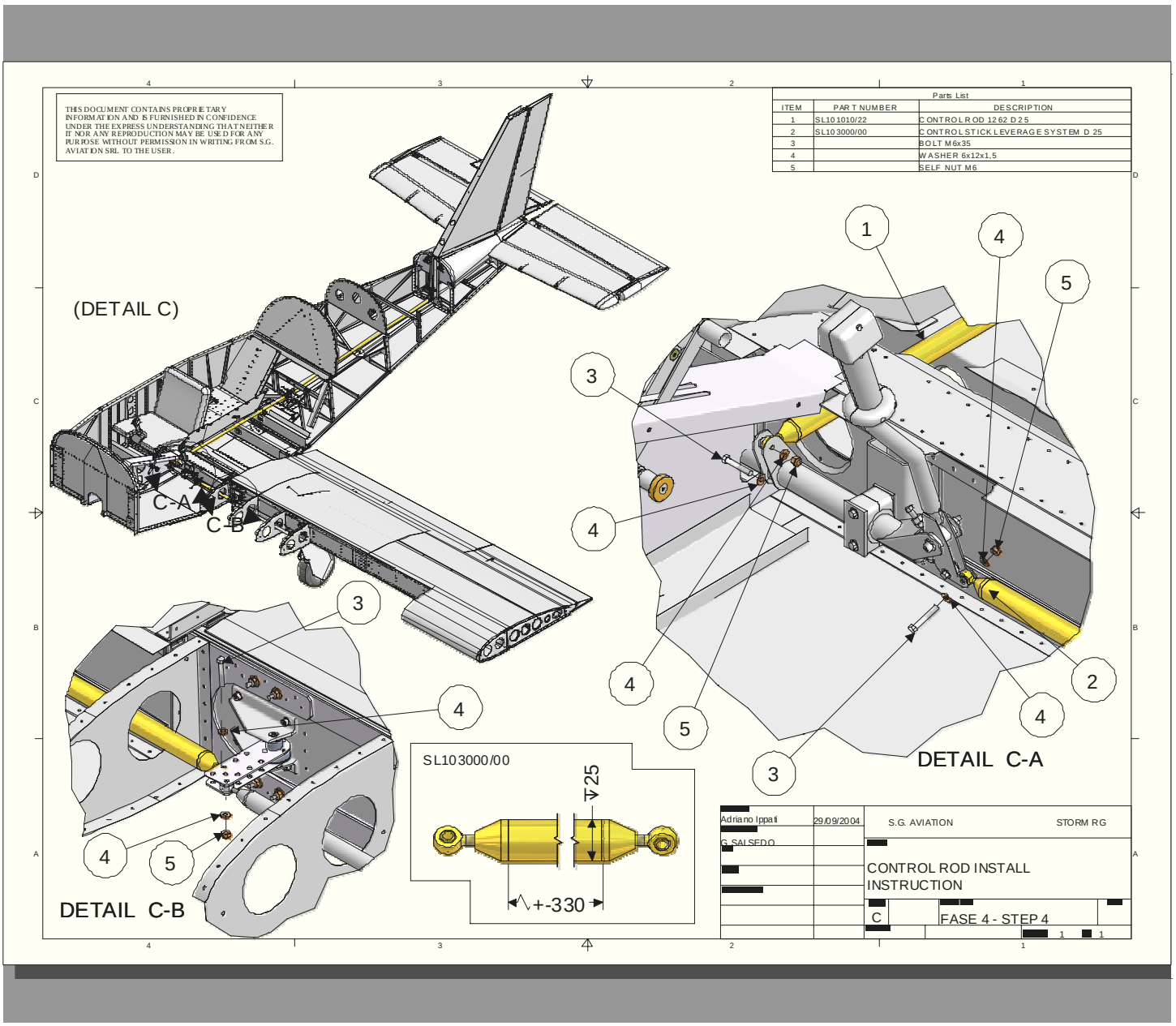
STORM RG

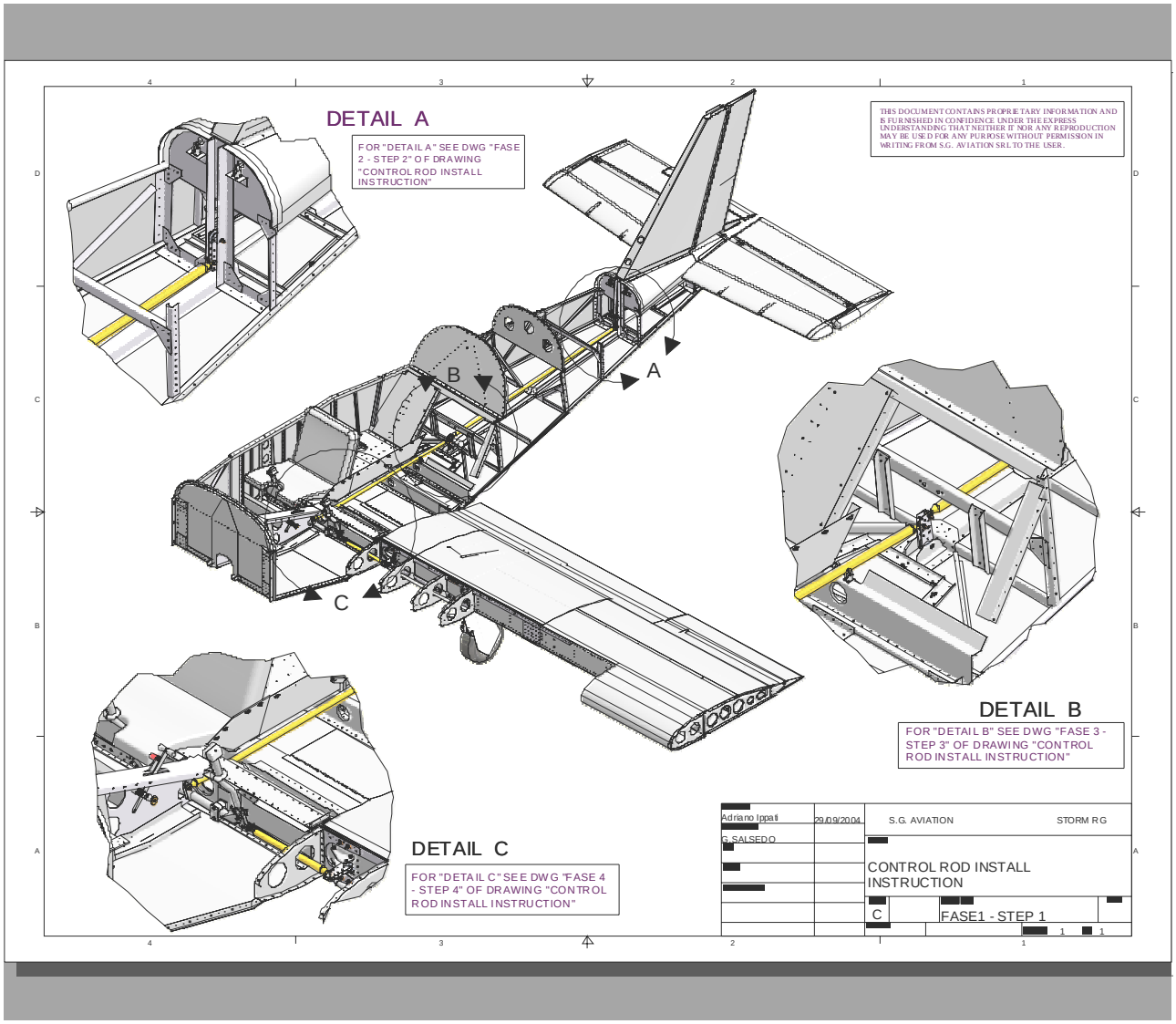
Final assembly



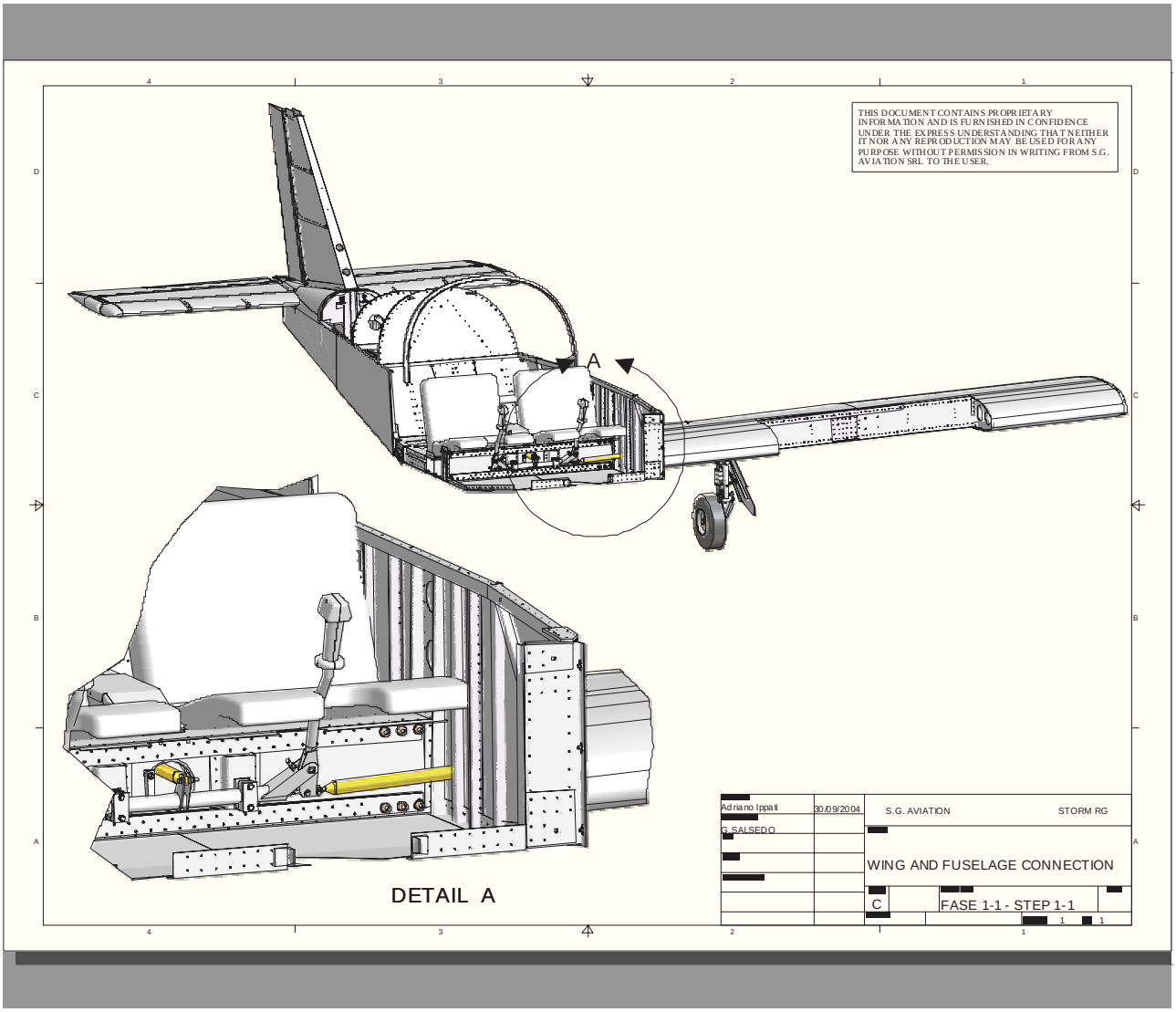
The **STORM RG** fuselage **is** a monocoque **or** stressed-skin structure. the fuselage can withstand tremendous loads when properly applied, but yet is prone to localized failure when subjected to concentrated loads. The skin shape is determined and maintained by web-like frames,stringers or bulkheads and also by skin stiffener strips. The longerons and bulkheads also provide localized strength for the attachment of wings; empennage, controls, canopy, etc. When the skins are riveted in place, the fuselage becomes very rigid and self supporting.

