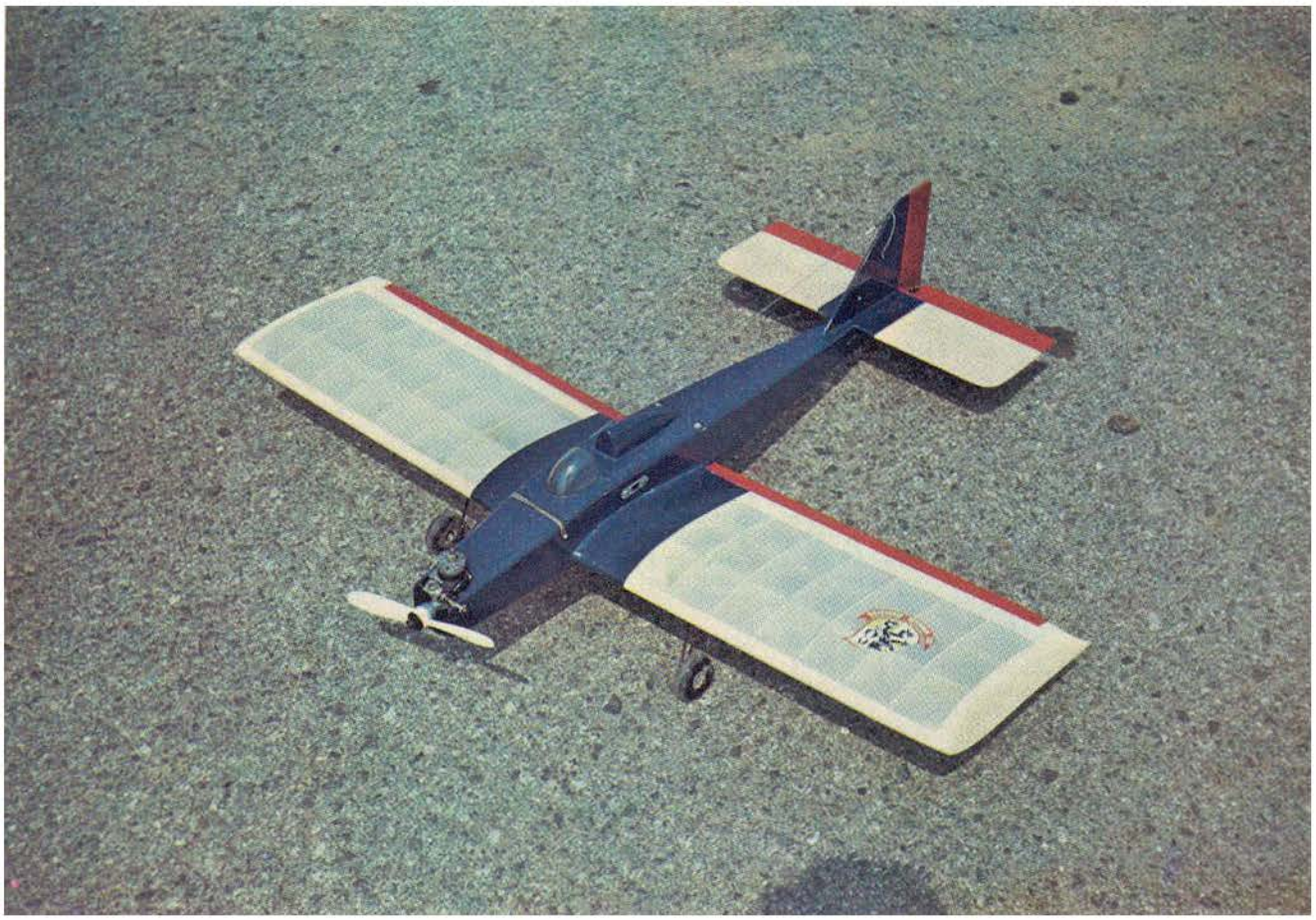


BY PAUL STRENGELL

THE HUMP

A .15 POWERED TRANSITIONAL 'TRAINER' THAT TURNED OUT TO BE SOMETHING MORE . . . . .

