



Condor 330

Glider Manual

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Notice and Disclaimer

The Condor 330 is intended for sale to professional hang gliding instructors. This manual is not intended to be comprehensive. It provides some specific information about the special attributes of the Condor, but contains minimal information of a general nature, and assumes a high degree of familiarity with hang glider design and construction, set up procedures, and flight training techniques. Contact Wills Wing directly if you have questions about the set-up, use, or maintenance of the Condor that are not answered in this manual.

Condor Specifications

Model	CONDOR 330	
Span	39'	11.9 m
Area	330 sq ft	30.7 sq m
Glider Weight	53 lbs	24 kg
Control Bar Size	WW AT 62/60 (62 inch downtubes, 49.5 inch basetube) (157 cm downtubes, 126 cm basetube)	
Pilot Weight	100 - 265 lbs	45 - 120 kg
V _{stall}	13 mph	21 kph
V _{max sustained}	32 mph	51 kph
Maximum Positive Test Load	884 lbs	402 kg
Ultimate Positive G Load Capability	3.5 G's at max pilot weight	
V _{ne} (Speed never To Exceed)	32 mph	51 kph
V _a (Max Maneuvering / Rough Air speed)	24 mph	38 kph

The Condor airframe and battens are entirely 7075-T6 (except for the control bar and kingpost which are 6061-T6).

Condor General Description

The Condor 330 is a special-purpose training glider designed for first solo flights by hang gliding students under direct instructor supervision, at very low altitudes. Focus of the design effort was to produce a very large span, very large area glider of very light weight, that would be easy to ground handle, launch and fly, and that would easily achieve flight in little or no wind at very low ground-speeds from a shallow slope.

Condor Operating Limitations and Flight Characteristics

The Condor is intended for use in still air, or in very light winds which are very smooth and uniform, without appreciable gusts or thermal activity. Because of its large area and span, control of the glider can quickly become very difficult in any degree of wind, thermal activity, or gusty conditions. The intended flight profile for a student pilot is for a foot-launched flight from a low and shallow slope, in calm or near calm wind conditions, with a straight glide at low altitude to a landing. Maneuvering should be restricted to minor heading changes of 20 degrees or less, and bank angles should not exceed 25 degrees and are better limited to 15 degrees or less.

It is suggested that the instructor should fly the Condor, both from the training hill, and from a higher launch, in mild conditions, in order to become familiar with the glider's flight characteristics. Operating limitations for the student pilot should be significantly more restricted than those under which the instructor would operate for the purposes of becoming familiar with the glider. Still, the instructor needs to be aware of significant areas of caution in the operation of the glider as the Condor does not meet normal utility class airworthiness standards.

For the launch phase of flight, the glider generally balances well, retains a suitable pitch attitude during the brief launch run, and leaves the ground within a few steps even in light or no wind.

In wings level flight, the Condor exhibits flight characteristics typical of a large single surface glider with ample sail billow. The roll rate is slow and highly damped, though initial response in smooth air is relatively immediate. Pitch response is damped, and pitch pressures on either side of trim are high. We recommend trimming the glider for flight at the speed the instructor wants the student to fly. In our experience a trim speed of 15-18 mph works best. Trim speed increases with increasing bank angle, and for this reason it is best to limit operation to shallow bank angles, especially for students. In a 20-degree bank, you can expect a trim speed increase of 3 to 5 mph. Beyond 45 degrees of bank, the glider can become significantly roll unstable, and develops an increasing nose down trim. During recovery from a 45 degree banked turn, the can glider exhibit continued nose down trim and roll instability resisting the recovery until the bank angle is reduced to about 25 degrees. We therefore recommend that flight operation be strictly limited to bank angles of 25 degrees or less even during operation by the instructor.

During landing there is relatively high back pressure on the bar during the flare.

