

ADDENDUM 261-RV1

GENERAL INSTRUCTIONS FOR ADDING VORTEX GENERATORS TO RV-3, -4, -6/6A, -7/7A, -8/8A AIRCRAFT

1.0 GENERAL

1.1 These instructions are for adding vortex generators to specific RV model aircraft to reduce the stall speed. These instructions will also give information on other areas of the aircraft that may benefit from the use of vortex generators. This kit contains Installation Procedure-Vortex Generator kit No. 261-2, addendum 261-RV1, 65 vortex generators No. 261-1, and a 3M very high strength pressure sensitive adhesive tape.

2.0 DETERMINING LOCATION OF VORTEX GENERATORS ON WING

2.1 Measure along the wing contour from the trailing edge of the wing 50.8 inches for the RV-3 aircraft or 54.50 inches for the RV-4, -6/6A, -7/7A, -8/8A aircraft as shown in figure 1. That will give you the distance along the contour of the upper surface of the wing to the leading edge of the vortex generator's position from the trailing edge of the wing. Mark that location at the wing root and near the wing tip with a felt tip pen (Sharpie extra fine point) lets call those two points A. Measure back from those locations 2.5" and mark a new positions at the wing root and near the wing tip with a felt tip pen lets call those two points B. Apply masking tape from the wing root point B to near the wing tip point B in a straight line and with the upstream edge of the masking tape adjacent to the two point B points. This masking tape will be used as a straight edge guide. See figure 2 on page 2.

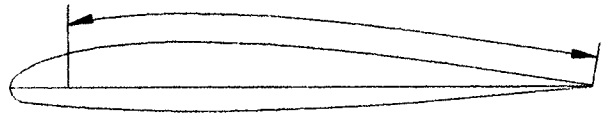


FIG. 1

2.2 Take template 1 on the template page at the back of this installation procedure and past it to a sheet of aluminum flashing, thin wood veneer, balsa wood, or .030" thick sheet plastic. Make a hard copy template by cutting along the lines of the paper template.

2.3 Pick up the vortex generators by the sail so as not to contaminate the bottom of the vortex generators with body oils as this will weaken the strength of the bond. Place the bottom of the vortex generator onto the 3M special adhesive tape so that the bottom of the vortex generator is entirely covered by the special adhesive tape. Place the vortex generators side by side with a small space between them. With a sharp knife cut the tape using the side of the vortex generator's base as a straight edge. This will leave the bottom of the vortex generator completely covered

with the special adhesive tape and its backing liner paper. Press the tape to the bottom of the vortex generators to eliminate any air bubbles. If necessary pin prick any air bubbles that may not be removed by just pressing the tape to the bottom of the vortex generator. When working with this special adhesive tape the temperature must be 65° F or higher and it takes 24 hours to come to full strength.

- 2.4 Tape the template adjacent to the masking tape and at the wing root as shown in figure 2. Stick the vortex generators to the wing by removing the backing liner paper and placing them in the five template notches making sure that the vortex generators are correctly facing forward as shown in figure 3. Move the template over so that the first template notch lines up with the last vortex generator attached to the wing. Attach four more vortex generators to the wing. Continue repeating this operation until all the vortex generators are placed on the wing panel. Then repeat this procedure for the other wing panel. Remove the masking tape when completed.