Before I hear any snide remarks about the names of these two airplanes, let me explain that I only build and design my own planes so I can give them any name I like. In fact, my standard procedure is to think up a name and design an airplane to fit it. The fact that the thing might fly is strictly coincidental.

All kidding aside, and in spite of their names, the "HUMP" and the "BUMP" are fine fliers and have served me well over the past year. Both have literally had their wings and tails flown off, with only one crash and that was with the original "HUMP" which succumbed to pilot error during landing. The second "HUMP" (shown in the photos) has been retired twice, but brought back to active duty both times for something to fly.

The "HUMP" was the original of the two. It was intended to be a transitional trainer from a Lanier Cessna with which I had been learning to fly. However, in bridging the gap I guess I left out a span 'cause it proved a bit more than I could handle at the time. Though stable, it was just a little too responsive for my ill-trained reflexes.

I liked the basic size and planform so, rather than drop my idea, I took a more conventional approach to a trainer and put the wing on top. The "BUMP" (it rhymes) was born.

This filled the gap and I began to find out what R/C multi was like. She proved capable of all but sustained vertical maneuvers and showed no bad habits. Since the wing loading was a little high the landings were a bit faster than I was used to and this proved to be my undoing with the "HUMP" later on. Don't get me wrong, the higher sink speed wasn't bad, it was just higher than the Cessna. In fact, I feel it is an advantage over a "floater" and, once I mastered my sink rate, my landings improved.

The "BUMP" finally wore out so I built another "HUMP" (to replace the original) to really prove whether it was a worthwhile design. I found it actually performed very much like the "BUMP", but, as stated before, was somewhat more responsive. Of the two airplanes the "BUMP" is probably the better overall flier, but I actually prefer the "HUMP" because of its responsiveness and appearances (ugh!).

CONSTRUCTION

GENERAL:

These are small airplanes and their performance is very dependent on

their wing loading so select your wood carefully. However, don't sacrifice strength for weight. The leading edges and main spar should be fairly hard and the stab, medium hard. I wasn't kidding when I said I had flown the wings and tails off the originals. Medium wood will suffice for the fuselage sides and medium soft to soft for the remainder.

Construction of either the "HUMP" or the "BUMP" is relatively simple; however, I'm going to assume that some of the potential builders are those who have gained the initial experience needed to fly airplanes like these on ARF types and have yet to build a built-up model. For this reason, contrary to a good many construction articles I have read lately, I will attempt to be a little more detailed in my construction description.

WING:

Cut out two rib templates from 1/16" plywood and drill two 1/4" holes in each template as shown on plans. Both templates should be identical, with the holes in perfect alignment. Start cutting blanks out of medium 1/16" balsa. You don't need to be precise on the outline, in fact, it must be oversize, and don't bother cutting out the spar slot nor the trailing edge recesses. After you have the required number of blanks, carefully position a template on each blank and drill the two 1/4" holes in each one.

Stack the blanks on two short pieces of 1/4" dowel, placing a plywood template on either side. Sand all the ribs to match the outline of the templates. Rough out the trailing edge recesses with a knife and finish to the exact outline with a piece of fine sandpaper or a file. Use a razor saw to cut the spar slot slightly undersize and use a small metal file to finish to the correct size.

Remove the two templates and pin the stack together to prevent shifting. Remove the rear dowel. Use a 1/4" square file (can be found in most hardware stores and you will find it a handy tool in the future) to shape the rear spar hole by working it back and forth in the 1/4" hole.

The above may sound like a lot of work, but, unless you own a good jig or band saw, its the easiest way I know to produce a really good set of matched wing ribs. Make all the ribs at once and trim some as necessary for sheeting and landing gear blocks.

Sand one edge of a sheet of 1/8" x 2" x 36" hard balsa perfectly straight using a long sanding block and the edge of a straight work bench for a guide. Mark the center and all rib locations on this piece and cut to the correct width with the straight edge as the bottom of the spar. Cut the rib notches, but do **not** cut the spar in half.

