Construction:
Control Systems

Builders Log--Quickie Q-200 S/N 2868

Component and Plans Section		Date(s)	Hours Required	
SECTION 5-1 HOT WIRING	HOT WIRED Main wing cores with Jim Talbot	11/3/84	16.0	8.0 @ 2 people
	"	11/4/84	10.0	5.0 @ 2
	" w/ Dave Lange "	11/13/84	4.0	
		11/14/84	4.0	

Details

Hot wire templates for all surfaces were borrowed from Gary Jones of Salt Lake City dealership. Hot wire saw belonged to Dave Moore

Two left outboard MW cores were cut because plans were not correct plans correction Q2 PC2 corrects this. New core was cut correctly

Post-cure flaws (if any) — Date and type of repair

None cores were smooth and unwarped - no burn or hesitation marks were present.

Tops of elevator core micro'd and prepped for glassing 8/11/85

Tops of elevator and aileron cores prepped for glassing - leading and trailing edges bonded to flat surface 8/11/85

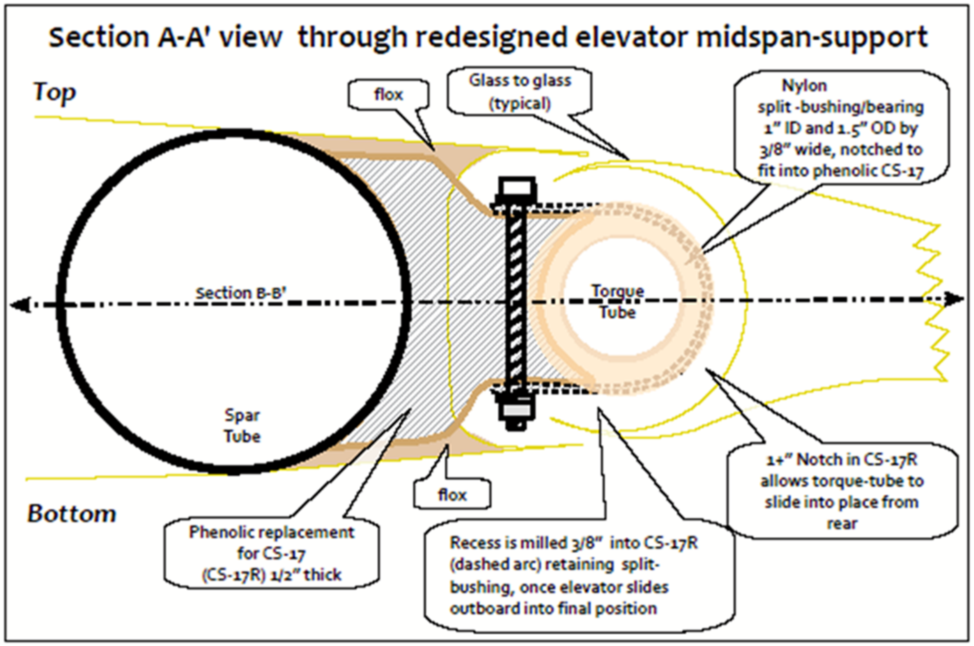
Layout previously cut foam cores for ailerons, elevators and rudder on flat jigging table.
Sand torque tubes and bond to foam cores per Q2 plans section 6-1, 6-2, 6-3.

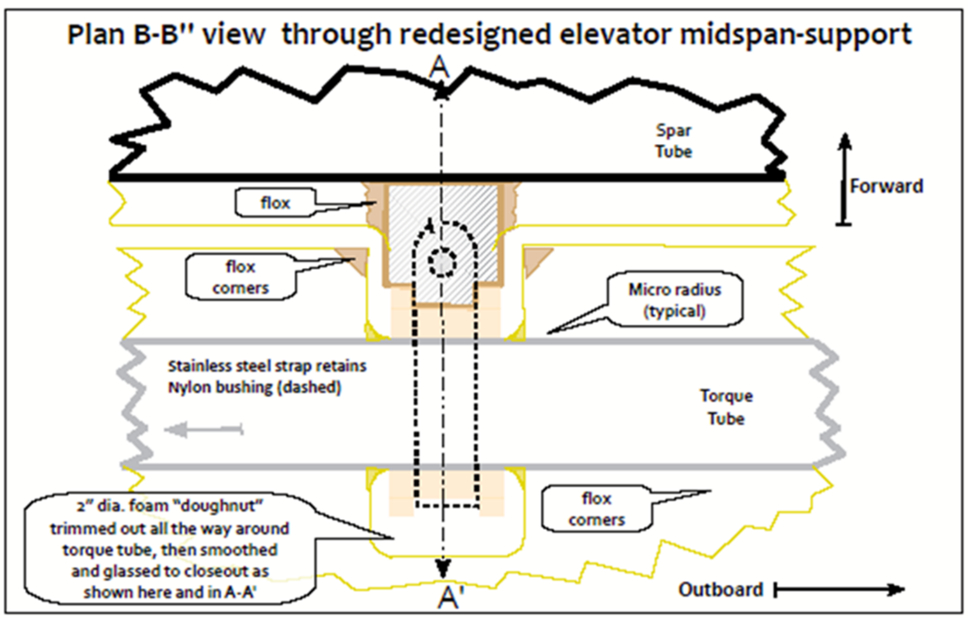
GLASSED BOTTOMS OF ELEVATORS AND AILERONS 8/13/85

DETAIL - GLASSED ELEVATOR CORE 8/13/85

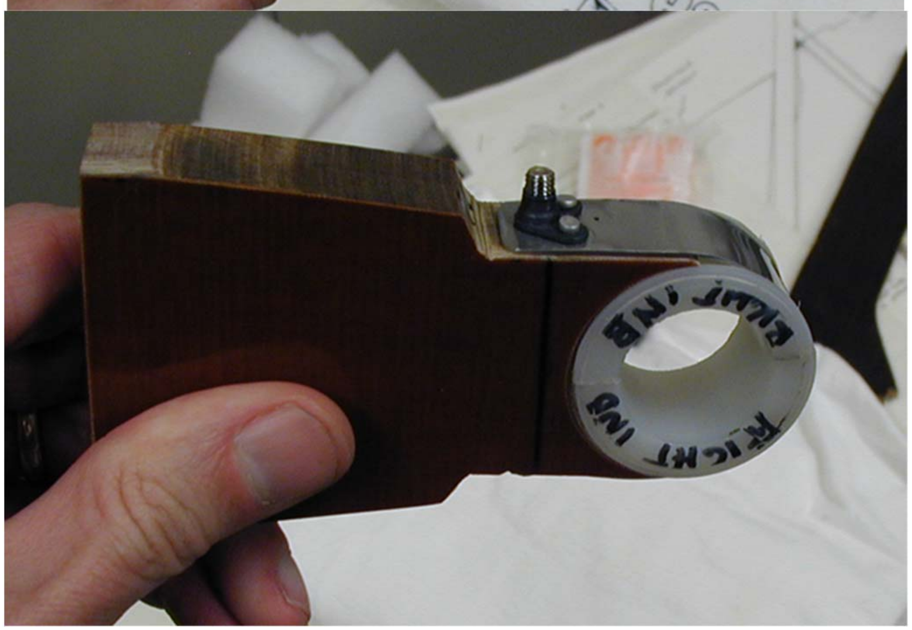
Glass both top and bottom of both ailerons and elevators per Q2 plans section 6-2-, 6-3 and Q200 supplements (original canard construction, Quickhead's updated construction supplement)

Midspan elevator support redesign. For full report on this design see:
http://n8wq.scheevel.com/documents/Redesigned_Midspan_elevator_hinge_%20Scheevel_2012-07-21.pdf

