SAFETY ALERT
NTSB National Transportation Safety Board
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AVIATION
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Wake Turbulence: Helicopters and Small General Aviation Aircraft Also Pose a Risk

The problem

- Many pilots may think of commercial airliners as the primary source of dangerous wake turbulence; however, accidents involving wake turbulence can be caused by aircraft other than airliners, including helicopters and smaller airplanes.

- Every aircraft in flight generates wake vortices, or wake turbulence, which can pose a hazard to other aircraft that travel through or near these vortices, including damaging aircraft components, loss of aircraft control, or occupant injuries.

- To avoid the hazards of wake turbulence, pilots must learn to envision the location and movement of the vortices generated by other aircraft and adjust their flightpath accordingly, especially during takeoff or landing. A variety of factors can influence vortex generation and its potential effects, including the weight, size, speed, and configuration of the vortex-generating aircraft (see figure 1).

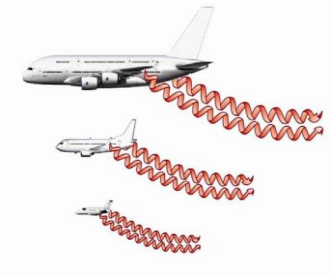

Figure 1. Wake versus aircraft size. (Source: FAA)

- Over the past 20 years, 43 domestic general aviation accidents have involved wake turbulence. Of these, 14 were caused by helicopters, 5 by corporate jets, and 9 by other small general aviation or military fighter/trainer aircraft (the others were caused by airliners or large military aircraft).

Related accidents

- In July 2022, a light sport airplane attempted a landing at an uncontrolled airport when a helicopter crossed the runway several hundred feet ahead of it. The airplane encountered the rotor wash from the helicopter, became inverted, and struck the runway. **The pilot's inadvertent encounter with rotor wash/turbulence during short final approach resulted in a loss of control in flight.** (ERA22LA304)

Figure 2. Right wing damage. (Source: FAA)

- In September 2021, a small airplane was holding short of the runway for takeoff at an uncontrolled airport while a helicopter was inbound. The helicopter side-stepped toward the taxiway after clearing the airplane. The airplane departed and, during takeoff, encountered the helicopter's wake turbulence, which resulted in the pilot's loss of control. The airplane entered a steep roll and impacted the runway. A postimpact fire ensued in which the pilot was fatally injured. **The pilot's decision to depart shortly after a landing helicopter crossed the runway resulted in an encounter with the helicopter's wake turbulence and a loss of airplane control.** (CEN21FA426)

Figure 3. Airplane wreckage.

- In December 2011, a single-engine Cirrus airplane was on approach to land at a controlled airport. A Gulfstream twin-engine corporate jet was also in the traffic pattern. Following the Gulfstream at a lower altitude, the Cirrus airplane encountered the jet's wake turbulence, which caused the smaller airplane to roll and impact the ground, fatally injuring the pilot and seriously injuring the passenger. **The Cirrus pilot's failure to maintain adequate separation behind the corporate jet resulted in an encounter with wake turbulence and a subsequent loss of control.** (WPR12FA067)

Figure 4. Airplane wreckage.

- In September 2003, the pilot of a small airplane sequenced himself into the traffic pattern on approach to a municipal airport behind an Aviat Husky that was following a De Havilland Beaver. As he neared the runway, he concluded that the Husky would not exit the runway before he touched down, so he executed a go-around. As he added full power, he encountered wake turbulence from the Beaver, which caused the left wing of the airplane to drop. **The pilot's remedial actions upon encountering the wake vortex were inadequate, and the airplane impacted the terrain, causing serious injuries to the pilot and passenger.** (SEA03LA196)

Figure 5. Example of a De Havilland Beaver. (Source: USAF)

What can pilots do?

- **Always be aware of where other aircraft are in relation to your aircraft.**
- **If you are following a larger or heavier aircraft toward the runway, fly slightly above that aircraft's glidepath since vortices sink toward the ground, and maintain that glidepath to a touchdown point beyond the touchdown point of the larger preceding aircraft.**
- **Be aware of wind conditions (including direction and speed) along your final approach path and how the wind can affect an aircraft's wake vortex generation and position. Other factors can also influence vortex generation, such as:**
  - **The weight of the vortex-generating aircraft**
  - **The vortex-generating aircraft's height above the ground**
  - **Wind shear, which can cause a vortex to rebound after its initial descent**
- **Be particularly alert in calm wind conditions and situations where the vortices could:**
  - **Remain in the touchdown area**
  - **Drift from aircraft operating on a nearby runway**
  - **Sink into the takeoff or landing path from a crossing runway**
  - **Sink into the traffic pattern from other airport operations**
- **When a lead aircraft climbs or descends through your projected flight track, vertical separation is no longer in place and a vortex encounter is possible. Use caution when climbing or descending behind other aircraft.**
- **Pay extra attention to helicopters. Stay at least 3 miles behind a cruising helicopter or 3 rotor diameters away from a hovering helicopter (see figures 6 and 7).**

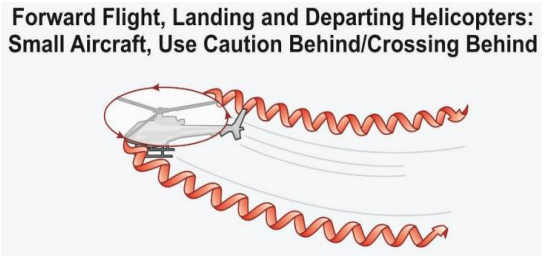

Figure 6. Helicopter wake. (Source: FAA AC 90-23G)

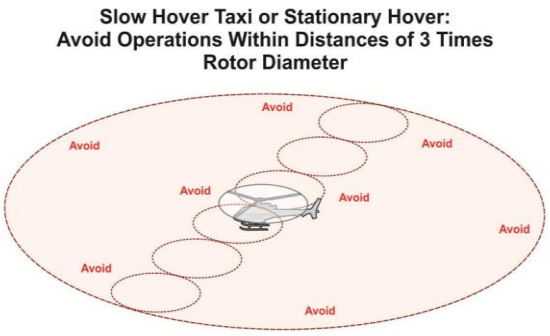

Figure 7. Helicopter vortices. (Source: FAA AC 90-23G)

- **Be familiar with all vortex avoidance procedures and practice them during training.**
- **Also be familiar with vortex recovery techniques.**

Interested in more information?

- The FAA's AC 90-23G, Aircraft Wake Turbulence, contains information on wake vortex behavior, alerts pilots to the hazards of aircraft wake turbulence, and recommends operational procedures to avoid wake turbulence encounters.

- FAA's AIM, Section 7-4, Wake Turbulence, contains general information about vortex strength, behavior, and avoidance procedures.

- FAA's Safety Team and US Helicopter Safety Team video The Rotorcraft Collective: Caution! Helicopter Wake Turbulence contains basic information about rotor vortices and the separation GA pilots should maintain from a cruising helicopter or a hovering helicopter.

- National Association of Flight Instructors Mentor Series video Caution Helicopter Wake Turbulence: Not Something You Hear Enough contains in-depth information about helicopter rotor turbulence, rotor diameters of common helicopters, and information about the distance GA pilots should maintain from them.

Access NTSB Safety Alerts from the Safety Alerts page at www.ntsb.gov. For additional information on the NTSB investigations in this alert, access the public docket using the investigation numbers (NTSB Accident ID) cited above. Use the CAROL Query to search NTSB safety recommendations and investigations.

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