CONTROL FABRICATION AND INSTALLATION

NOTE: *The STORM RG can be built with the standard ELECTRIC flap control. Details of actuator, actuator bearing blocks, and other parts differ, so* ***before*** *you begin installing parts, be sure you have studied the appropriate drawings and have a clear idea where things go.*



DWG FASE 1 – Step 1

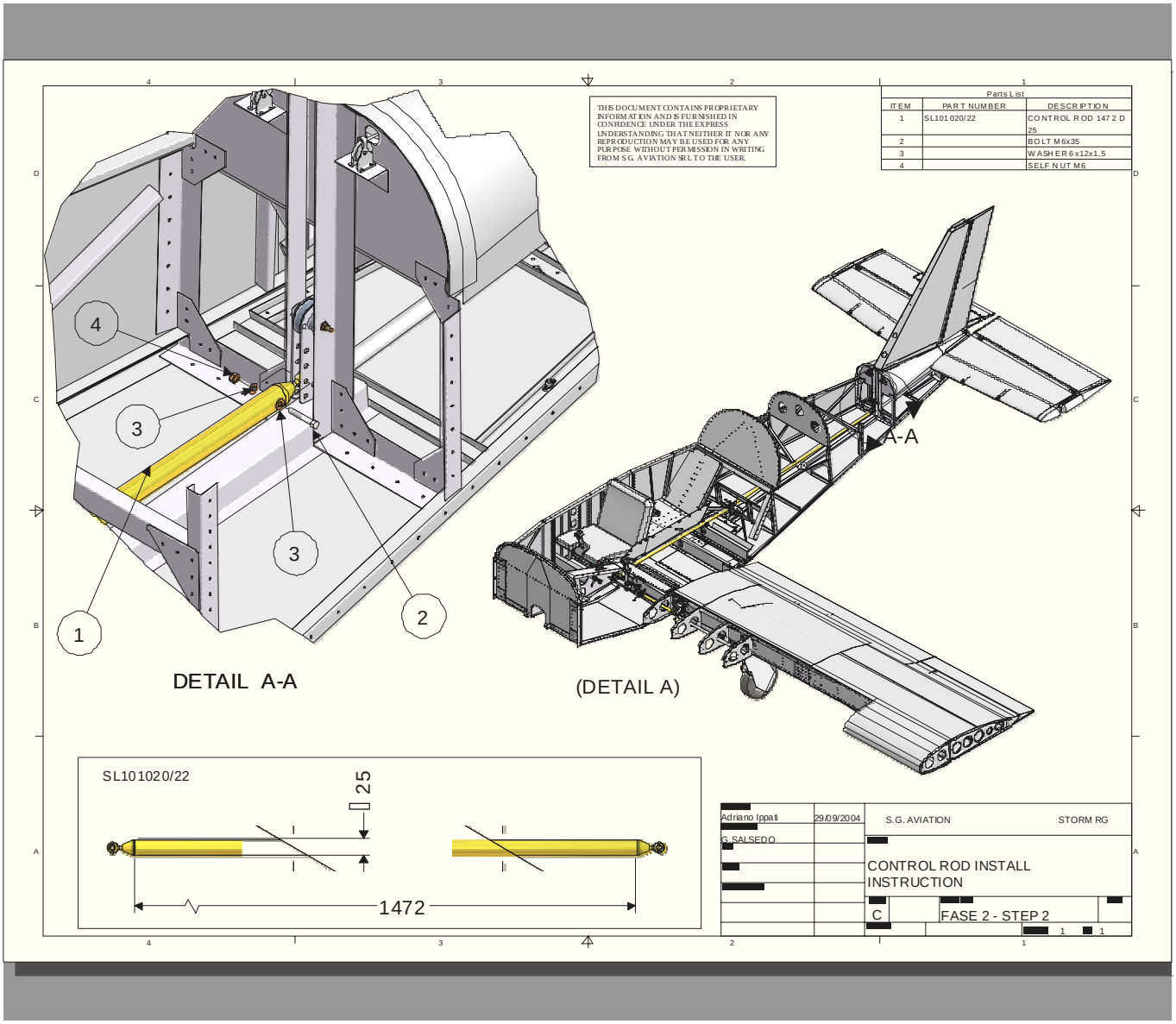


CONTROL COLUMN & STICKS

To be fabricated in accordance with ……. and installed per ……. Final installation of the Control column cannot be done until the wing is permanently in place. However, it can be fitted temporarily for the purpose of determining clearances and fabrication of control push rods. The control stick is attached with with two plastic bushings and bolted to the wing box.

