

Safety Notice SN-22

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VORTEX RING STATE CATCHES MANY PILOTS BY SURPRISE

A vertical or steep approach, particularly downwind, can cause the rotor to fly into its own downwash. This condition is known as vortex ring state due to the vortices that develop as the downwash is recirculated through the rotor disk. Once vortex ring state exists, adding power (raising collective) can unexpectedly increase descent rate due to the increase in downwash recirculating through the rotor. Maximum engine power may not be enough to stop the descent before a hard landing occurs.

To avoid vortex ring state, reduce rate of descent before reducing airspeed. A good rule to follow is never allow your airspeed to be less than 30 knots until your rate-of-descent is less than 300 feet per minute.

Signs that vortex ring state is developing include increased vibration levels, decreased control authority ("mushy controls"), and a rapid increase in sink rate.

If vortex ring state is inadvertently encountered, two recovery techniques are available. One technique involves reducing collective pitch (to reduce downwash), lowering the nose to fly forward out of the downwash, and then applying recovery power. This can result in significant altitude loss which may not be acceptable on an approach.

A second technique known as the Vuichard recovery involves applying recovery power while moving the helicopter sideways, assisted by tail rotor thrust, out of the downwash. When flown properly, the Vuichard recovery produces minimal altitude loss.

Pilots should always be aware of wind conditions and plan descents to avoid vortex ring state. Training should emphasize recognition and avoidance of vortex ring state and include instruction in both recovery techniques.