VIRGINIA FLIGHT SCHOOL SAFETY ARTICLES – NO 01/05/07

WAKE TURBULENCE – AN INVISIBLE ENEMY

The review of reported occurrences by the Safety Officer revealed one incident involving a potential loss of control of the aircraft. The description of events by the pilot indicated an approach for landing behind, what turned out to be a large Oryx military helicopter at Virginia airfield. Here is the excerpt form the report :

"During night flying circuits, we were sequenced no 2 in the pattern behind a helicopter of unknown type. A large separation was maintained because we thought it was s slower aircraft. However, it was later discovered to a an Oryx military helicopter. During the circuit we unwittingly reduced separation to the Oryx. During take off after the go around, we experienced a reduced rate of climb followed by extreme turbulence and then a non induced 45^0 left roll followed by a 45^0 right roll." Fortunately control was successfully recovered and the training period completed without further incident.

Here is an extract from an FAA accident report, the flight of which, did not end that well :

On June 30, 1999, about 1210 hours Hawaiian standard time, a Cessna 150M, N63614, collided with the ground while landing at the Ford Island Airstrip, Honolulu, Hawaii, after encountering rotor wash from a nearby military helicopter. The instructor reported that they were practicing

soft and short field landings to runway 4. He stated that while they were on the downwind leg of the traffic pattern, they observed a Navy UH3H helicopter on the base leg to the same runway. As they began a short final approach they saw that the helicopter had landed and remained on the runway, so the instructor advised the student to go around. At that point, the C 150 was slightly past the runway threshold and the helicopter was approximately 2,500 feet down the 4,000-foot runway. The instructor stated that as the student initiated the go-around, the aircraft encountered some "turbulence." They felt several "bumps" and the aircraft rolled 90 degrees to the right. He took over the controls but had difficulty maintaining control of the aircraft. He stated that he attempted to fly out of the rotor wash, but didn't have sufficient altitude to maneuver safely. The airplane sank onto its right wing, bounced, and landed on the nose gear, which then collapsed."

Routinely we do not encounter larger aircraft at Virginia airfield so wake turbulence is not that much of a problem. However on that occasion rotor turbulence (vortices) from an eight ton military helicopter could have ended in a scenario like the one in Honolulu.

HOW WAKE TURBULENCE IS GENERATED

Lift is produced by the creation of a pressure differential between the upper and lower surfaces of a wing (or heli rotor), the lower pressure being on the upper surface of the wing relative to the lower surface. Now in physics there is a natural motion from a high pressure area to a lower pressure area – air will move from the bottom to the top of the wing/rotor. At the tip of the wing this effect is most pronounced and this motion combined with the forward movement of the wing through the air produces a "corkscrew" effect of air in a circular motion trailing behind the aircraft. The photo below clearly illustrates the effect. Since our encounter was with helicopter induced turbulence I will discuss that specifically in this article. Heli turbulence is usually of significantly greater strength than for that produced by a fixed wing aircraft of similar weight.

The strongest wake turbulence from a helicopter also occurs at lower operating speeds (20 – 50 knots) as this is usually when the most power is going through the rotor system.

OCCURRENCE OF HELICOPTER WAKE TURBULENCE ACCIDENTS

The majority of wake turbulence accidents involving helicopters and light aircraft occur during the take off/landing phase of the light aircraft while helicopters are hovering near the runway or flying in the circuit traffic pattern. The strong "corkscrew" rotor vortices can induce extreme roll/yaw rates where recovery can be impossible. This is especially dangerous during take off and landing when there is little height available for recovery as we have seen. If the light aircraft is in the middle of the rotor vortices high sink rates can also be experienced.

WAKE TURBULANCE AVOIDANCE

In light or no wind conditions one should allow for a 5 NM following distance between a medium sized helicopter and above (Oryx) and the following light aircraft. In terms of time during take off one should allow three minutes between the departing medium helicopter and the following light aircraft. At the end of the day, it is the pilot's responsibility to avoid wake turbulence. More in depth articles on this subject can be found at the following websites :

www.caa.govt.nz When you are on the site select "G" from the topics A – Z menu. Page down till you get to GAP Booklets. Select GAP Booklets. Scroll down the subject list till you see "Wake Turbulence" Select!

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