IHST International Helicopter Safety Team
Our Vision: An International Civil Helicopter Community With Zero Accidents

How to Train to Survive a Real Autorotation

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What happens when the engine stops for real……..

Power Failure at Altitude or Forced Landing training is something that we don't do enough of, and when we do practice, are we doing it properly? Is it best to practice in the aircraft or in the simulator? Are you ready for a real engine failure? Let's look at some of these questions.

Your priorities and actions will change somewhat depending on what condition of flight you are in, and there will be many variables that your instructor should discuss with you. For the purposes of simplicity we will concentrate here mainly on losing power from the cruise condition of flight (above minimum rate of descent autorotation speed).

What is a PFL?

Let's first of all define what a Practice Forced Landing (PFL) means to you. A PFL is an exercise, normally flown with an instructor or check airman, to simulate the emergency where the engine suddenly fails to provide power to the main rotor and tail rotor gearboxes. This differs from a Practice Autorotation where you are typically exploring the helicopter's flight envelope in autorotation during training and rehearsing exercises using a progressive approach to reduce the entry height to meet PTS requirements. You should be competent, current and familiar with all the basic and advanced autorotation techniques before proceeding to practicing a PFL.

Training Environment

The safest place to start rehearsing your engine failures is in a synthetic environment; the higher the fidelity the better but a non-motion device will still give good training as long as the cockpit and throttle functions are close to the helicopter that you are flying. But invariably you will also need to consider some airborne training. Let's look at how we can do that safely.

Planning

It is important that the training flight be properly briefed on the ground to include:

- A reminder of the advanced autorotation techniques to be used. Confirm currency and completion of previous autorotation training including knowledge of the Progressive Approach AC issued by the FAA.
- How the Practice Forced Landing (PFL) will be introduced. Discuss symptoms to be used preceding the simulated failure such as abnormal T's and P's, unusual vibration or change in engine noise.
- The difference between a PFL and a training autorotation.
- The forced landing procedure.
- Factors affecting the choice of landing area including wind velocity.
- Forced landings from different altitudes and positions relative to the wind.
- The go around procedure.

The Training Exercise

The exercise should only be practiced over an airfield or selected fields that would be good for an engine off landing.

HASEL checks should be conducted by the instructor or student prior to entry to ensure the safety of the maneuver:

- **H**eight – sufficient?
- **A**rea – Authorized and suitable in all aspects especially for an engine off landing if the engine quits for real?
- **S**ecurity – All secure, strapped in and no loose articles? Doors?
- **E**ngine – all T's& P's in the green. Normal Torque or Manifold Pressure. Fuel good. Carb heat (if fitted) as required.
- **L**ookout – Any other aircraft around?

The instructor should introduce the PFL with a verbal warning of "Practice Engine Failure Go". If the CFI also wishes to reduce the throttle to simulate the engine loss, the student should be reminded that it does not move when the engine fails for real to avoid primacy misconception. Then the flying pilot needs to consider the following:

- **Aviate** – Enter autorotation (see below)
- **Navigate** – fly to your selected landing point considering wind.
- **Communicate** – Mayday call (and crash checks as per the RFM.)

The entry into autorotation is critical to survival and the following actions are essential and synchronous:

- **Positively and fully lower the collective** – reverse the airflow and decrease the angle of attack to a tolerable level to preserve rotor RPM (RRPM). Apply pedal.
- **Aft cyclic to adjust for the auto attitude** – plus sustain or regain any lost RRPM (or Nr) and stabilize the rate of descent.

Once in a safe flight configuration;

- **Stabilize** the aircraft in the auto-rotational descent or glide using optimum attitude and therefore airspeed to navigate to the landing point.

Either then:

- Go around or
- Conduct a flare and power recovery (or possibly a "full touch down" at an airfield).

Common Faults

Some common faults are:

- Not being positive enough or not fully lowering the collective.
- Not holding attitude or applying enough aft cyclic to conserve RRPM/Nr.
- Continuing to turn into wind or chosen landing heading regardless of height.
- Neglecting checks or concentrating too much on checks to the detriment of "Aviating".
- Flying the airspeed and not the attitude.
- Failure to recover airspeed above the minimum for an effective flare and power recovery.
- Failure to adjust flight path when clearly overshooting or undershooting
- Not deciding early enough on the type of recovery if different from the initially briefed intention, resulting in confusion at the latter stages.
- Failure to use differing attitudes/airspeeds to adjust autorotative glide to make the landing spot.
- Failure to correct for drift and maintain balanced flight.
- Continuing the flare too near the ground.
- Poor choice of landing area.

Summary

Remember that there is a difference between a practice autorotation and a practice forced landing (PFL).

When conducting a PFL follow these guidelines:

- **Aviate.**
- **Navigate.**
- **Communicate.**

If your engine fails (simulated or real):

- **Positively and fully lower the collective.**
- **Apply proper aft cyclic to hold or adjust for the auto attitude to conserve or recover RRPM or Nr.**

Also:

- **Decide early on the type of recovery at the end of the autorotation (if a PFL).**
- **Select and vary the most appropriate attitude (airspeed) and angle of bank to make your selected landing point.**
- **Always take the wind into account.**

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