STRAIGHT-IN AUTOROTATIONS

OBJECTIVES

A. Understand the principles and cautions of a straight-in autorotation.
B. Practice and correctly perform straight-in autorotations.

This is a descending maneuver in which the engine is disengaged from the main rotor system and the rotor blades are driven solely by the upward flow of air through the system. It can be performed as an emergency procedure in the event of engine or tail rotor failure. *COLLECTIVE must be lowered IMMEDIATELY after engine power loss to prevent main rotor stall.* The best glide speed in an autorotation for the R-22 is ≈ 65 KIAS.

PROCEDURE

1. Prepare to Enter:

▷ At a final leg altitude of 700' AGL, clear the area and surface beneath and ahead of the helicopter.

▷ Apply full carburetor heat.

▷ The correct time to enter autorotation will be when the landing spot appears to falter momentarily in its relative movement toward the helicopter. This may occur roughly 6 to 7 finger-widths below your attitude reference mark on the windshield.

▷ When the spot seems lined up right, clearly state "3…2…1…ENGINE FAILURE".

2. The Entry, or D-TRAC (D.own, T.hrottle, R.ight, A.ft, C.heck):

▷ Immediately lower COLLECTIVE full-***Down***.

▷ Roll the ***Throttle*** to the idle position to simulate the engine failure and *hold it firmly against the stop for the remainder of the autorotation*. Immediately counteract yaw with ***Right*** PEDAL for straight heading.

▷ Enter a slight ***Aft*** CYCLIC input to counteract the nose down tendency.

▷ ***Check*** the COLLECTIVE by pulling it up slightly to control rotor RPM. The goal is to have rotor RPM stabilize in the green on the tachometer.

4. The Approach, or "the SARS scan" (S.pot, A.irspeed, R.P.M., S.trings):

▷ Most of your visual scan time (≈ 80%) will be spent outside, on the landing ***Spot***. Use lateral CYCLIC to maintain your ground track.

▷ Spend the remainder of your time in the cockpit, scanning between instruments:

- Check the ***Airspeed*** indicator to make sure your approach speed is ≈ 65 KIAS.
- Check the rotor tachometer to make sure rotor ***RPM*** is around the middle of the green. If necessary, use slight checks on the COLLECTIVE for RPM.
- Use the ***Strings*** to make sure that you're flying in trim for maximum forward efficiency.

B. The Level, Flare and RPM Recovery to hover:

▷ At about 40' AGL (telephone pole height), use AFT CYCLIC to bring the helicopter to a skids-level attitude. Hold this level attitude for about a three second count. Helicopter will continue to descend, though a bit more slowly.

▷ After the count, start a smooth AFT CYCLIC flare. Rotor RPM may climb a bit. Watch for overspeed and check with COLLECTIVE only if RPM is about to move into the red.

▷ As forward airspeed begins to dissipate, Crack open the THROTTLE to the point where the RPM governor takes over use FORWARD CYCLIC to bring the helicopter back to a skids-level attitude, at 10' AGL. and raise COLLECTIVE as necessary to cushion into a normal hover at 5' AGL.

▷ Push the carburetor heat lever back in.

TOLERANCES

▷ Initiate the entry at the proper point.
▷ Establish proper trim and autorotation airspeed within ± 5 KIAS.
▷ Maintain RPM within normal limits.
▷ Compensate for speed and direction of wind to avoid undershooting or overshooting the landing spot.
▷ Come to a hover within 200' of a designated point.

SAFETY TIPS

▷ CLEAR the area and surface beneath the helicopter.
▷ Ensure the THROTTLE is held in the detent area until after the flare.
▷ Properly apply antitorque PEDAL to prevent yaw during throttle reduction.
▷ Do not do a "throttle chop"; make sure COLLECTIVE is full-down before reducing throttle.
▷ Make IMMEDIATE power recovery if the following conditions do not exist through 100' AGL:

- Aircraft aligned with touchdown point
- Rotor RPM in the green
- Airspeed within ± 5 of 65 KIAS
- Rate of descent < 1,500 fpm

COMMON ERRORS

▷ Failure to put COLLECTIVE full-down before reducing throttle.
▷ Failure to hold the THROTTLE in the detent area for the entire maneuver
▷ Failure to maintain an attitude for a 65 knot airspeed
▷ Failure to use sufficient antitorque pedal when lowering COLLECTIVE
▷ Failure to use PEDALS with the strings to maintain in-trim flight.
▷ Failure to time the RPM recovery properly, resulting in ground contact

