

F3 Weight and Balance

Weight:

A gyroplane, like any other airplane, is designed to be as light as possible and still be safe and strong. Any weight added to a gyroplane must be lifted off the ground, and any additional weight will result in decreased performance:

- Longer takeoff run
- Higher takeoff speed
- Reduced angle and rate of climb
- Shorter range
- Higher landing speed
- Longer landing roll

For these reasons, no Air Command gyroplane should carry no more than its maximum allowable gross weight. Better performance will result if less weight is carried.

To compute weight, consider the following as it applies to you:

Pilot weight, ready to fly	170 lbs
Fuel, 5 gallons (6 lbs./gal.)	30 lbs
Baggage (tool kit)	<u>5 lbs</u>
Total weight	205 lbs
Useful load (for example only)	250 lbs

In this calculation, the useful load was not exceeded.

Weighing the Gyroplane:

Your first step in weight and balance computations is to weigh the gyroplane. Do this indoors or on a day with no wind. The gyroplane should have all options installed which will be used in flight (rotor brake, wheel brakes, wheel pants, instruments, etc.)

Remove the rotor blades. If you have only one scale, make two platforms the height of the scale. When weighing, be sure the gyroplane is level. Move the platforms as needed so you can get a reading on the scale for the two main landing gear wheels and the nosewheel. Then weigh the rotor blades and hub separately and record the weights below.

- Weight on nosewheel _____ lbs.
- Weight on left wheel _____ lbs.
- Weight on right wheel _____ lbs.
- Weight of rotor blades _____ lbs.
- Total Empty Weight of gyroplane _____ lbs.

Next, weigh yourself. Dress as you would dress for flight, wearing a helmet, jacket, gloves, etc. Record your ready-to-fly weight below.

- Weight of pilot ready-to-fly _____ lbs.

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Balance and Stability:

A gyroplane pilot must consider not just weight, but where it is located on the gyroplane. For your gyroplane to be capable of flying safely, the gyroplane's balance point must be within a very narrow range. This balance point is called the center of gravity. The fore and aft limits within which the center of gravity must be located during flight are called the center of gravity limits.

A nose-heavy condition can cause problems in controlling or raising the nose of the gyroplane, and a very nose-heavy condition can result in total loss of control and destruction of the aircraft. A tail-heavy condition can cause light control forces, and a very tail heavy condition may reduce longitudinal stability enough to cause total loss of control and destruction of the aircraft. For these reasons, gyroplanes are designed to fly safely within specified center of gravity limits.

Airplane pilots calculate weight and balance differently than gyroplane pilots. The computations used on airplanes won't be discussed here, though they could be used to determine weight and balance on a gyroplane. Instead, we'll discuss a much simpler way to compute weight and balance on a gyroplane. It's called a "hang test."

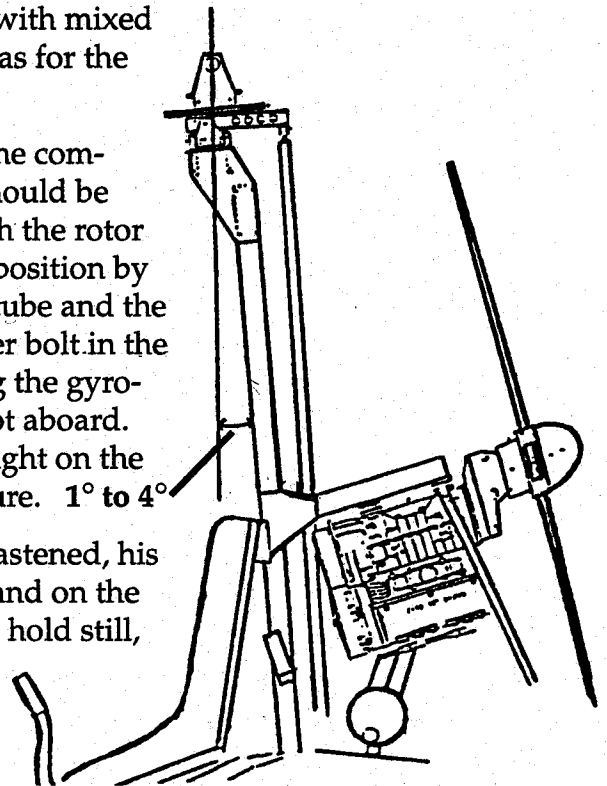
The Hang Test:

A hang test is done by hanging the gyroplane and measuring the angle of the mast from vertical. (Hanging the pilot separately is unhealthy. Belt him into the seat.)

Before doing the hang test, fill all fuel tanks with mixed fuel. The pilot should be dressed for flight, as he was for the weight computations.

Find a place where you can safely suspend the combined weight of the gyroplane and its pilot. This should be indoors, or if outdoors, in no-wind conditions. With the rotor blades detached, lock the rotor head in the neutral position by inserting a bolt or similar item between the torque tube and the front stop. Attach a strong rope or cable to the teeter bolt in the rotor head. Take care not to damage the bolt. Hang the gyroplane high enough to clear the ground with the pilot aboard. Attach a plumb bob made of fishing line with a weight on the rotorhead to get a vertical line from which to measure. 1° to 4°

Put the pilot in the seat with the safety belt fastened, his feet on the pedals, right hand on the joystick, left hand on the throttle, and head in flight position. The pilot must hold still, and the gyroplane must also be unmoving to achieve accurate results from a hang test. The mast of the gyroplane should not hang straight down. If balanced correctly, the gyroplane will hang with the vertical datum line one to four (1 to 4) degrees forward of the mast (see illustration). Measure this angle with a protractor.



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The angle of one to four degrees is likely to be achieved with pilots weighing 120 to 250 pounds ready-to-fly. If the pilot is **not** within this weight limit or a reading cannot be taken between one and four degrees, mast forward, contact Air Command International for further directions.

IMPORTANT: IF A READING CANNOT BE TAKEN BETWEEN ONE AND FOUR DEGREES, MAST FORWARD, THE GYROPLANE IS NOT AIRWORTHY AND NO FLIGHT SHOULD BE ATTEMPTED.

**Hang Test (Weight and Balance) Computations:
COMMANDER GYROPLANE**

Aircraft Serial # _____
Engine Make _____ Engine Size _____ cc Engine Serial # _____
Minimum flight speed 20 mph Never-exceed speed 140 mph

Empty weight with optional equipment _____ lb.

Fuel capacity _____ gal. _____ lb.

Pilot weight, ready to fly _____ lb.

Optional Equipment list (check if used) (Add if **not** included in Empty Weight)

- ___ Instruments _____ lb.
- ___ Prerotator _____ lb.
- ___ Wheel brakes _____ lb.
- ___ Pilot enclosure _____ lb.
- ___ Instrument pod _____ lb.
- ___ Wheel pants _____ lb.
- ___ Auxiliary gas tanks _____ lb.
- ___ Radio equipment _____ lb.

___ Other (list) _____ lb.

Gross weight _____ lb.

Hang test: Aircraft balance checked with pilot weight and full fuel tanks.

Pilot weight _____ lb. Angle of Mast, degrees _____ °

Owner's name _____ Date _____

Assistant's name _____ Date _____

IF YOU WANT TO LICENSE YOUR GYROPLANE IN THE EXPERIMENTAL CATEGORY, THE CHART ABOVE WILL BE REQUIRED FOR LICENSING.