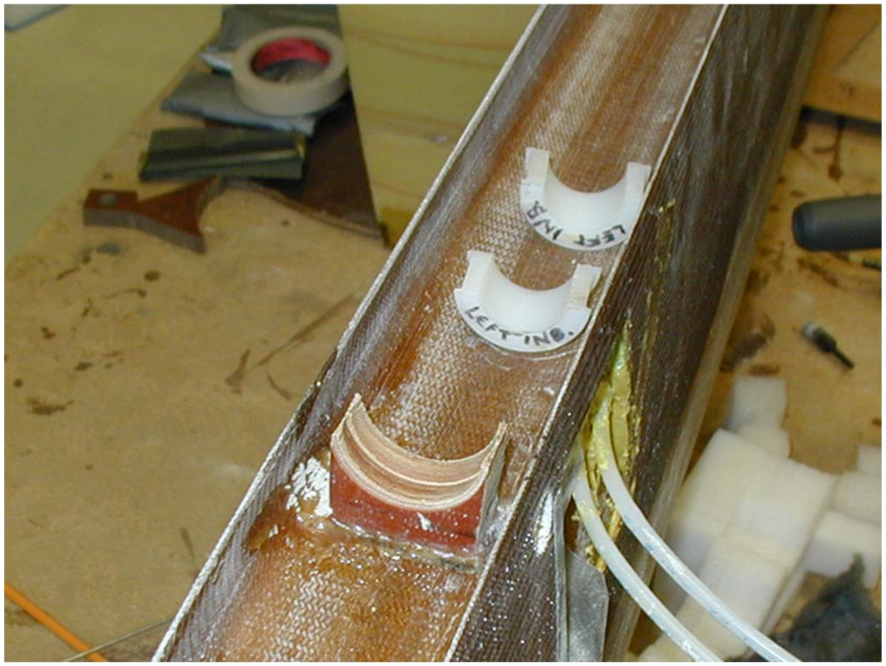




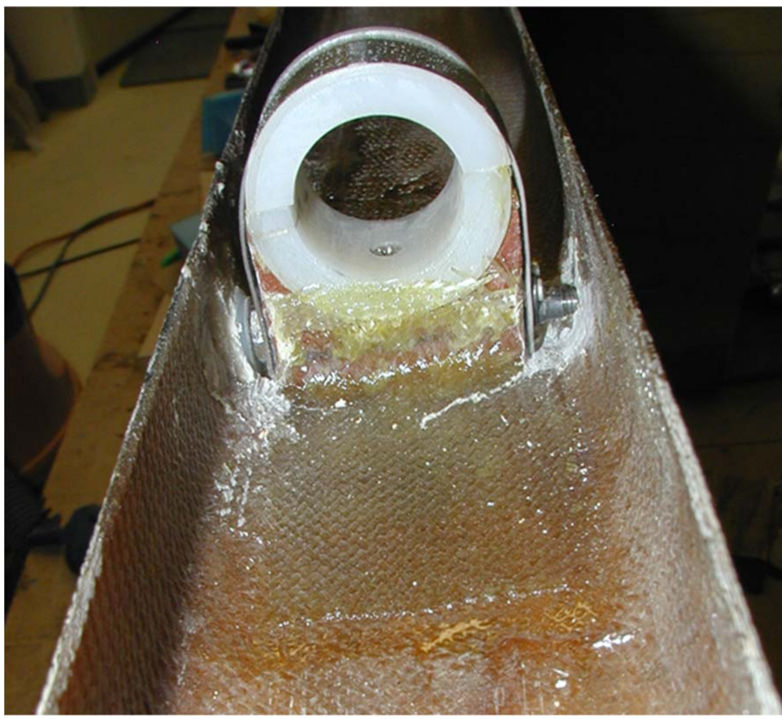
Original design was replaced with a more robust design that both increases the strength of the center of the torque tube and eliminates any critical corrosion issues. The design is similar to the hinge assemblies for elevator torque tubes on all models of Waco biplanes, a proven reliable hinge geometry. The redesigned hinge section views are shown to the left. Full range of motion as well as strength of the revised design were verified by manual testing after installation. This assembly replaces assemblies outlined on pages 10-7 and 10-8 in Q-2 plans. Details of installation are shown on the following pages.

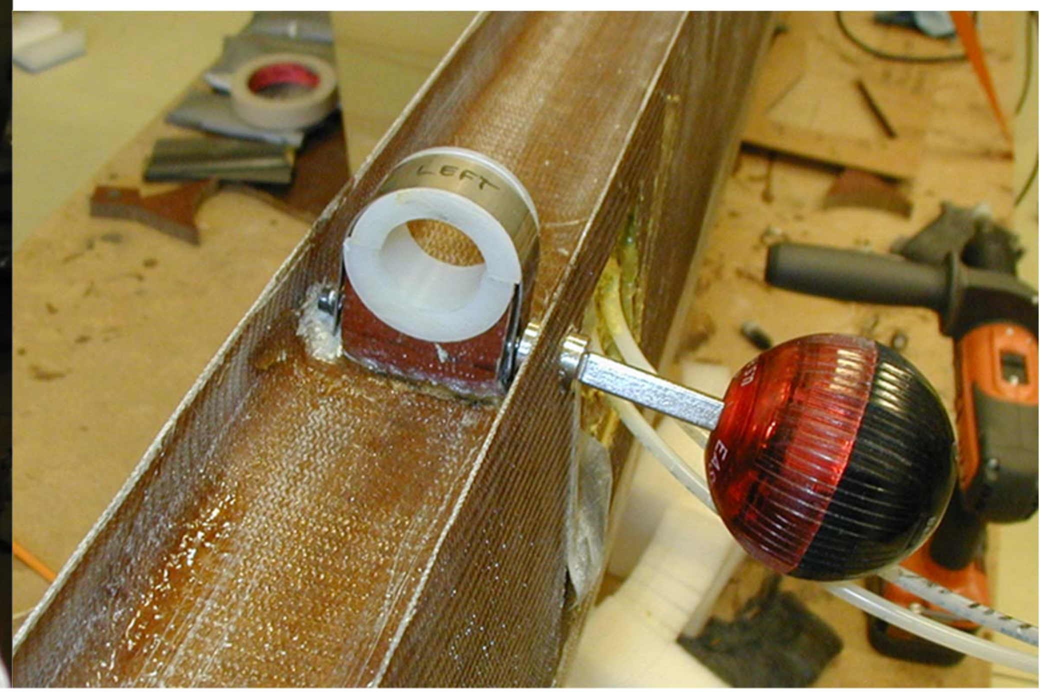


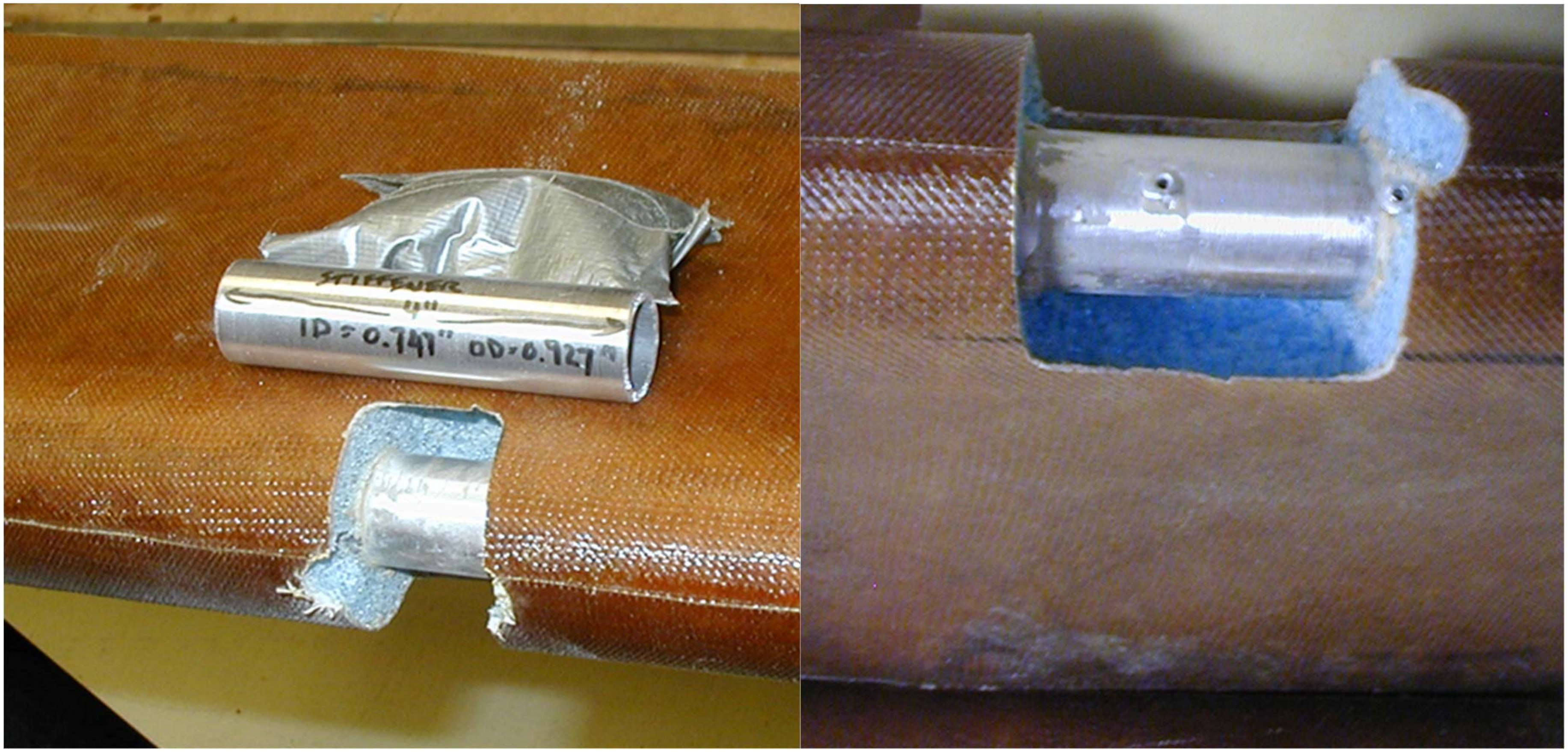
Replacement for Q-2 CS17 and CS18 hinge support is cut from ½" thick phenolic. The large base portions is trimmed to match the shape of the tubular carbon spar so as to bond with flox to the spar and align with the elevator torque tube. Left and right are mirror images of each other. The stainless steel strap is "pinned" by the AN-3 bolt that penetrates the strap, then through a hole in the phenolic and is secured on the opposite side by a locking nutplate. The bolt is removed from a hole in the bottom of the slot core for removal of the elevator.



