

**FLIGHT TRAINING & SAFETY NEWSLETTER****ISSUE: 7 JUL 2004****[JOIN FCI'S NEWSLETTER](#)****Upset Recovery  
and  
Spin Training  
Specialists****FAA ADVISORY CIRCULAR, AC-90-23E  
"CAUTION WAKE TURBULENCE"****[LIST OF OTHER TRAINING ARTICLES](#)****Presented by: [Mike "Smo" Smothermon](#)**

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The following information on Wake Turbulence AVOIDANCE is reproduced from FAA Advisory Circular, AC-90-23E, "Caution Wake Turbulence." The section on Wake Turbulence RECOVERY (at the end of the article) is from FCI Emergency Maneuver Training's Upset Recovery Training Program.

**Wake Turbulence - The Problem**

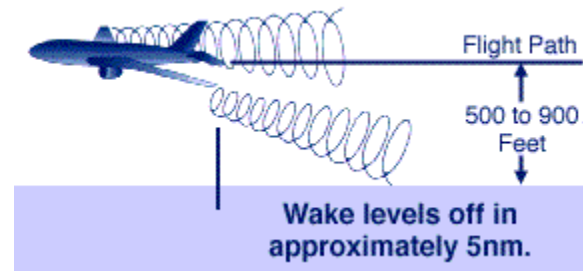
All Pilots are taught to be aware of wake turbulence. However, recent incidents indicate that pilots need to keep in mind how severe wake turbulence can be. In any event, wake turbulence is still out there and it can put a pilot and the aircraft at risk. This page was prepared as a reminder to pilots, to make them aware of wake turbulence and how to best avoid it.

*Remember, the best defense against wake turbulence is to know and avoid areas where it occurs.*

**What is Wake Turbulence?**

All Aircraft produce wake turbulence. Wake vortices are formed any time an airfoil is producing lift. Lift is generated by the creation of a pressure differential over the wing surfaces. The lowest pressure occurs over the upper surface and the highest pressure under the wing. This pressure differential triggers the rollup of the airflow aft of the wing resulting in swirling air masses trailing downstream of the wingtips. Viewed from behind the generating aircraft, the left vortex rotates clockwise and the right vortex rotates counterclockwise.

The intensity or strength of the vortex is primarily a function of aircraft weight and configuration (flap setting etc.). Heavy aircraft, flying slowly, in a clean configuration, produce the strongest vortices. For example, a large or heavy aircraft that must reduce its speed to 250 knots below 10,000 feet and is flying in a clean configuration while descending, produces very strong wake. Extra caution is needed when flying below and behind such aircraft.



**Induced Roll - The Greatest Hazard** While instances where wake turbulence caused structural damage have been rare, the greatest hazard is induced roll and yaw. This is especially dangerous during takeoff and landing when there is little altitude for recovery.

Short wing span aircraft are most susceptible to wake turbulence. The wake turbulence-induced roll rates can be extreme. Countering roll rates may be difficult or impossible even in a high performance aircraft with excellent roll control authority.

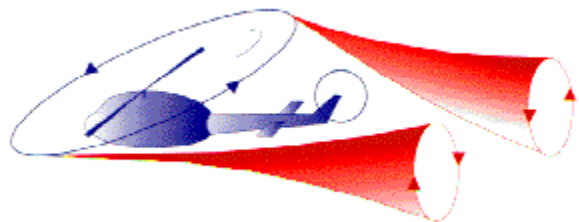
### Parallel or crossing Runways - Stay Heads Up for the Wake

During takeoff and landing, the vortices sink toward the ground and move laterally away from the runway when the wind is calm. A 3 to 5 knot crosswind will tend to keep the upwind vortex in the runway area and may cause the downwind vortex to drift toward another runway.

At altitude, vortices sink at a rate of 300 to 500 feet per minute and stabilize about 500 to 900 feet below the flight level of the generating aircraft.

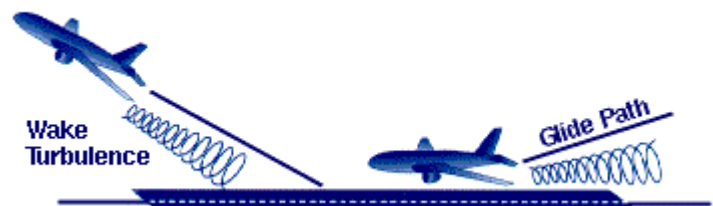
### Helicopter Wake

Helicopters also produce wake turbulence. Helicopter wakes may be of significantly greater strength than those from a fixed wing aircraft of the same weight. The strongest wake can occur when the helicopter is operating at lower speeds (20 - 50 knots). Some mid-size or executive class helicopters produce wake as strong as that of heavier helicopters. This is because two blade main rotor systems, typical of lighter helicopters, produce stronger wake than rotor systems with more blades.