Use a piece of straight, medium 3/8" x 3/4" for the leading edge. Mark

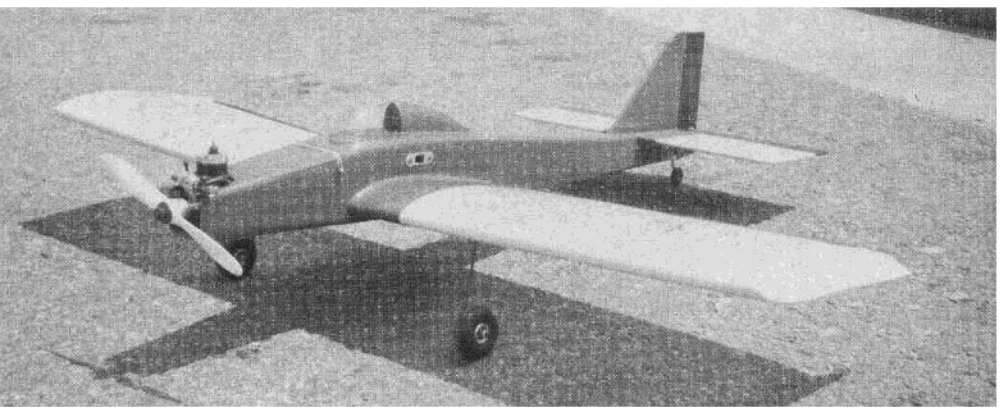
AND BUMP

A HIGH-WINGED VERSION OF THE 'HUMP' THAT IS CAPABLE OF ALL BUT SUSTAINED VERTICAL MANEUVERS.....

the rib locations and center, then cut the rib slots using two pieces of hacksaw blade taped together. Do **not** cut in half.

Slide the ribs (except the center rib on the "BUMP"), in proper order, onto a straight piece of 1/4" square. Position the ribs and slip them into their respective places on the main spar. Pin the main spar on its correct location on the plans. Block up the rear spar ½" and reposition the wing ribs as necessary. Slip the leading onto the ribs and pin it down on 5/16" high blocks. (Note: the two center ribs on the "HUMP" wings are slanted out to allow for dihedral). Glue all the joints using Titebond or similar glue.

Allow the glue to dry for awhile, then glue the top 1/16" x 1" trailing edge in place. Let the wing dry thoroughly and remove from the plans. Pin the wing to the workbench, **upside down**, and blocked up so the trailing edge is flat. Glue the 1/16" square spruce in place on the top trailing edge and then the bottom 1/16" x 1" trailing edge. Pin the entire trailing edge down securely and check to see that it is straight. Allow to dry before removing.



Using a tri-square, carefully mark the center line on the trailing edge and rear spar, then cut the wing in half with a razor saw. Pin the wing halves together, leading edge to leading edge and block the tips up for the proper dihedral angle with the bottom of the main spars flush with, and perpendicular to, an edge of the work bench. Block up the trailing edges so both are the same distance above the workbench, then, using a long sandpaper block, with the workbench edge as a guide, sand the proper bevel into the wing center section.

If you are building the "HUMP" wing you may now epoxy the two panels together and pin them to the workbench, leading edge down, until the epoxy sets. Be sure to check for the proper dihedral angle and for any possible misalignment. The "BUMP" wing is done in a similar manner except the center rib is slipped onto one panel before the two are joined and then positioned after the panels are joined.

After the epoxy has set, install the dihedral braces on the leading edge and main spar and the balsa filler in the trailing edge. On the "HUMP" wing, sand the bottom of the main spar flat between the center ribs and also cut away the rear spar as shown.

The wing tip blocks are made by sawing a piece of soft 1" x 2" block in half diagonally. This is best done on a bench saw, but in lieu of that, it can be done with a handsaw if you are careful. Trace the rib outline on the block and saw to shape. Make the tip plate from fairly hard 1/8" sheet. Glue the tip blocks in place and then the tip plates. Sheet the center section with 1/16" sheet.

