

## 10 HP Hovercraft

by [mickydee](#) on April 11, 2011

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**Author:mickydee**

My name is Roland MacDonald, my friends call me Mac  
I am a retired but not bored engineer  
My great joy is my workshop, a two car garage with heat and air.  
I am a private pilot with 1800 hours flying time  
I have built four Kit planes and restored two Cessna aircraft  
My last contact with electronics was in the vacuum tube world.  
I am really enjoying the new transistor world.

**Intro: 10 HP Hovercraft**

I was looking for a project that my Grandson and I could build. together. We decided on a hovercraft after watching a TV special. Knowing absolutely nothing about hovercraft we researched the web on the subject and found the Universal Hovercraft website to be the best source.  
We had an old 10 HP Briggs horizontal shaft electric start engine from an old riding mower that looked like it would fit the bill. We bought the plans for their UH10F craft. We liked it because it only uses one motor. Most hovercraft use a separate motor for lift and thrust. This one directs approximately 1/3 of the thrust air to provide both lift and inflating the skirt. Most of the materials could be found at the local builders supply.  
The only parts we needed to buy from Universal Hovercraft were the Plans, propeller, propeller hub, and the skirt material. Although it busted our \$500 budget we decided to purchase their materials kit which included all the epoxy, fiberglass, screws, and glue. The skirt is the heart of this thing and we didn't want to save penny's on something this critical. It was a fun project for the both of us. It would be a great Father and Son project.



**Step 1: TOOLS AND MATERIALS LIST**

Tools required

- Table saw to cut 4 X 8 Foam and plywood
- Keyhole saw or saws all to cut openings for air ducts
- Scroll saw for plywood duct and body peices
- Shop vac for vacuum blanket
- Two to four saw horses
- Several plastic squeegees
- Basic hand tools

Materials list

- From home depot cost about \$80
- For the hull
- 1 sheet 1" white Styrofoam
- 4 sheets 2" blue construction foam 4 x 8
- 4 sheets 1 /8" plywood (doesn't have to be marine)
- 2 12' lengths 1 x 2 lumber( pine is fine)
- Hardware kit from Universal Hovercraft \$349
- This kit contains every little thing you will need to complete this project including Plans, fiberglass, skirt, glue, skrit screws,epoxy, and a 24' steering cable
- DRIVE KIT from Universal Hovercraft \$159
- Includes propeller, hub, and bushings
- MISC. \$20
- Small roll plastic sheeting 2 to 4 mills
- Paint

Total cost of the project was around \$600 plus the cost of a new or used motor.

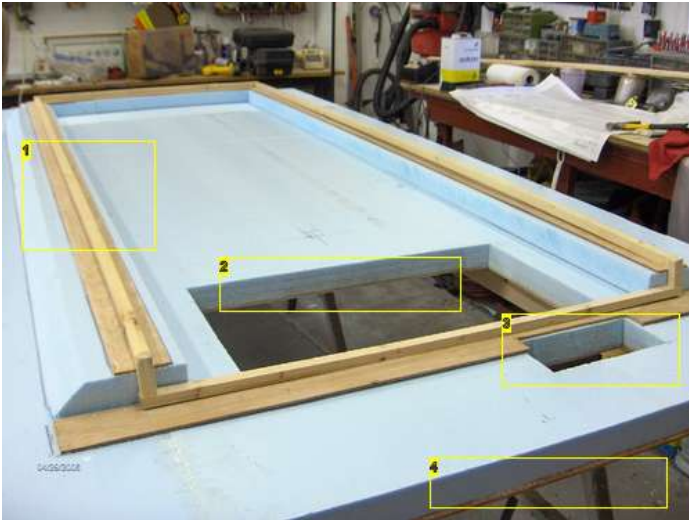


#### Image Notes

1. Wire screen attach points
2. Lift handles Two people can lift it easily unto a trailer

### Step 2: BUILDING THE HULL

Cut the 2" foam to make a 5' X10' rectangle. This dimension will provide a floatation of 600 lbs. If you need to support more weight double up on the foam. It won't weight much more. Skin the top side with the 1/8" plywood. Cut and glue the plywood strips to the foam, and then glue the 1 x 2 strips to the plywood. With a scroll saw cut the two holes for the lift, and skirt air. Glue a 6" wide piece of plywood across the hull where you will instal the motor support post.