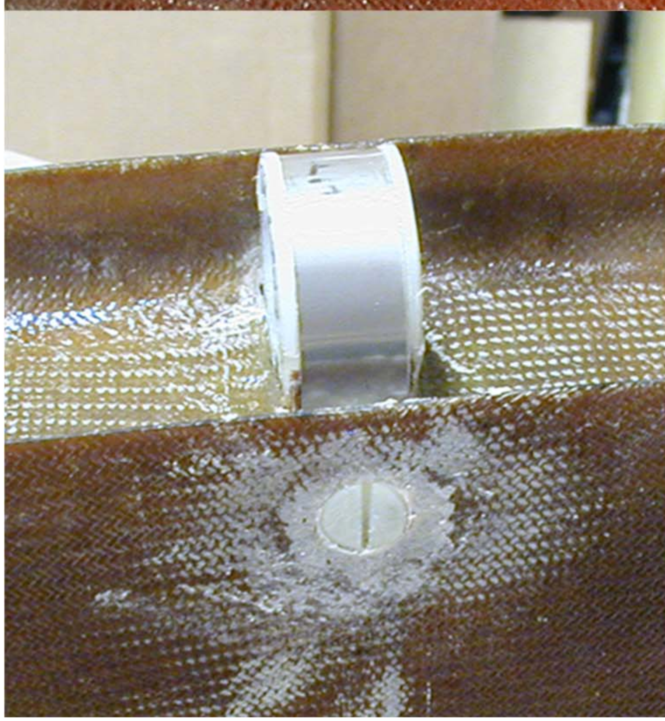
The CS17/18 replacement is shown bonded into position. Flox bond to the spar is internal to the slot core, then one half of the nylon-bearing "split donut" is secured to CS17/18 with flox and a recessed securing screw. Then 2 BID's are laid up to secure to the internal slot core. Total support assembly is shown in mounted position in the lower left photo, and access is demonstrated in lower right phtoto April, 2012







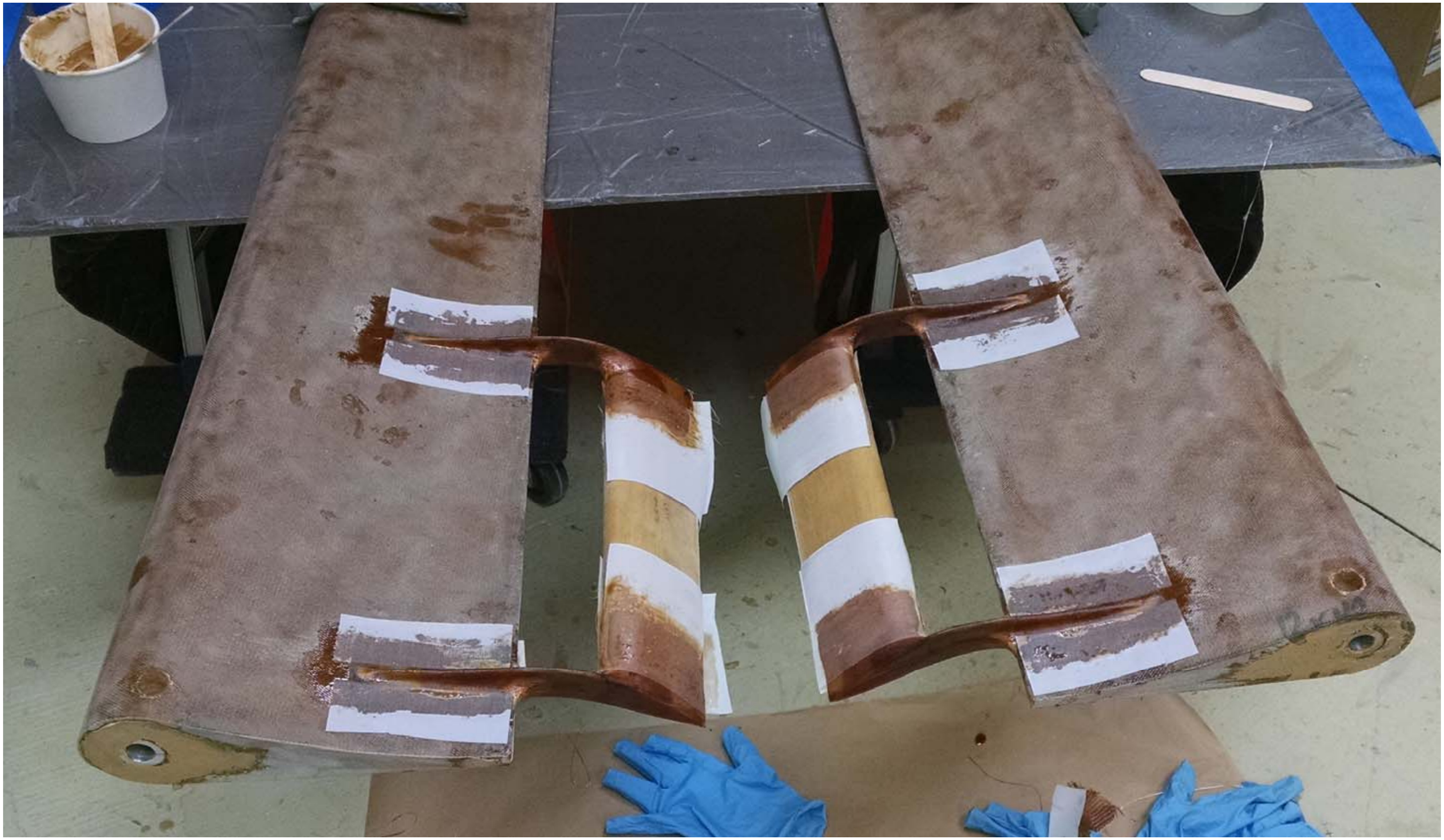
Once glass and foam are removed to accommodate the pivot assembly, a 4” long, 0.18” wall tube is slid into the torque tube and positioned to straddle to the bearing area of the elevator torque tube. This internal tube serves as a doubler to increase flexural and torsional strength of torque tube and helps to bear the load of the hinge assembly. The doubler tube is secured with two MSP43 cheery rivets, spaced to allow the pivot to slide inboard for elevator removal. April, 2012



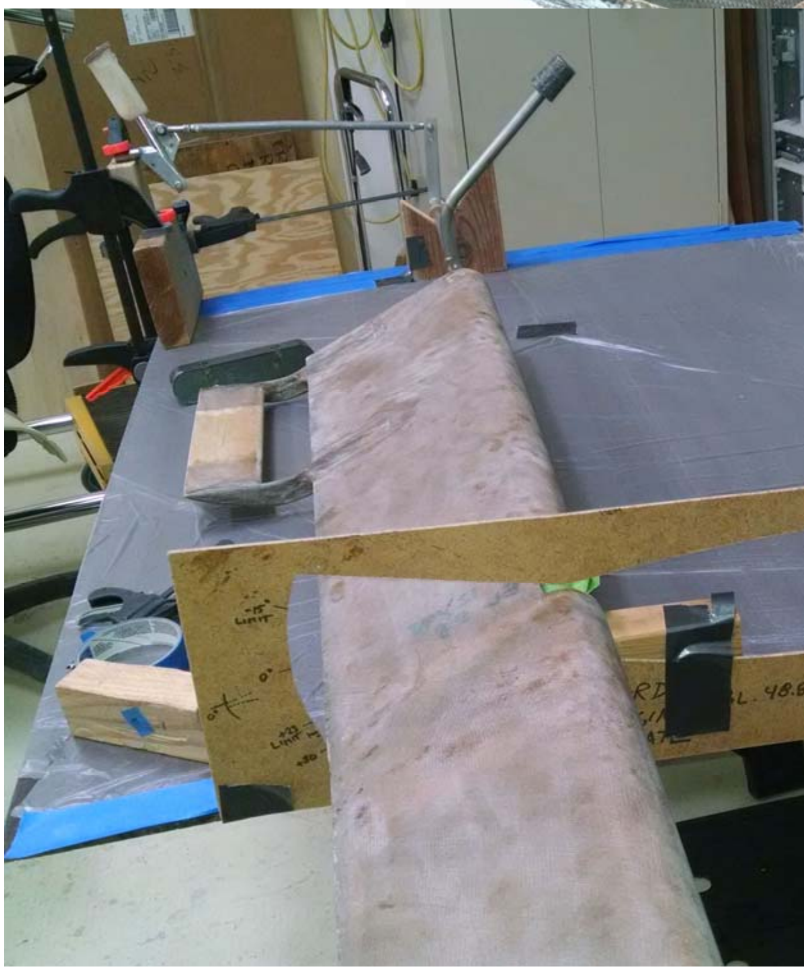
Once installed, the pivot range of motion and free play is tested as is strength and freedom of motion under stress (upper photo shows top surface of wing with full down elevator deflection. Pivot security is verified with rearward directed loads up to 50 pounds over range of elevator deflection. The access hole for removal of the AN3 securing bolt is on the bottom of the wing in the slot core. This hole is closed out with a piece of threaded nylon rod tapered to fit wing contour and slotted to be removed with a screwdriver to allow socket wrench access to bolt for elevator removal. This plug also prevents bolt from loosening

“Sparrow strainer” servo tab is fabricated, assembled and installed per Q-200 plans per Q-200 plans supplement page 4. Support arms were reinforced with additional UNI plies to give strength. This change was added after discussion with a builder who experience on breaking off at the support arm junction with the trailing edge of the elevator while in flight.

Trim inside edges of elevators to assure clearance through range of motion near strake access closure panel. October 2017



Additional beef up of sparrow strainers along attach arm consists of 1 UNI ply both top and bottom of the attach arm and two plies of 3 oz BID cloth close out on both ends of arm. This is on top of previous 1 BID patch previously applied to attach point and two 3oz plies top and bottom of airfoil previously applied. Same lay up exists on both top and bottom of each elevator. November 2017.



