

Keep the boat covered, dry and neat with ventilation

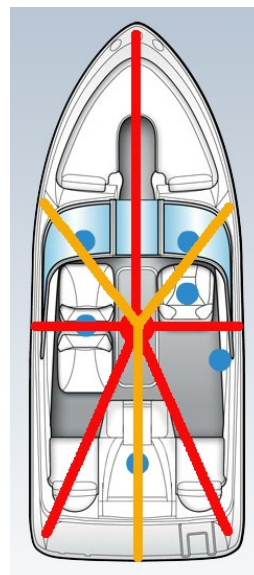
A lot of us have to store their boats outdoors and exposed to the elements. For protection of the boat when stored we use boat covers of various quality. I tend to go with the cheapest (\$100) ones as I found that they last 3 years in the AZ sun whereas the expensive ones (\$400+) have a lifetime of 4-5 years. Clearly cheaper to go with the cheap ones and I always have a spare one at home.....

(Please read all the way through! Some modifications were made while building multiple models for fellow boaters)

Just throwing the cover over the boat and securing it with straps will cause a problem. When it rains the water will collect on the tarp and it will sag in. At a certain load your windshield can break or some other stuff will give way. The water will also soak through the cover and end up in your bilge (you hopefully have the drain plug removed!).



The first required action is to have some support under the cover to make sure that rain (or snow) will not make it cave in. There are multiple systems out there but I found the cheapest one ([Attwood](#)) very decent and useful. All you need in addition to these parts is a piece of 2x4" wood. At \$20 it is also a cheap unit and not worth to start playing around with ropes and sticks.



The straps should be arranged in a way that they give support over the entire boat surface. The ones shown in red are mandatory. The amber ones depend on the type and shape of boat. Make sure that the tip of your pole (the red center) is the highest point of your setup. The Attwood kit comes with a VERY long single strap and several shorter ones with plastic buckles. I attached all the straps to the center piece and use the short straps with plastic buckles to attach to the bow and stern cleats and towards port and starboard side I have them around the bimini poles.

So far so good and the job is well done. Now you can store the boat for the winter and just pick it up in spring to go boating. Well, no! There's just another issue which can even hit in dry climate. Moisture and the results of humidity! Boat covers are usually pretty watertight (they better are!) and will trap moisture from inside the boat. This can lead to something we really don't want: fast growing mold on everything organic including the vinyl of the seats. YUCK!



To prevent this from happening the cover has to be vented at its highest point which is at the pole. There are systems on the market which consist of a pole and the vent but unfortunately they don't have a way to attach straps to them. The vent, [Boat Vent II](#), is fortunately available without a pole and can be found on ebay for less than \$10 including shipping.

For dry areas it is usually sufficient to just have passive venting. To achieve this a short piece of ABS or PVC pipe which fits into the bottom of the vent center piece can be glued on top of the plastic pole support (Attwood). When you store the boat set up the strap system, throw the cover over the front of the boat and push the vent on top of the short pipe on the pole. Step out and complete the covering. When the

boat warms up in the sun the air inside will also get warmer than the ambient air and will escape through the vent.

In more humid areas this may not be sufficient to prevent mold growing in the boat and it gets worse when the boat is covered immediately after an outing with some moisture or water still in the stupid carpet or trapped in the bilge. Did I mention it before: take the drain plug out!



The solution to this is active venting with a fan. There is a fan-vent model out there with a solar cell but unfortunately it is a very flimsy design and in addition has a very low power motor and a tiny solar panel as can be seen in the picture.

Reviews all over the Internet claim that it breaks very easy, solder joints are weak and the snapped on the cover falls off very easy. When exposed to the sun for a while the material gets brittle and the snaps break off or the entire unit breaks.

It just isn't a good idea to have the entire unit in the canvas which one has to roll up or fold together.

Unfortunately I haven't found THE system on the market. They either have vents and no support straps or they have straps and no ventilation and solar powered vents are rare. Time to design my own one again.....

A better solar solution can be home made for a reasonable amount of money and a bit of elbow grease! It will also move a lot more air to make sure that moist air is removed from under the cover. This is also a great way to remove excessive heat in hot climate (like in Arizona summers)!

