ian@737ng.co.uk   **1st January 2009**

Right, several people have asked me how I fitted the Steering Tillers and got them working. So after about the fifth request, I thought it might be worth explaining what I did to get the 'Steering Wheel' fitted and operational.
There is something satisfying about taxiing out using the tiller.
This .pdf file is based around the ROUTECH Steering Tiller which comes from Dieter Jakob in Romania.

You are going to need:
a 100kohm potentiometer,
a joystick controller to connect to,
a Registered Version of FSUIPC
a 6mm Bolt at least 10cms long
two nuts to fit the bolt
some large 6mm washers
flat bar to make the bracket
some nylon tube 6mm I.D.
some two part Epoxy Adhesive.

Before you start, doing it this way, requires that you also use FSUIPC to control your Rudder Axis because there is no axis within FS for the steering tiller. FSUIPC makes use of it's own rudder control to 'simulate' the Steering Tiller. However, that being said, a lot of guys I know simply assign the Tiller Axis to the Rudder inside FS. This works fine, but the FSUIPC control is a little more refined. See the FSUIPC manual for more.

Ok, if you look at the diagram further down, there are two views. An assembled view and an exploded parts view. The first step is to decide exactly where you want to position the tiller. Obviously it needs to be in a realistic and comfortable position to allow full control of the aircraft in the taxi.

This is going to allow you to mark up and drill thru your side wall for the centre bolt on which the tiller is going to revolve.

I've drilled the centre hole out in the Tiller to accommodate the 6mm bolt which we are going to fix into the tiller with the Epoxy Adhesive at a later time. We will be doing a practise assembly first to make sure that everything goes together and the bolt has been cut to the correct length.

Basically, this is how it all 'pans out':
The bolt is passed thru a washer that fits inside the tiller hub and then thru the tiller itself. A large metal washer is fitted onto the bolt between the hub of the tiller and the sidewall to act as a friction disc (I did actually use two fibre washers with a smear of 'Vaseline' on the second tiller). The bolt is then passed thru the sidewall and the second washer is fitted. Run the first nut onto the bolt and tighten it up so the Tiller is held in place reasonably securely, but is still relatively free to move when rotated. Run on the second nut and tighten it up against the first nut so they lock each other in place.

That's it for fitting the Tiller Wheel itself……

Now the tricky bit. We need to make a bracket to hold the potentiometer in line with the bolt, so they can be joined with the piece of nylon tube.   I can't help you with dimensions because your installation will be different to mine. But as a guide, my brackets are 30mm (top part which bolts to the sidewall) x 50mm (depth to accomodate the potentiometer nylon tube and bolt) and 70mm deep (to enable me to have a clearance to fix the bracket to the sidewall).
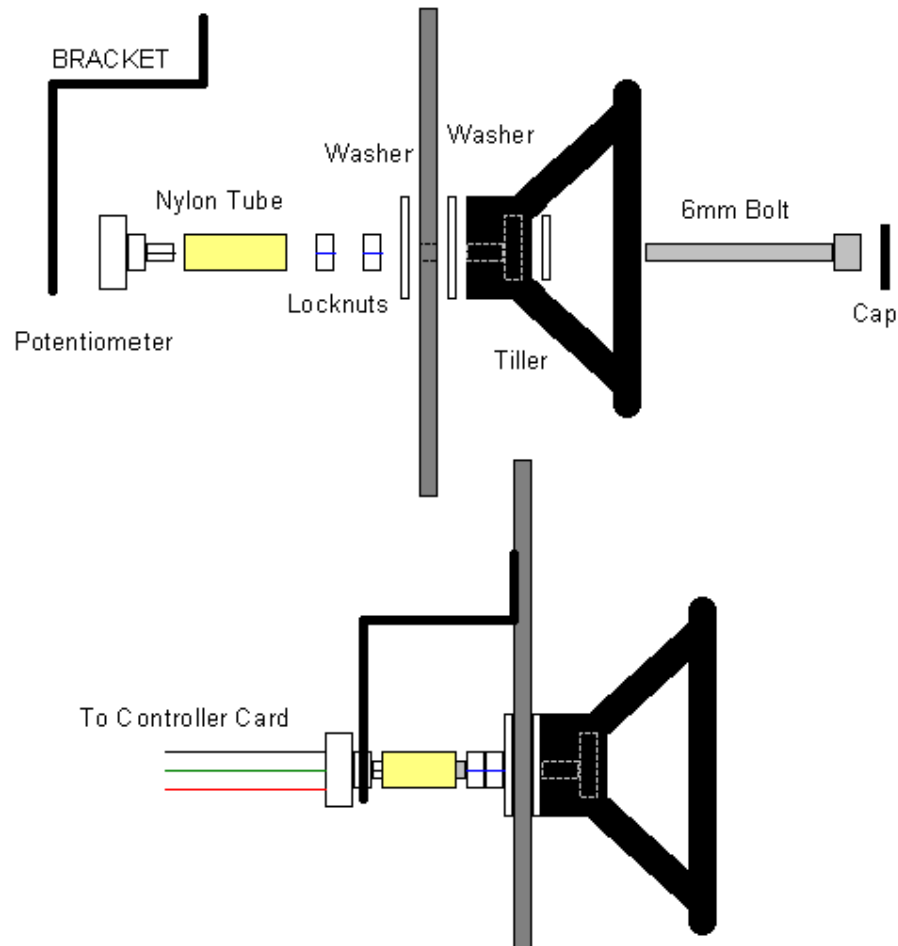
Once the bracket has been made, drill 2 x 4mm holes in the top part which will be used to fix the bracket to the sidewall.   Then drill a hole in the down part to pass the neck of the potentiometer thru and fix it in place.   Slide the nylon tube over the bolt as far as it will go (better still if you have to 'screw' it on). Pass the nylon tube over the shaft of the pot as far as it will go.   This is the point where you have to 'adjust' the length of the bolt and the nylon tube so they all fit together nicely and you are able to present the top part of the bracket flush to the sidewall.   Once you have achieved this, mark the holes for the fixing bracket.   You can now 'dis-assemble' everything because you are going to fix the bolt into the hub of the steering tiller with the expoxy adhesive.   It is important that it is a good bond, because the bolt and the tiller must rotate together.   Once the adhesive has set, assemble the tiller back into the sidewall as previous. Remember to drill the holes in the sidewall to fix the bracket to it.
Fit the nylon tube to the bolt with some more epoxy Adhesive and leave to set.
Point to note: Drill a 1mm hole through the nylon tube where it fits over your potentiometer. The potentiometer has a split in the shaft which we will line up with the hole in the nylon tube when all is assembled.   We will pass some thin gauge wire thru the holes and the split in the pot shaft so that torque is passed thru the bolt and the tube to the pot shaft without fear of slippage.
Assemble the pot shaft into the tube and line up the holes and the split.   Fix the bracket to the sidewall.
Now finally thread some wire or a paperclip thru the holes in the tube and the shaft and twist the ends together.   That's the assembly finished……….