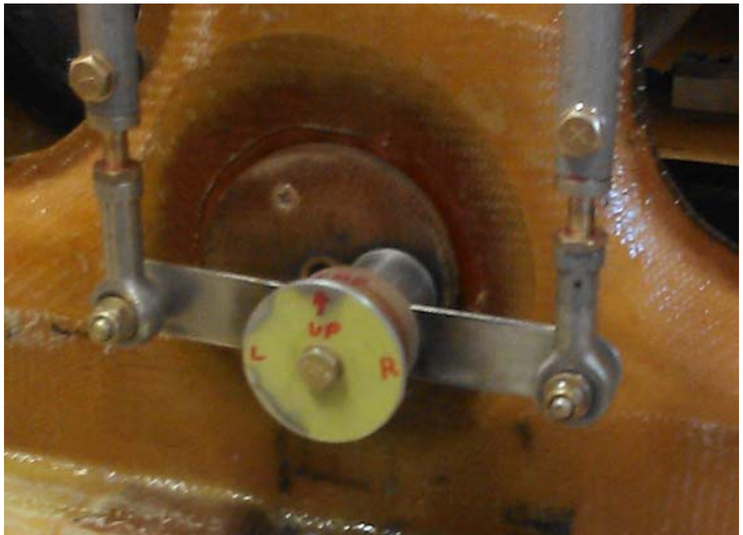
Layout and test mass balance through range of deflection of elevator on bench, then install in aircraft and test same, verifying non-interference of mass balance arm with existing controls and fuselage side. November 2017.

Braise attachment hardware onto mass balance arms and install weights with retention bolts braised into end of arm. Verify security and clearance in aircraft. January 2018.

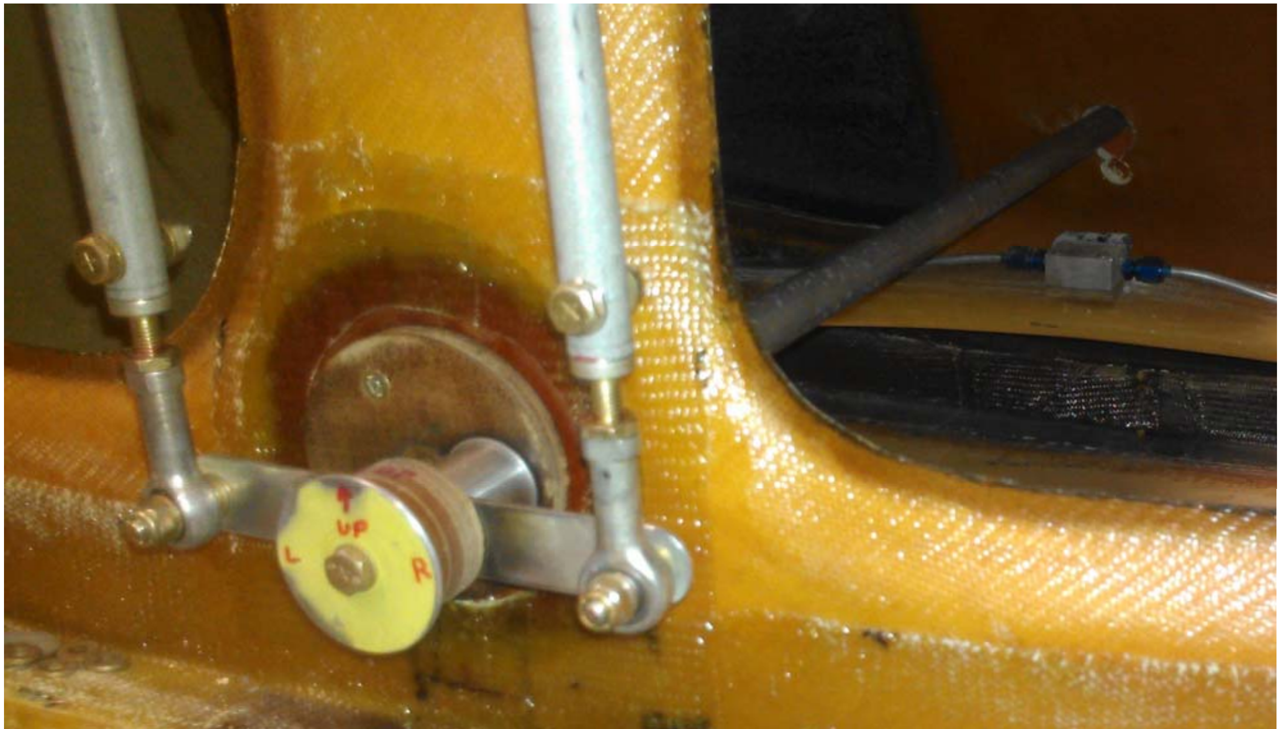
Mounting of CS1 bearing and associated assembly in center console per Q-2 plans section 14-8. QCSA2 was modified to allow for more rearward travel of control stick.

Elevator and aileron/control stick assembly test-fit and travel limits and clearance verified

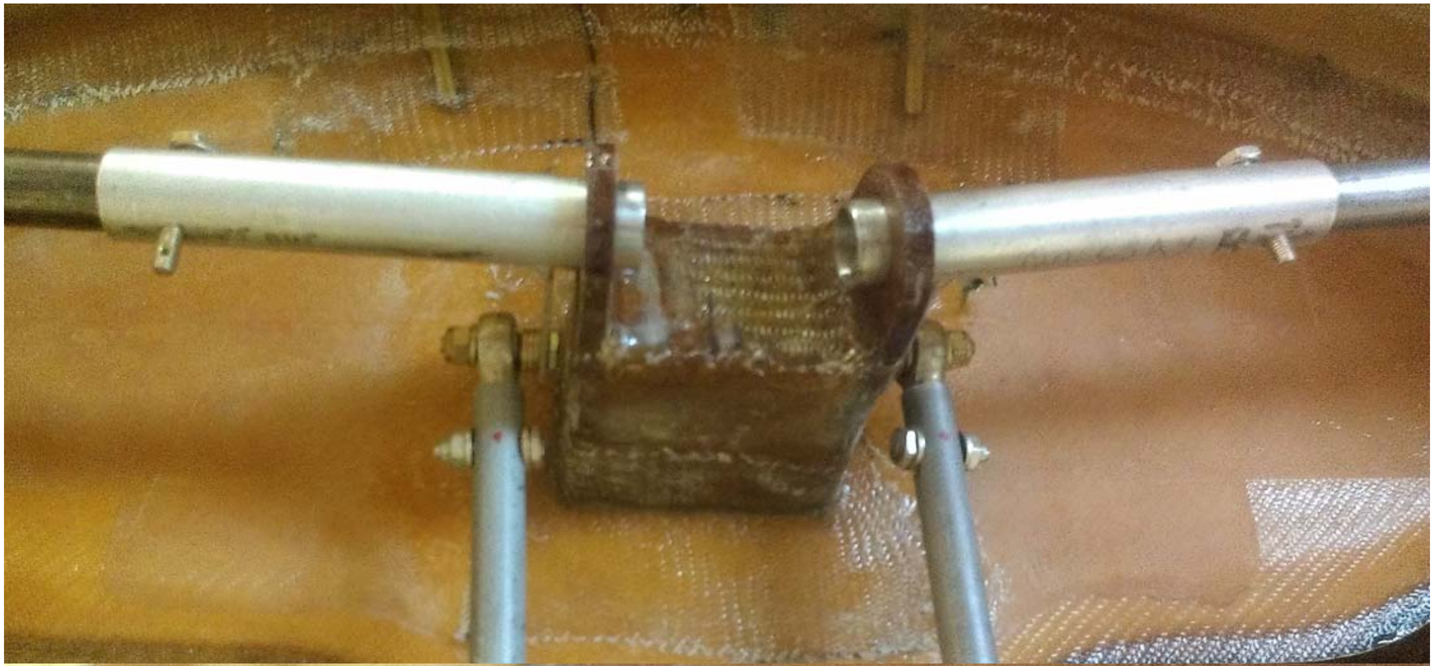
Push rods and torque tubes for elevators installed and test for clearance and range of motion. Note that left and right torque tubes each have a mass balance arm installed. The Mass balance arm is flush against the Rulon shoulder bearing installed in CS15. The mass balance arm replaces the spacer shown on page 10-10 in the Q2 plans and prevents inboard travel of elevator assembly. Right side is mirror image of left side.



QCSA3 is installed through the rotating phenolic reflexor-body assembly in FS 95 bulkhead. Lengths of aluminum spacer are cut to fit over the shank of QCSA3 on both front and back with a oil-embedded thrust bearing between those spacers and the reflexor-body retainer plate (forward side) and reflexor pulley (aft side). These spacers serve to square up QCSA3 as it passes through the reflexor. The CS2 torque tube and CS3 spacer are assembled and drilled per plans to accommodate AN3 bolt.



Additional view of assembled control and reflexor system and aileron torque tube CS2 passing through the seat back bulkhead



Views of upper torque tube assembly Q2CSA4's (upper photo). The left torque tube is shown projecting through the rulon bearing (chalky red color, lower photo). This shoulder bearing has the shoulder on the outboard side of CS6. The spacer which prevents inboard travel of aileron seats against a oil impregnated thrust bearing located between it and the shoulder of the rulon bearing.

Photos of reflexor control handle being fabricated. Center of control is phenolic, cut as a disk with an integral attach flange. A steel clamping strap is incorporated into the control lever. Twisting the control handle tightens a clamping bolt to serve as a friction lock. A pulley is modified and bolted to the control handle assembly. To adjust the reflexor the control handle is moved forward (nose down) or back (nose up), which rotates the reflexor mechanism mounted on the FS94 bulkhead.