#### Image Notes

1. This wood structure provides the inside attach points for the skirt
2. Hole cut for the lift air
3. This hole provides air to inflate the skirt
4. Outside of skirt attaches here

### Step 3: VACUMN BAGGING

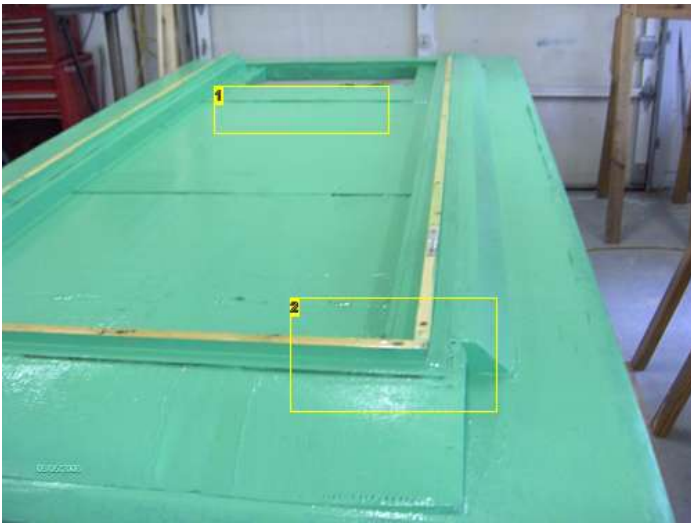
The underside of the hull must be waterproof . The entire underside is covered with fiberglass cloth and epoxy. This can get a little messy if you are not careful. It is important to get all the air bubbles out before it dries. A simple vacuum blanket pulls everything down tight. Don't let this scare you it is really quite easy. First cover the freshly epoxied fiberglass with a layer of thin plastic sheet. Then cover the sheet with a blanket.

This way the blanket won't stick to the fiberglass. Cover the blanket with a larger piece of plastic sheeting and tape it down to the floor all around the edges Make a small slit in the plastic and plug in the vacuum hose from your shop vac. Turn it on and watch the vacuum pull it down to the floor. If it won't pull a vacuum check for leaks in the tape. I ran the vacuum for about two hours and did a great job. When you take it apart the plastic will pull of easily as it will not stick to the fiberglass



#### Step 4: Underside of the hull is now complete

This is what the underside of the hull should look like

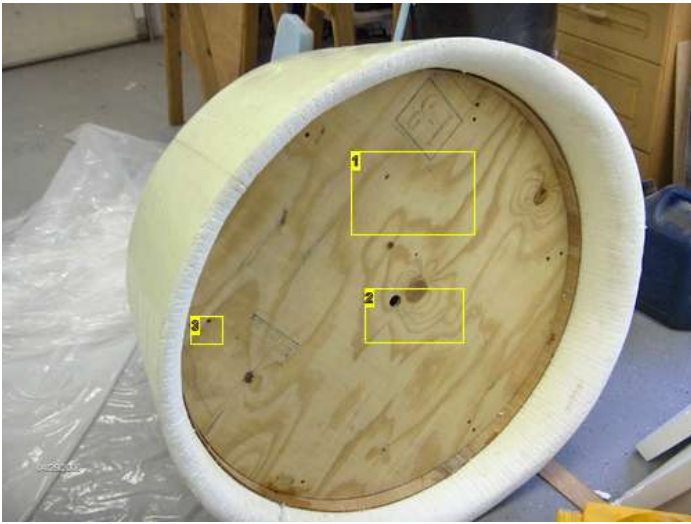


#### Image Notes

1. MOTOR POST SUPPORT
2. INSIDE SKIRT ATTACH POINT

#### Step 5: MAKING THE DUCT

The duct is made from less dense 1" white Styrofoam. The plans show you how to lay out a curving arc that will wrap around the plywood plugs in the middle. Start by screwing together the two plywood discs to spacers the width of the duct. Wrap these discs with a band of 1/8" plywood. After you cut the ducts to the proper shape (arc) Cut kerfs 3/4" deep all around the inside of the ducts so they will bend around the form easily. Be sure and maintain the exact centers of the discs. Later you will drill them out to the size of your motors crankshaft. Don't separate the duct from the form at this time. When it gets to be time to locate the duct to the hull these holes will let you mount the duct perfectly in line with your engine shaft. The plans go into great detail on this step and we didn't have any problems with it.



