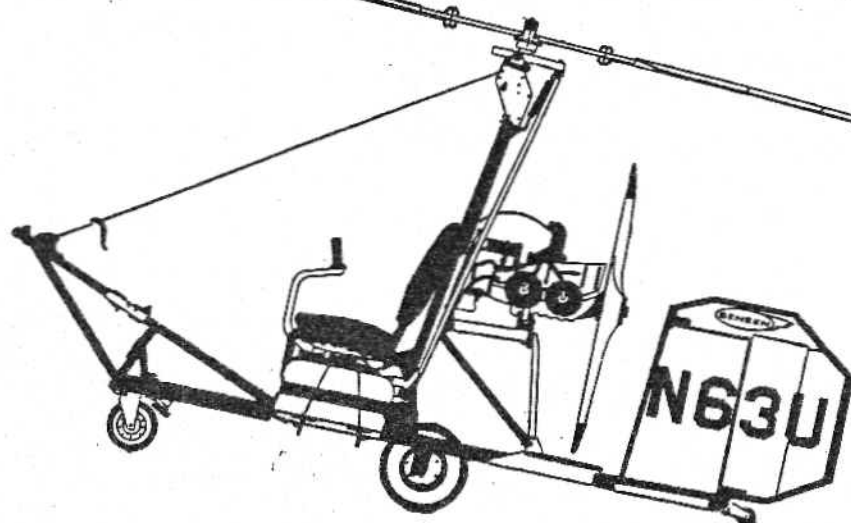




B-80 CONSTRUCTION & TOOLING MANUAL



GYROCOPTER[®]

A GUIDE TO:

- ... design & mechanical requirement
- ... construction methods
- ... tooling techniques
- ... pilot weight variance
- ... "hang-test" (C.G.) procedure

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CONSTRUCTION SEQUENCE

The following outline gives the correct order of construction and assembly for each individual kit required to assemble the B-80. Each Kit includes the construction, assembly and rigging adjustments pertinent to that individual Kit. These construction steps should be carried out in the following sequence:

Step 1 Construct the 8-41 Airframe and the 8-30 Landing Gear simultaneously. Drill all required holes in Keel, Mast, and Axle tubes. Construct and install the nosewheel assembly and the tailwheel on the Keel tube. Install main wheels on Axle tubes. Bolt the basic structure together, which will now stand on its own wheels.

Step 2 Install the 8-52-J2 Joystick, 8-20A Control Head, and 8-61 Metal Rudder. Adjust and rig each according to instructions provided.

Step 3 Hang-test your machine for proper tilt angle. Check nosewheel contact weight.

Step 4 Install Rotor and Hub as per instructions.

This completes the construction of the B-80A Glider-Trainer.

Step 5 Install the Engine Mount, Engine Accessories, and Propeller on your engine.

Step 6 Be sure to change the Glider-Trainer headplates to the 'Copter Plates

This completes construction of the B-80 Gyrocopter.

Step 7 Remember to re-check your weight-and-balance tilt angles, and nose-wheel weight on the ground with pilot in the seat.

The Gyrocopter is now ready for ground testing.

To make certain that your engine installation is performing correctly, test it first statically. Please, see "Engine Test and Requirements".

"TOOLING TECHNIQUES"
and
CONSTRUCTION HINTS MANUAL

This Manual is prepared to give you a better understanding of the general means and procedures of manufacturing your Gyro. Even though some of the procedures listed are common knowledge, you will do well to read and study this entire Manual before beginning any construction of your machine.

ENGINEERING APPROACH AND MATERIAL CHOICES:

1. The materials for your Gyro were chosen for their:

- a. Ease of machinability with simple hand tools.
- b. Mechanical structural characteristics to allow adequate safety factors.
- c. Acceptable fatigue strength, yield characteristics, and elastic properties.
- d. Good resistance to corrosion.

2. The structures for your Gyro were chosen for their:

- a. Simple straight-forward structure approach, with redundant structure members wherever possible.
- b. Bolt-together structure for ease of construction, inspection, and replacement of needed parts.
- c. Minimum number of parts to be formed or bent by the builder.
- d. Simple layout procedures.

3. The majority of the airframe and engine mount structures are designed to transfer loads from one member to the other by shear loading of the attaching bolts. The aircraft bolt length is chosen to provide a proper grip length to assure that the solid portion of the bolt is bearing on the structural member.

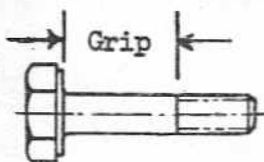
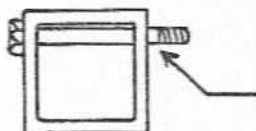
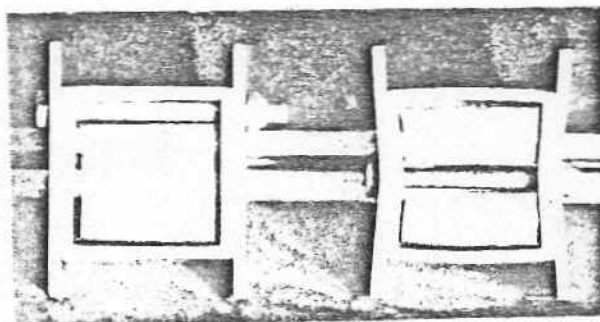


Fig. 1



The grip, or solid portion of bolt, should extend past outside wall at least $1/16"$.

4. The aircraft bolts are located on the structure of the square and rectangular tube to just clear the inside wall of the tube. This makes the wall of the tube itself a compression member. This prevents the collapse of the tube when the bolt and nut are tightened.



RIGHT

WRONG

Fig. 2

GOOD WORKMANSHIP PRACTICE

5. NEVER scribe a locating layout line with a sharp tool across the surface of a structural member. This becomes a severe stress riser and will promote fatigue failure of the part on this scribed line.

MAKE all layout marks or scribe lines in the confines of the hole to be drilled ONLY, or use pencil lines and erase them before assembly.

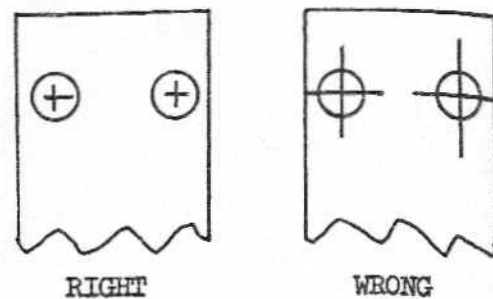


Fig. 3

6. To lay out hole locations or dimensions on plate material, always measure from the same two sides of the material, such as "A" and "B" shown.