All we've got to do now is get it working :o))   As I do use FSUIPC to control all my axes, this part deals with the setting up of the Tiller with FSUIPC.   First of all, both my rudders have been assigned and calibrated within FSUIPC. If you hook upto the FS Rudder axis, skip this bit and go onto the 'Centreing' Section at the end.
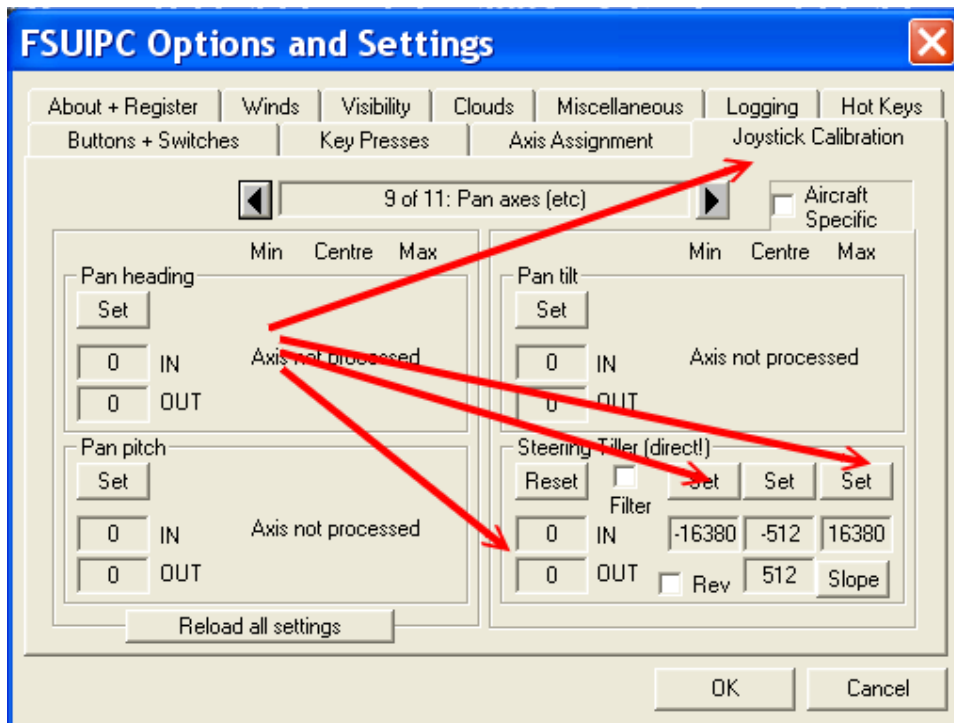