Photo shows the connected reflexor operating mechanism (control lever). The assembly is mounted with two AN3 bolts through a reinforced plywood support that is glassed to the fuel tank and fuselage wall by 3 BID on either side of the plywood. Glass is laid over a flox fillet at base of the plywood. A turnbuckle controls the tension of the control cable. Cables pass though the seat back and landing gear bulkheads via fairleads made of nylaflow tubing pieces, floxed in place.

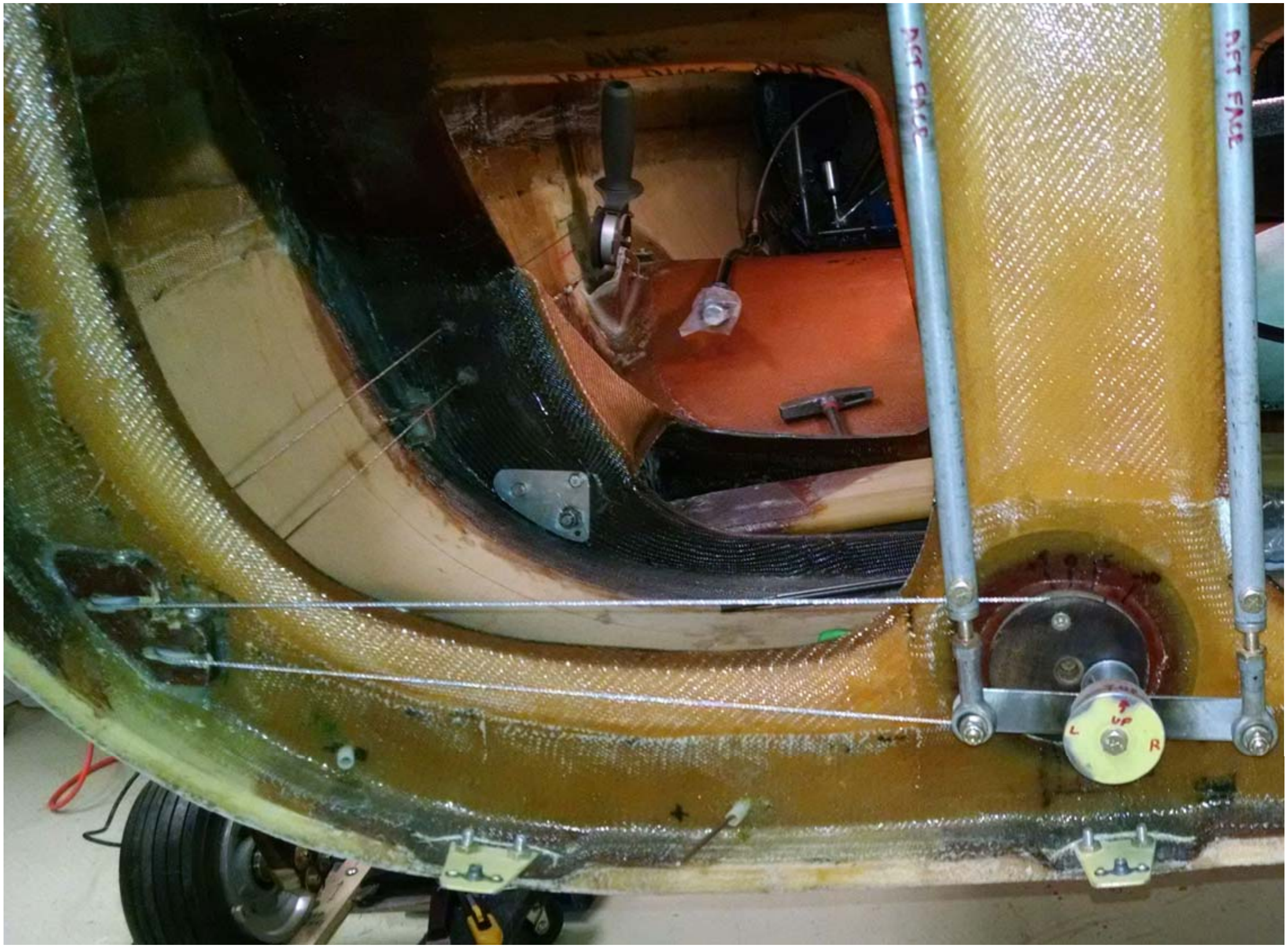
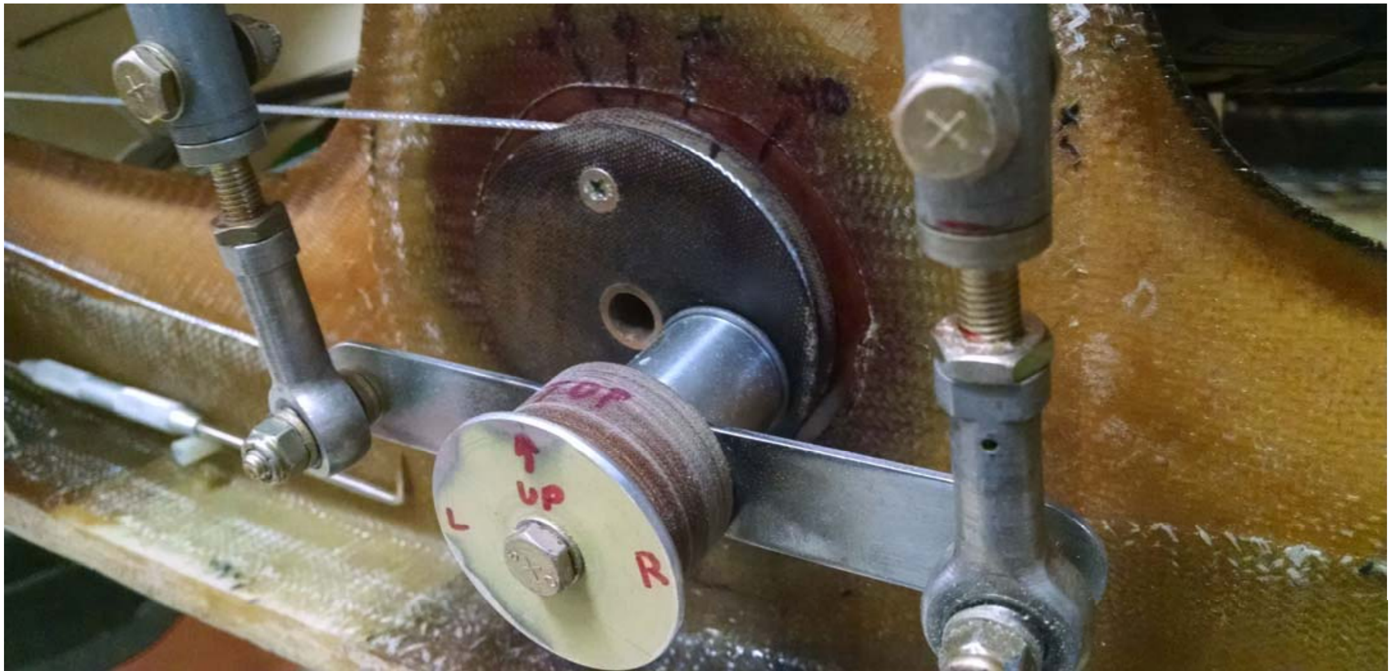
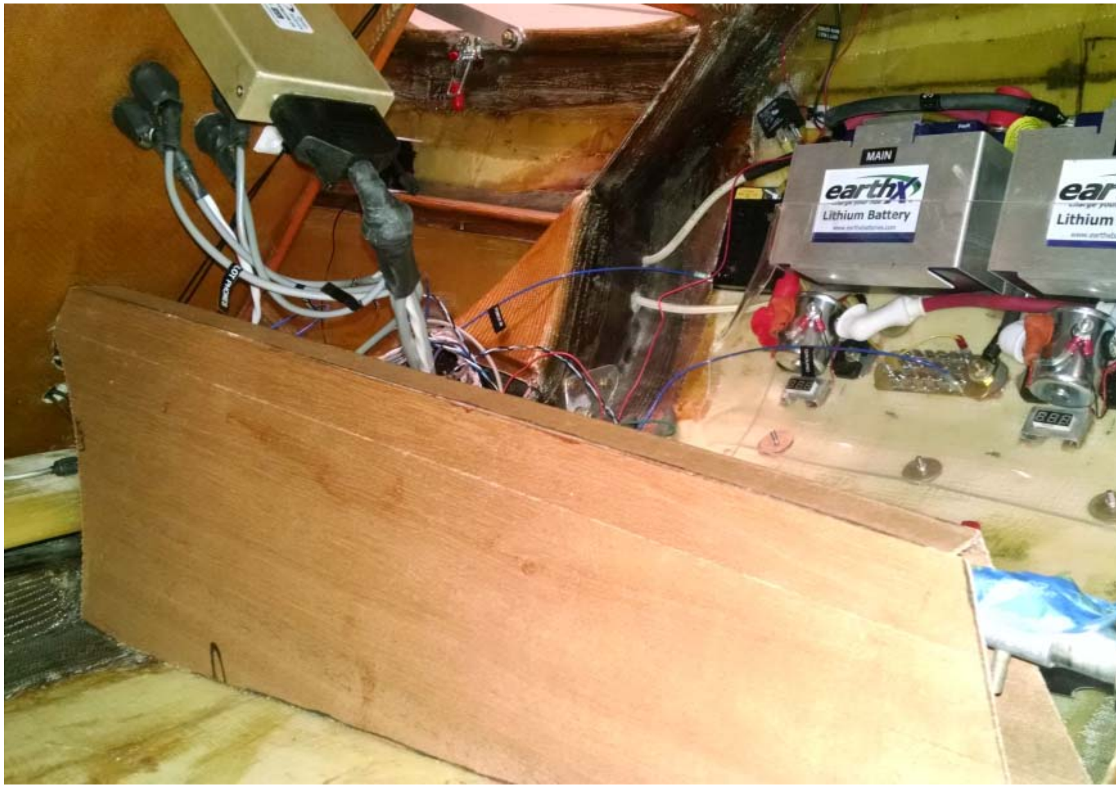


Photo shows reflexor control cables that feed through two guide pulleys retained by a reinforced phenolic mount in FS94, then on to the control pulley mounted on the reflexor-body. The cable is single continuous section that is looped around reflexor control-pulley 3 times. The tightened turnbuckle locks the cable position on the pulley by friction due to cable tension around the control pulley. Range of motion stops on control pulley are added later.