#### Image Notes

1. plywood temporary discs the size of the propeller
2. Center hole drilled to the size of the crank shaft of your engine
3. Temporary screws to spacers inside to hold discs in place. four places

### Step 6: MAKING THE MOTOR SUPPORT POST

Cut a 2 x 4 piece of pine to the length specified in the plans And put it in the hole cut into the hull (center line of craft) Use plenty of epoxy for this. Cut a base plate from 3/4" plywood for mounting the engine. Fit rear legs from pine and drill and screw braces everywhere you can. This will keep vibration to a minimum I used gorilla glue in every joint. I put epoxy lay ups all around the post for added strength.



### Step 7: MOUNTING THE DUCT

Temporarily mount the motor in place and drill the plywood disc to the size of your crank shaft. Set the duct in place and align it up with the motor crank. Use shims to assure good alignment. When you are satisfied that it looks straight anchor the duct in place with spray can expanding foam. Put it on heavy as it can be shaped or removed easily with a knife or file. When it hardens you should have a rigid mounted duct that is aligned with the motor crank shaft lined up with the center of the duct. At this time you can remove the plywood discs from the duct by removing the screws that hold the spacers. It should pop right out.



#### Image Notes

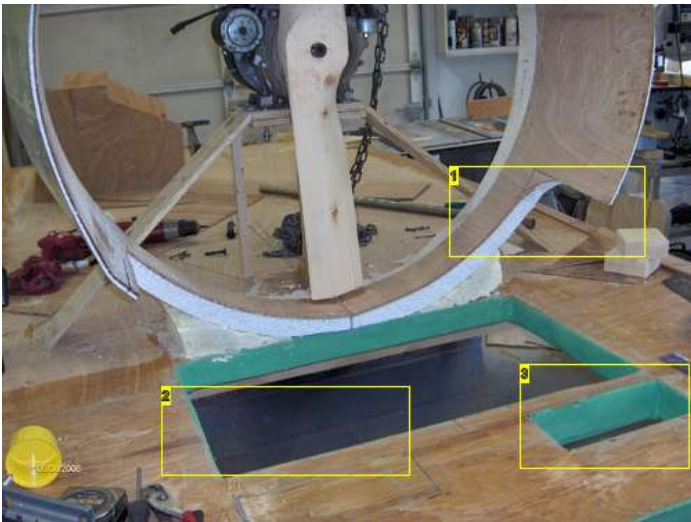
1. Saw kerfs to aid in bending the foam around the plywood band
2. Spray can foam
3. Temporary screws holding inside spacers in place

### Step 8: THE PROPELLER

You can buy the prop two ways, either finished or unfinished. You can save a lot of money by finishing your prop your self.

First slide the prop onto the crank without the hub to see if it fits inside the duct without binding. A duct is most efficient when the prop fits closely inside the duct. Be very careful when removing tip material, it's easy to cutoff but hard to put back . Once you have the tip clearance set you can begin to sand the blades with a power sander and finish by hand. Once you get it smooth you MUST balance it to avoid vibration.

Hang the prop on a rod held in a vise to see which blade is heavier than the other. Don't short cut by shortening the tips. Just keep sanding the blades. Most props are pretty close when they arrive so it is not an undaunted task. Once it is balanced give it a couple coats of paint to preserve it. It's a good idea to paint a white band at the tips for safety's sake. By now the foam is hard so you can cut the bottom of the duct with a sabre saw to conform with the openings in the hull for lift air. Now is a good time to trial fit the prop and hub to the motor to make sure it runs true inside the duct. The motor should be bolted down securely. Turn the prop over slowly by hand. Check for at least 1/8" clearance all around. You can adjust by putting small shims under the motor mounts if needed.



#### Image Notes

1. This cut allows for maximum air flow to the lift and skirt openings
2. Opening for lift air
3. Opening for skirt inflation

### Step 9: BUILD THE AIR CHAMBER

The purpose of the air chamber is to divide the air flow between lift and thrust. The picture doesn't show it in its proper place. We just needed a flat area to glue and fiberglass it together. It is made from 1/8" plywood.