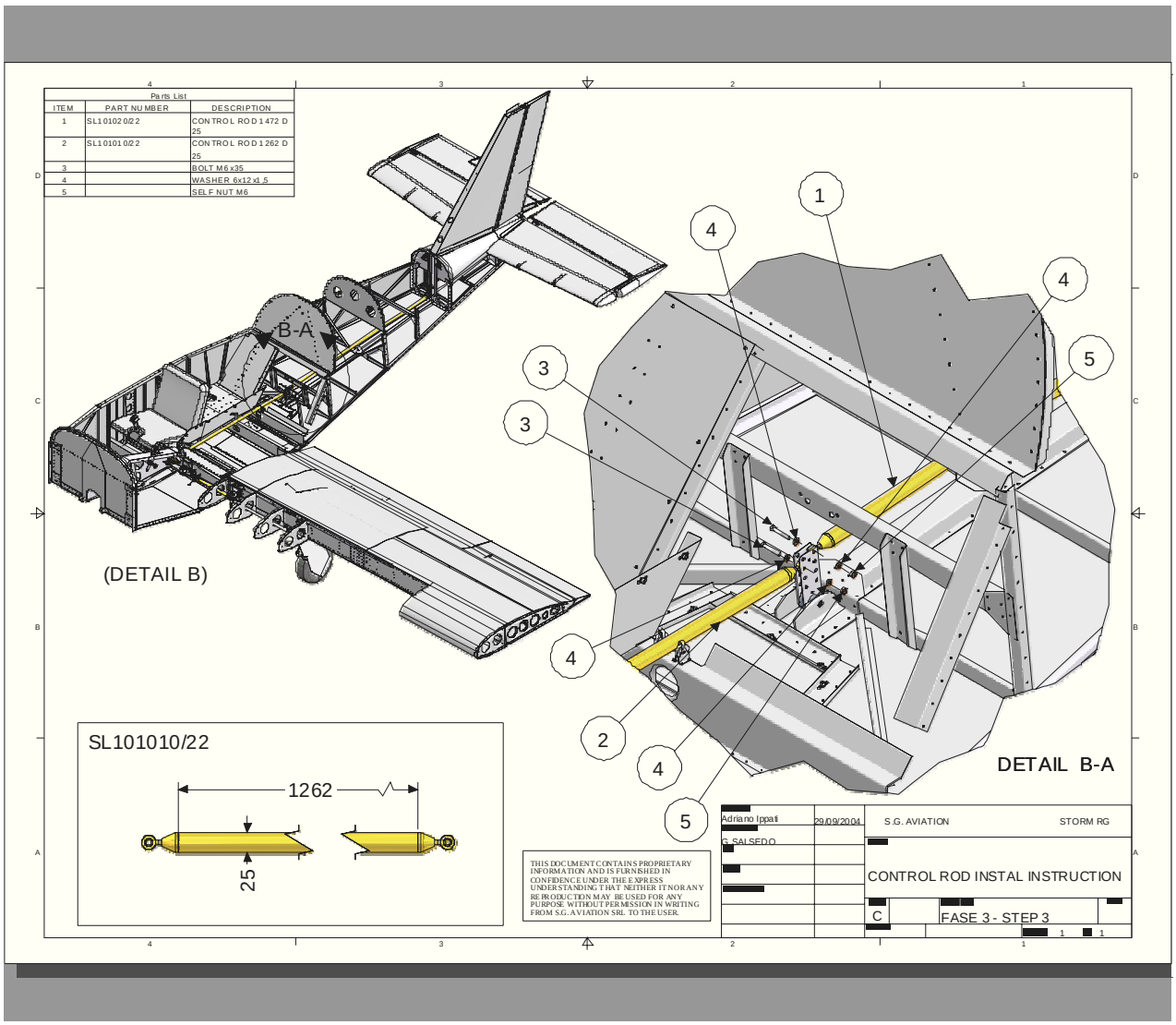
With the control in place, the control sticks can be installed and the push rod and bearings can be installed. Adjust the bearing travel so that the control sticks are parallel in the neutral position perpendicular to the control column. When the wings are installed, the ……push rod assemblies can be fitted, trimmed to final length, riveted, and installed. When positioning the ailerons in neutral and the push rods in neutral position, check the position of aileron bellcrank DWG ……and adjust the push rod …….. if necessary to achieve this neutral position.

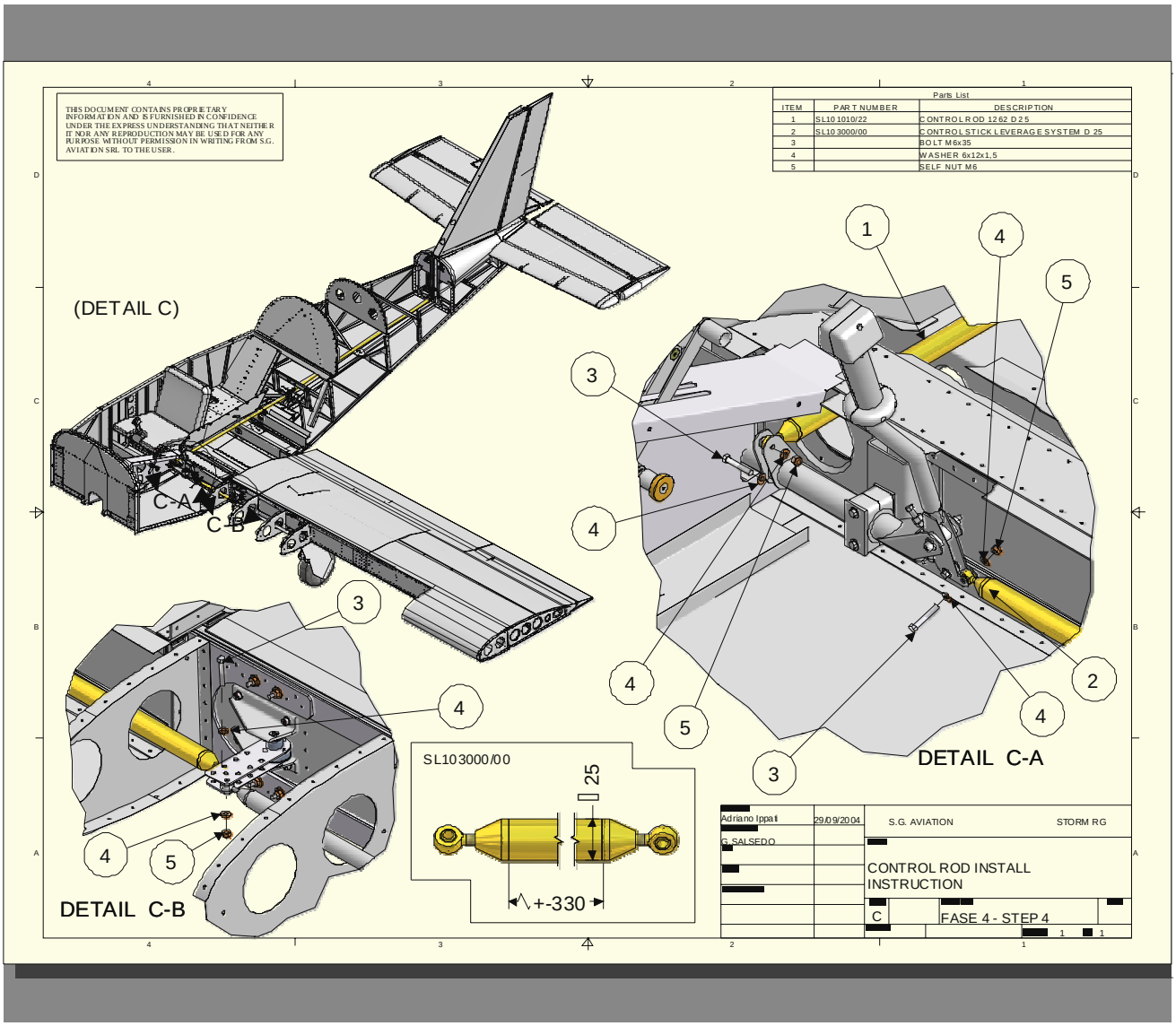
The elevator push rods …….. and …….. must be fabricated and fitted. The blunt shape of these ends will cause interference with the bellcranks if rod end adjustment is too short.Note that these …….. end fittings are bare aluminum and must be primed just like the tube. The forward end of the …….. diameter …….. is finished as shown on ……**,** but the aft end will be cut to final length and completed during when the empennage is installed on the fuselage.