Side "A"

Be sure to use an accurate square to cross hole center lines.

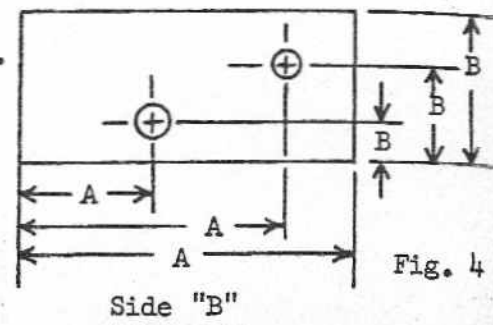


Fig. 4

7. Use a high quality Steel Tape to lay out all dimensions. Check the "clip" end of tape for quality. Check the tape with another accurate steel rule and be sure that the dimensions from the "clip" end to the numbered dimensions are graduated correctly.
8. Always chamfer all sharp corners with a fine file or a scraper. Always remove all scratches by fine sanding, cold working the material with a hard smooth rounded tool, or with a fine steel wool pad. After any of the above, polishing the area with a rubbing compound or ultra fine kitchen scouring pad will enhance the appearance. Never leave notches or sharp edge sections of angular cuts. Always provide a smooth radius at intersection and bends. Always file or sand notched angle ends flush with angle web, and polish radius to prevent fatigue.
9. To assure proper location and uniform holes, we recommend that you follow the below step procedure.

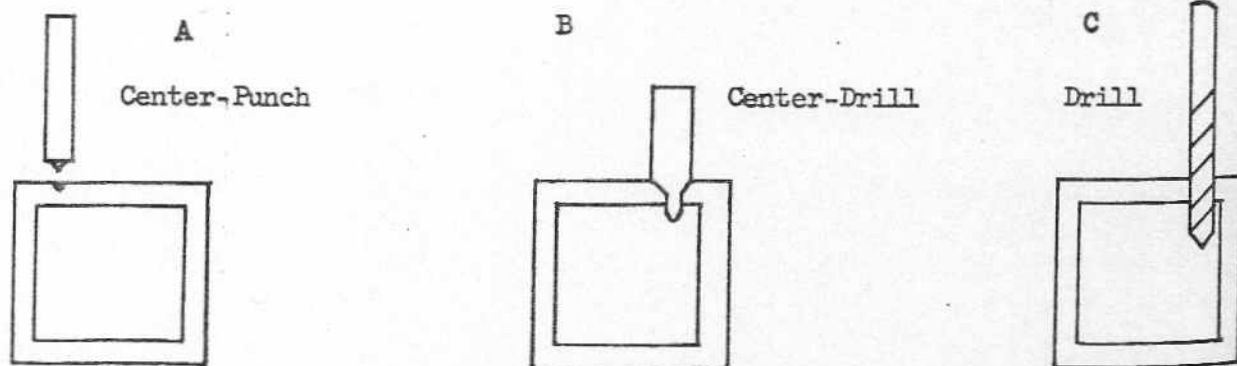


Fig. 5

- 9 a. Carefully lay out hole center and center-punch hole location lightly.
- 9 b. Carefully pick up center-punch mark with your center-drill, and drill the hole until the chamfer of the center-drill is reached. This will help center the drill bit and prevent it from "walking".
- 9 c. Through-drill the hole using the correct size drill bit. Always use a "cutting oil" lubricant on the drill bit. This will aid in keeping the bit cool, prevent material build-up on the end, and will aid in cutting much faster and cleaner.

10. Correct Hand-Drilling procedure, if a drill press is not available:

- a. Clamp tube to be drilled to a waist-high structure that will not move with drill pressure. It is easier to maintain positive control of a hand-held drill waist high and horizontal, than when the drill motor is held vertical.
- b. Hold the neck of the drill motor in the palm of your hand, with your thumb extended to touch the tube side wall, acting as a front support guide, (See Illustration). Hold handle of the drill in other hand, with arm tight against body, using body as a pivot to stabilize drill and control "feel" pressure.
- c. As you feel the drill bit "breaking-through" the material, use the extended thumb as a depth stop.

11. Common problems with hand-held drill motors and improper drill bits:

- a. The point of the drill is not properly ground. Purchase only a quality drill bit as the cheaper bits often have a very thick web, requiring excessive drill pressure to penetrate the material.

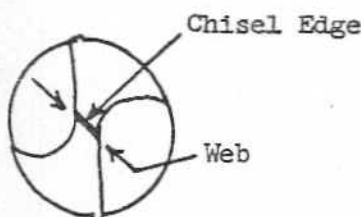


Fig. 6

A drill bit with incorrect point will produce an oversize and possibly cratered hole, leaving an unsatisfactory bearing surface to transfer loads from the grip portion of the bolt to the structure.

- b. Test your drill bits before drilling the structure holes. Use the TK-140 spare "test-drill" square tube. Check the drilled hole for a smooth wall surface and a close fit with the proper size bolt.

