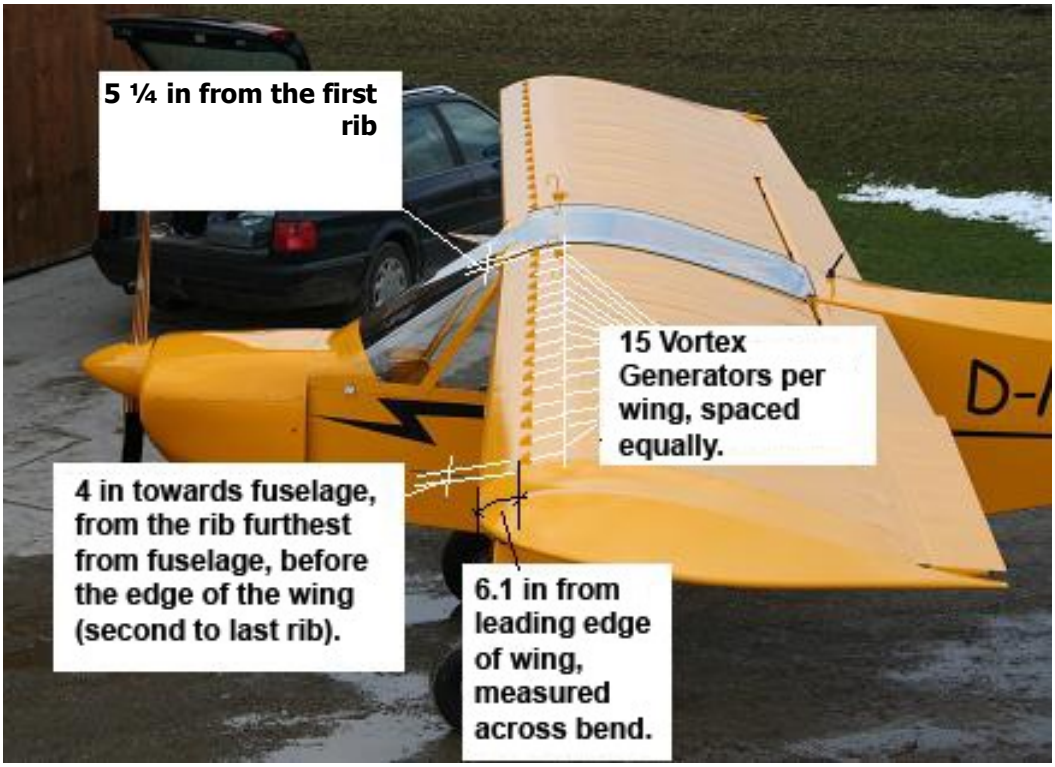

Figure 2: Vortex Installation On Wings

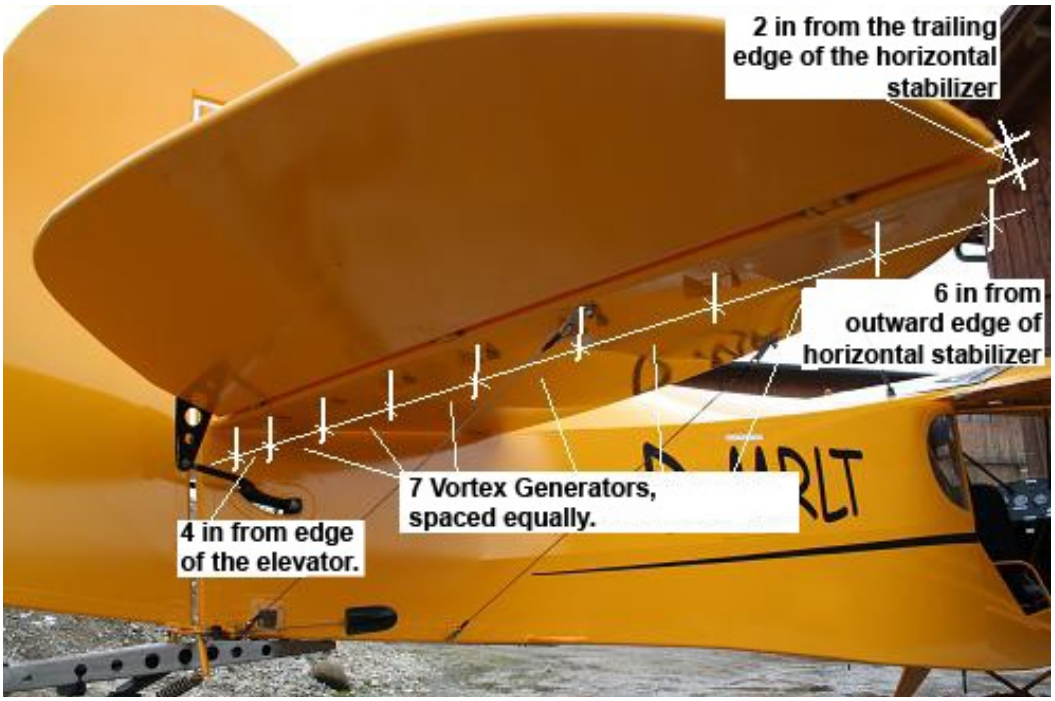

Figure 3: Vortex Installation On Horizontal Stabalizer