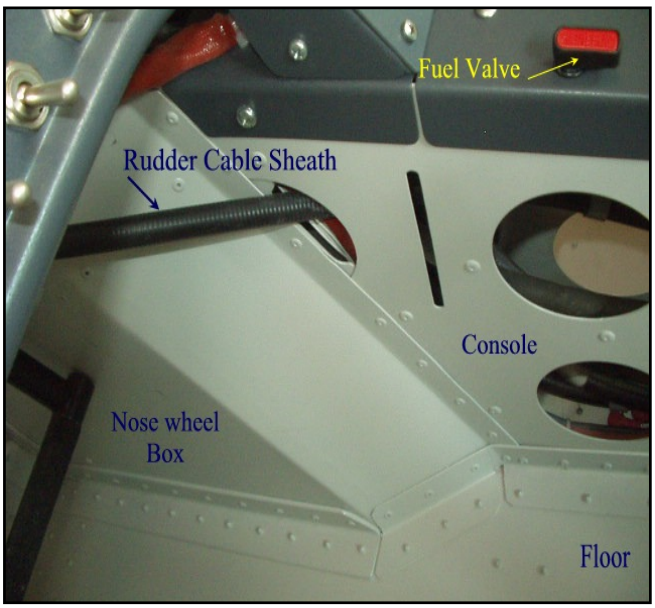
The ……. push rod assembly which connects the control column to the bellcrank can be completed now. The length is determined by setting the control stick in the neutral position (this not necessarily vertical. The control stick slopes forward 0°-5° in neutral position) and setting the bellcrank vertical. Remember to cut the tube long enough so when rod end bearings are installed, more than half the threads are engaged on each end. (Later, the length of the ……. push rod can be checked by putting the elevator in the full up position and the control column in the stick-back position with its bottom arm only 10mm from contacting bulkhead ……. In other words, we want the stick to be as far back as possible without interference when the elevator is in the "full up" condition. The overall length of the pushrod can be adjusted with the rod end bearings as long as more than half the threads on each bearing remain engaged.)

Once installed, check for any possible interference.





RUDDER & BRAKE CONTROLS

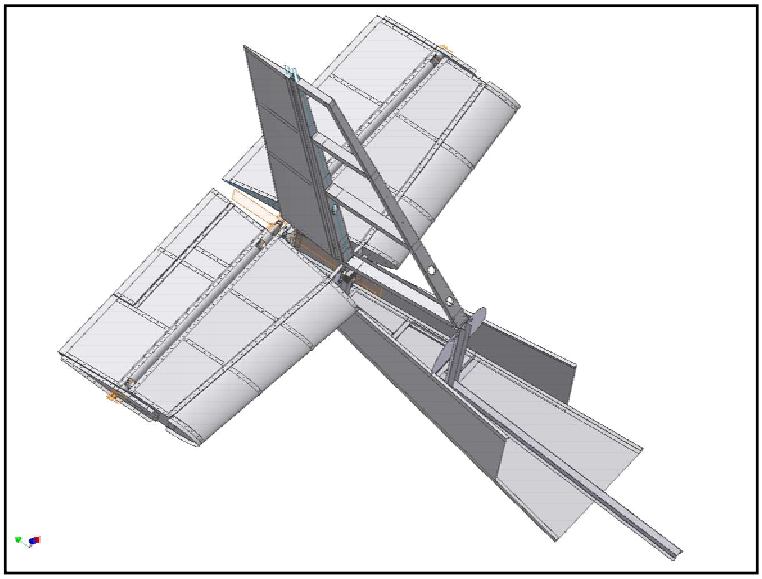


Rudder and brake pedals are fabricated and installed per ,,,,,,,,,,,,,,. Make the ,,,,,,,,,,,,,,,,brake pedals, but leave the……. side plates clamped to the pedal for the moment. Bolt the pedals and brake master cylinders in place on the …….. rudder pedals. It will be necessary to use extra washers on the bolts at the bottom of the master cylinders to space them from the brake pedals and avoid interference during operation. The exact position of the……..side plate will determine the angle of the brake pedal. Bolt the master cylinders to the side plates, then loosen the clamps slightly, and adjust the position of the side plates, until the brake pedals rest in the same plane. Tighten the clamps to hold this position and drill.

An optional dual brake kit, available through SG.Aviation Option Catalog, can be installed on the right side also. This kit has been designed for easy retro-fitting, and may be installed at any time.