180 Autorotation with power recovery

Collective controls RPM
Pedals maintain heading/ Trim
Cyclic controls attitude/ airspeed/ RPM

Verbalize

Reference Horizon

- Brief maneuver before Takeoff and on Downwind
- Final approach, level @ 75Lknots, pattern altitude, **Sight picture**: ref strings
- Enter with: **eyes on horizon, 3, 2, 1…**
- Simultaneously lower collective, right pedal for trim, aft cyclic for pitch attitude of 65 knots, then roll off throttle, check RPM/ collective Cyclic into turn with slightly more collective check.
- **Verbalize "DOWN, RIGHT, AFT, ROLL, CHECK"**
- Bank established**, TURN CHECK: RPM, check horizon,**
- Eyes inside, confirm **60 - 65Knots**
- Manage **RPM**, airspeed, trim, landing zone
  - High RPM, up collective- down rpm
  - Low RPM, down collective = down RPM
- Manage **Bank** as needed, ref **spot**
- **Leveling** from turn with cyclic, slightly **down collective**, slight **FWD cyclic**,. Should be above 100'→straight in

- Prior to 100': "RPM, Airspeed, Rate of Descent, in GREEN"
- Verbalize **"Approaching flare….**
- **40'** flare with smooth **aft cyclic** to build RPM, Slow AC, reduce Rate of Descent *(similar pitch as Q stop)(centerline)*
- **……flare, flare, flare"**
- Ref **RPM nearing peak** of flare (take note)
- As AC slows, **crack open throttle** to ensure engine will come on, smoothly raise collective to bring RPM above 80%, governor takes RPM to 104%
- **"Crack throttle, Raise collective, left pedal, FWD cyclic"**
- As AC parallels ground, 8-10', continue to raise collective to **hover power**, Left pedal and FWD cyclic to **level AC.**
- End at **stable** 3-5' **hover**

Straight in Autorotation with power recovery

Collective controls RPM
Pedals maintain heading/ Trim
Cyclic controls attitude/ airspeed/ RPM

Verbalize

Reference Horizon

- Brief maneuver before Takeoff and on Downwind
- Final approach, level @ 75Lknots, pattern altitude, **Sight picture**: ref strings

- Enter with: **eyes on horizon, 3, 2, 1…**
- Simultaneously lower collective, right pedal for trim, aft cyclic for pitch attitude of 65 knots, then roll off throttle, check RPM/ collective
- Verbalize" DOWN, RIGHT, AFT, ROLL, CHECK"
- **check horizon**
- Eyes inside, confirm **65Knots**
- Manage **RPM**, airspeed, trim, landing zone
  - High RPM, up collective- down rpm
  - Low RPM, down collective = down RPM

- Prior to 100': RPM, Airspeed, Rate of Descent, in GREEN"
- Verbalize "**Approaching flare….**
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- **"Crack throttle, Raise collective, left pedal, FWD cyclic"**

- As AC parallels ground, 8-10', continue to raise collective to **hover power,** Left pedal and FWD cyclic to **level AC.**
- End at **stable** 3-5' **hover**

Section 13(cont) SIMULATOR / FLIGHT TRAINING

Emotional & Mental Stress:

A flight instructor will not be scheduled or accept a flight if their mental or emotional condition could in any way jeopardize the safety of a flight.

Flight Duty Removal:

Flight instructors shall not engage in flight duty if a lack of rest or the instructor's physical condition could, in any way, jeopardize the safety of flight.

Flight Plans:

Instructors are encouraged to take advantage of ATC surveillance and communication services during flight training operations. All flights however will be planned in relative detail prior to initiating that flight and properly logged with the appropriate PBH personnel and posting area. After hour flights require in-house notification at takeoff and landing, and any possible delays experienced.

Refueling:

With respect to Customer / Student supplied aircraft, it is the responsibility of the customer / student to:

- Monitor fueling and/or defueling of their aircraft
- Determine that the type of fuel is in accordance with the manufacturers recommendation
- Take all reasonable precautions to determine that there is no fuel contamination
- Verify that the proper quantity of fuel is delivered to the aircraft
- Pay all incurred fees for said aircraft during flight.

If the aircraft is to be supplied by PBH, it is the responsibility of the flight instructor to assure the aforementioned items with exception to fuel, parking fees, hangar fees, etc.

Maneuvers & Limitations:

No PBH instructor will perform any maneuver not approved by the Chief Instructor in either company supplied or customer / student supplied aircraft. All approved maneuvers are clearly indicated in the flight instruction lesson plan.