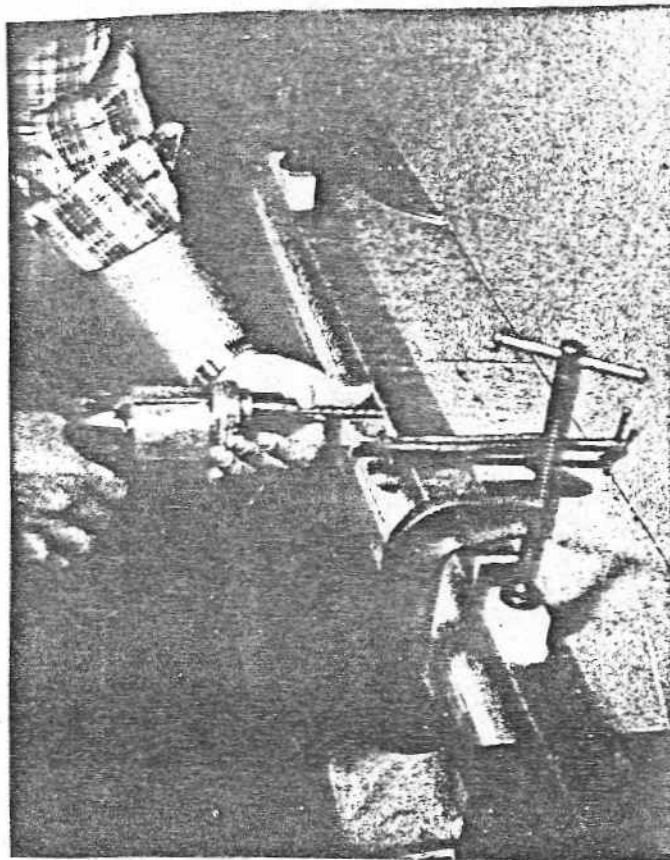


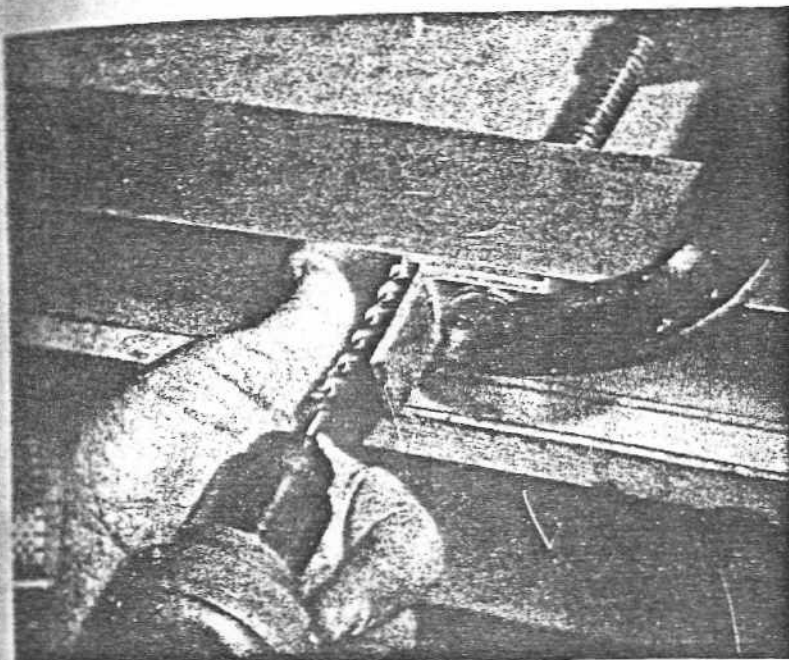
Illustration of the correct hand-held drilling technique, with the thumb as a front support guide

Fig. 7

- c. Too much pressure is applied to the drill, causing the bit to pick up a heavy chip load, which will make it chatter or walk off hole center. Too large a chip load will also "dig-out" the hole, making it larger than the drill bit.
- d. The drill bit is not vertical to the face of the material. Use the sight gauge included with the TK-140 Tools in the 8-41 Airframe Pack. (See Illustration).
- e. The drill bit breaks through material caused by excessive pressure on the drill motor. (Use travel stop explained in 10 b.)

12. Use of the TK-101 Hole Locating Transfer Fixture:

- a. The Transfer Fixture is designed to properly space holes to be drilled in the square and rectangular tubes from the inside wall of tubes. Proper use of this fixture will automatically establish proper edge distance, therefore your only dimension layout will be from the tube ends to hole centers.
- b. Select side of fixture with proper hole size, 3/16" or 1/4". Letter the hole sizes on tube as they are marked.
- c. Obtain a good quality 10 ft. steel rule. Hook tape end on the numbered, squared end of tube to be dimensioned, and stretch tape the full length of tube. Tape should be parallel with, and 1/2" from the edge of tube; clamp in this position.

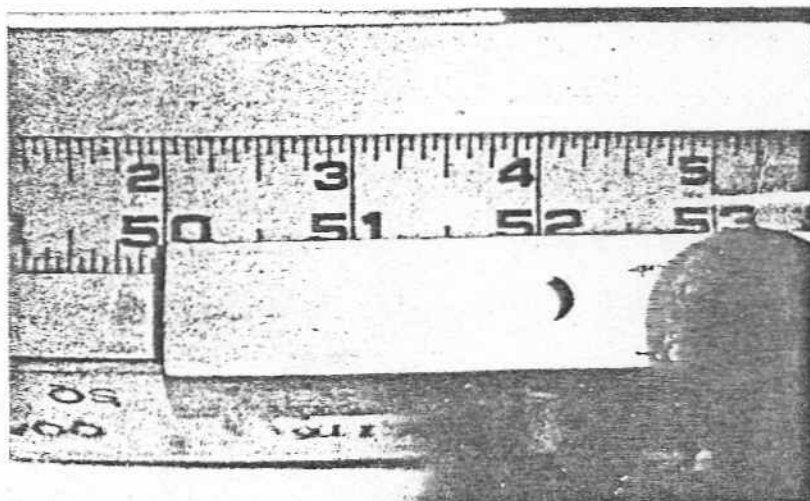


Sight Gauge - TK-140

Clamp "Sight Gauge" to tube wall, placing it just on edge of hole to be drilled. Use the top web of angle-gauge as a vertical and horizontal reference to align the drill bit over hole.

Fig. 8

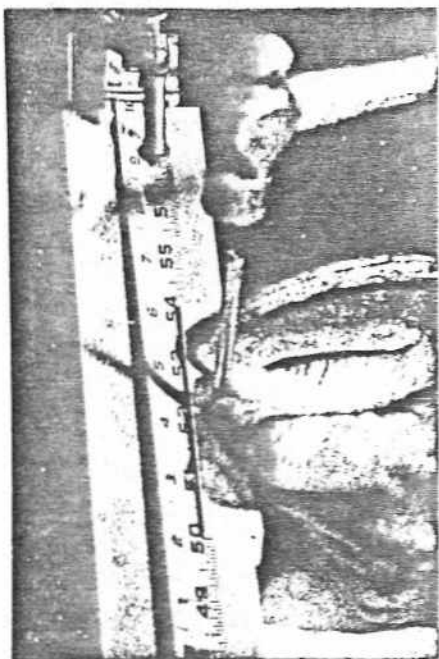
- d. Slide Fixture along edge of tube on top of steel tape. The Transfer Fixture locating holes are on 2" centers from either end. Align end of Fixture, plus or minus this 2" dimension, of the spanwise drawing indicated dimension. When properly located by visual alignment, clamp Fixture in position.
- e. Insert correct size Transfer Punch and strike it to mark location of hole to be center-drilled and drilled. Note: The tips of Transfer Punches are Not hardened and should be struck lightly, to be followed by a regular center-punch procedure.
- f. Repeat this procedure on all sides of tubing to be drilled.



