Last File Update : 10/01/2007

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*** X-AIR Concept, Design and Manufacture ***

X-AIR "H"

Complementary Notes to the Assembly Manual:

ESSENTIAL TIPS FOR OPTIMISATION OF IN-FLIGHT BEHAVIOUR AT THE TIME OF KIT CONSTRUCTION

INTRODUCTION

First of all, you should trust that an X-air "H" (or any X-air for that matter), which has been properly assembled and tuned, is an aircraft:

docile, predictable, flying hands off, comfortable in turbulence, easy to take–off and land, not prone to spin, symmetric in stall.

If any of the above listed qualities is missing, if at any time you feel uncomfortable and think that your aircraft's behaviour is odd, or out of the text book, SOMETHING IS WRONG, stop flying and find out what went wrong and where. It may be a kit problem — although we are striving towards perfection, it seems, well.. that we have not reached it yet — but this is an extremely rare occurrence for in fact, most cases come on account of a misunderstanding in assembly, or tuning, or both. In any event, even if the kit is perfect, even if your assembly job is perfect, it is always possible to change a friendly aircraft into a flying whale. Simple things, for example: wrong CG position, ailerons looking good on the ground but dynamically asymmetric (yes, it IS possible), over-tightened bolts restricting free movement of controls, accidentally flattened ribs resulting in asymmetric wing profile, etc..

The following tips may or may not appear in the assembly manual, however you should look at this write up as an essential complement to the assembly manual, superseding the manual when there is an apparent conflict. If any of these tips appears obvious to you, please bear with me and move to the next: during 30 years in this business, I have witnessed more dreadful assemblies than one can imagine..

A. WING ASSEMBLY AND SETTING CONTROL SURFACES

A.1. Dummy assembly:

Before doing anything else we insist on a dummy assembly of the wing, without the sail, why? Simply because this is the only way to be sure that your ailerons controls are set properly, with all linkages visible and accessible for easy adjustment. Do it and you will spend on this job at most 1 hour, skip it and you are likely to be in trouble for years to come..

What we mean by "dummy assembly" is to assemble the 2 wing naked structures on the aircraft, with wing struts, jury struts, WITH flaps and ailerons, with all controls linkages and cables connected from stick to aileron horn in place, but WITHOUT the wing sail. You should be able to seat in your aircraft, move your controls with the stick and see everything in action: cables, linkages, push pull rods, bell cranks, ailerons. As a result everything is beautifully adjustable at your fingertips!

A.2. Check up of washout symmetry:

Please refer to the manual, there is no change. The normal washout angle between wing root chord and tip tube should be **no less than 2 degrees, no more than 2.5 degrees;** more important is a **perfect symmetry**. Twisting cables for adjustment may seem odd but it is usually sufficient to obtain a perfectly symmetric washout on both wings. Tapping gently the tip tube helps. This adjustment should be done BEFORE drilling the hole for the pin on the wing tip: when you are fully satisfied with the washout, drill the hole and insert the pin. Please note that the absence of sail makes this entire procedure much easier and more precise. The best tool for washout measurement is one of those spirit levels with a rotating internal dial (serves many purposes on an aircraft including checking/adjusting prop pitch). Do not hesitate to invest in one.

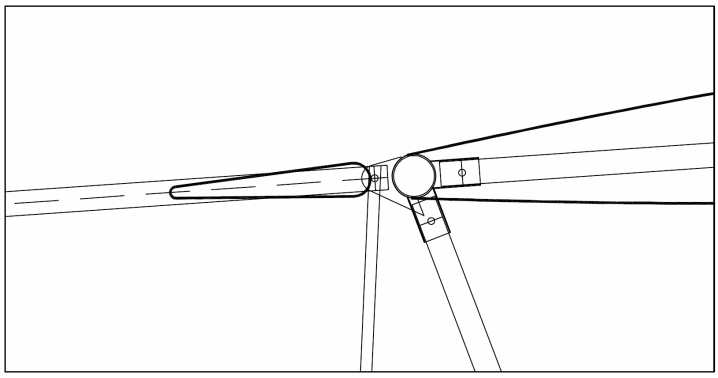
A.3. Adjustment of flaps and ailerons:

Please note that aileron cables and push pull rods are preset at factory: therefore — unless they have already been tampered with — there should be little adjustment required, but there WILL be. It is of utmost importance to have this job done perfectly to avoid subsequent unwelcome side-effects in flight.

***A.3.1 Flaps*:**

Start by adjusting the flaps: that is simple enough, both flaps linkages should be adjusted in such a way that, in the most backward position of the flap selector (as seen from the pilot's point of view, that is flaps "clean"):

The Flap trailing edge tube be aligned with top fuselage tube as per sketch below:



That is the basic position for an "H" fitted with the standard Jabiru 2200 power plant. In the case of lighter engines, such as the 582 Rotax, we may have to play with this value and set the flaps lower, with 20 mm between top of fuselage tube and top of flap trailing edge as the lowest limit: we will get back to this point in a further chapter treating of weight and balance (aircraft CG). Here also it's easier to work if you have not covered the fuselage yet: it's a simple see-through job..