The Condor 330 is a special purpose glider. It is not a utility class glider, and does not meet utility class airworthiness standards. It utilizes a very lightweight structure and has very limited structural capacity. It is most certainly not in any way suitable for tandem flight, nor for any abrupt maneuvering. It is designed for solo flight only, within the placarded weight range, at very low altitudes above the ground (no higher than you care to fall). It is designed for straight and level flight, with minimal maneuvering. At no time should the bank angle be allowed to exceed 25 degrees, due to concerns with roll and pitch instability at bank angles above 40 degrees.

Condor Vehicle Testing

The Condor is not certified to any airworthiness standards, nor does it meet general utility class standards. We have conducted pitch tests and positive load tests on a three-component test vehicle over a limited range of speeds, loads, and angles of attack.

In pitch tests at 15 mph, the Condor was shown to be stable over the entire tested angle of attack range from plus 35 degrees to negative 18 degrees. In pitch tests at 22 mph, the Condor was shown to be stable over the entire tested angle of attack range from plus 35 degrees to zero degrees. In pitch tests at 28 to 32 mph, the Condor was shown to be stable over the entire tested angle of attack range from plus 15 degrees to minus three degrees.

In positive load tests, the crossbar was observed to be approximately one foot out of column at the maximum recorded load of 884 lbs (440 kg) at 32 mph (51 kph) with the glider at maximum lift angle of attack, indicating that airframe structural failure was imminent. (There was no damage to the glider

in this test, and all deformation was elastic). Applying a standard aviation safety factor of 1.5, the Condor should never be flown so as to allow for the possibility of more than 590 lbs (268 kgs) total load. This represents a limit load factor of 2.3 G's at the maximum recommended pilot weight, and requires that maneuvering speed be limited at 24 mph.

Notes on Condor Set-Up and Tuning

The Condor comes configured with a two-position xbar sweep wire. (Two tangs are attached at the end of the sweep wire.) This allows for a looser and a tighter billow setting. The looser setting provides a slight increase in roll response, but reduces the glider's inherent tendency to track in a straight line, lowers the glide ratio and raises the stall speed by as much as 1 mph. The tighter setting makes the glider more likely to track straight, improves the stall speed and glide ratio performance, but reduces control authority somewhat.

We recommend the tighter setting for straight flight in true calm air conditions or light winds which are extremely smooth. (These are the optimum conditions for the use of this glider). The looser setting may be more appropriate in conditions where thermal activity of wind gusts may require the student to make corrections to maintain directional control.

When setting up and breaking down the Condor, be aware of the fact that it utilizes a very light structure, with very long frame members. Take care not to exert bending loads on the keel, and to keep the keel as much as possible in plane with the leading edges. We have found it helpful to erect the kingpost and attach the top rear wire before spreading the wings during set up as this adds stability and support to the keel. (The wire must then be detached and re-attached after the xbar sweep wire is attached. *Please note that there is a webbing loop on top of the sail at the trailing edge. It is intended that the top rear wire be passed through this loop, in order to support the reflex in the rear of the keel pocket.*) This will also prevent the kingpost top from being wedged behind the crossbar as the wings are spread, which otherwise has a tendency to happen.

Inserting the battens is best done with the xbar not tensioned. The longest battens will tend to catch behind the leading edge. Sometimes you can pull the batten out slightly, fluff the sail upwards and re-insert the batten, and it will clear the leading edge. Sometimes you will need to go to the front of the batten and lift it over the leading edge tube.

The plug-on number one battens are bent in order to better match the curve of the sail. The shorter segment is the front, and when installed properly, the batten should curve downwards towards the tail like a normal cambered batten would.

During breakdown, take care when folding the wings in that the crossbar center does not drop down between the keel and leading edges, and become wedged there as the wings are folded in.

If you are short-packing the glider (removing the rear leading edges) for transport, take care when re-installing them for set-up that they are installed in the correct side, with the proper orientation, and that the slots in the rear leading edges are fully seated and locked against rotation.