Transfer
Fixture
TK-101

Fig. 9

Measuring tape is clamped 1/2" from tube edge. Center of hole to end of Transfer Fixture is 2". Edge of fixture is clamped on the 50" or 54" dimension, therefore your hole to be drilled is at the 52" location.

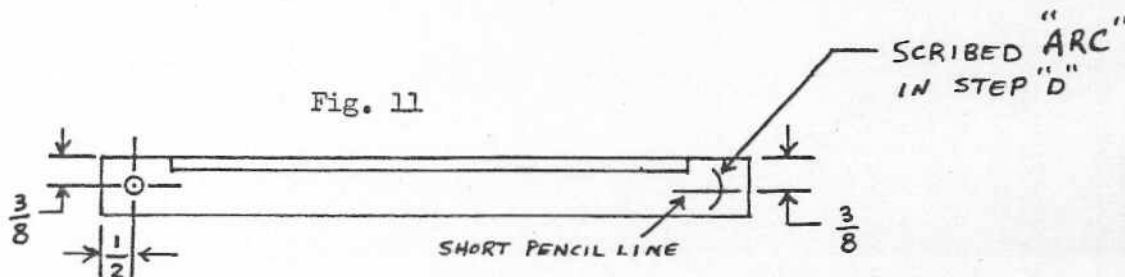


The 3/16 and 1/4 Transfer Punches are intended for lightly marking hole center locations only. Do not use as a center punch. Use punches on steel parts last, as steel will quickly dull the point, and render the punches useless.

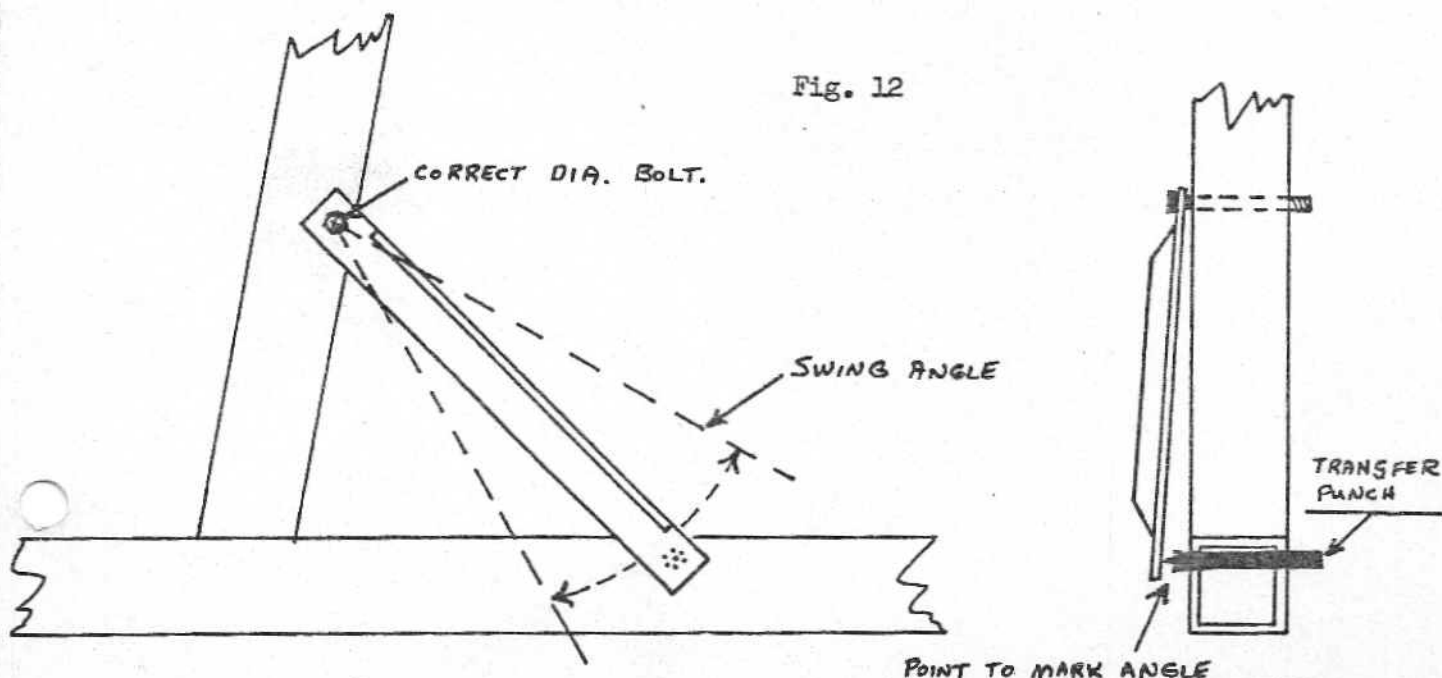
Fig. 10

13. Typical method of locating correct center to center hole distance on brace angles to match pre-drilled holes in Mast, Keel, or Axle:

- a. Lay out hole center location on one end of angle. Center-punch, center-drill, and drill to size.
- b. On the other angle end, draw a short pencil line as shown on the center of the angle width web.



- c. Insert correct diameter bolt through pre-drilled angle hole and 2" tube to be braced. The angle then becomes a pivot. Insert correct diameter Transfer Punch through pre-drilled hole in mating member for brace attachment with the point protruding enough to touch web of angle.

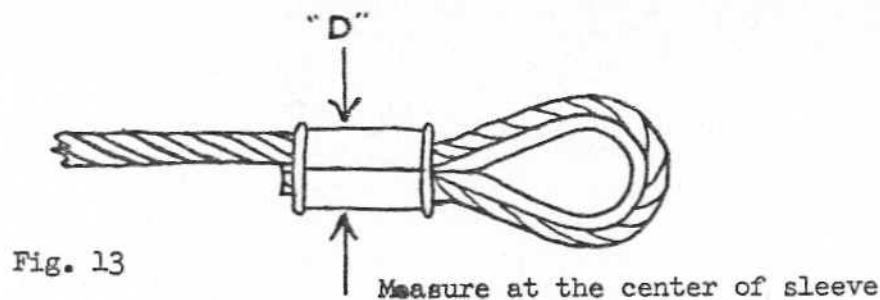


- d. Swing angle as a pendulum against point of Transfer Punch to barely scribe a short "arc" as shown above, within the confines of the hole to be drilled.
- e. Remove angle, center-punch, center-drill and drill at the intersection of the pencil line and scribed arc. Repeat a like procedure on mating angle.

