

RECOGNITION AND RECOVERY FROM LOW ROTOR RPM**PURPOSE:**

To become thoroughly familiar with the recognition of low rotor RPM and the techniques of recovery. Prior to performing this maneuver, the pilot should be familiar with RHC Safety Notices #10 and #24.

DESCRIPTION:Cruise flight, takeoff & approach**A) Entry and Recognition**

During cruise flight, takeoffs and approaches, at 104% RPM, the instructor will, turn the governor off, then slowly decrease the throttle to 95% RPM. The low RPM condition will be recognized by:

1. A noticeable decrease in engine noise.
2. Aircraft vibrations and cyclic stick shake especially at higher airspeeds.
3. The low rotor RPM warning horn and light at approximately 97% RPM.

The instructor should demonstrate the further increase in vibration and decrease in engine noise by decreasing the RPM to 92% RPM.

B) Recovery Technique

Upon recognizing the low RPM condition, simultaneously add throttle and lower the collective half inch to one inch to regain operating RPM. Larger collective movements will require additional throttle due to the correlator. A gentle aft cyclic movement will prevent the nose from going down and inhibiting the recovery, but the primary recovery controls are the collective and throttle. Avoid any forward cyclic input, which will inhibit RPM recovery. Once RPM is regained, slowly raise the collective to reduce the sink rate, while closely monitoring the RPM.

At a Hover

During hovering flight at 104% RPM, the instructor will turn the governor off and slowly decrease the throttle to 95% RPM. Note the obvious decrease in engine noise and the tendency for the aircraft to settle back toward the ground. As the aircraft settles, the tendency for some pilots will be to increase the collective to stop the descent. This may only increase the RPM decay and increase the descent. Recovery is the same as in forward flight. Lower the collective simultaneously adding throttle. If RPM cannot be regained prior to ground contact, insure that the helicopter touches down in a level attitude.

PERFORMANCE STANDARDS:

The pilot should be able to recognize and recover from low rotor RPM prior to reaching 90% RPM.

VORTEX RING STATE

PURPOSE:

To demonstrate the dangerous results of operating at low airspeeds, moderate to high power settings, and high rates of sink.

DESCRIPTION:

Settling with power is most dangerous when it happens at relatively low altitudes. The most common condition is during a steep approach with a tailwind. It should be demonstrated at an altitude of at least 1000 feet AGL.

To enter a maneuver, adjust the power to approximately 5" below hover power. Hold altitude with aft cyclic until the airspeed approaches 20 kts. Allow the sink rate to increase to 300 FPM or more as the attitude is adjusted to obtain airspeed of less than 10 KTS. The aircraft will begin to shudder. Application of additional up collective will increase the vibration and sink rate. If this condition becomes well developed, rate of sink in excess of 2000 FPM can result. **Do not allow the condition to develop beyond the initial indications and avoid large control inputs.** Recovery should be initiated at the first sign. The maneuver can also be entered from an OGE hover.

To recover, apply forward cyclic to increase airspeed and simultaneously reduce the collective. When the airspeed indication indicates 20–30 KTS and the trim strings have become effective, increase the collective to the 5 minute takeoff limit and adjust the cyclic to a maximum performance climb attitude. The recovery is completed when the VSI reads 0.

Another recovery technique is called the Vuichard Recovery after an FOCA inspector in Switzerland. Initiate the recovery by increasing the collective to takeoff power, simultaneously applying left pedal to maintain heading and right cyclic (10°–15° bank) to get lateral movement. Once the right side of the rotor disc reaches the upwind part of the vortex the recovery is completed. Average loss of altitude during the recovery is 20–50 feet depending on the duration of the recovery procedure.

PERFORMANCE STANDARDS:

The pilot must thoroughly understand and recognize the settling with power conditions and be able to safely recover.

RECOGNITION AND RECOVERY FROM LOW ROTOR RPM

PURPOSE:

To become thoroughly familiar with the recognition of low rotor RPM and the techniques of recovery. Prior to performing this maneuver, the pilot should be familiar with RHC Safety Notices #10 and #24.

DESCRIPTION:

Cruise flight, takeoff & approach

A) Entry and Recognition

During cruise flight, takeoffs and approaches, at 102% RPM, the instructor will, turn the governor off, then slowly decrease the throttle to 95% RPM. The low RPM condition will be recognized by:

1. A noticeable decrease in engine noise.
2. Aircraft vibrations and cyclic stick shake especially at higher airspeeds.
3. The low rotor RPM warning horn and light at approximately 97% RPM.

The instructor should demonstrate the further increase in vibration and decrease in engine noise by decreasing the RPM to 92% RPM.

B) Recovery Technique

Upon recognizing the low RPM condition, simultaneously add throttle and lower the collective half-an-inch to one-inch to regain operating RPM. Larger collective movements will require additional throttle due to the correlator. A gentle aft cyclic movement will prevent the nose from going down and inhibiting the recovery, but the primary recovery controls are the collective and throttle. Avoid any forward cyclic input, which will inhibit RPM recovery. Once RPM is regained, slowly raise the collective to reduce the sink rate, while closely monitoring the RPM.

At a Hover

During hovering flight at 102% RPM, the instructor will turn the governor off and slowly decrease the throttle to 95% RPM. Note the obvious decrease in engine noise and the tendency for the aircraft to settle back toward the ground. As the aircraft settles, the tendency for some pilots will be to increase the collective to stop the descent. This may only increase the RPM decay and increase the descent. Recovery is the same as in forward flight. Lower the collective simultaneously adding throttle. If RPM cannot be regained prior to ground contact, insure that the helicopter touches down in a level attitude.