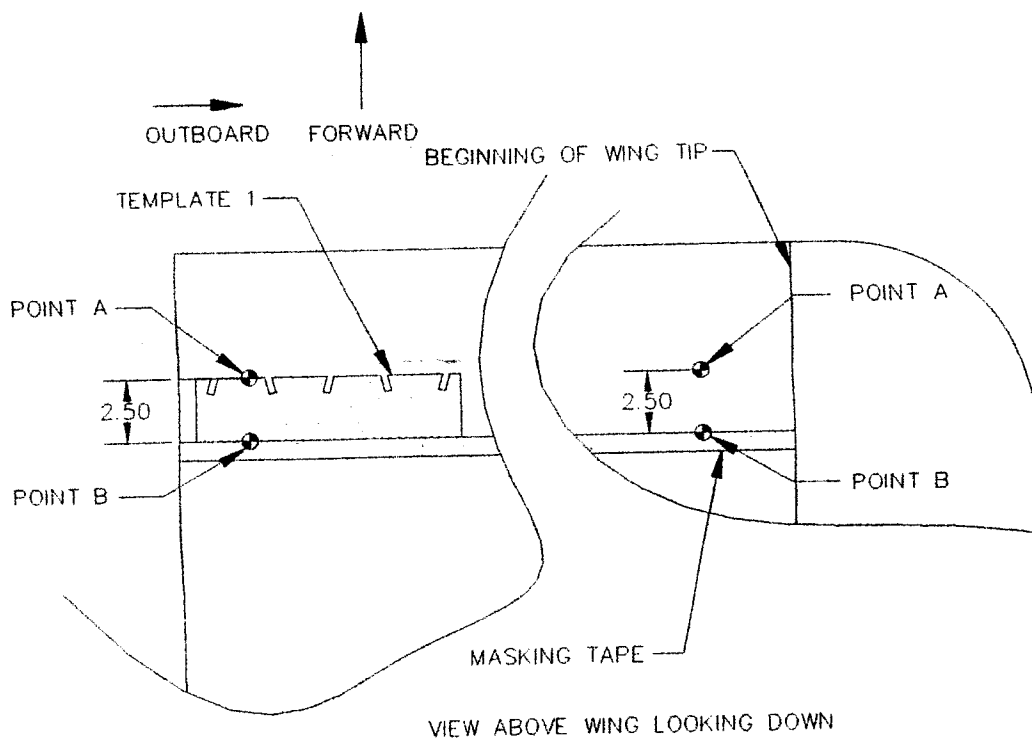


FIG. 2

3.0 FURTHER ENHANCEMENTS

- 3.1 This completes the STOL kit modification to your aircraft in the most economical manner. It is possible to further enhance the slow speed handling qualities of your aircraft with the addition of more vortex generators. The remainder of this document shows how this can be accomplished should you want to pursue this approach.

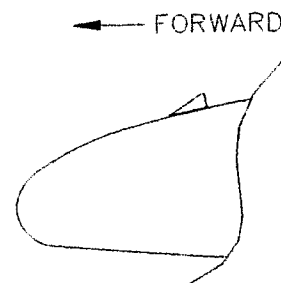


FIG. 3

4.0 DETERMINING LOCATION OF VORTEX GENERATORS ON HORIZONTAL TAIL

4.1 Now that the wing has vortex generators installed the wing can fly at a higher angle of attack before it stalls. Generally the elevators are designed to allow the wing to obtain an angle of attack that just gets the wing to the stall angle of attack with a little bit of spare power. However, the elevators will now have to get the wing to a higher angle of attack. Adding vortex generators to the bottom of the horizontal stabilizer will further enhance the elevator power.

4.2 The method of determining the location of the vortex generators on the bottom of the horizontal stabilizer is very similar to that used on the wing. Measure 2.6" forward of the trailing edge of the horizontal stabilizer. If there is a rivet line near the trailing edge of the horizontal stabilizer measure 2.6" ahead of the rivet line, this will ensure that the vortex generators will not interfere with the rivets. Mark that location at the root and at the beginning of the tip of the horizontal stabilizer with a felt tip pen. Apply masking tape from the horizontal stabilizer root to the beginning of the tip in a straight line with the downstream edge of the masking tape adjacent to the marked positions. This masking tape will be used as a straight edge guide. See figure 4.

