CHALLENGER & CHALLENGER II DESIGN CRITERIA & LIMITS

A. Maximum useful load
   1. single place = 265 lbs.
   2. two place = 500 lbs.

B. Flight attitude limits (single & two place)
   1. 60 degrees up
   2. 30 degrees down
   3. 60 degrees bank

C. Velocity never exceed
   1. single & two place = 100 mph
   2. all clipped wing models = 120 mph

D. Crosswind takeoff & landing capability is 20 mph at 90 degrees for both single place & two place Challengers. 30 mph for all clipped wing models.

E. Maximum front seat pilot weight is 250 lbs. for both the single and two place aircraft. Solo flight is restricted to the front seat.

F. Minimum front seat pilot weight is 125 lbs. for both single and two place aircraft. Pilots who weigh less that these minimums must add ballast to the nose gear structure or seat structure to bring the center of balance within it's limits. If the nose wheel remains in contact with the ground at level attitude with the engine not running, the pilot may assume he is within the aft C.G. limits. If the nose wheel will not remain in contact with the ground, ballast must be added until it does. Solo flight is restricted to front seat. (on two seat Challengers with the heavier "503" engine, electric start and 10 gal. tank, ballast may have to added to the nose for pilots under 160 lbs.)

G. Flight attitudes trim provisions. (optional)

   1. elevator trim tabs for pitch trim (trim for level flight with ailerons/flaperons at 0 deg.)
   2. rudder trim tab for yaw trim (make sure it doesn't interfere with the elevator)
   3. flaperons for modest pitch trim and for improving landing and takeoff performance
   4. Ballast may be added to the nose or tail for optimum balance
   5. Flight attitude trim summary: Generally speaking, pilots who weigh over 200 lbs. may need some pitch trim and pilots under 150 lbs. may need some nose ballast. Rudder trim is desirable for hands off yaw stability.

H. Engines tested and approved for the single place Challenger:

   2. Rotax "277" - one cylinder, two cycle, free air cooled, Rated horsepower = 28 (part 103 ultralight legal)
   3. Rotax "377" - two cylinder in-line, two cycle, fan cooled, Rated horsepower = 35
   4. Rotax "447" - two cylinder in-line, two cycle, fan cooled, Rated horsepower = 40

I. Engines tested and approved for the two place and all Clipped Wing Challengers:

   1. Rotax "447" - two cylinder in-line, two cycle, fan cooled, Rated horsepower = 40
   2. Rotax "503" - two cylinder in-line, two cycle, fan cooled, Rated horsepower = 48-52

Cautions

The Challenger is not an acrobatic aircraft! Abrupt maneuvers should always be avoided! Flying ultralights or conventional airplanes involves travel in three dimensions, and such activity is subject to mishap, injury, and possibly even death.

The following create major hazards and risks:

Wind, Weather and turbulence
Air traffic and air space regulations
Electric lines, trees, and other obstacles
Pilot error, poor judgment etc.

If you are already a pilot, you should know about the adverse effects of wind, turbulence, ice, rain, snow, etc. If you are new to flying, your training should include study of weather and how it affects flying. The dealer that you bought your Challenger from is the one to see about training; however, some important things to be aware of will be covered in this manual.

WIND GRADIENT

Wind gradient is the difference between the wind high above the ground and the wind near the surface of the ground. Normally the wind near the surface is less than the wind higher up because of ground friction. When descending from 100 feet to ground level into a 20 mph headwind, for example, you will have to hold a higher airspeed on final approach because as you get closer to the ground the headwind will decrease and your indicated airspeed will decrease. When landing into a 20 mph headwind, maintain at least 45 mph on landing approach. As far as landing downwind - DON'T!! ALWAYS TAKEOFF AND LAND INTO THE WIND!!

CROSSWIND TAKEOFFS & LANDINGS

The Challenger will handle a direct crosswind of 20 mph; however, we recommend that you avoid high crosswind takeoffs and landings until you become more experienced in this aircraft. Because of the light weight and large wing area, ultralights can be tossed around by high winds and turbulence.

When taking off with a crosswind, remember to use aileron control to keep the upwind wing from coming up and apply opposite rudder to keep the plane on the center line of the runway. This is standard practice with any light airplane. Once airborne, establish a crab angle into the wind to maintain a straight path over the runway.

