

Control Hardware

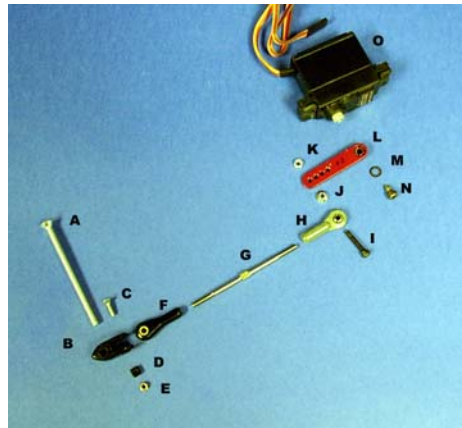
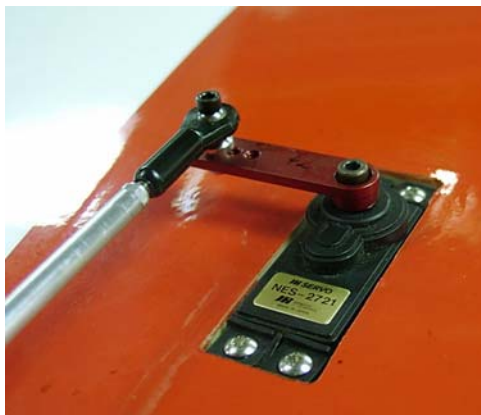
You can see that we have paid a lot of attention to geometric relationships. Here's where the difference between a 0.60-size sport airplane and a Giant Scale aircraft gets really important from a precision and reliability standpoint.

On the plans there is an isometric drawing depicting the servo linkage system. The control rod shown is a thick-walled aluminum tube that has been cut to length and tapped at each end to accept a 4-40 stud backed up with an aluminum lock nut. (K&S manufactures the tubing; ask for part no. 6030 from your local hobby store.)

The aluminum tubing system is very reliable as a control rod and it looks great if you take the time to polish it. But we decided that for the sake of not having to build each rod we would go with Hangar 9's new titanium control rods called Pro-Links.

Pro-Links are threaded opposite directions on each end, turnbuckle style, so that you can perform adjustments while the servo rod assemblies are installed in the aircraft. Easy maintenance is always one of my top priorities when building a model. Nelson sells 4-40 ball links tapped both directions to work with the Pro Links.

Black plastic ends have the normal right hand threads and the black end with a machined dimple (formerly gray plastic as labeled in the photo as "H"). Ball links are tapped left-handed. For additional information on linkages see the *Model Aviation Scale Aerobatics* column in the January 2002 issue.



I hope you can see that the point here is to have a solid, firmly bolted, and secure linkage system that does not flex or vibrate. For our control hardware we used Nelson (formerly Rocket City) 10-32 swivel link kits, Item RCL71A. The 10-32 is slight overkill so if you'd like to go a little lighter you can use the 8-32 kit item RCL70A without a problem.

The labeled photo shows an exploded view of the parts that we used to make up the control linkages. It is essential to build linkages to this level to maintain the aircraft's integrity in operation.

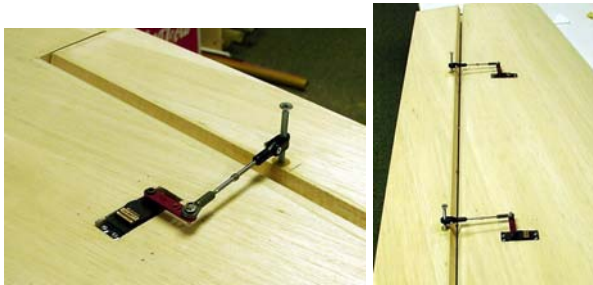
The parts labeled A through F come in the Nelson 10-32 swivel link kits. (A) is the 10-32 mild steel machine screw that will be used for the control horn. It is threaded into a 1/2-inch diameter birch dowel embedded in the control surface.

The clevis (B) threads onto (A). (F) is a special link that fits into the clevis (B) with a bushing installed instead of a steel ball. The 4-40 machine screw (C) fits through (B) and (F) and is secured with a threaded insert (D) and locking nut (E).

(G) is a Hangar 9 titanium Pro-Link. They are sold in various lengths in a package of two. (H) is the Nelson grey (now dimpled black) left-hand threaded ball link. The conical standoff (J) comes in the package with the ball links (H) as does a slotted 4-40 machine screw and a lock nut (K). I replace the slotted machine screws for a much more user friendly Allen head cap screw (I).

(L) is an S.W.B. 1-1/4-inch aluminum servo arm. The arm (L) is attached to the servo (O) using a metric 3mm x 6mm cap screw (N). I always replace the factory Phillips screw for the much easier to use cap screws. The washer (M) comes with the servo and acts as a locking device but before the airplane is flown you should lock all of the servo arm screws in place with Loctite.

We pre-fitted everything in the wings and made up all of the control linkages and servo extensions. The control horn bolts will not be glued in until after covering the airplane. At that time we will epoxy them into the dowels and use a Dremel cut-off wheel to remove the head of the bolt and trim to the appropriate length.



To connect the two wing servos together on one channel and allow them to work in tandem without binding issues, we used JR Matchboxes. (See *Model Aviation Scale Aerobatics* column March 2003 for more information about matchboxes.) For convenience, we put the matchboxes in the root of each wing panel and made a hatch from 1/32-inch aircraft plywood.

Four small screws are countersunk at the corners so everything fits flush when the wing is on the airplane. The photos were taken before we cut the servo lead exit hole in the matchbox hatch door. With the matchbox located in the wing, only one servo extension from each wing panel will need to be connected to the receiver, eliminating possible confusion from multiple connections.

For your final installation pad the matchbox with foam.