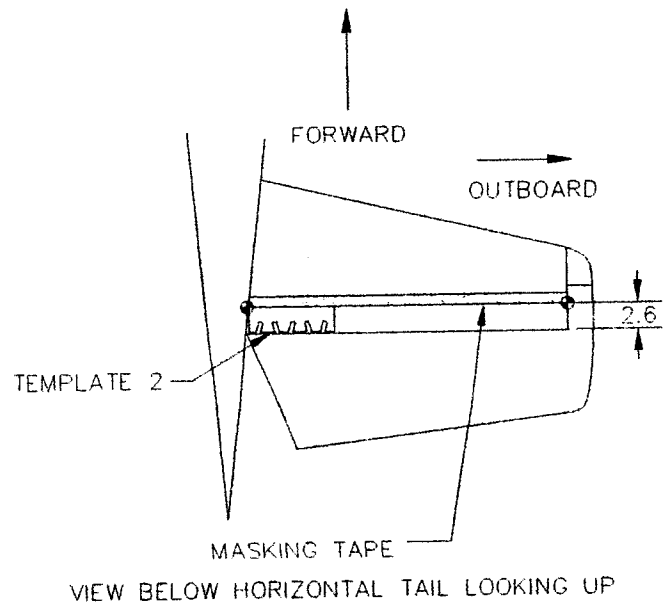


FIG. 4

4.3 Take template 2 on the template page of this installation procedure and proceed as you did in paragraph 2.2

4.4 Repeat the procedure described in paragraph 2.3.

4.5 Tape the template adjacent to the masking tape and at the horizontal stabilizer root as shown in figure 4. Stick the vortex generators to the horizontal stabilizer by removing the protective liner and placing the vortex generators in the five template notches making sure that the vortex generators are correctly facing forward as shown in figure 3. Move the template over so that the first template notch lines up with the last vortex generator attached to the horizontal stabilizer. Attach four more vortex generators to the horizontal stabilizer. Continue repeating this operation until all the vortex generators are placed on the horizontal stabilizer. Then repeat this procedure for the other horizontal stabilizer panel. Remove the masking tape when completed.

5.0 DETERMINING LOCATION OF VORTEX GENERATORS ON VERTICAL TAIL

5.1.1 With regards to the vertical stabilizer you may prefer vortex generators be placed on the vertical stabilizer, however, it is less likely than the likelihood of preferring vortex generators on the horizontal stabilizer. If during the flair out and landing at your new slower speed you prefer to

have more rudder authority then proceed to paragraph 5.2. Note: the deluxe 261-AD1 kit provides enough vortex generators for the wings and horizontal stabilizer of the average homebuilt aircraft. If the vertical stabilizer requires vortex generators they can be purchased as kit 261H a bag of 25 vortex generators. If you find that the vertical stabilizer does not require vortex generators then proceed to paragraph 6.0.

- 5.2 Measure 2.6" forward of the trailing edge of the vertical stabilizer. If there is a rivet line near the trailing edge of the vertical stabilizer measure 2.6" ahead of the rivet line, this will ensure that the vortex generators will not interfere with the rivets. Mark that location at the root and at the beginning of the tip of the vertical stabilizer with a felt tip pen. Apply masking tape from the vertical stabilizer root to the beginning of the tip in a straight line with the downstream edge of the masking tape adjacent to the marked positions. This masking tape will be used as a straight edge guide. See figure 5.
- 5.3 The placing of vortex generators on the vertical stabilizer is different than on the wings and under the horizontal tail. The average wing with common airfoils found on general aviation and homebuilt aircraft will stall at about 15° . It is common to have a wing incidence of around 1° . So that means that the fuselage is flying at an angle of about 14° during the final stages of landing. That also means that the airflow over the vertical stabilizer is approximately 14° above what the airflow would be when the aircraft is in the level position. So in normal cruise flight the rudder has sufficient authority. However, as the angle of attack of the wing increases you want to increase the rudder authority. The best way to accomplish this is to place the vortex generators in the horizontal position when the aircraft is level, and not stagger the vortex generators as was done on the wing. The vortex generators will be flying at a 0° angle of attack in cruise flight and approximately 14° angle of attack in the final stages of landing, actually slightly more than 14° angle of attack since with the vortex generators on the wing the wing is now capable of flying at a higher angle of attack before stalling.

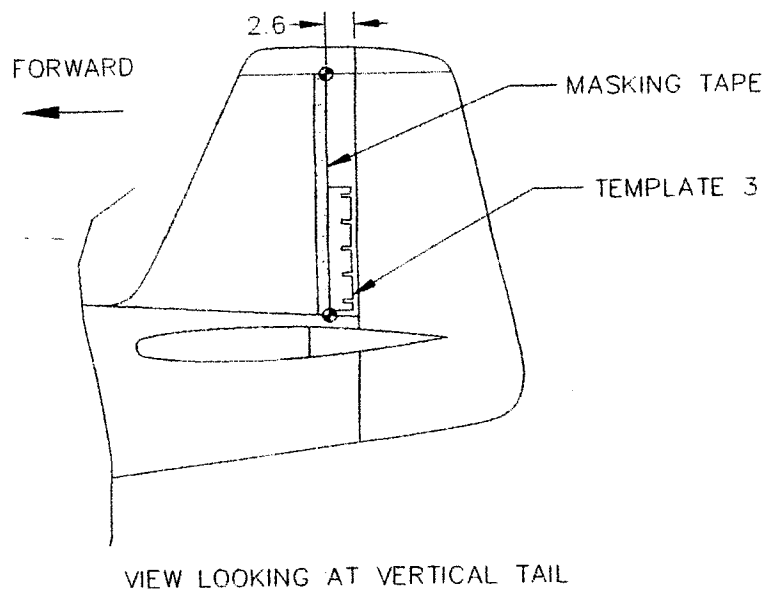


FIG. 5

- 5.4 Take template 3 on the template page of this installation procedure and proceed as you did in paragraph 2.2