So connect the rudder pot to your Joystick controller card and start FS. Open up the FSUIPC menu and choose Axis Assignment. Assign your Axis to Steering Tiller as in the First Image.
Then go and calibrate it as in the Second Image.
I'm not going to go into detail how to do that here, just read the relative sections in the FSUIPC User Manual.
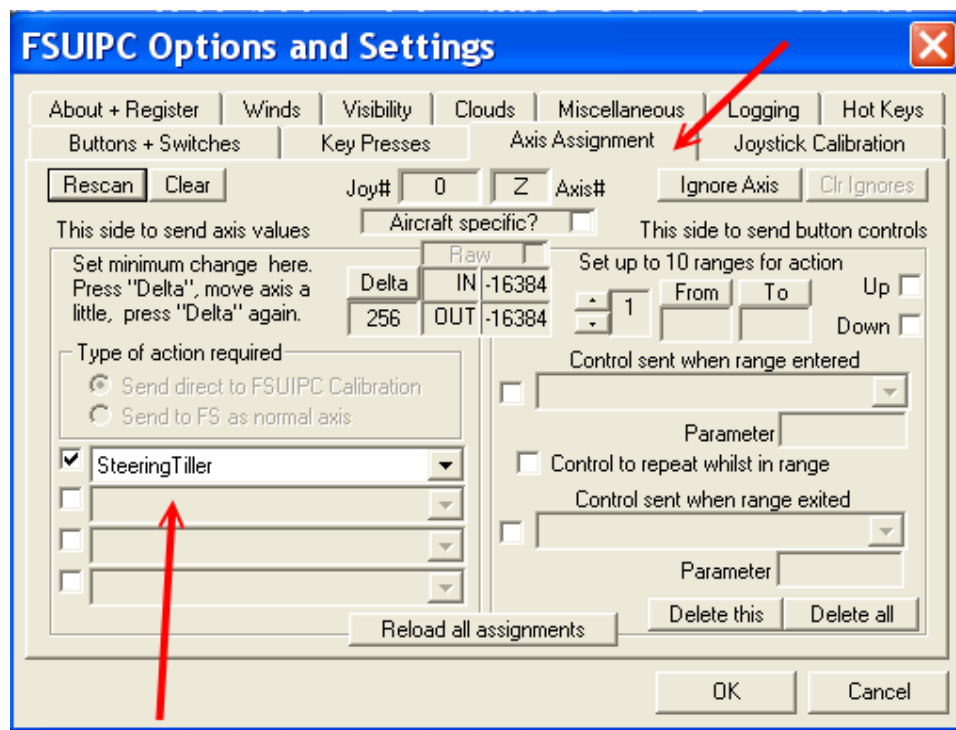
Note For FSUIPC Users. What Pete's done is use the Rudder Axis to enable us to have a Steering Tiller. But the way he's done it is quite clever. He's introduced the limit **MaxSteerSpeed** which you will see in your fsuipc.ini file. I think the default setting is 60. What happens is when you assign a Steering Tiller Axis, that axis takes authority over the axis assigned to the rudder on a sliding scale between 0 and the value of the MaxSteerSpeed (60 in this case). At 0kts the Tiller has all the authority and at 60kts the rudder has authority. So because one axis gives way to the other at 15kts, the steering tiller has 75% and the rudder 25%, at 30kts, they have 50% each, at 45kts the Tiller has 25% and the rudder 75% and by the time we reach the MaxSteerSpeed value (60kts), the rudder has full authority. Hope I explained that well enough.

SETTING THE CENTRE
This part deals with getting the Steering Tiller 'Centred' so you get a uniform turn both to the left and the right.
Place the tiller in what will be it's centre position (with the pointer facing forward, parallel to the floor). Loosen the nut holding the potentiometer into the bracket and rotate the body of the pot until you are somewhere near the middle of it's travel.
In **FSUIPC**, simply rotate the body of the pot until you get a zero reading (or as near to it as possible) in the In and Out boxes on the left of the Tiller section on the menu page. You can refine your control by using the Dead Zone settings or the Slope (my favourite) options.
In **FS**, it's not quite as 'polished' because there is no real accurate readout of the position of the axis. You may like to go into the game controllers menu and set the pot based on the position of the red bar in the properties box for the axis you have assigned and then fine tune with some practise taxiing.

Once you get it working, you'll spend all day just driving round your favourite airport believe me.

Incidentally for those who do not know, the direction of control is this. Looking at the tiller straight on, turn it clockwise – you go right, turn it anti-clockwise - you go left for the Captain. The Co Pilot Tiller is the opposite way round.

Hope you enjoyed that and that I was able to help you understand it all. Please feel free to comment or correct me if I 'goofed'. Thanks for your interest and I hope you feel motivated.

Regards Captains….. Ian