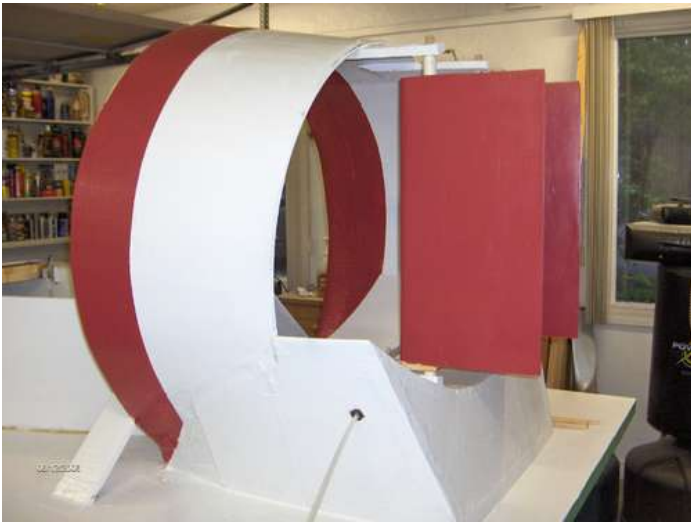
### Step 10: Install the air chamber

Slide the three-sided chamber in place and glue or fiberglass in place. I prefer to use fiberglass when ever possible. When the bond is set install the top of the box. You will probably have to put a weight on the rear to hold it tightly to the bottom frame. When it is dry fiber glass the edges and you are done with the air box.



### Step 11: THE RUDDERS

The rudders are cut from 1" foam. Drill holes in the top and bottom to fit dowel pins. Glue the dowel pin in the bottom. The top pin just drops in to allow for removal of the rudder. I used a belt sander to fashion an airfoil to make them lighter and more aerodynamic. Don't make them too thin. Cover the rudders with one layer of fiberglass to give them strength. Glue small drilled blocks at the top of the duct, and the air chamber to receive the dowel pins. Connect the two rudders together at the bottom dowel pin with a short length of aluminum or wood stock. This is where the steering cables are attached. Run the cables through the air box and route them through eyelets to the control stick. Don't terminate them yet until you build the body. We used a 2' long piece of 1" PVC for a control stick.



### Step 12: MAKE IT LOOK GOOD WITH A BODY

Start by laying out the basic shape with a marking pen and screwing 3/4" stock to the line. The 1/8" plywood bends easily to conform to the shape. Next clamp and glue the 3/4" stringers to the top. Fit a 2 x 4 between the sides to form a dash board. This is a good time to attach the throttle cable to either the dash or the side strips. Later on we put a lanyard connected to the kill switch in the dash. This is a requirement if you want to run it in any sanctioned races. Cover the top with a plywood sheet and fit some scrap foam to form the nose piece. Run the steering cables through the sides and attach them to the stick. Make a little seat that feels comfortable. We padded ours with some foam and scrap vinyl. Paint the whole craft with a couple coats of any paint you may have laying around. We chose white because it stays cool even in direct sunlight. A little trim color makes it unique to you and really makes it stand out. Now that it is painted is a good time to add a screen to stop wayward hands and arms from getting into the prop area. That could ruin a good day. We had some left over wire fencing and fashioned a guard from that. We also added four lifting handles in the corners to aid in lifting it on and off a trailer.



### Step 13: THE SKIRT

I am sorry that I didn't take pictures of the skirt installation but the plans go into great detail on this step. I put the craft up on horses to make it easy to get at the inside attachment. The key to a good skirt is in the corners. They are over lapped and glued with the special glue that is supplied by Universal Hovercraft. The skirt is held in place by 200 stainless screws and washers. The only tricky part is the screws around the rear of the air box. The skirt is very rugged and we have not had any trouble with it.