THE FUSELAGE

EMPENNAGE/FUSELAGE ATTACHMENT

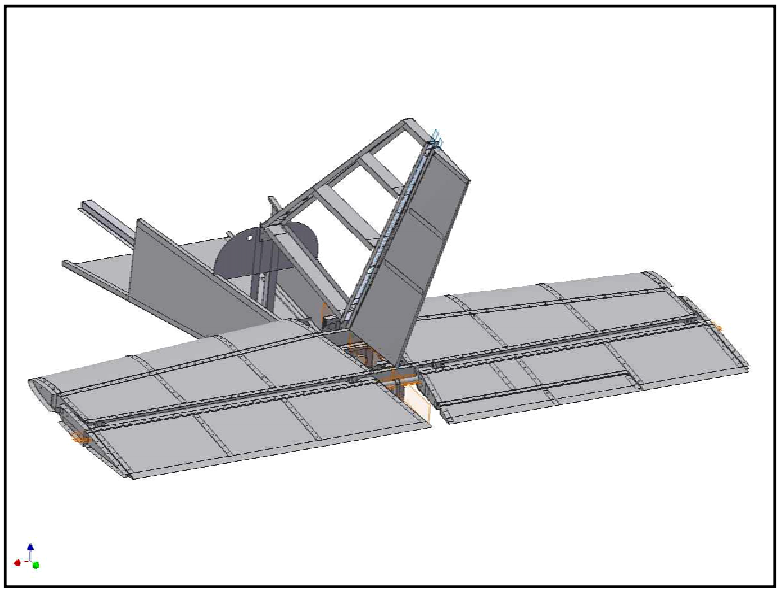


The horizontal stabilizer is the first of the empennage components to be attached to the fuselage. Position the horizontal stab on the fuselage, and clamp it loosely to bulkhead SL101180-29-22 and SL101180-30-22 as shown in DWG. First, square the stab with the fuselage, keeping the rear spar perpendicular to the fuselage centerline. One means of checking this is to measure from each stab tip to a common point on the forward fuselage centerline. When the measurements are equal, the stab is square.

Level the stab with the top longerons so it is set at a zero incidence angle to the fuselage, i.e., its center line should parallel the fuselage top longerons. This can be measured several ways as shown in DWG.

Since it is difficult to measure from the center line of the stab, a displaced center line can be established by using blocks set on top of the spars. The distance up from the longerons to the center of both spars can also be measured. Check both ways to assure accuracy.

Drill the bolt attach holes as shown in DWG on the forward stab spar. Due the same for the AFT stab spar trough the rear bulkhead SL101180-29-22. Now the vertical stabilizer can be attached. Position vertically as shown on DWG. Align vertically with a carpenter's level or by checking tip-to-tip distances from the horizontal stabilizer . Center in fuselage at the same time. The combination of these adjustments should accommodate any reasonable mis-match.



Although some aircraft designs offset the vertical stabilizer to counteract P-factor, we prefer to align it with the centerline of the airplane. The different engine/prop possibilities and the variation between individual aircraft make it impossible to provide an offset that is correct for a given airplane. It is easier to trim the aircraft with a small rudder tab. Before drilling, the vertical stabilizer forward spar must be shifted until the stab is perfectly parallel to the fuselage center line. This alignment can be checked several ways.

This consists of attaching two strings to the fuselage center line somewhere forward on the fuselage and also to a bar clamped to the rear of the vertical stab. The vertical stab is determined to be in line when both strings are in equal position on both sides of it. A similar check could be done with just one string, switching from side to side for checking. Another check is to mark the leading edge center of the stab skin with a marking pen. Then visually look straight down the fuselage and move the stab until the mark is centered. Checking the alignment of the vertical stab with reference only to the sides of the fuselage adjacent to it will only be valid if the fuselage is in perfect alignment. (It is possible to have a twist in the fuselage and still align the tail surfaces correctly to the fuselage center line.) With the position determined and re-checked, the spar can be marked and the empennage dismantled for drilling.

Now the elevators can be attached and the elevator push rod can be finished. With the control system in neutral position and the elevator in trail, the length of the ctrl rod should be such that adjustment both ways is available in the rod end. However, *over half the thread should be engaged on each end,* so that it is impossible for a rod-end bearing to thread off the push rod when both ends are pinned.

RUDDER CABLE INSTALLATION

Rudder cables are installed through the snap-in bushings and pulleys positioned in the holes shown in bulkhead DWG. Because of the sizes of the end fittings, the rudder cable must be installed from the rear to the front, as the front end is the only one with a small enough diameter to pass through the fairleads. Note that the rudder cables have been assembled with sections of polyethylene tubing on them. These are used as fairleads where the cable exits the rear fuselage skin.

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FUEL SYSTEM

The standard STORM RG fuel system is shown on a Digital movie in your CD . "Standard" refers to a system using a positive-G (non-inverted) fuel pick-up, low pressure fuel pumps, and float carburetor. Since the tanks are below the level of the carburetor, a dual fuel pump system is required. The system shown conforms to industry standards by using an engine driven mechanical fuel pump as primary with a secondary electric "boost" pump for use during starting, take-off & landing, and in case of failure of the primary pump. Fuel lines are routed from the tanks, through the fuselage skins, to the fuel selector valve. This valve is located in a central position making it easily accessible and visible (tank selector position) to the pilot. Fuel is then routed from the common "outlet" port of the selector valve to the boost pump, and from there forward through the firewall, to the Gascolator (fuel filter), engine fuel pump, and carburetor.

