Building a Hebridean Wind Vane.

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UPDATE

I wrote this note in 2014. The Hebridean Windvane can now be supplied with all the metalwork cut shaped and drilled. If you choose this option, you can skip the ‘metalwork’ section and save yourselves a few weekends work!

I own a 1976, 27ft Albin Vega which I sail out of Ullapool in the North West of Ullapool. Like many owners of small boats I have hankered for wind vane self-steering to make life easier when sailing long distances short-handed.

Wind vane self-steering works by fixing a boats course relative to the wind direction; The wind vane is placed with its leading edge into the wind, as the boat moves off course the vane is pushed over by the wind and the movement used to turn a small rudder which, by using the force of water, is used to turn the main rudder. This corrects the boats course until the leading edge of the wind vane once again points into the wind. With the wind vane flopping from side to side the boat then snakes along the desired course; this is just like hand steering however in practice, when wind vanes are set right they perform much better than most people.

There are many options to acquire a wind vane; from those professionally built to ingenious self builds; all in their own way master the complexity in the linkages from vane to rudder. Sailing on a budget ruled out the former and I lacked either the ‘brain space’ or time to adapt one of the many self builds that I have either seen on other boats or read about in PBO.

The Hebridean Wind Vane, designed by John Fleming, offered a third option, a DIY kit. http://www.windvaneselfsteering.co.uk/. The kit will fit boats with a freeboard of 600mm to 1000m and reassured by John and several testimonials from other users, certainly capable of managing an Albin Vega. What I especially liked was that all that was required to support the Wind Vane was a single fitting at transom level, this would make it easier to fix to the boat with the bonus of being able to easily lift it out and store it when not in use. I sent John a cheque for £330 (plus a small amount for carriage) and almost by return the kit arrived.

Getting Started

I have yet to meet John Fleming, but through the pages of the manuals I feel I have learnt something of his personality, “separate the pages from your plans and put them in a display book with plastic inserts to protect them from getting dog-eared…. Keep the fastenings in their plastic wrapping until needed…..” The plans and notes are very detailed but hard to read as a book, fortunately once started they made sense, you simply progress from one component or task to the next: However take head of John’s advice “understand what the part you are on is for even if it is not possible to complete the assemblage at that stage…” This is especially true for the metal parts; be prepared to flick back and forward through the manuals (a lot), all eventually became clear to me; indeed occasionally I would depart from the instructions where my own experience and tools available offered an alternative way to reach the same end point.
The Metalwork

February in the Highlands can be cold and dark, two weekends in my warm shed proved a much nicer alternative to braving the wilds. The recommended list of tools only requires a slow speed drill but I would have struggled without a proper pillar drill and associated vice for holding the parts. I also splashed out on cobalt drill bits, though more expensive, when used with metalwork oil they last much longer and are less prone to breaking. I also used a 115mm angle grinder with a 1mm cutting disk rather than a hacksaw, though you have to be comfortable in handling these. For polishing and rounding edges for the finished parts I either used a flap disk on the angle grinder or a bench mounted belt sander. A good engineers vice is essential.

The work is exacting but equipped with a centre-punch and metal marking scribe I found it straightforward: I was mentally back in my school metalworking shop with the smell of hot oil in the air and the ghost of my teacher peering over my shoulder enforcing care and accuracy; I loved every minute.

Fig 1: Lots of drilling required

Fig 2: The kit supplies the stainless steel cut into correct lengths of box tubing together with clear instructions as to how to fashion these into the component parts.
Fig 3. Component parts cut and drilled.
The Wooden Frame

With the metal parts made, I was distracted by other projects and commitments (not least launching the boat in the spring) so it was until the approach of a summer cruise that I was spurred on to resume construction.

Woodworking is well within my comfort zone and I possess a band saw and table saw. I purchased two 3.8m lengths of American White Oak; (cross section 20mm by 145mm), this and associated glues and paints are an additional cost. A boat-building friend introduced me to Collano Semaproc 60 polyurethane glue; fantastic. I treated the wood with the two part International Wood Sealer; finishing the boat mounting and the pendulum with yacht enamel and the frame with Sikkens Cetol HLS Plus and Filter 7.

The frame parts are accurately assembled by aligning on of a hardboard template. Though not essential for extra strength I made the cross-trees using a laminate of 6mm strips of larch and oak. In order to shape the pendulum into a streamlined profile; I removed the guards from the table saw and working with extreme care I cut groves to the required depths so the profile could be formed by removing the space between the saw cuts with a plane.

Fig 4. Assembling the frame

Fig 5. Frame complete with pivot and vane attachment.
With the wood work shaped and put together the next step is to grab all the metalwork and start putting everything together.