14. Use of the TK-132 Nicopress Sleeve Squeezer:

(A factory-finished "Swage" Tool is supplied with the 8-41 Airframe Materials package. If you do not have this tool, a simple squeezer can be made as follows.)

- a. Cut a $5/8 \times 1 \times 6$ " Steel Bar into (2) pieces, 3" long. Clamp the $5/8$ " faces together; lay out and drill (2) $3/8$ " holes, $1/2$ " from each end and insert (2) 6-24A bolts and tighten nuts.
- b. At the mating seam of the 1" side halves, lay out, center-punch, center-drill, and drill (1) $11/32$ " hole for $1/8$ cable; (1) $1/4$ " hole for $3/32$ cable; and (1) $3/16$ " hole for $1/16$ cable. Chamfer and debur holes.
- c. To clamp the Nicopress Sleeve on cable, thread sleeve onto cable and insert free end of cable into remaining sleeve half to protrude out the opposite side approximately $1/8$ ". Insert thimble into cable eye, and pull cable tight around thimble.
- d. Insert cable and sleeve assembly into the correct hole size of the Steel Bar and tighten the 6-24A bolts to squeeze nicopress sleeve around cable.



e. After squeezing the sleeve, be sure to check it for proper O.D. dimensions as shown below.

18-1-C	1/16"	Sleeve ...	(.185 Max. Dia.)
18-2-G	3/32"	Sleeve ...	(.265 Max. Dia.)
18-3-M	1/8"	Sleeve ...	(.355 Max. Dia.)

15. Proper procedural sequence for all drilled holes:

A. Lay out locations as dimensioned on drawings, center-punch, center-drill, and drill to size and debur.

16. Hardware selection and replacement:

A. Refer to assembly drawings and Packing List for correct selection of attaching hardware. A flat washer is installed under all attaching nuts.

17. Recommended torque values:

	<u>Bolts in Shear</u>	<u>Bolts in Tension</u>
3/16" Dia. Bolts	20-25 inch lbs.	40 inch lbs.
1/4" Dia. Bolts	50-70 inch lbs.	100 inch lbs.
3/8" Dia. Bolts	160-190 inch lbs.	390 inch lbs.

A. Each material package will have its own torque requirements listed.

B. The above readings may vary depending on the type of structure being bolted:

- On a solid block there is no danger of crushing.
- On airframe tubes, the maximum torque listed above will prevent distortion of the compression web of tube.
- On a round tube structure such as the Seat Back or Bottom, or the Overhead Control Stick, the torque will be restricted to the amount of crush load the tube will withstand without distortion. Observe the structure very closely to prevent ANY distortion.

C. When installing and tightening a nut on a bolt, the nut should always have one or more washers under it. HOLD THE HEAD OF BOLT with a wrench to prevent it from turning, and turn the nut. NEVER TURN THE BOLT, as the plating will wear off and accelerate corrosion of the bolt.

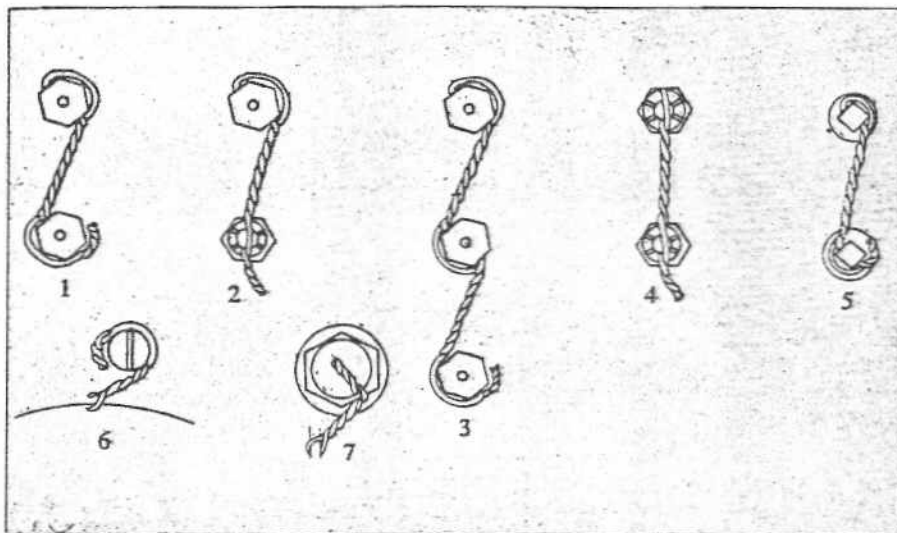


Fig. 14A

Fig. 14B

8. Safety Methods -- Safety Wiring

Safetying is the process of securing all aircraft, bolts, nuts, screws, pins, and other fasteners so that they do not work loose due to vibration. A familiarity with the various methods and means of safetying equipment on an aircraft is necessary.

There are various methods of safetying aircraft parts. The most widely used methods are safety wire, cotter pins, lockwashers, and special nuts, such as self-locking. Safety wiring is the most positive and satisfactory method of safetying nuts, which cannot be safetyed by any other practical means. It is a method of wiring together two or more units in such a manner that any tendency of one to loosen is counteracted by the tightening of the wire.