THE STALL

As all pilots know, a "stall" has nothing to do with the engine. A stall is when the wing is not producing enough lift to hold the weight of the airplane. When the Challenger stalls, you'll notice very little tendency to quit flying; instead the nose will mush down and the plane will continue flying. At idle and holding the elevator control stick all the way back, you can still hold the wings level in a controlled "mush" attitude, although losing altitude at about 500 feet per minute. Practice stalls with and without power and slow flight near stall speed to get the feel of the flight characteristics of the Challenger.

WAKE TURBULENCE

As a pilot or student pilot, you have probably experienced wake turbulence. It is caused by the lift generated from another airplane flying through the air, much the same as a motorboat creates a wake on the surface of the water. The larger the airplane, the greater the wake turbulence. Even an ultralight creates wake turbulence. To experience wake turbulence in your Challenger, fly in circles, maintaining the same altitude and you will fly through your own wake turbulence. It will feel as though there are "bumps" in the air which are created by the wingtips and are called wingtip vortices. The wingtip vortices from large jets are severe enough to cause a small aircraft to loose control. So remember, don't land behind other airplanes especially if they are larger than yours. If you do land behind another plane, try to stay as far behind as possible and touch down on the runway ahead i.e. farther down the runway than the plane ahead landed.

WIRING AND ELECTRICAL SYSTEM

Inspect all electrical connections for corrosion, frayed wires, and worn insulation. Replace any part found to be defective. Check battery (if installed) for leaks or corroded terminals. If any battery acid leaks or spills on the airframe, rinse immediately and neutralize with baking soda mixed with water. It is a good idea to enclose the entire battery in a heavy-duty freezer bag or plastic container to insure against acid leakage onto the airframe. If this is done, be sure to allow venting to outside air so battery gasses may be released. A sealed "gel cell" battery eliminates most of these problems.

Any electrical device that is added to the electrical system i.e. position lights, strobes, electric starter etc., should have a fuse in its circuit to prevent short circuit fire hazards and electrical system damage.

Make sure that spark plug wires are routed clear of other electrical wires to prevent ignition problems and instrument damage.

Insure that all electrical wires are well padded where they come in contact with the airframe or motor and route wires clear of fuel system. If used, the CHT probe should be checked for broken wires or cracks in the probe itself. Check all connections at the instrument panel for broken wires or corroded terminals.

TRANSPORTING AND FIELD SET UP (see photos in back of manual)

The Challenger can be transported to the flying site on a trailer or towed on its own gear. However, we do not recommend towing for long distances as the wheel bearings are not designed for high speeds or long trips. However you transport your Challenger, be sure that the wing struts and jury strut brackets are protected from rubbing against the wing fabric and main wing struts. We use small pieces of foam rubber taped around the small u-brackets and then fold the jury struts and secure them to the main wing struts with a tie-wrap. You may fold the main struts up against the wing and secure at the wing root. Remember, any part that rubs on another part will cause chafing or scratches and should be well padded.

Field set up can be done by one person although it is easier and faster with two. Refer to photos at the end of this manual. First unload your Challenger and check to see that all parts and attachment hardware are accounted for.

Establishing a sequence of assembly will speed set up time. It works well to attach the tail surfaces first and then the wings. Start with the horizontal stabs then the rudder, then the elevators. Make sure all safety pins are installed properly. Connect the elevator pushrods and rudder cables and safety all connections.

With the wing tip on the ground (pad if necessary) or held by your helper, install the main spars into their respective brackets and install the main spar attach bolts, castle nuts, and safety pins. Lift wing tip up and insert wing struts in their respective brackets inserting bolts in brackets through strut holes. Do the same with the other wing but do not install the castle nuts and safety pins at this time. Connect the aileron pushrods to the aileron control bellcranks with clevis pins and safety pins.

The next step is to secure the Velcro center section closure. To get the proper tension on the wing fabric, the Velcro closure must be attached while one wing panel is held up at a 30 degree angle. After securing the Velcro closure, lower the raised wing, inserting the wing struts into their brackets and install bolts, castle nuts, and safety pins. Also install the nuts and safety pins on the other wing strut brackets if you have not done so already.