**Vane Parts.** The base is a sandwich of stainless steel plates and plywood bolted together to form a solid block which fits snugly on round stainless tube on the top of the frame. It can be rotated allowing the vane to be adjusted to set its angle to the wind. It is clamped when set by a two bolts and wing nuts. The vane pivots on top of the base and uses an assemblage of the metal parts with the vane made from carbon fibre tubing and a sail (I used fabric from an old tent). It proved very important to keep the weight of the sail down, my first attempt was 1000g, mark two; 450g!
The side to side movement of the vane is transferred to a push rod which moves vertically up and down this moves a pivot assembly (fitted to the foot of the wooden frame) to create a sideways push and pull which in turn rotates the pendulum. Acting like a small rudder the rotating pendulum causes the whole assembly to swing from side to side around its main pivot either to port or starboard. Fitting and adjusting all these parts these is an exacting task demanding accurate measurement of distances and angles, but with careful reading the notes guide you; it is very satisfying to slowly assemble the pieces and watch everything come together. The final tuning is managed by two balancing counterweights: The first, connected to the vane, keeps it upright when not deflected by the wind; the second, connected to the push rod pivot, offsets the weight of the upper push rod and vane.

As I worked through all these fittings I felt that I was dipping into John Flemings mind, how he has put this together is very ingenious. However when you understand how each part works as I mentioned earlier, you can add your own subtle variations; for me this included how I put together the vane sail, carbon push rod and balancing counterweights. My kit was the 14th dispatched and as John welcomes feedback some ideas may be reflected in future additions of the manual.
The mechanism which causes the whole assembly to swing from side to side round its single pivot point is the key feature of the Hebridean Wind vane. The rudder action of the pendulum creates a huge turning force as the boat moves through the water, this in turn is transferred via the control lines, cross trees and pulley blocks to the main tiller. In a steady breeze, with my boat sailing at 4 knots, I was hard pressed to forcibly pull the tiller against that supplied by the vane.

**Fitting the Wind Vane to the Boat**

The wind vane pivot slots into a socket fashioned from an assembly of box section stainless steel. This is held in place by bolts between a sandwich of wooden blocks which are in turn fixed to the boat. The socket can rotate should the pendulum hits something underwater but for the most part, being clamped tight, it stays at the correct angle. Designing how you fit the wooden blocks to the boat is an individual choice as you will need to adapt the design to your own transom; the guide below shows how to decide where the socket should sit. I decided that I wanted to be able to remove the mount so that I could still use the transom hung steps, the manual gives a couple of alternative options, including how to use with a transom hung rudder.

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**Fig 11 and 12 - How to check where to fit the socket to your boat.**

**Fig 13 - Fit the block to hold the socket is unique to your boat.**
Fig 14 - First fitting on a sailing holiday taking advantage of being at a marina (mark 1 vane proved too heavy)

Fig 15 - final fitting!

The control ropes.

The cross trees are held in place by two stays back to the main frame. The main control ropes clip to the cross trees and are fed through pulleys on the push-pit before crossing to the other side of the boat to another set of pulleys and then back to the tiller. Although you can just tie these ropes to the tiller, I joined them with a short length of chain; this could just drop onto a bolt drilled through the tiller. It is therefore very quick to just push the chain off the bolt and disengage the wind vane, also minor adjustments to the control lines can be achieved by moving the attachment point by a few chain links.
Sea Trials!

This is for another article. The wind vane did not work first time for me, but in all cases, the faults were all of my own making. I brought everything back to the shed and carefully checked and retuned the assembly; returning it to the yacht and refitting it, it worked perfectly. I sailed close hauled off the mooring in a gentle force 3 wind then tacked up the loch, cockily turning the boat by adjusting the vane position. As I headed to the Summer Isles the wind freshened to force 4; the Hebridean Wind vane coped perfectly and continued to do so as I gybed round and headed home downwind.
Summary

I am delighted to have a working wind vane self-steering on my boat, new sailing opportunities open up. If I add up all the costs; kit, wood, glue, paint, rope and pulleys; the price would still be under £500. I find it hard to work out how much time it took to build as I fitted the construction around other activities. If pressed I would allow two weekends for the metal work, two weekends for the woodwork, two weekends for the extras and two weekends for putting everything together. I have a well-equipped workshop and am comfortable at using the tools it contains, if you are not put off by the ‘how to guidance’ that is a key element of Practical Boat Owner then you should be able to comfortably tackle the construction. I did find the plans and notes that accompanying them, though very comprehensive, required close reading and study, they became easier to follow once I started but I did find myself looking at photos from other builds to help make some aspects clearer; particularly when it came to fitting the wind vane to the boat. I am sure all this will be resolved in future versions of the manual taking account of comments as more and more Hebridean Wind Vanes are built.

What I really like, is that as I do all my own boat maintenance, having built the vane myself, I know that should I need to I could easily make repairs using readily available materials.