The leading edge on the "HUMP" wing may now be rough shaped except for the center section where it fits into the fuselage. Final finishing of the wing is done after assembly to the fuselage.

The "HUMP" wing is finished by assembling the servo box in the center section, sheeting the center section and shaping the leading edge and wing tips. A long sanding block is particularly useful in the final shaping of the leading edge to insure a uniform shape across its entire length. After the wing has been sanded, wrap the center joint with nylon tape glued or epoxied in place. Install the aileron torque arms using nylon tape and epoxy. The ailerons may now be shaped and fitted, but do not install until after covering the wing.

FUSELAGE:

Since there aren't any curved lines in the fuselage, I highly recommend that the fuselage sides be laid out on the wood by measurement and drawn with a straight edge. This is much more accurate (if you're careful) than tracing the sides from the plans. Use medium hard wood.

Cut out the 1/32" plywood doublers and glue to the sides with contact cement. Use at least two coats of cement and weight the sides while the cement is setting. While the cement is drying cut out all the bulkheads, uprights, install blind nuts in the firewall, etc., so fuselage assembly can proceed uninterrupted when the sides are ready. Glue on the uprights when the sides are dry.

Tack the fuselage top view to the work table and position bulkheads 2 and 3 on the top view, being sure they are firmly anchored and perpendicular to the table. If you haven't done so, cut out the notches for the wing leading edge, trailing edge and spar in the "HUMP" sides. The use of "fast set" epoxy can speed assembly of the fuselage considerably, but be sure everything is positioned accurately before the epoxy sets. Align the sides on bulkheads 2 and 3 and pin or block in position until the epoxy has set. Now epoxy the firewall in place, pull the sides together and glue at bulkhead number 4 and the tail. Use masking tape and pins to hold everything in place. Try to be as careful as possible because the alignment of the entire plane is dependent on the accuracy of the fuselage.

When all is dry, set, or cured, remove the fuselage from the plans. Sand the edges flush and smooth with the bulkheads. Glue in the cross pieces at each upright and the 1/8" sheet filler at the tail. If you're building the "BUMP" you can now glue in the top and bottom sheeting, plywood landing gear mount and nose blocks. (tack glue the nose hatch cover so it can be removed later). Sand off the whole mess so its neat and suits your fancy. Carve out the nose sheeting to fit your engine and you've essentially finished with the "BUMP" fuselage.

If you're building the "HUMP", you can glue the top rear sheeting permanently in place, but the bottom sheeting and front and rear hatch covers should be tack glued. The blocks on top of bulkhead F-2H can also be permanently epoxied in place, as can the ¼" sheet on the nose. Sand everything to shape, then remove the hatch covers and the bottom sheet. Remainder of fuselage is completed during final assembly.

TAIL SURFACES:

These are self-explanatory. Use light but firm wood. The stab can be made from solid sheet if you prefer although the built up stab is a little lighter and warp resistant. Round off all edges as shown and sand smooth. Do not hinge rudder and elevator until later.

FINAL ASSEMBLY:

HUMP

Slide the completed wing into place on the fuselage and adjust until it is in perfect alignment. Epoxy the leading edge, trailing edge and spar to the fuselage. Fill in the leading-trailing edge slots with scrap balsa and glue the bottom sheeting permanently in place. When the assembly is dry, finish shaping the wing leading edge and sand the whole works to shape.

BUMP

If you haven't done so, drill the fuselage for the wing dowels. Make the landing gear from sheet aluminum. If you are unable to obtain any aluminum, I'm sure there is a ready made gear which will fit. Drill 1/8" mounting holes in the gear and in the 1/8" plywood mounting plate on the fuselage.

The wing is fitted to the fuselage by cutting away the top of former F-2B so the leading edge fits properly.

THE FOLLOWING APPLIES TO BOTH THE "HUMP" AND "BUMP"

Glue the stab in place being sure it is correctly aligned. After it is dry, mark the centerline on the fuselage top and cut away the sheeting just forward of the stab to permit the fin to be glued in place. Use a triangle or square to check that the fin is perpendicular to the stab.