Then make sure that all adjustable linkages have enough thread in, and lock the counter-nuts tight.

***A.3.2 Ailerons*:**

You have already connected everything: cables from stick assembly to swivel arm (canopy linkage); short connecting rod & long push pull rod from swivel arm to bellcrank; connecting rod from bellcrank to aileron horn. Both sides. Now, each of the following steps, as well as the sequence, is VERY important.

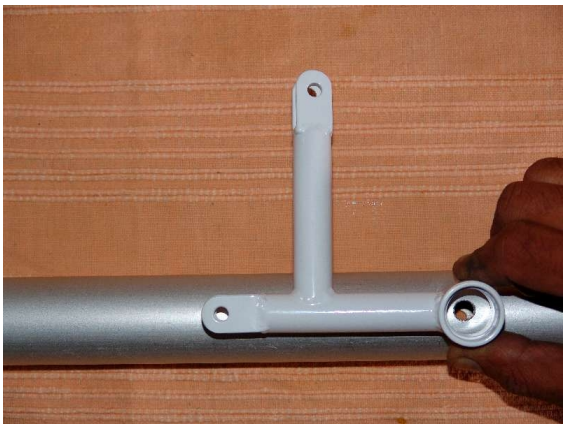
1. Start by centering perfectly and lock the swivel arm on top of your head, in the cockpit: kits up to 1084 contain a tool to that effect ; from kit 1085 to 1120, make your

own aluminium locking plate with two 6mm holes drilled precisely at a distance of 221 mm. Further kits have a tool included.

2. Center the sticks to your satisfaction by adjusting the turnbuckles: cables should be well tight and firm, without any slack. (usually, it is not in this part of the system that we risk parasitic friction)

3. Both connecting rods in the cabin should be set exactly identical in length.

4. Adjust push pull rods in the wings in such a way that the bellcrank lever arm on which they apply is strictly in line with the corresponding compression bar.



5. Finally adjust the connecting rods to the ailerons in such a way that each aileron is in line with his neighbouring flap. That is the basic aileron position; we will come back on this point when we treat of weight and balance.

6. Verify that all adjustable linkages have enough thread in, and lock the counter-nuts tight.

Spray silicone lubricant on all hinges/links etc.. Make absolutely sure that ALL HINGE NUTS ARE LOOSE BY AT LEAST ONE THREAD (do not fear, these are nylocs and they have a safety ring).

!! Remember: barring rare exceptions, over tightening nuts & bolts is a crime on an aluminium tube/sailcloth airframe **!!**

Once this procedure has been completed, release your sticks: you should feel absolutely free movement of the sticks, no resistance whatsoever all along the line. If you suspect parasitic frictions, you may troubleshoot by isolating sections of the system: for example, if you disconnect the ailerons, they should be so free that if you lift one of them and leave it alone, it falls back instantly; if not, your hinge bolts are too tight... Another common mistake is to have the bolt at the bottom of the sticks (where they rotate) too tight..

Now, using your nice protractor tool, you can verify the travel of the control surfaces:

1. Flaps : neutral - 10 degrees - 20 degrees - 35 degrees
2. Ailerons : neutral - 40 degrees up - 20 degrees down

Small variations are ok, but NOT asymmetry.

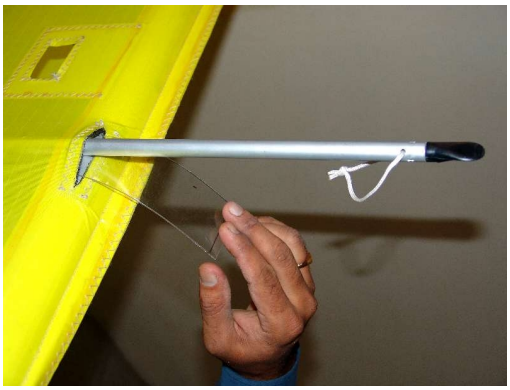
A last check (part of the vital actions) : STICK TO THE LEFT = LEFT AILERON UP

A.4. Covering the wing:

First of all, you do not want to take all this trouble if your battens have been squashed out of shape during transport or for any other reason: CHECK THEM AGAINST ORIGINAL PROFILE. If your original batten template is missing, use a full scale (1to1) plot of the ACAD file attached (Profile_H.dwg). Then, the method indicated in the assembly manual is correct in every point except one, essential: after having introduced the full length of sail onto the structure, DO NOT TIGHTEN THE LACING YET, leave it loose with a bit of slack. BEFORE tensioning the lacing you should introduce all the battens (ribs), starting from the tip towards the root, upper surface first, followed by lower surface. There are only 2 kinds of battens:

- Those with a pronounced curvature, to be introduced in the upper surface of the wing as seen in flight.

- Those with a lesser curvature, to be introduced in the lower surface of the wing as seen in flight. (Tip: use a 1" wide strip of thin lexan between batten and trailing edge tube, as a pad to prevent rubbing metal against metal)



The risk of flattening the profile is further minimised if you insert all the upper battens ½ way first (from tip to root), then a second pass in full.