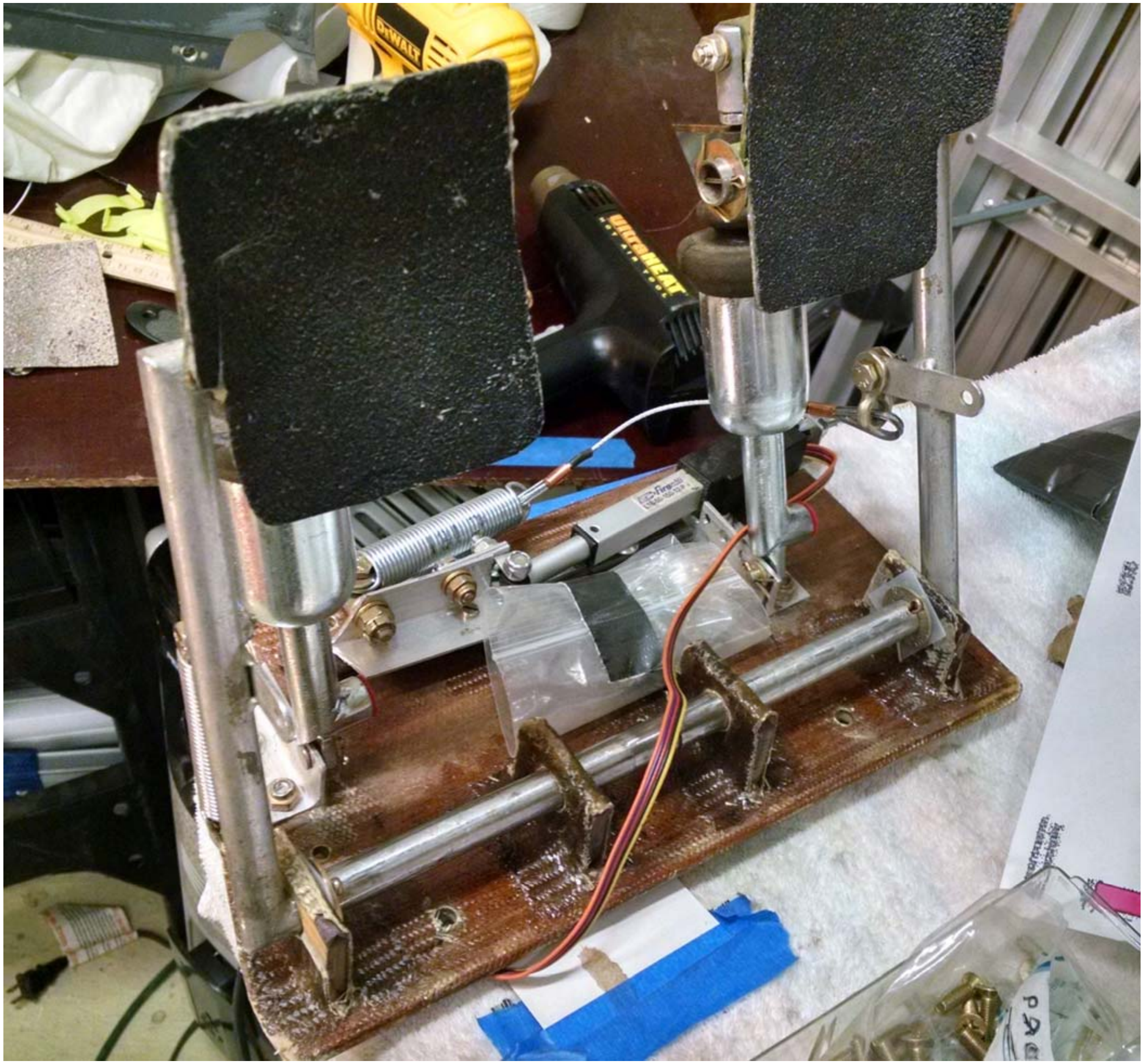
Details of reflexor control cable on guide pulleys on rear side of FS94 bulkhead (lower photo) and wrapping 3 times around control-pulley (mounted to reflexor-body). Control lever moves cable to rotate pulley/reflexor-body, adjusting reflexor setting.



Create removable tunnel/shroud from 1/16" plywood with flox corners reinforced with 2 BID plies lapping onto floor of cargo area. September, 2015.

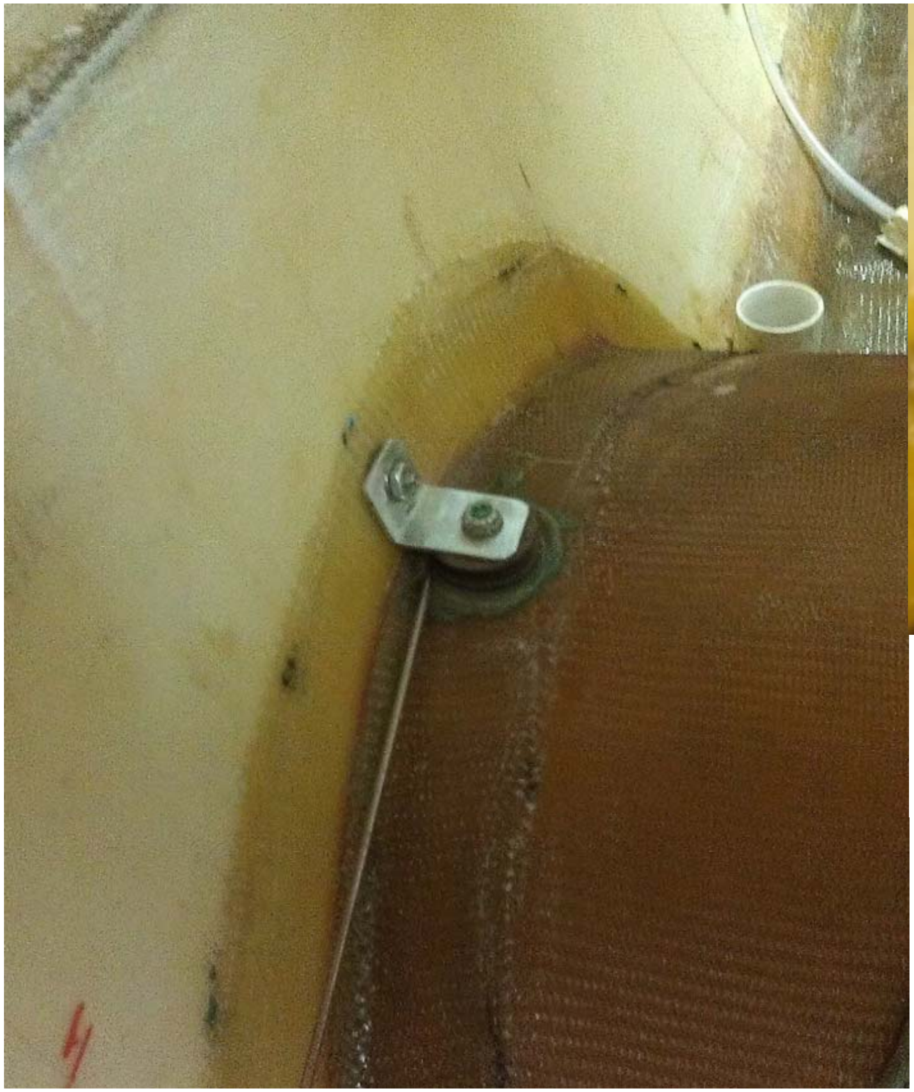
Rudder platform assembly is built from ¼" marine grade plywood with 2 plies of BID on top and bottom of platform. Rudder pedal

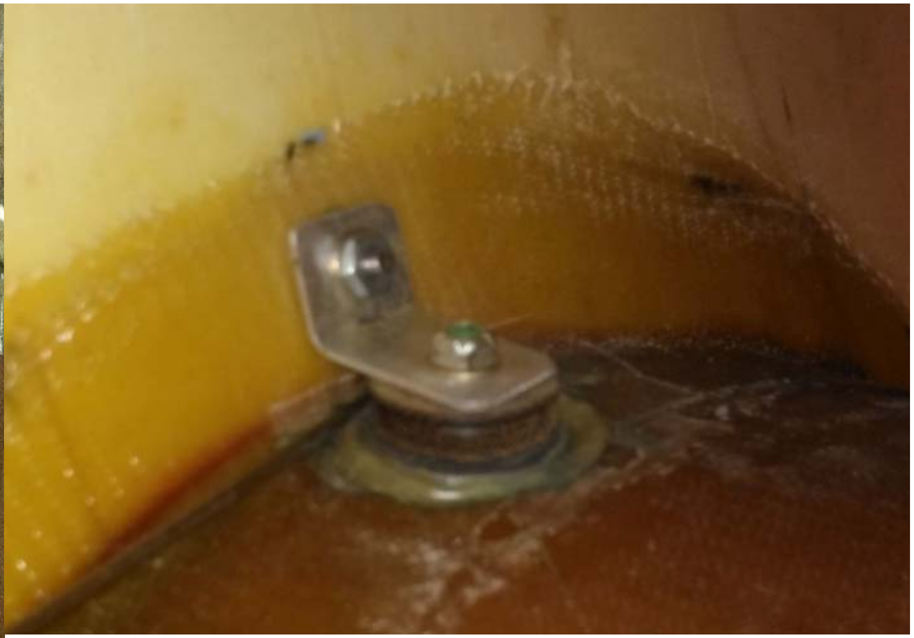
Fitting rudder pedals to brake cylinders and testing clearance and range of motion and security on brake platform.