This starts with the same passive vent cover as shown above installed at the same location as the pole. Get a straight 3" schedule 40 coupling from your favorite home improvement store and cut a piece from it which is a bit longer than the wing-nut which extends from the passive vent assembly (total ~1.75", that's about half). With ABS cement glue this piece centered on the bottom of the vent and let fully cure. You will have to cut some notches into it first to get it all the way down over the ribs on the vent bottom part as it should seal well. No leaks allowed on the output side.....

Now get a computer fan. Defective PC power supplies or old PC cases are a very good source as the fans are usually still in good shape and have a very long lifetime! Otherwise you have to buy a new one for a few dollars. Make sure it states brushless on it! Cut a ~1" slice off a 3" schedule 40 drain pipe (black ABS), check the direction the fan is blowing and glue it centered on the output side. Make sure that there are no holes uncovered as this is the output side and you want all the air pushed through the vent. Worst case fill it with some glue and pieces of the ABS pipe "saw dust". Let fully cure! Take a 3" to 2" reducer, shorten the 3" side to about 1/2" and cut large openings into the transition. This is the air entry for the fan and doesn't have to look good. Can be done with a Dremel tool like the notches to attach the previous part. Glue it to the bottom of the fan with the larger side. You will



only be able to glue the "ears" of the fan to the reducer but that's OK. This is where the air should come in and it doesn't matter where it comes from. Now take a ~1" piece of 2" pipe and glue it centered on the top plate of the cover support. The picture above shows from left to right: vent bottom disk with coupler glued on, top ring for fan, reducer with vent holes. On the left is the complete fan assembly shown upside down. This slightly complicated setup was chosen to be able to remove the fan and to have it set up in a way that it can't be put in the wrong direction. If the fan ever fails you just have to break the pipe/reducer off and glue them to a new fan. (see Update)



Make sure all is glued well as it has to hold the load when you tighten the cover. Once all the glue joints are fully cured, you better wait a day or two, solder an extension cable to the wires of the PC fan with a connector which fits the one supplied with your solar panel. This panel should provide at least 1W. My recommendation is the [Nature Power 2W Solar Battery Maintainer](#) which is available for ~\$20. It is reasonably protected from the elements and rated for outdoor use. Not a super-duper product but it does the job....

Now everything is ready for the first installation! Cut the LONG strap supplied with the Attwood cover support into the amount of pieces to generate the structure as shown above and secure the ends to the top plate of the pole. As I am not a fan of a permanent connections I did sew loops at the end which go into the slots of the pole-plate. Connect them all and make sure the pole is as vertical as you can eye-ball it. Place the modified fan on top of the pole (the coupler goes onto the 2" piece) and make sure again that it will blow upwards (towards the vent!). If not, try taking it apart and glue it right this time....

Place the cover over bow and windshield of the boat and mark the spot the vent with fan has to be located, directly above the pole. Cut a 2.25" hole into the cover fabric (that hurts...) and install the vent as per its instructions. Plug the fan into the vent and then onto the top of the pole. Connect the fan wires to the solar panel which can be placed somewhere at the perimeter of the boat. I put a cable tie over the cover and the vent extension (the 3" coupler). This raises the top of the vent a bit up and reduces the risk of water intrusion.

Step out of the boat and attach the boat cover as usual. Make sure that you don't pull too hard on the vent/fan assembly! In other words carefully tighten the cover straps alternating on both sides and bow and stern.

Now only the solar panel has to be secured. Mine was hanging on two pieces of left-over straps attached to the boat cover for quite some time but if you have an extended swim platform it may be a good idea to make an attachment to it. In the AZ sun the intensity is high enough even if the panel isn't oriented straight to the sun but if you are in a less fortunate climate you may have to target the sun better and make the mounting more rugged.

A nice side effect of the solar panel is that you can use it as a trickle charger for the summer season where the boat hopefully is used a lot and during winter storage you install the fan and power it instead of the battery (which is better stored at home). However, in my case I use the ventilation most of the time in summer too to get the hot air out of the boat in the intense afternoon sun.