### Stay On or Above Leader's Glide Path

Incident data shows that the greatest potential for a wake vortex incident occurs when a light aircraft is turning from base to final behind a heavy aircraft flying a straight-in approach. Use extreme caution to intercept final above or well behind the heavier aircraft. When a visual approach is issued and accepted to visually follow a preceding aircraft, the pilot is required to establish a safe landing interval behind the aircraft s/he was instructed to follow. The pilot is responsible for wake turbulence separation. Pilots must not decrease the



separation that existed when the visual approach was issued unless they can remain on or above the flight path of the preceding aircraft. (Keeping the preceding aircraft stationary in the over-run prior to it passing the threshold will ensure you are above its glide path.)

## Warning Signs

Any uncommanded aircraft movements (i.e., wing rocking) may be caused by wake. This is why maintaining situational awareness is so critical. Ordinary turbulence is not unusual, particularly in the approach phase. A pilot who suspects wake turbulence is affecting his or her aircraft should get away from the wake, execute a missed approach or go-around and be prepared for a stronger wake encounter. The onset of wake can be insidious and even surprisingly gentle. There have been serious accidents where pilots have attempted to salvage a landing after encountering moderate wake only to encounter severe wake vortices. Pilots should not depend on any aerodynamic warning, but if the onset of wake is occurring, immediate evasive action is a **MUST!**

## How to Avoid Wake Turbulence

1. **Takeoff** If you think wake turbulence from the preceding aircraft may be a factor, wait at least 2 or 3 minutes before taking off. (See AIM para. 7-58 b & c). Before taking the runway, tell the tower that you want to wait. Plan your takeoff to liftoff before the rotation point of the preceding aircraft.
2. **Climb** If you can, climb above the preceding aircraft's flight path. If you can't out climb it, deviate slightly upwind, and climb parallel to the preceding aircraft's course. Avoid headings that cause you to cross behind and below the preceding aircraft.
3. **Crossing** If you must cross behind the preceding aircraft, try to cross above its flight path or (terrain permitting) at least 1,000 feet below.
4. **Following** Stay either on or above the preceding aircraft's flight path, upwind, or at least 1,000 feet below.
5. **Approach** Maintain a position on or above the preceding aircraft's flight path with adequate lateral separation.
6. **Landing** Ensure that your touchdown point is beyond the preceding aircraft's touchdown point, or land well before a departing aircraft's rotation point.
7. **Crossing Approaches** When landing behind another aircraft on crossing approaches, cross above the other aircraft's flight path.
8. **Crosswinds** Remember crosswinds may affect the position of the vortices. Adjust takeoff and landing points accordingly.
9. **Helicopters** Helicopter wake vortices may be of significantly greater strength than fixed wing aircraft of the same weight. Avoid flying beneath the flight paths of helicopters.

## BUT IF YOU FIND YOURSELF IN WAKE TURBULENCE:

### POWER – PUSH – ROLL – GO AROUND

**POWER** – Whenever you are low and slow, add the power, you'll need it

**PUSH** – Unload the wings or “push” on the yoke until you are slightly “light in the seat.” This reduces the angle attack of the wings which gives you better roll control with the ailerons, reduces the drag on the aircraft for better acceleration, and if you are rolling over, slows your decent towards the ground.

**ROLL** – We often get asked, “which way do I roll, with or against the roll?” That is a tough one to answer and is why pilots get all that extra “pilot pay!” Of course, if you have the choice, you'd always like to roll (unloaded) to the nearest horizon. If there isn't a nearest horizon, or if you have rolling momentum, continue to roll (unloaded) in that direction to the horizon.

**GO AROUND** – Never try to salvage a landing after a traumatic event like that. Take it around the pattern, wind your watch and take a deep breath and get back to the task at hand ... landing the aircraft. Once safely in the hangar, then think about what happened, how you could prevent it in the future, and let other folks know what happened so they can also learn from the experience.

The following video clip is demonstration of a “simulated” wake turbulence encounter and the proper recovery as taught during our Upset Recovery Training program. Take a look at it and let us know what you think ... hopefully, we'll all learn something from this exchange of experience!

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### **FCI's Training Recommendations:**

What is your best defense in aircraft unusual attitude or upset conditions?

1. First, attempt to **avoid conditions that can induce unusual attitudes** in the first place. Steer clear of thunderstorms and wake turbulence. Avoid IMC or flight into low visibility conditions if not properly certificated and trained. Avoid distractions.
2. Second, **get the proper training**. According to an article in AW&ST (May 8, 1995 issue): "Training should include flights in aerobatic aircraft to practice recovery techniques because no simulator can model the disorientation of actually being upside down... recurrent training every two years, with time in an actual aircraft, would be a good start." Regardless of the aircraft that you fly, proper training will enable you to learn to react decisively in a high-pressure environment, and to learn proper recovery techniques to avoid a "panic" response that could worsen the situation.
3. **Contact an FCI - Emergency Maneuver Training representative**. Certainly, we would like to take this opportunity to recommend our program at FCI which offers [three course layouts](#) to choose from. Please give us a call a 1-866-359-4273 and ask to speak with a flight training specialist or submit this [online form](#) for more information today!

**Get this training somewhere. The life you save may be more than just your own.**

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