# Gyroplane Take-off Procedures

## I. Demonstrate your knowledge of the standard take-off procedure (and your ability to explain it to your student) by outlining the specific steps to execute take-off in the MTO Gyro in logical, step-wise fashion. In addition, include the rationale for each step and the anticipated result of each action taken.

### Standard Take-off Procedure in Gyroplane

**Gyro Take-off** requires coordination of two distinct, but interrelated, elements:

1. Rotor speed
2. Airspeed

Sufficient rotor speed with insufficient airspeed will put the gyroplane on the backside of the power curve *(i.e., slow air speed with a high rotor disc angle.*)

Alternatively, sufficient airspeed/ground speed (or excessive speed if the cyclic is too far forward on take-off), but insufficient rotor speed will result in failure of the aircraft to leave the ground in a timely fashion.

Sufficient rotor speed AND airspeed to achieve take-off are accomplished through a series of carefully defined and coordinated steps:

1. Perform pre-rotation to achieve sufficient rotor speed to prevent rotor blade flapping (approximately 200 RPM) with the cyclic in the full forward and centered position.
2. Initiate forward acceleration of the aircraft by releasing the brake, placing the cyclic in the fullback and centered position, and gradually applying power with the throttle.
    - *This maneuver LOADS the rotor system by putting the rotor disc in its maximum rearward angle.*
    - *This allows the rotor disc to spin up to the maximum RPM that can be reached <u>while the aircraft is still on the ground.</u>*
3. As the aircraft accelerates forward, the rotor generates more lift and the nose wheel becomes light at which time the pilot can sense a reduction of the aircraft's forward speed.
4. At this time, more airspeed is required. This is accomplished by moving the cyclic slightly forward. Doing so results in re-acceleration of the aircraft that can also be sensed.
5. Continue to make incremental changes to forward cyclic position in order to balance on the main wheels while increasing power. These coordinated, incremental cyclic and throttle adjustments will allow the proper increase in forward air speed <u>and</u> maintain the proper angle of attack for takeoff.
6. At this point, adjust the cyclic and throttle to achieve 500 feet per minute at 60 miles per hour.

## II. What are the essential differences between a soft field and a standard take-off?

**How Soft Field Take-off Differs from Standard Take-off Procedure**

Taking-off from a soft field in a gyroplane differs from the standard take-off procedure primarily in the following ways:

1. The nose wheel comes off the ground sooner than with the standard take-off procedure.
2. Take-off roll is shorter.
3. Acceleration to climb speed is accomplished with the nose higher than the standard procedure and obtained is after the plane is airborne.
4. *NOTE: The angle of attack for a soft field takeoff is higher than that for standard take off.*

## III. Demonstrate your knowledge of the differences between soft field and standard take-off procedures (and your ability to explain it to your student) by outlining the specific steps of a soft field take-off that differ from a standard take-off in logical, step-wise fashion.

**Soft Field Take-off Procedure**

1. Pre-rotate rotors as with a standard take-off.

*NOTE: The greater the rotor RPM achieved with pre-rotator prior to take-off, the shorter the take-off roll distance.*

2. Instead of positioning the cyclic from the full back position to more mid-range with initial acceleration as would be done in a standard take-off, position the cyclic to hold a slightly nose-high attitude (Anticipate climbing in this nose-high attitude behind the power curve once airborne.)
3. Apply sufficient power to maintain this "nose higher than normal" attitude while rolling forward. Balance on the main wheels as the rotor RPMs increase to speed sufficient to obtain and maintain flight.
4. Once the plane is airborne, re-position the cyclic slightly more forward to level the aircraft and accelerate to climb speed by applying and maintaining sufficient power to climb.
   a. *NOTE: Anticipate that, upon becoming airborne in the "nose higher than normal" attitude, airspeed will be about 10 MPH lower than the best climb speed, i.e., aircraft will be flying behind the power curve.*
   b. *NOTE: Failure to level the aircraft once airborne and continuing to fly behind the power curve may result in the plane slowing down and settling back to the runway.*
   c. *NOTE: Best angle of climb in MTO Sport Gyro is 55 MPH.*
5. Keep the aircraft heading under control during this early climb phase. Failure to do so could result in ground contact with sideways (yaw or turn/tilt) movements, thus increasing the likelihood of aircraft roll-over.
6. If, for whatever reason, take-off must be aborted, anticipate a harder landing than normal.