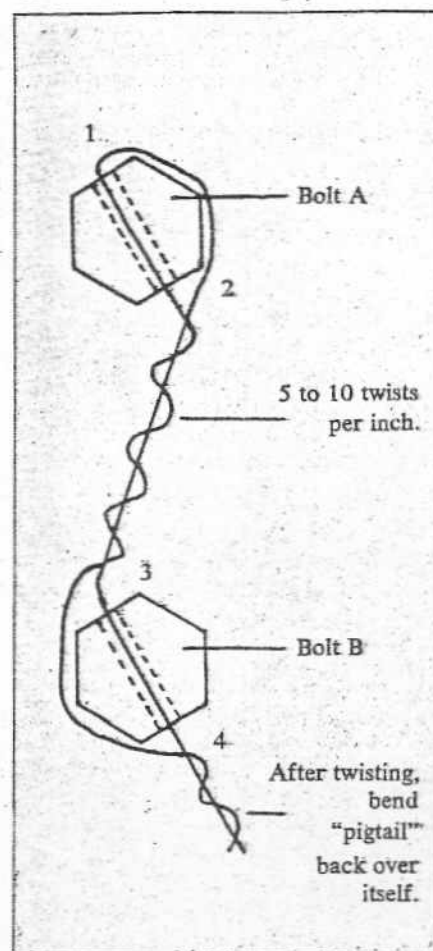
Nuts, bolts, and screws are safety wired by the single-wire or double-twist method. The double-twist method is the most common method. The single-wire method may be used on small screws in a closely spaced closed pattern, on parts in electrical systems, and in places that are difficult to reach. Figure 14A is an illustration of various methods which are commonly used in safety wiring nuts, bolts, and screws.

Figure 14A, 1, 2, & 5 illustrate the proper method of wiring in pairs. Number 3 illustrates several components wired in series. Example 4 illustrates the method of wiring castellated nuts and studs. (Note: there is no loop around the nut.) Examples 6 and 7 illustrate a single-threaded component wired to a housing or lug.

Figure 14B illustrates the correct method of wire insertion, twisting, and the completion after twisting of bending the "pigtail" back over itself. Numbers 1, 2, 5, and 5 in Figure 14A are completed as described in Figure 14B.

When safetying widely spaced bolts, a group of three should be the maximum number in a series. For closely spaced bolts, the number that can be safety-wired by a 24-inch length of wire is the maximum in a series. The wire is arranged so that if the bolt or screw begins to loosen, the force applied to the wire is in the tightening direction.

Parts being safety-wired should be torqued to recommended values and the holes aligned before attempting the safetying operation. Never over torque or loosen a torqued nut to align safety wire holes.



19. Proper riveting procedure is as follows:

- a. Clamp or hold the two members to be riveted tightly together to prevent rivet from expanding between the surfaces.
- b. Press firmly against the "Head" of the rivet with approximately a 2 lb. steel bar to prevent rivet from backing out of material.
- c. With a small ball-peen hammer, lightly tap "buck-tail" of rivet with light peening strokes to set the rivet.

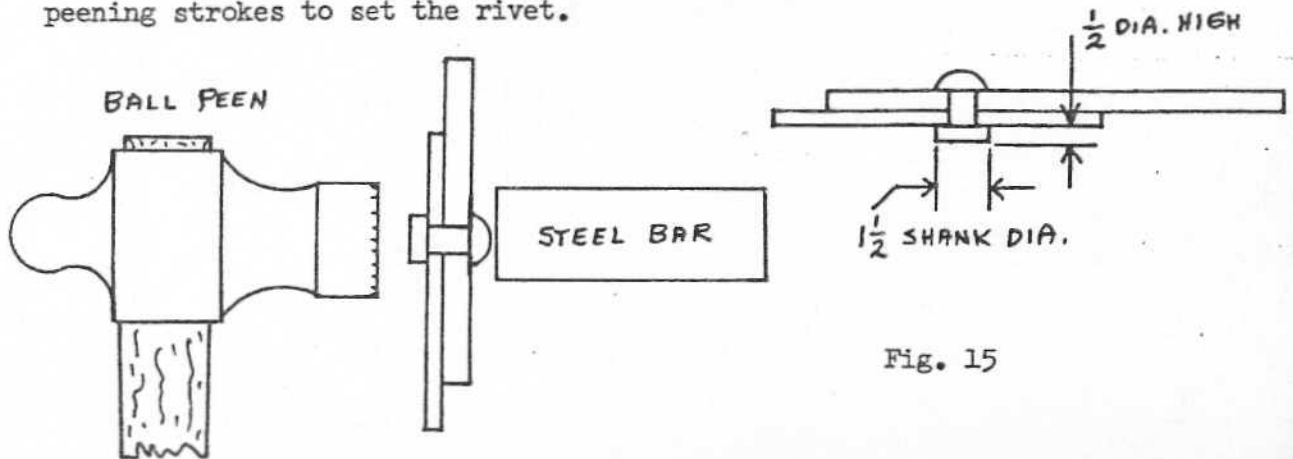


Fig. 15

- d. The "up-set" or "buck-tail" of rivet should be approximately 1-1/2 the diameter of the rivet shank, and 1/2 the diameter of rivet in height.

20. Proper Method for Installing Cotter Keys:

Align the hole in bolt with the slot in the Castellated Nut and insert key. The prong bent over the bolt should not be longer than the diameter of the bolt. You may have to cut it to fit. To get the prongs to fit tightly against the bolt, tap them lightly with a mallet.

The below illustration shows the preferred method of installation.

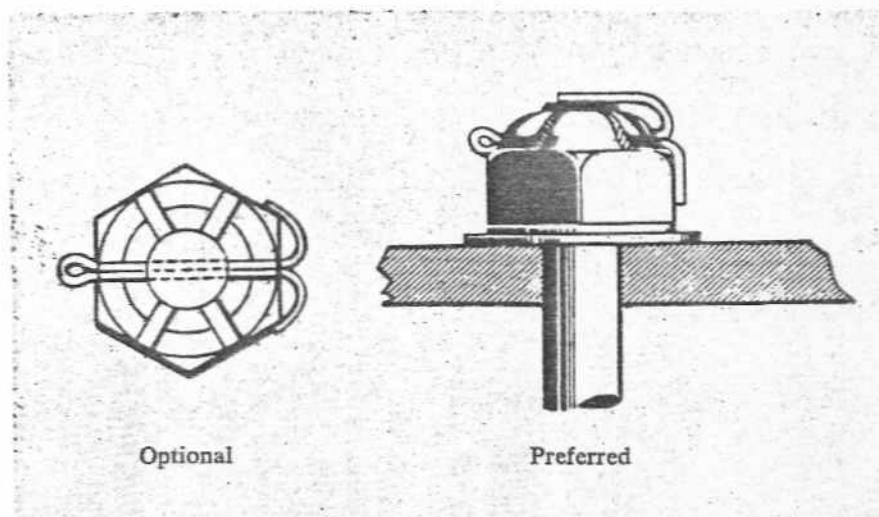


Fig. 16

REQUIRED 'HANG' & GROUND TEST

3-80

FLIGHT ENVELOPE, or any type of aircraft is defined ONLY when the "C.G." (Center of Gravity) location is also defined and kept within specified limits. The "C.G." limits not only apply to flight characteristics of the Gyro, but also include ground xi, take-off, and landing requirements.

easy method to determine the "C.G." of the gyro, relative to the rotor suspension is by a "hang-test" of the craft, clear of the ground at its teeter bolt. With the pilot in the seat in a normal flight position, center the control stick and measure the tilt angle of the Mast to the forward, relative to the vertical. To determine the "C.G." relative to the ground, place the nosewheel on bathroom scale, block-up rear wheels to the same height as the platform scales. With pilot in the seat, read the "contact" weight of nosewheel on the scale.