## Step 14: THE BIG DAY THE TEST DRIVE

The first thing we did was to drag it outside and start it up to check on how it hovered. The skirt filled up with air at a little more than idle and we could push it around easily. We gave it more throttle and it began to move forward. My grandson got in first and drove it all around the back yard. It seemed to respond good to steering control but we learned that it tends to side slip if you are going too fast when you go into the turn. Next I got in and also had good results. Time for the water tests. We took the hovercraft to my best friends house, he lives on a 1000 acre lake and has a small beach to launch from. The craft floats well on it's own and with a person that weighs 200 lbs. I elected to be the test pilot and put on a life jacket for safety. Starting the engine brought it up to a nice hover. Increasing the throttle a bit started the craft moving forward and away from the beach. More throttle and it began to move forward more briskly. It seemed to handle really good. at full throttle until I tried my first turn. To my surprise I started to go sidewise and then backwards. With a little experience I learned to lean my body into the turns and reduce throttle slightly and was able to negotiate the turns much better. I don't know how fast I was going because I don't have a speed indicator, but I left a pretty good wake. Leaning forward seemed to increase the speed. When my grandson took his turn he seemed to go a little faster than me and he was riding more level than I was. I think maybe the seat should be a little more forward. We really had a blast and 8 or 10 people of all sizes and weights tried it out. The heaviest guy weighed around 300 lbs. Although it floated well, he could not get the performance that we could. Under 225 lbs. was O.K.

We played for 2 hours and burned two tanks of gas and didn't have any problems. All in all it was a great test day, This craft is fun, easy to drive, and proved to be very safe. Our youngest pilot was 10 or 12 years old . My only other comment would be to install a quieter exhaust as the neighbors were not impressed with the noise. It attracted a lot of attention as many people had never seen a hovercraft before.



## Step 15: A SHORT VIDEO

Some how I misplaced the longer video



## Related Instructables



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**Print Wall Hanging** by artfulann

Sun



**capri sun gun** by funwithfire



**Creepy UV LED Sun Jar!** by depotdevoid



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**5-minute Sun-Shader** by dnicky2288


## Comments


50 comments [Add Comment](#)


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 **rocketman20** says: May 25, 2011. 2:43 PM [REPLY](#)  
Do you know how many holes and how big they are on the inside of the skirt.


 **mickydee** says: May 25, 2011. 7:35 PM [REPLY](#)  
I don't know what you mean by holes! There are no holes in the skirt except for the screw holes to hold the skirt to the wooden strips. The total screws are around 200 with about 75 on the inside and 100 or so on the outside. I didn't have any problems with the skirt tearing or coming loose. The skirt inflated at just above idle and the craft lifted up about 3 to 4 inches. I hope this answers your question  
mickydee


 **enjohnson** says: Jun 11, 2011. 8:15 AM [REPLY](#)  
mickydee, rocketman20 is talking about another common design for hovercrafts. Instead of having a hole in the base for air to be pumped into and then a second hole for air to go into the skirt, there is just one hole to fill up the skirt. The skirt then has numerous smaller holes around the perimeter facing in to pump air out of the skirt and underneath the craft therefore providing the necessary lift.


 **avatar\_i** says: Jun 8, 2011. 7:24 PM [REPLY](#)  
Forgive me if I missed this, and I am quite bad at math, but: How far and/or how long can you run this beauty on a gallon of gas? If you were to estimate the gallons per mile- as it were- what do you think it might come out to? My thinking here is to build one for one human and two 30~50 pound Dogs to be traveling about.  
Looks like a blast to ride in, too! I only hope I can successfully built it!  
Quite entertaining and instructive, and one of my top ten favourites!  
Thanks!


 **husamwadi** says: May 23, 2011. 10:50 PM [REPLY](#)  
what was the maximum speed


 **MRHint** says: May 23, 2011. 4:13 PM [REPLY](#)  
Congrats!

 **jackhg** says: Apr 14, 2011. 5:22 PM [REPLY](#)  
mickydee,  
great project, looks good, I am happy the project worked well for your group, nobody was hurt, everybody had fun with hc.  
let us know what you doing in the future  
jack

 **mickydee** says: Apr 18, 2011. 7:58 PM [REPLY](#)  
I would like to play with my Arduino Uno and try to build a balancing robot.  
mickydee

 **mark429** says: May 20, 2011. 8:02 PM [REPLY](#)  
It's funny you mention the Arduino... I am in the middle of building a model hovercraft that will be semi-autonomous and plan to use the arduino uno as a system to help prevent crashes and aid in properly steering the craft as I'm sure you discovered it can be a little tricky steering.. for me if felt somewhat like driving a rear wheel drive car on an ice rink. Once I have my prototype all worked out I plan on scaling it up for use on a Universal design hovercraft... they really are the best. If you watch any hovercraft races you'll notice they are always among the top performers. As a side note in my quest for all things hovercraft I discovered goldstein hovercrafts llc sells some wonderful low priced kits for experimenting with hover-crafts and I highly recommend their R/C kit, it is a blast and I put the kit together in less than hour, they include tons of spare bodies and parts to encourage experimenting . I'll see if I can throw together an instructable on the model unit and hope to have a full size craft as cool as yours for my son when he is old enough! Kudos on a GREAT instructable!