Glue the plywood "tongues" on the hatches. Make and install the tapped hardwood blocks for the hatch hold downs on the "HUMP". Use hooks with rubber bands for the front hatch hold downs. The triangular stock in the nose should be epoxied in place and the entire nose section interiors coated with epoxy for strength and fuel proofing.

The head rest and windshield on the "HUMP" are optional. You may prefer a bubble canopy or nothing at all.

For finish and cover I recommend MonoKote or Solarfilm. I silked and doped the "HUMP" shown in the photos and regret that I wasted the time. Solarfilm was used on the "BUMP". From the standpoint of weight and warps, both very important in these small planes, the plastic films have no peer. If you insist on a silk and dope finish you're on your own, but do keep it light.

After covering is complete the control surfaces can be hinged to the wing, stab and fin. The tail wheel can also be installed.

Locate the bulkhead in the center of the "BUMP" cabin to suit the size of your receiver. Mount the engine and, with a long drill or piece of sharpened wire, drill a 1/8" hole for the throttle tubing. I use 1/8" nylon tubing and 1/32" wire for the throttle linkage with a "Z" bend to connect to the throttle arm and a "kiwk-link" soldered to the servo end. Either put in a "V" bend for adjustment or unsolder the "kwik-link" to set up the throttle.

I used a 3 ounce Sullivan slant top tank in both airplanes. The tank should be kept as high as possible and the fuel line routed so it is free of kinks. I replaned the brass tubing with 1/8" nylon tubing since you can bend it nicely with just a little heat. Also I've noticed the brass tubing embrittles after prolonged contact with fuel and is very likely to split without warning and with possibly disastrous results.

As for mounting servos, I don't recommend using servo tape and I speak from experience. These small airplanes don't have the mass to absorb engine vibration like the big 5 to 7 pound ships. As a result the incessant vibration will eventually get to something and usually its the servo motor, namely the brushes and commutator. The standard servo tray (for Kraft KP-10 size and smaller) will fit the "BUMP", but you will have to make your own for the "HUMP". Use 1/8" plywood for the tray and No. 2 sheet metal screws for hold downs.

The servos (KP-10's) on the "HUMP" were mounted as follows:

ENGINE – Behind wing spar with long axis across fuselage and output wheel on right.

RUDDER – Behind and parallel to the engine servo with the output wheel on the left.

AILERON – On the right side behind the rudder servo, with long axis parallel to the fuselage center-line and the output wheel to the front.

ELEVATOR – Next to the aileron servo on the left side with the output wheel to the rear.

The switch was mounted just above the rudder servo on the left side.

Pushrod installation is conventional though a little tight on the "HUMP". On the "HUMP" you should route the rudder pushrod to the right side of the rudder and the elevator pushrod to the left side of the elevator.

Mount the landing gear and wheels and you should be about ready to go. Install the receiver and batteries and check the C.G. It's quite possible you'll come out a little tail heavy with the batteries in the receiver compart-

BILL OF MATERIALS

WING

Balsa:

3/8" x 3/4" x 36"	1 ea.	L.E.
1/8" x 2" x 36"	2 ea.	Spar & tips
1/4" x 1/4" x 36	1 ea.	Spar
1/16" x 1" x 36"	2 ea.	T.E.
1/16" x 3" x 36"	3 ea.	Ribs
1" x 2" x 12"	1 ea.	Tips

Miscellaneous

1/32" plywood - reinforcement
1/16" wire
1/8" nylon tubing
threaded brass tube
1/16" x 1/16" x 36" spruce

FUSELAGE

Balsa:

3/32" x 3" x 36"	2 ea.
HUMP - fuselage sides	
3/32" x 3" x 36"	3 ea.
BUMP - fuselage sides & bottom	
1/8" x 3" x 36"	2 ea.
HUMP - top & bottom sheet (soft)	
1/8" x 3" x 36"	1 ea.
BUMP - bottom sheet (soft)	
1/16" x 3" x 36"	1 ea.
BUMP - top sheet	
1/8" x 1/8" x 36"	1 ea.
Uprights	
1/8" x 1/4" x 36"	1 ea.
Cross pieces	
3/8" x 3" x 12"	1 ea.
HUMP - top hatch	