VARIABLE COMPENSATION "C.G." CONTROL. The geometry of the Gyrocopter is basically fixed. The fuel tank is located near the correct "C.G." of the aircraft, thus having a minimum effect on weight, whether empty, or full. (Tilt is increased approximately 1/2 degree forward with full tank.) The pilot's weight, however, may range from 120 to 200+ pounds. This is 50 to 75% of the total empty weight of the Gyro! This relatively large weight change results in a considerable shift of the "C.G." location. (Change in the Hang-Test of approximately 4°.)

The nosewheel contact weight may also change from 10 to 60 pounds, depending on the pilot's weight, which affect the steering control while taxiing and the airspeed at which the Gyro rotates from nosewheel to tailwheel during the take-off.

The method to compensate for a lighter weight pilot and to obtain a correct "C.G." tilt angle and nosewheel contact loading, would be adding lead ballast weights to the front end of the fuel tube. This may require up to 30 pounds of ballast! The preferred method is to move the lighter weight pilot forward on the seat by using a back cushion. This method corrects both

the tilt angle and nosewheel contact loading without adding additional weight to the Gyro.

Determine the approximate thickness of the back cushion you might require, if any, by the following chart based on your weight. Then obtain and use the correct thickness of cushion each time you operate your Gyro.

120 lb pilot	----	3 inch cushion
140 lb pilot	----	2 inch cushion
160 lb pilot	----	1 inch cushion
180 lb pilot	----	none required
over 180 lb	----	none required

VARIABLE COMPENSATION FOR DIFFERENTIAL PILOT SIZE -- (Leg Length)

Temporarily clamp your Rudder Pedal tube assembly on the Keel tube next to bolts retaining the nosewheel on Keel. Sit in the seat with feet on the pedal tube, and move pedal tube fore or aft to a comfortable leg position. Hang-Test your Gyro to verify the correct cushion thickness of back to obtain correct angle of Mast tilt, and readjust rudder pedal location if necessary, for the most comfort.

Now measure nosewheel contact ground-contact pressure or weight. 30 pounds minimum is required! Follow instructions contained with the Landing Gear package to permanently mount pedal tube to the Keel.

If you anticipate your machine to be flown by pilots of different weights, an inflatable back cushion is a better answer. Determine by hang-test the correct inflation of the cushion for correct spacing needed for each pilot weight.

If you add any equipment or accessories to your Gyro at any time, the "Hang-Test" MUST be repeated! THIS IS A MUST, DON'T SKIP IT!

WARNING: A Glider-Trainer or Gyrocopter MUST NOT be operated or flown until the

proper Center of Gravity (C.G.), relative to the rotor suspension is determined by this "REQUIRED HANG AND GROUND TEST". Improper C.G. placement will result in dangerous operating conditions in both flight and ground contact control during take-off, and landings.

TYPICAL "HANG-TEST" PROCEDURE

Step 1- The complete ready-to-fly Glider-Trainer must be equipped with the long 8-20A-018 Glider-Trainer Head (Cheek) Plates.
(or)

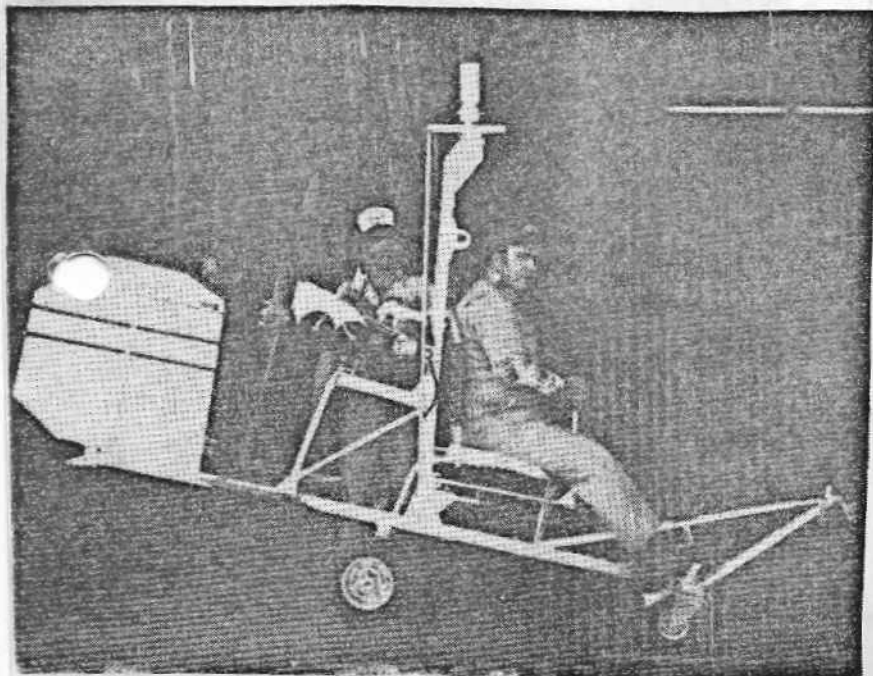
Step 2- The complete ready-to-fly Gyrocopter must be equipped with the short 8-20A-019 Gyrocopter Head (Cheek) Plates. The Fuel Tank should be empty.

Step 3- Select a back cushion that matches the pilot's weight from chart shown in the Variable Compensation "C.G." Control section.

Sit in the Gyro seat with selected back cushion.

Determine the location of Rudder Pedals.