STOP! AT THIS TIME CHECK AND RECHECK ALL ATTACHMENT POINTS FOR CASTLE NUTS, SAFETY PINS, ETC.

After rechecking ALL attach points, the next step is to connect the jury struts using clevis pins and safety pins. Once you are sure that everything is in order, preflight your Challenger.

PREFLIGHT INSPECTION

The following is a list of preflight inspections that should always be conducted before flying:

All attach points safetied.
Wing and fuselage covering intact (no holes or rips).
Reduction belts properly tightened.
Motor mount bolts properly tightened.
Control system functioning properly.
Fuel system functioning properly.
Fuel in tank (50-1 gas/oil mixture).
Seat belts secure.
Throttle and choke functioning properly.

The importance of a thorough preflight cannot be over emphasized. You should follow the factory recommended preflight and try to develop a systematic, habitual approach. Once established, never vary from your method and of course, ALWAYS do your own preflight. Start at the cockpit and work your way around the Challenger in a counterclockwise manner.

ENGINE RUNUP

a. Put on your helmet
b. Check controls for free and correct movement and travel.
c. All electrical connections properly connected and insulated.
d. Prime carburetor with squeeze bulb.
e. Apply choke
f. Shout "CLEAR PROP" (make sure no one is near propellor arc).
g. Start engine with key switch or pull starter with throttle at idle.
h. After engine starts, slowly remove choke as engine warms up.
i. While engine is running, check tachometer and CHT for proper readings.
j. Break in engine as per engine manual.
k. Shut off engine with key switch or stop button.

TAXI TEST

After warming up the engine, you are now ready for some slow taxi test. Make sure you have your helmet on, seat belt secure, and choke is on. Check throttle response. When all is in order, begin taxiing slowly, practicing left and right turns to get the feel of how the Challenger handles on the ground. Taxi with the stick full back as this keeps the load on the nose wheel at a minimum. Remember to allow time to coast to a stop since brakes are not standard equipment. Increase taxi speeds to 25 mph and check aileron, rudder and elevator control responses. When the nose starts to raise, release back pressure on the stick and try to balance the aircraft on the main wheels. Remember, the Challenger will fly at 30 mph, so be careful not to become airborne before you are ready.

STOP! IF YOU HAVE NOT HAD PROPER FLIGHT TRAINING, DO NOT ATTEMPT TO FLY THE CHALLENGER! CONTACT YOUR DEALER TO ARRANGE FOR PROPER TRAINING! DO NOT TRY TO TEACH YOURSELF!

CROW HOPS

Before attempting your first flight, we recommend practicing short low level hops or "crow hops" as they're called. By doing "crow hops," you will not only get the feel of how the Challenger handles but you will also be able to tell if all control functions are working properly. Choose a calm day and long runway for your first practice session. Taxi to the center of the runway and check that all controls are functioning properly. Advance the throttle until you can hold about 30 mph and steer down the center of the runway. You will notice that the controls are rather light and easy to coordinate. Pull the stick back until the nose wheel comes off the runway slightly. Then by coordinating elevator and throttle, increase airspeed to 35 mph and the Challenger will gently become airborne. Fly at two or three feet above the runway gradually throttling back till the aircraft gently settles back down the runway. After practicing a few "crow hops," you'll be ready for a flight around the pattern. At this time, we recommend a complete preflight inspection to insure that all is in order. Check fuel quantity, valves on, all airframe attachments secure, etc.

FIRST FLIGHT

Again, pick a calm day and a long, smooth runway. Always take off into the wind if any and remember the following flight characteristics of the Challenger.

	single place	two place	1pl. clip wing	2pl. clip wing
Take off speed	35 mph	40 mph(dual) 30 mph(solo)	40 mph	45 mph(dual) 38 mph(solo)
Best angle of climb	36 mph	42 mph(dual 35 mph(solo)	42 mph	48 mph(dual) 43 mph(solo)
Best rate of climb	39 mph	45 mph(dual) 38 mph(solo)	45 mph	53 mph(dual) 48 mph(solo)
Stall speed	27 mph	30 mph(dual) 25 mph(solo)	30 mph	35 mph(dual) 30 mph(solo)
Cruise speed*	55 to 75 mph	65 to 75 mph	75 to 90 mph	75 to 85 mph
Top speed*	63 to 80 mph	72 to 90 mph	95 to 105 mph	90 to 100 mph
VNE (never exceed speed)	100 mph	100 mph	120 mph	120 mph

*depending on options and payload

The stall is gentle and straight forward. You will notice a slight "growl" from the propellor as you come close to the stall speed. This is caused by the smooth airflow over the wing separating and becoming turbulent.