 **mickydee** says: May 21, 2011. 1:02 PM [REPLY](#)  
have fun! I think making a model would be a blast. I checked out the Golstein site and it looks like a bargain. The kit would save you all the trouble of finding motors and props, and ducts. I would prefer a larger model myself . Let me know your progress  
mickydee

 **bricabracwizard** says: Apr 19, 2011. 6:55 PM [REPLY](#)  
Great Hovercraft! Please let me know as soon as you build or have instructables on your balancing robot. I have just bought an Arduino Uno and was wondering what to do with it!



**steven1324** says:

May 18, 2011. 3:42 PM [REPLY](#)

On my iMac, there is no sound.... I wonder why? Maybe instructables doesn't work perfectly with macs. I usually have to work around lots of problems.



**sdobbie** says:

Apr 14, 2011. 1:53 PM [REPLY](#)

It would be better if it was powered by lithium polymer batteries and a big brushless motor.



**makincoolstuff** says:

May 18, 2011. 2:46 AM [REPLY](#)

well batteries take ages to charge and can be really dangerous as hightekrednek2396 said when they get wet. i find a petrol motor great as you can quickly refill it and it is far safer than a large amount of batteries. also, batteries can create a weight issue. i think how he did it was perfectly fine



**sdobbie** says:

May 18, 2011. 8:27 AM [REPLY](#)

Or he could have used a tank of hydrogen and burned the hydrogen in the engine. As if it was a normal gas engine.



**hightekrednek2396** says:

Apr 25, 2011. 11:54 AM [REPLY](#)

Instead of batteries couldnt you use a solar panel and some super capacitors then you solved the battery problems.

And lipo batteries arnt cheap and very dangerous to people who don't know how to use them properly. And if water gets on them you better be able to get away from that boat immediatly or it's going to get very bad quick.



**jlprice** says:

Apr 23, 2011. 6:14 PM [REPLY](#)

What do you mean it would be better? Why would it be better?

If that were actually physically possible that would be a great idea. But of course it isn't possible and you don't know the difference.

Before you poke at other peoples work you should at least Google or check wikipedia for technical parameters. or rent a clue perhaps.

This is a great instructable. I look forward to seeing more about this project.

thanks  
-jeff



**mickydee** says:

Apr 14, 2011. 6:48 PM [REPLY](#)

We planned this to be a low budget project. Batteries , controller, and a motor would be cost prohibitive.  
mickydee



**albinoraven** says:

Apr 15, 2011. 6:07 AM [REPLY](#)

Why not just say throw a nuke engine on there.

If you hadn't noticed, it's a weekend FUN project. You want a hovercraft powered by lithium batteries and a brushless motor...hey fill your boots. Once you finish it let us know the costs and post up an instructable.

BTW great job MickyDee. I'm going to give this a shot sometime over the summer. I have an older 12HP Toro riding mower in the barn I've been trying to figure out what to do with. This looks like a great project especially with the ready made kits from universal hovercraft. Very cool!



**sdobbie** says:

Apr 15, 2011. 1:51 PM [REPLY](#)

No such thing as miniturised nuclear reactors as far as i've heard.



**thunder strike** says:

Apr 15, 2011. 4:00 PM [REPLY](#)

i could supply uranium, but of course i cannot sell it to you for that would be illegal, you can have it, though you will pay ythe water bill for it, because if the uranium is in my tapwater.



**Cubie2** says:

Apr 26, 2011. 9:35 AM [REPLY](#)

I live in Utah where there's a LARGE source of uranium. Perhaps I could hook you up with some. ;) Jk, that would be beyond illegal.



**sdobbie** says:

Apr 16, 2011. 9:38 AM [REPLY](#)

There is no uranium in tap water, the water is just radioactive!



**sdobbie** says:

Fossil fuel powered internal combustion engines are environmentally prohibitive. Unless you power them with bio diesel or hydrogen gas.

