# Ground Resonance

Area of Operation VIII — Emergency Operations

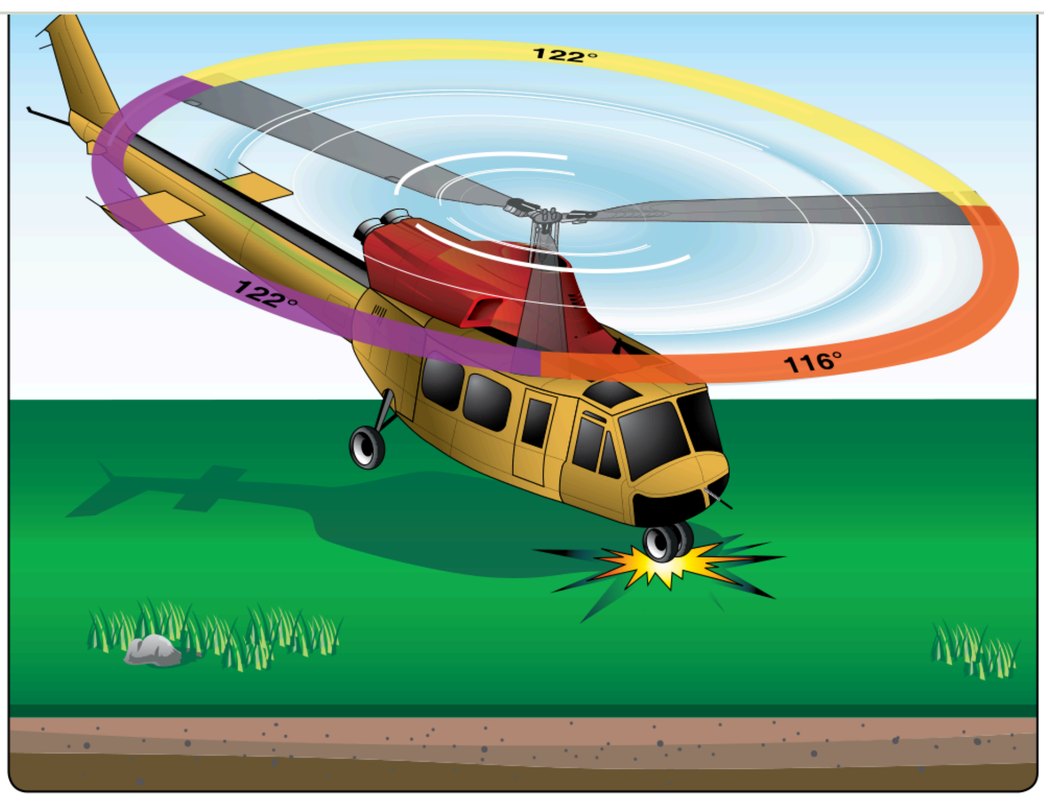
**Private Pilot task** PH.VIII.I **Commercial Pilot task** CH.VIII.I



**Objective.** To determine the applicant exhibits satisfactory knowledge and risk management associated with ground resonance.

## HOW IT IS FLOWN

condensed from the FAA Helicopter Flying Handbook, Chapter 11 — Ground Resonance




**HFH Figure 11-4.** *Ground resonance.*

1. A destructive vibration that occurs at certain rotor speeds when a helicopter with a fully articulated rotor (usually three or more blades) is on the ground. The airframe's natural frequency is excited by an out-of-balance rotor and the engine keeps adding energy, so the oscillation grows until the structure fails — it can destroy a helicopter in seconds.
2. Trigger: hard contact on one corner (usually wheel gear) sends a shock to the rotor head; the blades move about their drag hinges out of their normal 120° spacing, e.g. 122°, 122°, 116° (Figure 11-4). Another gear contact can aggravate the imbalance.
3. Recovery, rpm in the normal operating range: fly the helicopter off the ground and let the blades re-phase, then make a normal touchdown. Do not re-contact firmly before they realign — a second shock can start a violent, uncontrollable oscillation.
4. Recovery, rpm low: close the throttle immediately and lower the collective fully to put the blades in low pitch.
5. Rigid and semi-rigid rotors (the R44's two-bladed teetering system has no drag hinge) do not experience it; skid gear is less prone than wheel gear because tires' resonant frequency can match the rotor's. Know it because you will fly other types.

### WATCH FOR — DRAWN FROM THE HFH DISCUSSION

- Landing hard on one corner; dragging a skid or wheel on touchdown.
- Attempting to 'ride it out' on the ground with rpm in the operating range.
- Lifting off and re-contacting the surface before the blades re-phase.
- Not matching the action to the rpm available.

## SKILLS — THE STANDARD

the applicant exhibits the skill to:

### NO FLIGHT SKILL ELEMENTS

The ACS lists no Skill elements for this Task — it is evaluated through the Knowledge and Risk Management elements below (oral questioning and scenario discussion), for both the Private and the Commercial certificate.

## KNOWLEDGE

PH.VIII.I.K1–K6 · the applicant demonstrates understanding of:

- Exhibits knowledge of the elements related to ground resonance by describing:
  - a. Conditions that contribute to ground resonance
  - b. Preventive flight technique during takeoffs and landings
  - c. Landing surface
- Inspection of items that may contribute to ground resonance.
- Corrective actions during low and normal rotor rpm speeds.

## RISK MANAGEMENT

PH.VIII.I.R1–R3 · identify, assess and mitigate risk associated with:

- Factors that may contribute to the onset of ground resonance.
- Recognition of the onset of ground resonance.
- Recovery procedure selection.

**Standards:** FAA-S-ACS-15 Private Pilot Helicopter and FAA-S-ACS-16 Commercial Pilot Helicopter (text reproduced from the current ACS). **References:** FAA-H-8083-2, FAA-H-8083-21, FAA-H-8083-25; POH/RFM.
**Figures and technique:** FAA Helicopter Flying Handbook, FAA-H-8083-21B — figures reproduced unmodified.
Always confirm tolerances against the ACS in force on your checkride date and procedures against the R44 POH/RFM.

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