1/4" triangular stock

FUSELAGE

Miscellaneous

1/8" 7 1/32" plywood - bulkheads & doublers
hardwood blocks - HUMP hatch hold downs
3/16" dowel - BUMP wing dowels
Tatone short .15 engine mount (or a .19)
4-40 blind nuts
4-40 nuts & bolts

TAIL SURFACES

Balsa: (For built up stab)

1/16" x 4" x 36"	1 ea.	Stab
1/16" x 3/8" x 36"	2 ea.	Stab
1/16" x 1/4" x 36"	2ea.	Stab
3/16" x 2" x 36"	1 ea.	Fin, rudder, elevator
3/16" x 1/4" x 36"		Fin

Balsa: (For solid stab)

3/16" x 4" x 36" stab, fin, rudder, elevator
3/16" x 1/4" x 36" - fin

Miscellaneous

Hinges
Horns
3/16" plywood
1/16" wire
1/8" nylon tubing
1" wheel
2" wheels
1/8" wire for HUMP landing gear
No. 2 sheet metal screws
Aluminum for BUMP landing gear
Covering material
Titebond
Epoxy
.15 or .19 engine

ment. If so, wrap the pack with plastic so it's fuel proof and mount under the fuel tank. This should be enough, but in any event do **not** balance aft of the wing spar.

FLYING

Before even going to the field the following items should be checked and adjustments made as required:

1. *Center of gravity* – this should be no further aft of the point shown on the plans and up to ¼" forward of that point.
2. *Engine operation* – proper idle adjustment and linkage adjustment. Also check the engine throughout its entire range for severe vibration and for proper fuel draw.
3. *Controls* – check for smooth operation and proper throw. The ailerons should be even with a total movement of about ¼" up and down. The elevator should move up and down about 3/16". Use plenty of rudder throw for good ground handling. About ½" should be sufficient.
4. *Landing gear* – check for straight tracking and free rotation of the wheels. On the "HUMP" the wheels should extend forward of the wing leading edge when sitting on the ground.
5. *Radio* – check according to manufacturers recommendation. Be sure the receiver and batteries are well shock proofed and, especially on the "HUMP", that none of the wiring fouls the servos.
6. *Surfaces* – check for warps. Minor warps in tail surfaces are acceptable, but any warp in the wing should be removed before flying.
7. *Get an experienced flyer to get the plane trimmed the first time if you feel your ability is not up to the task.*

Ground handling with a tail dragger always leaves a little to be desired and neither of these planes are an exception. If you allowed plenty of rudder movement both are manageable except in moderate to heavy winds. Be sure to hold "up" elevator and apply power smoothly when taxiing.

If you're flying from a smooth field just apply power and steer it down the runway. After it's up to flying speed give it a touch of "up" and it should come off smoothly. Be careful with the elevators as they tend to be a little touchy, so take it easy. The ailerons on the other hand are not overly sensitive.

If you're flying from a rough field, soft ground, or grass, you'll have to hold some "up" elevator to keep from nosing over. As soon as you break ground release pronto or you may do your first (and last) horizontal figure 9. You can "horse" either one off the ground, but get a little experience first.

You should probably set up your first landing approach a little long to allow getting used to the higher landing speed. Kill the speed by bringing up the nose slowly. Don't overdo it, although the stall is gentle, it is complete! The thing just quits flying and comes down like an elevator so if you flare too soon – look out!!

I believe you'll find either plane very pleasant in the air. Both have nearly neutral stability, i.e., they stay in whatever position you put them. The "BUMP" snaps and spins nicely, but the rolls are a little slow. The "HUMP" on the other hand is difficult to snap, spins o.k., but rolls great. As stated before, the vertical maneuvers leave a lot to be desired because of the power loading. With a .19 in the nose . . . . who knows??? Let me know if your try it. □

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