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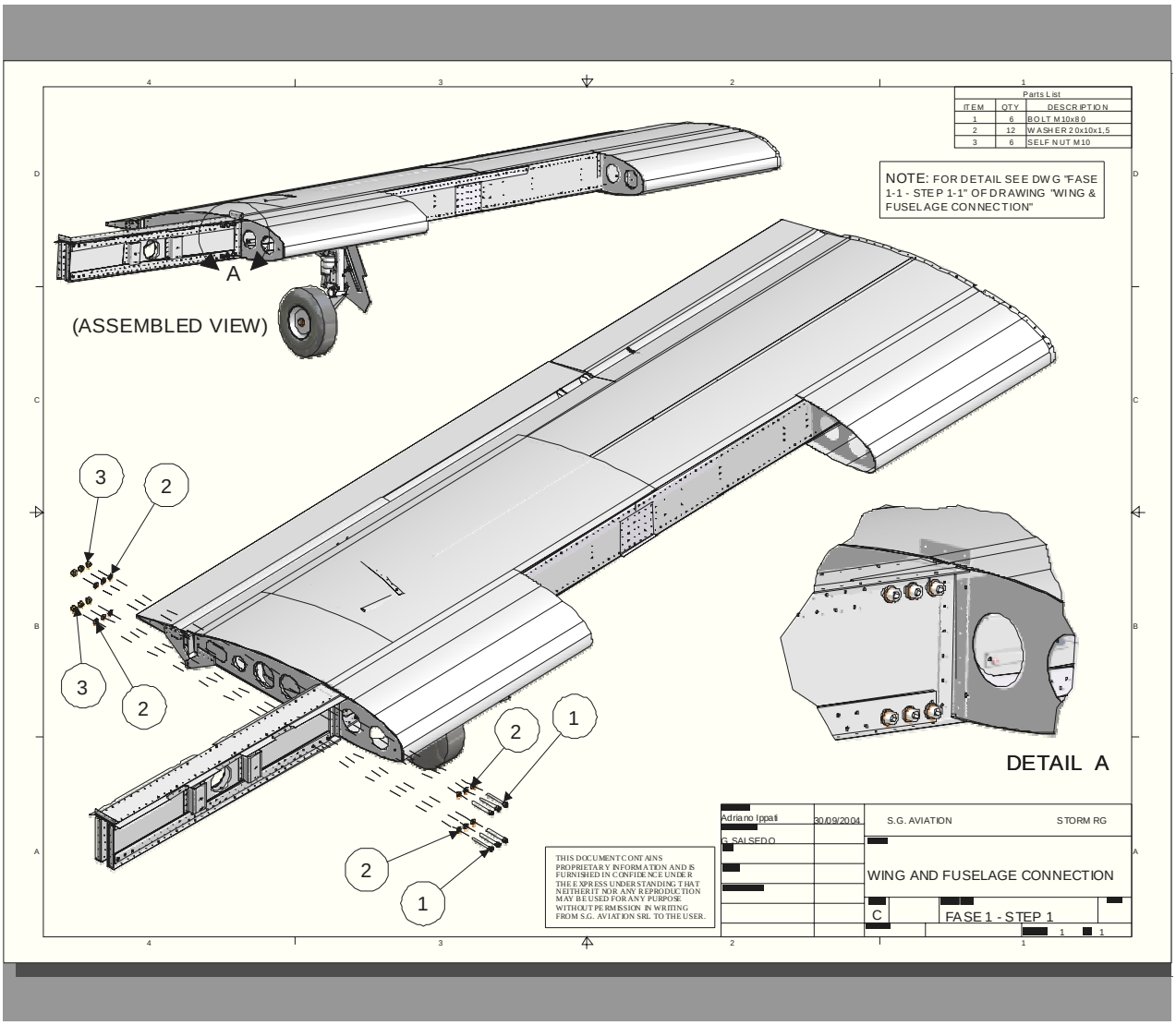
BATTERY INSTALLATION

The location in the AFT baggage bulkhead fuselage was selected for center of gravity (balance) reasons. A sealed recombinant gas or gelled electrolyte battery must be used to prevent spilling acid. The battery box used serves both as a battery hold-down and for electrical isolation. The use of any battery not having the protective features of the Gel Cell battery would require a more elaborate mounting box which must be sealed & vented to offer acid spill protection for both crew and airframe. Significant variations in installed equipment, such as a very heavy engine and/or constant speed propeller, may shift the empty C.G. beyond forward limits. If so, the battery should be relocated to a more aft position, probably in the fin compartment. Sufficient structure will have to be provided to insure the security of such an installation.

WING/FUSELAGE ASSEMBLY

During this phase of construction it is necessary to assemble the wings to the fuselage for a number of reasons including drilling of the rear spar/fuselage section attach, finishing the flap control mechanism, installing the wing tank/fuselage attach brackets, fabricating and fitting fuel & vent line, and installation of wing root fairings.



Actual installation of the wing panels to the fuselage should be very simple, as the spars have been fitted and drilled. It is helpful to file a slight bevel on the root ends of the spar to assist getting it started sliding through the slot in the fuselage bulkhead, and to prevent it from scratching and galling the bulkhead side as it slides through. As the wings are pushed in near center, be sure that the fuselage center bottom skin (which overhangs the fuselage) doesn't catch on the wing skin. When bringing the spar into its exact position, lining up the bolt holes in the wing box and spar, it is often helpful to use drift pins. This could be a disposable hardware store bolt with the end rounded or tapered on a grinder. Gently driving this into a nearly aligned hole will center the wing box/spar holes so that the six bolts M10 can be installed without excessive force.

With the main spar bolted in place, the next step is the attachment of the rear spars. Level the fuselage, both laterally and longitudinally. Then square the wing with the fuselage. This is done by

measuring from corresponding points on the wing tips to a common centerline point of the aft fuselage. Equate these distances at the same time checking that the wings have no forward or aft sweep. This can be done by dropping plumb line from the wing leading edge at inboard and outboard points to see that they all fall in a straight line. Mark this position with a vertical line at the rear spar attach, on both rear spar and center section.

If forward sweep is encountered, determine why the rear spar will not connect to the fuselage bracket. There is more than one possible point of interference. If necessary put some thicknesses between them.

Now the very important incidence angle must be measured and set. This is most easily done by using a level.Rest the level to the intrados of the wings near the rear spar and check .The RH incidence must be exactly the same of the LH wing incidence.

Clamp the fuselage bracket and the rear spar, check again the incidence of the RH and LH wing (Remember must be the same) and drill the two holes 6mm .Fuel and vent lines can now be fabricated and fitted. Fabrication consists of cutting to length, bending as required, and flaring the ends for fittings. Where required, install grommets on the lines before installing the final end fittings. Avoid making sharp bends in the tubing as it will tend to collapse and restrict the flow. The holes cut in the fuselage skin for the vent and fuel lines should be 20mm and 25mm respectively for mounting the grommets which seal the holes once the lines are installed.