Please note that the lower battens should be inserted in such a way that we have a bi-convex wing profile. (Tip: insert the lower battens upside down in the pocket for about 15 cm, then rotate 180 deg and insert in full)

Once all the battens are in place (fully pushed-in and jammed sideways towards the wing tip, using the tool 333235), then only you should tighten the root lacing. Two or three passes are necessary to obtain ultimate tension. Use rubber gloves to pull the sail alternatively along leading edge and trailing edge spars. Avoid excessive pull on the eyelets, they could tear: it is more a patient job of passing again and again, than of brute force. (Tip: for optimum results, fly a couple of hours and redo a tensioning of the lacing)

A. 5. Essential advantages of the above described method:

- Thanks to the loose sail, the battens profile does not get squashed out of shape and the original wing profile will be respected.

- The risk of puncturing a batten pocket is virtually eliminated, even when the wing has been dismantled many times.

- You will not damage the batten plastic tips, which otherwise may crack.

- And last but not least, while tensioning the lacing, the sail slides towards the root, the battens in their pocket resist in the opposite way: as a result the battens are locked in position and will never rotate in the pockets.

B. TAIL: STABILISER, RUDDER, ELEVATOR

It is understood that all the following operations will be done without the fuselage sail cover in place, for total visibility and access of all controls elements.

B.1. Stabiliser:

Fixing and removing the stabiliser is a simple affair and can be done in a jiffy when you need to save hangar space. However we should emphasise this point :

!! NEVER FORGET TO BRING THE STABILISER CABLES UNDER FIRM TENSION BY ROTATING ANTICLOCKWISE THE STAINLESS STEEL TENSIONER located on the leading edge of the vertical stabiliser **!!**

B.2. Rudder:

To adjust the rudder properly, start by using a rudder lock which can be made out of 2 aluminium tubes or wooden pieces.

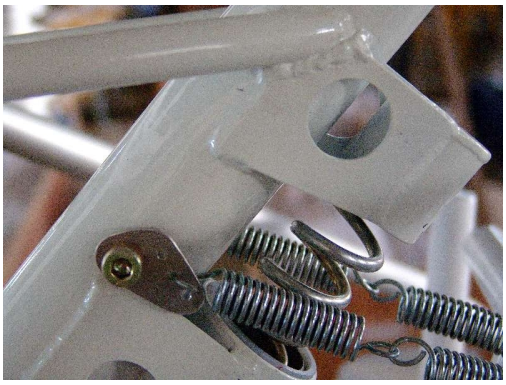
- Adjust connecting rods linking pedals and forks in such a way that:

1) the rudder cables ARE CROSSED and gently tight without excess (just don't allow for any slack, excessive tension is useless here) and,

2) the nose wheel is straight.

Kits from SL No 1121 onwards have self centering springs on the rudder pedals.

- Insert the springs in position

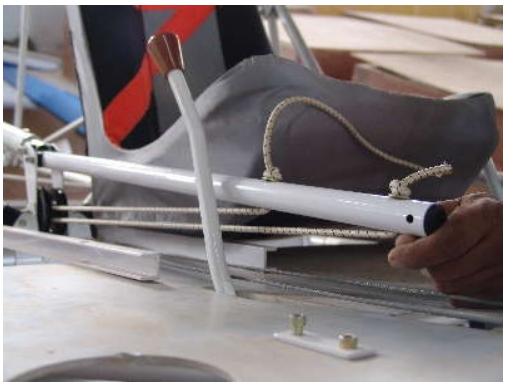


- Spray a silicon lubricant in the fork nylon bushes, the pedal bearings, the rudder hinges. Of course, just as you did with the ailerons, the hinges bolts should be free by at least 1 thread. Tighten the counter-nuts on the connecting rods.

- Verify the free movement of the fork/rudder: tail on the ground, when moving by hand the nose wheel out of alignement, it should should re-centre itself when released. Slight asymmetry can be corrected by inserting springs at different holes.
A last check (part of the vital actions): PRESS LEFT FOOT = RUDDER TO THE LEFT

B.3. Elevator:

Once you have assembled in place all the components as per the assembly manual instructions, please check that not a single bolt going through any part of the push pull rods be overtight: the right way to tighten these bolts is by simply bring the nut/washer in contact with the tube and STOP. Spray silicon on all the rotating joints. You should feel no resistance whatsoever when moving the sticks up and down, only the pressure of the elevator's weight.
Now this pressure has to be relieved by the bungee compensator provided in all the kits right from the beginning. See below how this bungee is attached:



The tension of this bungee should be ajusted in such a way that the bungee takes care of the elevator's weight, no more. As a result the control will move freely, stay where you leave it, with no tendency to fall forward or be pulled backward.

B.4. Elevator trim:

Please refer to the assembly manual, P.74, it's perfectly clear.

[To be continued…] (weight & balance, coming soon)