Apr 15, 2011. 4:14 AM [REPLY](#)



**espdp2** says:

But LITHIUM batteries drowning in a lake are fine! :-)

Be careful, and I would love to see your 'ible when you get finished.

Apr 19, 2011. 5:09 PM [REPLY](#)



**Galt** says:

Honestly...this is the sort of poorly thought out statement that I find offensive and beyond the pall of "being nice". Suggesting that someone replace one environmental negative with a greater negative is both irresponsible and just plain...uh, what's the word...significantly less than intelligent.

Apr 15, 2011. 8:40 AM [REPLY](#)

Costs and hazards of processing hydrogen into usable fuel, the entire ethanol tax payer funded lie and the environmental damage that making it does, the lack of real competitive energy per any unit of measure known between lack luster biocrap and petroleum, ...do you just repeat this stuff 'cuz you saw it on the tellie? The media making something a 'Green' darling usually just means that one of their owners has an interest in the company getting grants of our dough to make them richer.

Mickey, awesome build, and thanks for the wonderful Instructable. I'm kicking around a couple of similar kinds of projects for this summer with my son. If I can figure out a way to concentrate the radioactive isotopes from our aquifer and now dairy products ( that our President told us weren't a problem and couldn't possibly endanger us), maybe we could make a glow in the dark one that ran on gamma rays.

sdobbie, you are right about one thing. Eventually the dollar cost of building wind turbines and solar arrays will out produce their initial investment, but not necessarily the environmental impact of their manufacturing. The other issue that promises to make spending dollars today a good idea is simply that as the Federal Reserve continues to crank trillions into the money supply the increased prices (it's been inflation in the past but now because we have Obama it's ...well just don't call it inflation) that we pay will continue out of control. The effect of increasing the money supply by %6 and then pointing to the stock market gains of %5 and calling it a positive move toward recovery is actually dumber than hydrogen fuel. BTW...not against keeping the planet from becoming a toxic landfill, but look at the people getting rich off of steering sheeple into these 'Green' cul-de-sacs of idiocy. Hydrogen is getting a big push to avoid committing to the already available and totally viable electric car. How else is Exxon and GM supposed to make money? When "The Terminator" and George Bush are doing public relations special appearances to roll out something as stupid as hydrogen fuel, everyone should be grabbing their wallets and covering their bums, 'cuz something really really bad is already in the works.

Mickey you can kill my share of the ozone layer with your irresponsible environmental nightmare. I don't care if you and your grandson are worse than B.P., I like what you guys built together. ;)



**mmeadway** says:

Galt; You hit the nail on the head, especially the part about money supply. As someone professionally interested in biofuels, I have to agree with your assessment of hydrogen as well -- it's not practical. Besides which, we already have a very handy way of transporting usable hydrogen called "methane", and there are ways of cracking the methane to produce residual carbon and free hydrogen -- but not in a production mobile platform. Still, burning methane (natural gas) for vehicles is actually very practical and is far less polluting than gasoline. It's a good intermediate step, and there's a lot of natural gas handy domestically. All that said, let's assume that sdobbie is being serious (I'm struggling with that) and look at the alternatives for hobby projects.

Apr 15, 2011. 2:22 PM [REPLY](#)

My \$.02:

For a real-world example, let's use the Hyundai Sonata Hybrid. This uses a 5.3 amp-hour, 270-volt battery pack that weighs about 96 lbs and costs about \$10,000. This battery can supply about 1.4 kilowatt-hours (5.3 amp-hours times 270 volts) of energy (very approximate), or roughly 5 MJ (megajoules) before discharging (3.6 MJ per Kwh). Going back to energy densities, that means the battery pack is worth about 411 grams of gasoline (assuming gasoline is converted at 25% efficiency, or 12.5 MJ per Kg). At about 3.2 Kg per gallon, that means it's about 0.128 gallons of gasoline on a full charge. Gasoline therefore provides close to ten times the energy density of the batteries even at low efficiency, at a very small fraction of the cost.

The inevitable question comes up, which is "why can these cars go so far on the batteries with such small batteries?", and the answer is that you don't need all 40 HP provided by the Sonata's electric motor all the time. Usually, you need a fraction of it so the demand on the battery is lower. There's a huge difference in the horsepower required to maintain 30 MPH versus 60 MPH. Incidentally, it's interesting to note that the Volkswagen bug had a 36 HP engine, got nearly 30 MPG and topped out at about 60 MPH. The Hyundai Sonata Hybrid has a 40 HP electric motor. Hmmm.