In both cases, active or passive ventilation, it is a good idea to have the drain plug removed all the time. Not only will water drain in case there's a leak in the cover but it will also make sure that any fumes which accumulate in the bilge will escape or be pulled out. Mainly fuel fumes are of a concern here. The nice thing is that these computer fans are electronic ones and don't generate sparks which would be a bad thing with combustible fumes..... Especially with these old style plastic tanks (pre-2011) this setup will reduce the "stink", fuel fumes penetrating through the tank walls, quite a bit. Thanks EPA for tightening the requirements so late!

If you have any recommendations, improvements or questions feel free to contact me!

Happy boating, calm seas and a dry and growth free boat....

Jürgen

http://www.pinzi.us/boating/boating_library.php

Cost (including shipping and/or tax):

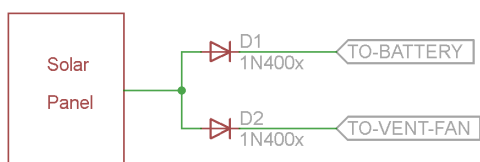
Boat Vent II	\$ 9.92	ebay
Attwood Boat Cover Support System 11886-4	\$24.99	Academy
Nature Power 2W Solar Battery Maintainer	\$27.75	SmartHome
ABS pipes and couplers	\$ *)	left-over from a home improvement project
(3" coupler, 3" to 2" reducer, 1-1.5" of 3" pipe, 1-1.5" of 2" pipe)		
Cable, connector		electronics stock at home
Computer fan, brushless		from defective PC power supply
2"x4" wood		left-over from a home improvement project
ABS glue		left-over from a home improvement project

*) pretty pricey if you have to buy it at the home improvement store! ~\$20 and lots of pipe left over.....

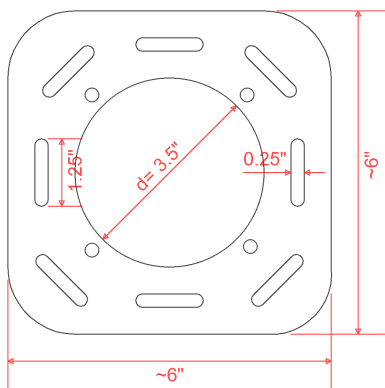
For \$63 I have a really functional system with large volume capability and a way to maintain the battery too. The solar panel can even be used elsewhere if there's no current use on the boat and at 2W it can power quite a bit. It is quite a bit more than what you would pay for the flimsy solar cover vent, \$35, but in the long run it's a lot cheaper as it doesn't have to be replaced often and it isn't a bulky piece attached to the cover and no provisions for straps.

Updates:

As the cable tie I used to "lift" the fan assembly a bit up had a tendency to slip and fail I replaced it with a \$1.45 stainless steel clamp from the local home improvement store.



The solar panel can provide a lot more "juice" than required to run the fan. I added a little circuit to have dual use as battery maintainer and vent-fan simultaneously. This can be achieved with two simple diodes.



As I had to do it all over again I skipped the Attwood boat cover support. Made a plate which slides over the top of the fan assembly with slots at the perimeter for straps. A 2" ABS pipe for the post and you are done. As a luxury item you can glue an ABS plate to the bottom. The 1" webbing and buckles can be ordered from [Sailrite](#) or elsewhere. Real buckles are a lot more convenient than these fiddle through sliding things. A decision comfort versus a little cost and more labor..... Pole and vent however are the difference between a disaster waiting to happen and peace of mind. My boating neighbor got serial #2 which I build for him after his windshield cracked from water accumulated on the cover and I purchased the Attwood

product after I had a free algae farming pool on the boat. Fortunately no further damage....As I had some issues with the glue adhesion on some of the fans I decided to make the plate from ABS too. I could have ordered a 1/4" thick ABS sheet from [McMaster](#) but wasn't willing to pay \$15 for a tiny piece of plastic and even worse \$10 for shipping. Couldn't wait a week for it to arrive either..... Instead I cut a 6" piece from my 3" drain pipe, cut it open at one side and heat formed it into a plate (160-175C, 325-350F; don't get caught by the admiral if you do it in the kitchen stove!). A tad thinner than



planned and not perfectly flat but it will do the job. The 3" pipe was glued into the center hole and 4 holes for the fan drilled into it. Four M4x60mm SS screws (#6x32-2.25" will work too) were inserted into the holes in the plate and metal clamps were cut short and used to hold the screws at the cut out holes of the reducer, secured with lock-nuts at the bottom. Now there won't be a divorce amongst these parts any more and exchanging a failed fan is a matter of taking out 4 screws. The template is here: http://www.pinzi.us/boating/SCV_strap-ring-sticker.pdf