- 5.5 Repeat the procedure described in paragraph 2.3.
- 5.6 Tape the template adjacent to the masking tape and at the vertical stabilizer root as shown in figure 5. Stick the vortex generators to the vertical stabilizer by removing the protective liner and placing the vortex generators in the five template notches making sure that the vortex generators are correctly facing forward as shown in figure 3. Move the template over so that the first template notch lines up with the last vortex generator attached to the vertical stabilizer. Attach four more vortex generators to the vertical stabilizer. Continue repeating this operation until all the vortex generators are all placed on the vertical stabilizer. Then repeat this procedure for the other side of the vertical stabilizer. Remove the masking tape when completed.

6.0 SAFETY CONSIDERATIONS

- 6.1 Adding vortex generators to your aircraft can significantly change the handling characteristics of your aircraft. Don't then go out and try a short field landing just after you installed the vortex generators. Go to a safe altitude and get a feel how the aircraft now stalls and how to make short field landings. See if at these slower speeds you prefer to add vortex generators to the horizontal or vertical stabilizer. Practice maneuvers at a safe altitude before trying them close to the ground. Practice practice practice before trying maneuvers close to the ground.


AIRCRAFT DEVELOPMENT
TITLE: Installation Procedure-Vortex generator kit
NO. 261-2
DATE OF ISSUE 12/30/04
REVISION

KIT SELECTED	ADDENDUM NUMBER	PURPOSE OF ADDENDUM
A	261-AD1	DELINEATES A PROCEDURE FOR DETERMINING WHERE VORTEX GENERATORS SHOULD BE PLACED ON AN AIRCRAFT TO DECREASE STALL SPEED BY EMPIRICAL DATA OR THROUGH FLOW VISUALIZATION USING SIMPLE FLIGHT TESTS. THIS KIT CONTAINS 150 VORTEX GENERATORS
A	261-AD2	DELINEATES A PROCEDURE FOR DETERMINING WHERE VORTEX GENERATORS SHOULD BE PLACED ON AN AIRCRAFT TO DECREASE STALL SPEED BY EMPIRICAL DATA OR THROUGH FLOW VISUALIZATION USING SIMPLE FLIGHT TESTS. THIS KIT CONTAINS 65 VORTEX GENERATORS
A ✓	261-RV1	INSTRUCTIONS FOR ADDING VORTEX GENERATORS TO RV-3 AIRCRAFT TO REDUCE STALL SPEED.
A	261-RV1	INSTRUCTIONS FOR ADDING VORTEX GENERATORS TO RV-4 AIRCRAFT TO REDUCE STALL SPEED.
A	261-RV1	INSTRUCTIONS FOR ADDING VORTEX GENERATORS TO RV-6/6A AIRCRAFT TO REDUCE STALL SPEED.
A	261-RV1	INSTRUCTIONS FOR ADDING VORTEX GENERATORS TO RV-7/7A AIRCRAFT TO REDUCE STALL SPEED.
A	261-RV1	INSTRUCTIONS FOR ADDING VORTEX GENERATORS TO RV-8/8A AIRCRAFT TO REDUCE STALL SPEED.

AIRCRAFT DEVELOPMENT
1220 RED OAK COURT
TROY, MO 63379

Title: Installation procedure-vortex generator kit

Page 1 of 2

Issue Date 12/30/04

Rev.

No. 261-2

1.0 PURPOSE

To explain the installation procedure for this kit in the safest, most cost and time effective manner.

2.0 SCOPE

This procedure is applicable to all kits sold by Aircraft Development with the kit numbers having the digits 261-(X...X)

3.0 GENERAL

All work must be accomplished per Aircraft Development Installation Procedure 261-2. This kit contains Installation Procedure 261-2, with an addendum for the specific model of aircraft being modified or how to generally modify aircraft with vortex generators.