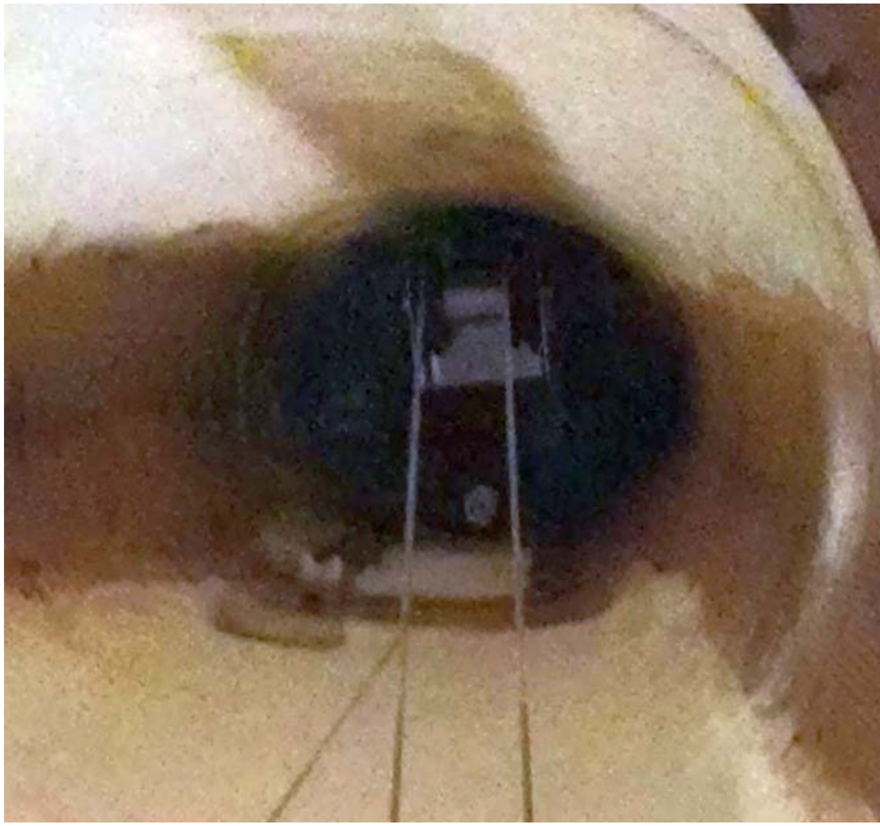
Fitting rudder pedals to brake cylinders and testing clearance and range of motion and security on brake platform.

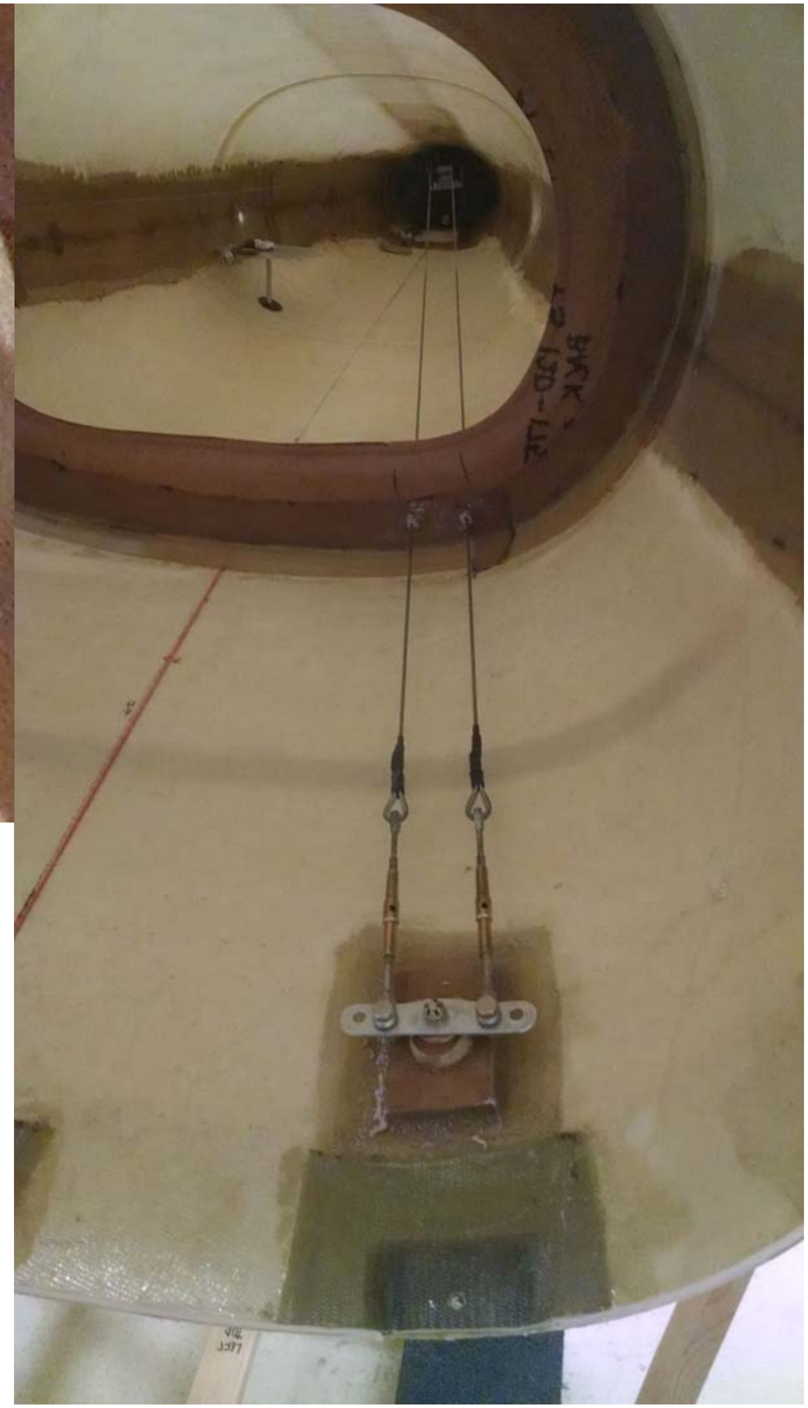
Detail views of installation geometry of rudder pedal platform and servo driven rudder trim and tension spring positioning.





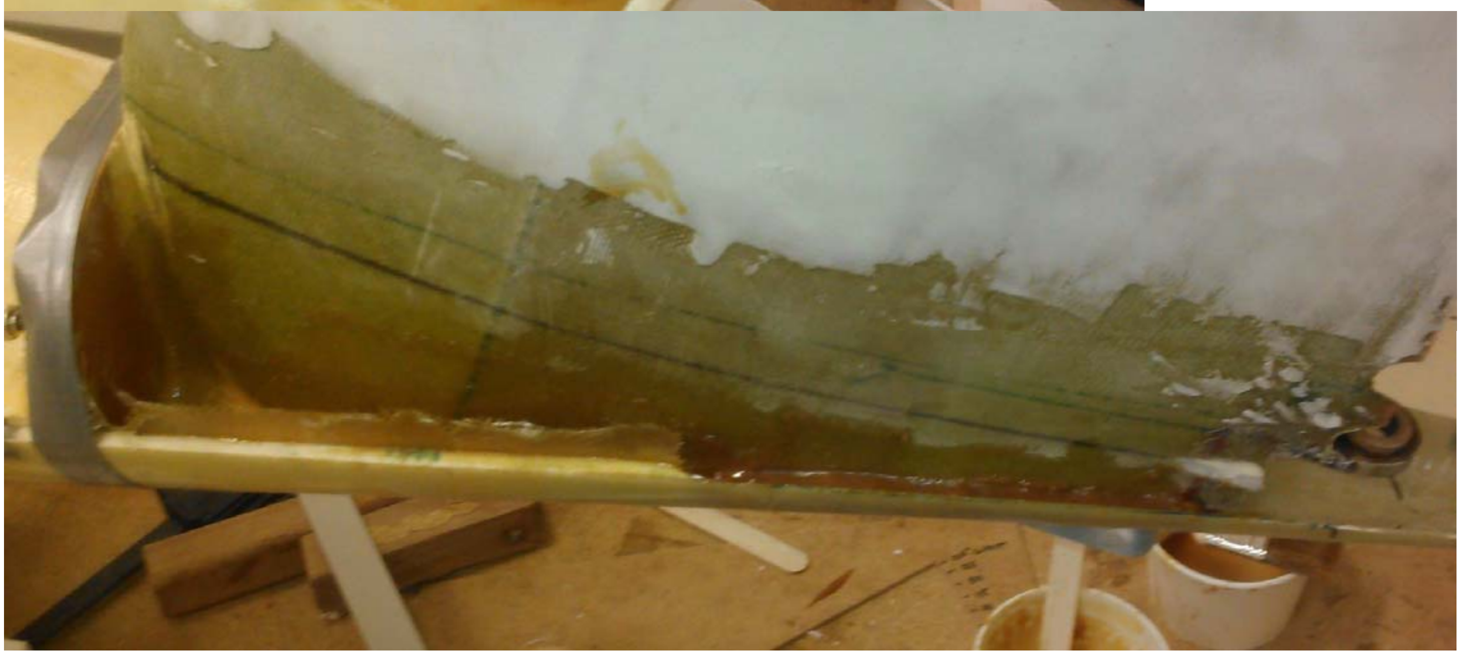
Rudder cable guide pully mounted to side of fuselage to route cable through left side of fuselage and bulkheads.