1" wide webbing was sewed with loops through the slots in the fan mounting plate and buckles on the other side. Two of the corner slots didn't get a strap as I don't need the front diagonal ones. The outer attachment is the same webbing with a loop at one end and the second part of the buckle. If you have a choice for the webbing take Polyester as the first one as it is UV resistant and stretches very little. Nylon is the second choice as it stretches a bit more and Polyethylene avoid as it doesn't have an outdoor lifetime. With acrylic there are various types and some are good, some are bad so I would avoid them all together. No matter what material you use Polyester thread is the best choice for sewing.



Complete fan head

Sure, it's a bit of work to get there but aren't we used to that with our boats already? And in winter it keeps us "boat-busy"! The nice side effect of doing it this way is that the cost dropped below \$50.

While typing this update I got a request from yet another fellow boater to build one for him. He's the one who owned the commercial solar vent and it broke just 5 months after installation. Do these guys think I want to open a business with it or that I have nothing better to do??? He will get my prototype (the Attwood based one in my boat) and I will get one with the above plate and pipe and straps with buckles. The new fan unit is already build just for fun..... Ordered some 1" buckles, 25pcs for \$12.50, on ebay, good for at least four systems as one never knows. Now I have to find a cheaper place than HD for the ABS reducers as my stock is depleted! I hope the guy a bit further down with the monster pontoon boat won't need help! He would need at least three of them. I better teach him how to build them.....

Temperature testing: Placed a recording 2 channel thermometer into the boat to measure ambient and inside temperature for a week each test. My boat is under a roof but more than half of the canvas is still exposed to the sun. Without the solar fan (I blocked the vent completely) the temperature difference was close to 19F. With the passive vent (not connected to the solar cell) it was a bit better at only 14F. Running the fan the inside temperature was only 4F over the ambient temperature. My conclusion is that this type of system isn't only important in wet and damp areas to prevent mold! It is equally if not even more important in hot climate to not deep fry the guts of the boat and even more to not make the fuel boil in the tank. My fear is that measured in the middle of the summer instead of spring the results would have been even worse.

More pictures:

Fan head with buckles



Complete fan and pole setup

The bottom of the pole got a piece of flattened pipe glued on to reduce the indents in the carpet.



Solar panel connector

Notice the vent holes at bottom of pole. Used a cut-in-half 4-pin trailer connector matching the solar panel.



Vent head assembly

The reducer is held with two screws to the 2" ABS pole



Vent cap with SS clamp



"Cover up"

The outdrive has a cover too!
Note that the vent is at the highest point. *)



Cost of final version:

2ft	3" ABS pipe	\$ 7.75	Home Depot
10ft	2" ABS pipe	\$10.18	Home Depot
1pc	3" to 2" ABS reducer	\$ 8.97	Home Depot
1pc	3" ABS coupler	\$ 1.97	Home Depot
1can	ABS glue	\$ 3.23	Home Depot
1pc	4" SS hose clamp	\$ 1.45	Home Depot
10pcs	M4*60, SS	\$ 5.72	McMaster
50pcs	M4 lock-nuts, SS	\$ 5.49	McMaster
25pcs	1" buckles	\$12.50	ebay
40ft	1" Polyester webbing	\$14.00	Sailrite
1pc	Boat Vent II	\$ 9.92	ebay
1pc	Nature Power 2W Solar Battery Maintainer	\$27.75	SmartHome

Total cost including ~\$15 shipping contribution (I ordered more stuff) for some of the above was \$124. Not bad considering that the solar panel does double duty as a battery trickle charger. Some material is left over which I hopefully can use for other things and not even more of these vents for fellow boaters.

*) One thing is for sure, the next cover I will buy will be for a much larger boat. When I add a swim platform it has to be longer anyhow and larger boats have a wider beam and the windshield further back. The larger boat cover will have the highest design point where the pole is and it will cover the sides and stern of the boat a lot better. Just have to decide whether a 21ft boat cover or even larger is the right one.

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