PERFORMANCE STANDARDS:

The pilot should be able to recognize and recover from low rotor RPM prior to reaching 90% RPM.

VORTEX RING STATE

PURPOSE:

To demonstrate the dangerous results of operating at low airspeeds, moderate to high power settings, and high rates of sink (Vortex Ring State).

DESCRIPTION:

The vortex ring state is most dangerous when it happens at relatively low altitudes. The most common condition is during a steep approach with a tailwind. It should be demonstrated at an altitude of at least 1000 feet AGL.

To enter a maneuver, adjust the power to approximately 13–15 inches manifold pressure. Hold altitude with aft cyclic until the airspeed approaches 20 KTS. Allow the sink rate to increase to 300 FPM or more as the attitude is adjusted to obtain airspeed of less than 10 KTS. The aircraft will begin to shudder. Application of additional up collective will increase the vibration and sink rate while the cyclic and pedal effectiveness is reduced. If this condition becomes well developed, rate of sink in excess of 2000 FPM can result. **Do not allow the condition to develop beyond the initial indications and avoid large control inputs.** Recovery should be initiated at the first sign. The maneuver can also be entered from an OGE hover.

There are two recovery techniques:

1. The traditional technique is to apply forward cyclic to increase airspeed and simultaneously reduce the collective. When the airspeed indicates 20–30 KTS and the trim strings have become effective raise the collective to takeoff power and adjust the cyclic to a maximum performance climb attitude. The recovery is completed when the VSI reads 0.
2. A more efficient recovery technique is called the Vuichard Recovery. Initiate the recovery by raising the collective to takeoff power (MCP at lower gross weights), simultaneously applying left pedal to maintain heading and right cyclic (10°–20° bank) to get lateral movement. Once the right side of the rotor disc reaches the upwind part of the vortex the recovery is completed. Average loss of altitude during the recovery is 20–50 feet.

PERFORMANCE STANDARDS:

The pilot must thoroughly understand and recognize the vortex ring state and be able to safely recover.

SLOPE OPERATIONS

PURPOSE:

To land from a hover and takeoff to a hover from a sloping surface.

DESCRIPTION:

Prior to conducting slope operations, the pilot must be thoroughly familiar with dynamic rollover characteristics. For training, use a maximum slope angle of 5°.

Slope Landings:

Position the helicopter cross slope at a stabilized 5-foot hover headed into the wind. Lower the collective slightly to establish a slow rate of sink. When upslope skid contacts the ground, begin applying lateral cyclic in the direction of the slope (upslope) to hold the skid against the slope. Maintain heading with pedals. Continue to apply cyclic into slope as the collective is lowered until the down slope skid is firmly on the ground. Once the collective is full down, center the cyclic to allow safe "head clearance" on the upslope side.

Slope Takeoffs:

The procedure for a slope takeoff is almost the exact reverse of that for a slope landing. Apply cyclic into the slope (upslope) and slowly begin to raise the collective. As the helicopter becomes light on the skids, pause and neutralize any aircraft movement. Continue to raise the collective maintaining heading with pedals. When the down slope skid breaks ground, slowly begin to center the cyclic. As a level attitude is reached, the cyclic should be approximately neutral. Continue to raise collective, maintaining position over the ground with cyclic and heading with pedals until a stabilized 5-foot hover is attained.

PERFORMANCE STANDARDS:

	Private	Commercial
Heading	$\pm 10^{\circ}$	$\pm 5^{\circ}$

VORTEX RING STATE

PURPOSE:

To demonstrate the dangerous results of operating at low airspeeds, moderate to high power settings, and high rates of sink (Vortex Ring State).

DESCRIPTION:

The vortex ring state is most dangerous when it happens at relatively low altitudes. The most common condition is during a steep approach with a tailwind. It should be demonstrated at an altitude of at least 1000 feet AGL.

To enter a maneuver, adjust the power to approximately 30% torque. Hold altitude with aft cyclic until the airspeed approaches 20 KTS. Allow the sink rate to increase to 300 FPM or more as the attitude is adjusted to obtain airspeed of less than 10 KTS. The aircraft will begin to shudder. Application of additional up collective will increase the vibration and sink rate while the cyclic and pedal effectiveness is reduced. If this condition becomes well developed, rate of sink in excess of 2000 FPM can result. **Do not allow the condition to develop beyond the initial indications and avoid large control inputs.** Recovery should be initiated at the first sign. The maneuver can also be entered from an OGE hover.

There are two recovery techniques:

1. The traditional technique is to apply forward cyclic to increase airspeed and simultaneously reduce the collective. When the airspeed indicates 20–30 KTS and the trim strings have become effective raise the collective to takeoff power and adjust the cyclic to a maximum performance climb attitude. The recovery is completed when the VSI reads 0.
2. A more efficient recovery technique is called the Vuichard Recovery. Initiate the recovery by raising the collective to takeoff power (70% torque for training), simultaneously applying left pedal to maintain heading and right cyclic (10°–20° bank) to get lateral movement. Once the right side of the rotor disc reaches the upwind part of the vortex the recovery is completed. Average loss of altitude during the recovery is 20–50 feet.

PERFORMANCE STANDARDS:

The pilot must thoroughly understand and recognize the vortex ring state and be able to safely recover using either of the above recovery techniques.

REVISION LOG

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7.15	MAR 2019	8.14	MAR 2019	9.13	MAR 2019
7.16	MAR 2019	8.15	MAR 2019	9.14	MAR 2019
7.17	MAR 2019	8.16	MAR 2019	9.15	MAR 2019
7.18	MAR 2019	8.17	MAR 2019	9.16	MAR 2019
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