It is advisable to continue "crow hops" until you feel comfortable with your performance. Add slightly more altitude each time and practice smooth landings Add some gentle "S" turns during the longer and higher "crow hops". Be sure you have plenty of runway left during each "crow hop" maneuver!

MAKE SURE YOU ARE PROPERLY TRAINED BEFORE FLYING THIS AIRCRAFT!!!!!!!

FIRST FLIGHT (CONT.)

If you have received proper flight training, proceed as follows:

Line up with the center of the runway and advance the throttle slowly to full throttle setting. Hold back on control stick to lighten nose wheel, gently releasing back pressure as the nose begins to lift off (see take off speed for your model on previous page). As the aircraft becomes airborne , hold elevator back pressure just enough to maintain "best rate of climb" speed. The Challengers all require some right rudder pedal pressure in climb to counteract the prop wash effect on the rudder which is similar to most standard aircraft. Climb to pattern altitude and throttle back to 5700 rpm or so and "cruise" airspeed. This is the rpm and cruise speed for normal flying. Try some turns, left and right, coordinating rudder and aileron controls. Some back pressure on control stick will be necessary in turns as in standard aircraft. To help coordinate turns, glider pilots tape a piece a string to the outside of the center of the windshield near the bottom. If the string stays straight, you are making a coordinated turn. Try it, it works.

NOTE: The standard two seaters require healthy inputs of rudder to coordinate a turn and even more-so with the installation of doors. ALSO NOTE: If you have done your practicing on the ground you will realize that the rudder pedals pivot near the bottom and must be pushed with the ball of your foot, not your heels as in standard aircraft.

LANDING

Landing is quite conventional. Gradually reduce throttle when you are sure you have the runway made. Final approach speed should be about 15 to 20 mph above stall speed and even more until you are more comfortable with the plane. Start the flare at about 10 feet above the runway, gradually bleeding off airspeed and altitude to touchdown at 5 to 10 mph over stall speed. With the engine at idle and main wheels on the runway, gradually pull stick back to keep weight off the nose wheel until speed is reduced enough for the nose to settle in on it's own. Don't turn until your taxi speed is reduced or you may damage nose gear.
CAUTION: If you should have to make a "go around" before touch down, remember that a "pusher" engine will cause the nose to pitch down as the throttle is advanced and pitch up as the throttle is pulled back. Be ready for this! Don't advance the throttle rapidly and be ready to pull back on the stick enough to keep the nose up. Also be ready to apply right rudder to counteract sudden application of power. If climbing out and the throttle is pulled back suddenly or if the engine quits, push the stick forward to keep the nose down to maintain airspeed.

ADDITIONAL NOTES FOR THE NEW CHALLENGER OWNER:

The serial number can be found above the front cockpit on top of the 2" square root tube.
The empty weight of a single seater ultralight is about 240 lbs and the two seater is about 310 lbs. This is without any options or accessories. Wheel pants will add about 6 lbs, instruments about 3 lbs., brakes about 3.5 lbs., two place doors about 8 lbs., single place doors about 5 lbs., flaperons about 1 lb., streamlined strut fairings about 5 lbs., 10 gal tank option about 2 lbs. and "Stits®" or "Ceconite®" covering with 6 coats of paint may add as much as 20 lbs (mostly aft of C/G). The average single seat ultralight with wheel pants, instruments and the "277" engine usually comes out around 245 to 250 lbs. The two seater with standard covering, wheel pants, brakes, instruments and the "447" engine usually comes out about 320 to 325 lbs.

On the next page is a 50 hour inspection form to help you maintain your Challenger in an airworthy condition. You can use this form for your annual inspections also.

GOOD LUCK AND HAPPY FLYING