Step 4- Remove the Rotor and Hub from the 8-20A Control Head. Suspend the Gyro about two feet above the ground by the teeter bolt from an overhead beam or branch, with a rope, cable or chain. Nosewheel must be off the ground.



Step 5- The hanging attitude of the craft is subject to pilot's weight, optional equipment placement, the position of the Control head, which must be held by the Control stick in a neutral position. (The 1-1/4" sq. Torque Tube on the Control head must be parallel with the top of the head (cheek) plates.) The teeter bolt should be at right angles to the Keel center-line.

Step 6- Sit in the seat with feet in position on rudder pedals, back of body in contact with seat-back or cushion, hand on Control stick which is moved to neutral position and held. Have an assistant measure the Mast angle relative to the vertical with a protractor or pitch-meter placed on the forward or rearward face of Mast, just above the pilot's head.

TILT LIMITS

The Mast angle MUST be tilted FORWARD from the vertical, nose down, between (1) one, and (3) three, degrees. If you have insufficient forward tilt, the preferred fix is, as mentioned, to move the pilot forward by using a thicker back cushion.

Step 7- When hang-test is within the correct limits of 1 to 3 degrees forward, set the Gyro on its wheels. Recheck Rudder Pedal location and mark its position on Keel tube.

Step 8- Place nosewheel on bathroom scale and block up main wheels to the same height on scales. Sit in the Gyro seat with hand on Control stick and feet on Rudder Pedals. Have an assistant read the nosewheel "contact" weight of nosewheel. MINIMUM ACCEPTABLE WEIGHT IS 30 pounds. Add ballast if necessary to front of Keel tube to reach the Minimum Weight of 30 pounds.

Re-check "Hang-Test" to make certain ballast did not move your correct tilt out of tolerance of 1 to 3 degrees forward.

REPAIR AND ADJUSTMENT

The Bensen factory-supplied, factory-finished items for the Model B-80 Gyro are: 8-10 Rotor Blades, 8-20A Gimbal Control Head, 8-20B Standard Rotor Hub, 8-20B³/₄ Extended Rotor Hub, and 8-52-J2 Joystick Control System. All of these components are designed specifically for the Model B-80 and must not be modified in any manner. They should be installed, used and maintained ONLY as specified in the individual Manuals included with each!

Each of the above factory-finished Kits are precision manufactured items, designed and made on very close-tolerance fixtures. Should ANY damage occur on any of the items, they should be returned to the factory for inspection and possible repair.

Changing just one part on any of these items could upset the flight characteristics of the entire Gyro. Bensen Aircraft Corporation WILL NOT attempt to repair any item which user has modified or attempted repair himself!

The 8-10 Rotor System, turning at flight RPM, has a tremendous amount of stored kinetic energy. Just like a large fly-wheel. If it contacts another object and decelerates rapidly, the magnitude of force is far greater than any possible normal flight loads. An immediate specialized inspection is necessary to determine the magnitude and type of load

the rotor and other components might have been subjected to.

The only way you can be assured of a continuing standard of performance and reliability is to return all items to the factory for expert analysis.

The propeller, if damaged, should be returned to its manufacturer, not to Bensen Aircraft. We do not have the proper equipment to deal with wood products. Save the documents that came with the propeller for possible future use. The manufacturer can easily repair nicks and dents produced by pebbles and small rocks if it is returned to them promptly. Do not allow moisture and soil to soak into the wood fibers, as that may make the repairs impossible.

The engine for your Gyro should also be returned to its supplier if you have any problems with it or need an overhaul.

These are guidelines for your safety. Follow them to the letter!

To repeat: The information given in this Manual, although accurate, is a "general" guideline information only. Refer to the Instruction Manual supplied with each individual B-80 Kit for detailed methods of construction, assembly, inspection, and flight operation, to include the PILOT'S MANUAL. If in doubt, call the Bensen factory anytime! We will be glad to help you achieve success with your "standard" B-80 Gyrocopter. But when it comes to your "modifications", or "improvements", don't ask as: you then become your own "design engineer", and will assume all potential liability for making any and all changes from the standard Bensen design.

ENGINE TEST

The ONLY CORRECT METHOD to test your Gyrocopter powerplant is on the ground -- NOT in the air! Proceed as follows:

1. **TIE THE MACHINE DOWN** by its tailwheel frame before any attempt is made to start the engine. DO NOT attempt to start the engine without this "tie-down" until you have become familiar with its operation and individual characteristics. You are dealing with an extremely light-weight aircraft and a powerful engine. Especially if the pilot is not in the seat. Even with all three wheels on the ground and locked, the Gyro will "runaway" at a full throttle setting.

2. When starting your engine, always watch the carburetor throttle arm setting. DO NOT depend on the throttle Grip position for an accurate indication of throttle setting. Always start engine with a 1/8 to 1/4 "cracked" throttle.

MANDATORY REQUIREMENT FOR THE 4318AX MODIFIED McCULLOCH ENGINE

1. Use only Aircraft grade fuel: "Av gas 100" or "100 LL", mixed with "40/1 McCulloch 2-cycle engine lubricant" at a ratio of 21 parts fuel to 1 part lubricant. (6 oz. lubricant per 1-gallon of fuel.)

2. MINIMUM FUEL PRESSURE REQUIRED:

2-3/4 to 3 psi at full throttle of 3600 RPM, and 2 psi minimum at 3100 RPM.

3. MAXIMUM Cylinder Head temperature is 475 degrees.

4. Read carefully the Operational Manual included with the 4468-1, (8-91B) Carburetor for full details on engine operation and defined limits.

5. DO NOT attempt to make "trial-and-error" adjustments and test them in-flight.

6. BEFORE any attempt to taxi or start your flight training, spend time setting in the seat of your Gyrocopter with the engine running, and the machine tied-down

Have your helmet on and ear plugs in your ears. Become acquainted with the throttle response, the feel of sitting in the seat at different engine power settings. Imagine that you are flying. Equally important, become familiar with the sound and vibration levels until you are fully aware of this strange-new feeling.

If you follow these guidelines, you will not be frightened by all the new things and noises "happening-at-once", and not become dis-oriented.

EVEN FOR THE EXPERIENCED GYROCOPTER PILOT, ENGINE TROUBLESHOOTING AND PERFORMANCE TESTS SHOULD BE MADE WHILE THE MACHINE IS ON THE GROUND, AND TIED-DOWN!