FLAP ATTACHMENT

The flaps can be installed on the wings. Connect the ctrl rod to the flap leverage coming out from the fuselage side and the Flap bracket. The flaps must be down 1,5° . This is most easily done by using a rule and a block spacer. Make a wood spacer 8 mm high; with an adhesive tape position it to the rear spar edge. Take a rule ± 800 mm long and position lengthwise to the under skin of the wing until the trailing edge of the flap. Adjust the rod bearing and tighten in this position. Due the same with the other flap.

WING ROOT FAIRINGS

As a general rule, aircraft which have Root fairings wing/fuselage intersections reduce drag and delay the stall of the wing near the fuselage. For the STORM RG, we provide two COMPOSITE fairings installing ease, and aerodynamic efficiency.

Use the dimensions as a guide, but make the final cut by scribing a line on the fairing that fits your fuselage. Pay particular attention when wrapping the fairing around the leading edge. It must be kept tight to the contour of the wing and it helps to have two people holding it in place while the final cut line is marked.Flush head screws are used to attach the fairing to the fuselage.

EMPENNAGE FAIRING

A molded fairing is supplied with the finishing kit. Because this fairing covers the intersection of the vertical stabilizer, horizontal stabilizer, and fuselage, any variation in the position of any of these surfaces can cause a misfit. This fairing will usually require some reshaping work to fit precisely.

The Composite Tail cone will usually require some reshaping work to fit precisely. Pay particular attention when wrapping the fairing around the fuselage Place the Tail cone and drill two holes each side and to the bottom. Install the anchor nuts to the fuselage .

Head screws are used to attach the fairing to the fuselage.

CONTROL STOPS

Ailerons control are installed on the control stick. The procedure for locating the position for the stop is to move the aileron to its max. up limit and hold it there while screwing or unscrewing the bolt. Aileron control stops are prescribed for up travel only, thus the down travel will be determined by the travel of the opposite aileron and the differential movement of the system. Control surface deflection is easy to measure with a digital "smart level". Center the control surface in the neutral position, set the level to zero, and move the surface to the desired deflection.

The control stops for the elevator. Elevator travel is 30° UP and 25° DOWN. The up stop is a piece of aluminum riveted to the Wing box upper FW flange. Thickness of this stop block is to be determined during fitting. The down stop is a piece of 3 mm thick aluminum angle riveted to the center console. Both up and down stops contact and restrain the elevator horn at the extremes of its travel.

Rudder stops are installed on the two leverages of the nose gear the limit of its travel is adjustable screwing or unscrewing the two bolts. Control surface travel can be determined through the use of templates. These templates can easily be made of cardboard, copying the airfoil to get the desired contours.

COCKPIT HEATERS

Cockpit heaters are a builder option for the STORM RG, and some thought should be given to cabin heating prior to completely finishing the fuselage. Even if you fly mostly in warm summer weather, the STORM RG easily operates at altitudes where a heater is extremely welcome. The exact details of your system depend on your engine and exhaust system. Exhaust Heat Muffs and Cabin Heat Boxes are available through SG Aviation Option catalog.

COCKPIT ALTERATION FOR EXTRA TALL PILOTS

The STORM RG cockpit has been designed to comfortably seat pilots and passengers of up to 185 cm, and possibly up to 195cm heights. This of course assumes pilots of average proportions. Those of less than maximum acceptable heights but with unusually long legs or torsos may find the cabin space to be cramped in that dimension.

In the interest of construction ease, the STORM RG seats are not adjustable in the same sense as are automobile seats. The seat backs are designed for ground adjustment through a 8 cm range of leg room variation. Short pilots may need additional back cushions in order to reach the rudder and brake pedals. Pilots with extreme leg room requirements can gain space by relocating the rudder pedal assembly forward and moving aft the seat back hinge. Most pilots of 6' to 6'2" height use a firm cushion of 5-6 cm thickness. Taller pilots can use cushion of as little a 2 cm thickness with reasonable comfort. Persons up to 2 mt have flown in the STORM RG leaning the seat bach and moving forward the rudder pedals. S.G. Aviation. should be contacted for specific help in this regard.

AIR SPEED & STATIC SYSTEM

The air speed pitot system and lines are shown in the wing plans. The pitot line runs along the forward side of the wing spar and is intended to continue on into the fuselage and along the central console, then to the instrument panel. Clear plastic line, included in the Kit, and easy to use material for this line. Or a more permanent line of aluminum tube and fittings could be used if the builder so desired. Surgical tubing can be used in lieu of tube fittings in connecting aluminum lines at junction points such as wing to fuselage.

For the most accurate possible airspeed readings, a airspeed static is installed in the pitot an other remote airspeed static system should be used. When the air speed static is vented directly to the cabin, inaccuracies can result because cabin pressure varies from ambient (atmospheric) due to air leaks and ventilation systems. Sometimes static vent lines are routed into the wings, but this does not assure an ambient source. A better method is to route the static line to an outlet located at some neutral pressure point on the airframe, usually somewhere on the aft fuselage. By trial-and-error, a position for this has been located on the STORM RG fuselage. The vent ports are just AVEX 1661-0410 Pop-rivets, set in the fuselage side skin. Their broken mandrels are driven out to provide an opening and 3,2 mm I.D. clear plastic tubing (hardware store variety) is slipped over the protruding ends of the rivets and sealed with Silicone Rubber. The lines are joined at the right side with a 3,2 mm plastic Tee fitting, also hardware store variety, and slip-over links of 6 mm clear tubing. Then a 6 mm O.D. polypropylene tube is slipped over the remaining outlet of the Tee, and routed forward to the instrument panel following a course through several bulkheads, just below the top longeron. Use NYLO-SEAL fittings to connect the static line to the airspeed, altimeter, VSI and other pressure instruments. Materials kits for this system are available from S.G. AVIATION OPTION Catalog.