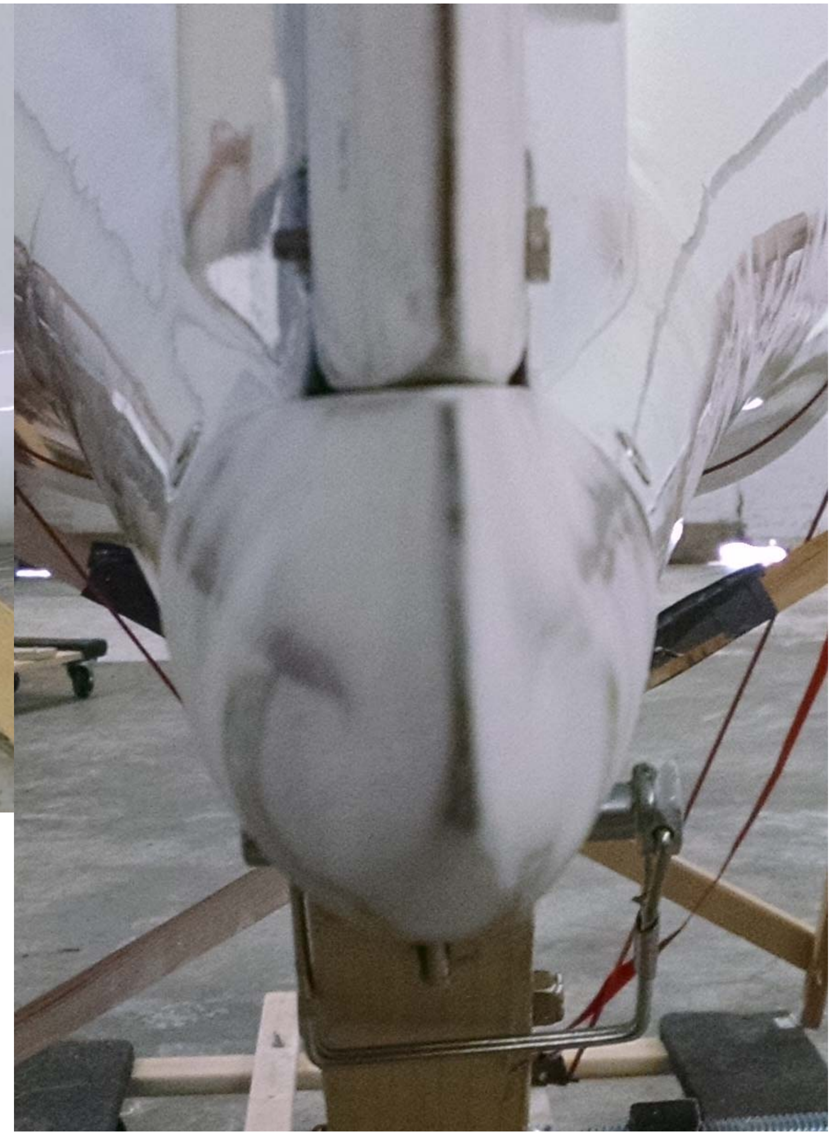


Rudder cable routing in tail cone. Pulley on FS 175 bulkhead guide cables into fairleads in tail foam core lining up with spindle on rudder torque tube (left view). The bellcrank on the right is fitted to a bronze bearing and mounted into a phenolic block anchor. Cables going forward mount in outer holes

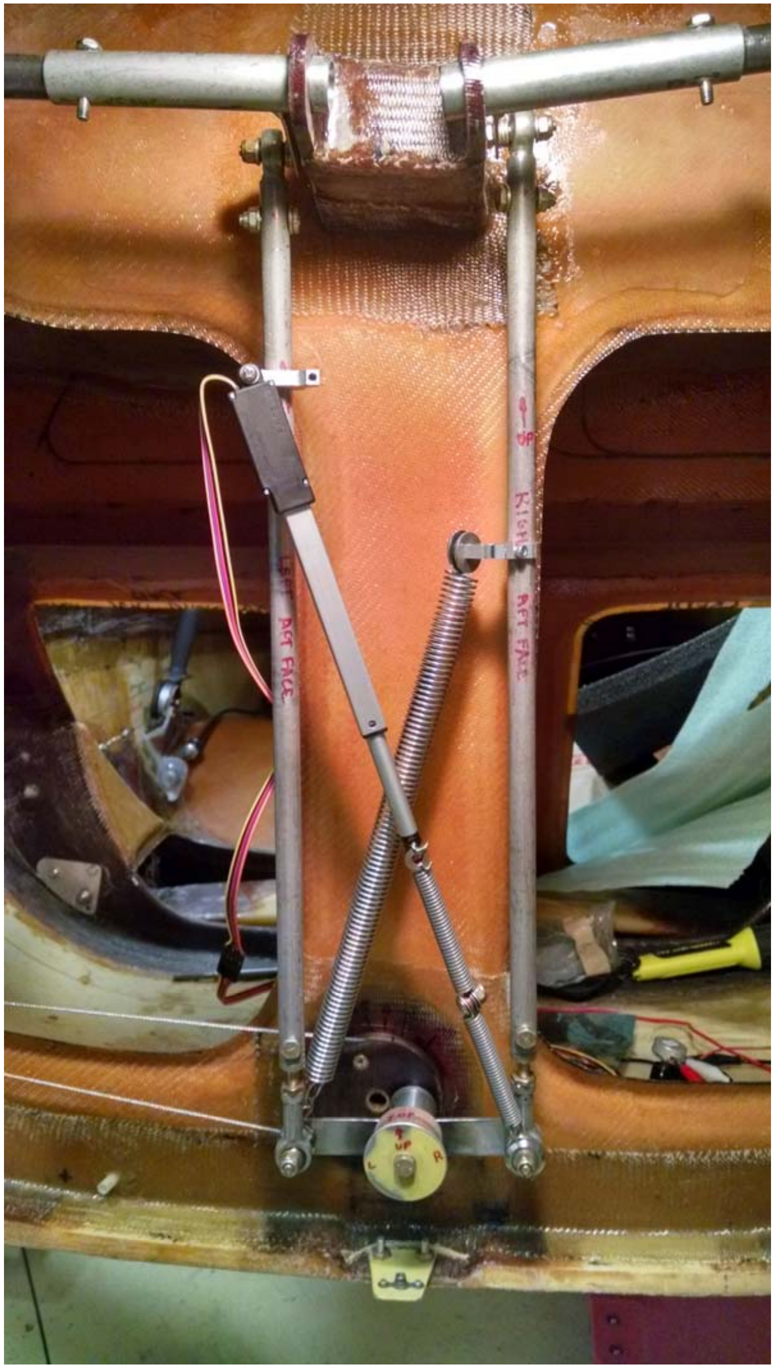
Reinforcement on forward face of FS 175 comm antenna lead is at bottom, and two nylaflow fairleads are at the top of the bulkhead. Photo below has a black line tracks the trajectory of the fairlead through the rudder core. Rear end of fairlead is shown projecting from the rudder core in the photo.



Detailed photos show routing of the rudder cable. The cable wraps 3 times around the phenolic spindle/spool and is clamped by two AN3 bolts on the rear side of the spindle. Entire rudder actuator assembly is internal to the tail.



Rudder assembly with tailcone fairing fastened into position. Spindle is entirely within fairing. Verify motion and free travel. November, 2017



Design, fabricate and install electric servo activated roll trim on aileron actuators. Video demonstrating test operation can be viewed at: https://youtu.be/P_iWRk4gRkA?list=PLBuOe9eOkMkvrmaz2vjUmXkl-JqGj54M_
January 2016.

Photo above shows slide controller for roll trim mounted below fuel selector in front of control stick. March 2017.

Control stick grip carved from balsa and glassed with 3 oz BID glass. Filled and painted. X-mit switch installed in top panel.

Pitot tube fabricated, carved and finished for install on mast already installed on canard. (includes both A/S and AOA ports for Skyview ADHRS input). January 2018

Final installation of pitot/AOA probe on steel mast on bottom of left canard. The pitot/AOA has 3/16” Nylaflow tubing and the mast contains ¼” nylon tubing. The 3/16” tubing is friction fit into the ¼” tubing with an airtight fit and secured with safety wire, then probe is slid into place and secured with 4 screws. February 2018.