4.0 GENERAL INSTALLATION PROCEDURE

4.1 It is important that the surface to which the vortex generators are going to be applied be clean and dry. This can be accomplished by cleaning with a 50:50 mixture of isopropyl alcohol and water. Where heavy oils or greases are present there may be a need to first cut the oil with a degreasing solvent, but this should always be followed with an isopropyl water cleaning to help ensure that any residue or film is cleaned off. If there is oxidation on the paint or a grimy finish to the aircraft that will not clean off easily with the 50:50 mixture, first clean the surface with a steel wool soap pads (such as Brillo) and water. Then use the 50:50 solution. One way to assess cleanliness is that a surface prepared for the vortex generators should be as clean as one being prepared for painting. Spray or wipe the 50:50 cleaning solution onto the surface and scrub with a clean lint free rag or paper towel until the surface is clean. Dry the surface with another clean lint free rag or paper towel. Be sure to change rags or towels often to avoid smearing the dirt around or contaminating already clean surfaces.

5.0 GENERAL INFORMATION ON VORTEX GENERATORS INSTALLATION

5.1 After the aircraft surface to which the vortex generators are to be applied, has been determined to be clean and dry, determine that the bonding surface of the vortex generators are clean. The vortex generator comes basically as a clean surface; however, it is a good idea to wipe the bonding surface of the vortex generator with the 50.50 solution to make sure the bonding surface is also clean. In using the 3M adhesive tape it is a good idea to apply the tape to the vortex generators and let the tape have 24 hours curing time to come to full strength.

6.0 GENERAL INSTRUCTIONS FOR INSTALLING VORTEX GENERATORS

- 6.1 This kit comes with a 3M very high strength pressure sensitive adhesive tape that is very simple and easy to use. Aircraft Development conducted testing on this adhesive tape and has determined that it is of sufficient strength to adequately support the vortex generators. Extra adhesive tape comes with this kit. Store this tape in a cool dry area as you may need it should you decide to expand this kit at a later date. For those that may have concerns about using a pressure sensitive tape for this application there are stronger adhesives available, though less user friendly. Listed below are some stronger adhesives that may be used.

General Electric's RTV-6802 tinted white, RTV-6803 tinted black, RTV-6008 translucent.
Lockite's Prism 401 with 770 primer

7.0 GENERAL INFORMATION

- 7.1 The deluxe generic vortex generator kit 261-AD1 contains enough vortex generators to do most homebuilt aircraft wings and if necessary the underside of the horizontal tail. In the case of an exceptionally large homebuilt aircraft or a biplane additional vortex generators may be required and can be purchased 25 at a time in kit 261H for \$68.75. The generic vortex generator kit 261-AD2 is the same as the 261-AD1 kit except it has enough vortex generators to do the wings of the average homebuilt aircraft. Some aircraft will not require that vortex generators be placed on the underside of the horizontal tail. This kit gives you the option of buying the less expensive kit and if need be purchase additional vortex generators later. The vortex generator kits that Aircraft Development has created for specific aircraft models thru flight testing contain the number of vortex generators dictated through flight test. If the kit did not denote the use of vortex generators on the underside of the horizontal stabilizer or both sides of the vertical stabilizer it is because adequate control can be maintained without vortex generators at those locations. However, it may be possible to further improve the controllability of those aircraft by adding vortex generators at those locations. These kits are designed to be the most cost effective kits. For those that might want to further enhance the performance of their aircraft the installation manual does have information on how to vortex generate those parts of the aircraft. Again additional vortex generators can be purchased in quantities of 25 by ordering kit 261H.

8.0 SAFETY CONSIDERATIONS

- 8.1 Adding vortex generators to your aircraft can significantly change the handling characteristics of your aircraft. Don't then go out and try a short field landing just after you installed the vortex generators. Go to a safe altitude and get a feel for how the aircraft now stalls and how to make short field landings. See if at these slower speeds you need to add vortex generators to the horizontal or vertical stabilizer. Practice maneuvers at a safe altitude before trying them close to the ground. If you're conducting flight tests per method 2 given in 261-AD1 or -AD2 remember you're in the process of expanding the flight envelope, be cautious you might possibly encounter some surprises. If you're in the process of installing additional vortex generators from your flight testing and don't have enough vortex generators to finish the job please do not fly the aircraft until you have acquired enough vortex generators to finish the job. It is important that you not fly the aircraft partially completed or with asymmetrically installed vortex generators.