When you do the math, you can see the problems. This is why I get upset with people who airily suggest that we switch to electric vehicles, and that the costs can be scaled with mass-production techniques. It does not work; the physics are against you to begin with. You can't put enough batteries at a low enough cost into a vehicle to make it work. You need at least five times the energy density we can now achieve, and even the upcoming nanowire batteries are only about double the density of the best batteries currently made. We can also get into arguments about wind power, but given the usable capacity versus the nameplate capacity and the unpredictable power outputs, wind power is just not going to replace base-load sources. Solar is far better, but very expensive (\$8 per watt of capacity, installed cost).

So, for sdobbie to suggest lithium polymer batteries is fine, but cost and lack of energy density (not to mention some very real explosion hazards which have prompted warnings in the R/C model industry) make them impractical for mid-scale power requirements, like small horsepower motors on project vehicles. If you're really worried about the environment, use methanol or ethanol after retrofitting your small engine. Of course, now you have to worry about aldehydes in the exhaust, but that's another story :-). Natural gas would work, but there are some very strict regulations on how tanks can be mounted due to the pressures involved (3,000 PSI or more) and the safety requirements.

Thought I'd at least attempt a practical observation or two...



**bricabracwizard** says:

Apr 20, 2011. 7:44 PM [REPLY](#)

I like your comments. I would be interested to know what you know or think about fuels cells which are supposed to be more efficient and lighter than other batteries. i.e. lead cell. I am asking as I am truly ignorant in this area.



**mmeadway** says:

Apr 21, 2011. 8:30 AM [REPLY](#)

I'm glad you like the comments; I'm by no means an expert on all of this stuff and there are a lot of smarter people than I working on these things. My interest is practical; I think we need to get away from imported energy sources which means that there's a wide variety of stuff we need to implement, and I've started a business to work on conversion of biomass (cellulose) to gasoline, diesel and methanol using catalytic reactions. There's a lot of work to do, but I think we can achieve energy independence without forcing our entire vehicle fleet to retool, or having to throw out our appliances and start over. We also need the boost to the economy that a domestic energy production industry would provide.

Fuel cells have a lot of promise, but the difficulty is the fuel; hydrogen is the preferred fuel with all the problems that go with it. Fuel cells themselves are very efficient and trouble free, it's the reactants (oxygen and hydrogen) that are the hard part. In order to run a fuel cell on methanol, for example, you need a "cracker" to extract the hydrogen from methanol (methanol crackers are the cheapest and easiest), and an air compressor (atmospheric oxygen partial pressure is too low for direct usage). This reduces efficiency, decreases reliability and makes it expensive. That primarily is why fuel cells haven't really caught on. There's a lot of infrastructure "glue" that's needed.

There is research on better crackers, but so far nothing really practical has emerged. Hydrogen has a LOT of energy per kg -- 108 megajoules vs. 47 for gasoline -- but it is really hard to store and transport. It has a tendency to leak through metals, and of course it is highly flammable. It has a nasty tendency to autoignite when combined with air and exposed to sunlight. It also has an invisible flame (well, it emits ultraviolet), which makes it difficult to work with. Concentrations of 4% to 74% in air are explosive, which is an extremely wide range; by contrast, natural gas is explosive at concentrations of 5% to 15%. So it's not easy to handle and it can be extremely dangerous. I do not like the idea of hydrogen tanks on the road.

In the meantime, car companies are producing fuel cell vehicles, but you have to have a source of hydrogen for them to run on. Honda has a decent fuel cell vehicle, available only in southern California because that's the only place there are practical hydrogen service stations. Hydrogen is stored at 5,000 PSI (wow), and regenerative braking with a battery pack is used to recapture energy and extend the vehicle range (about 240 miles on a tank of hydrogen). It uses a 100 KW fuel cell stack, which is fairly large; that's 10 times the size you'd need for a typical house. Interesting technology, and Honda has done a very nice job on the vehicle. Honda also sells natural-gas powered vehicles, so they have taken a lot of initiative in the market -- my hat is off to them for that.

There's some talk of using electrolyzers and hydrogen storage at wind farms to store wind energy for later use, with fuel cells used to convert the hydrogen and oxygen. The overall efficiency is supposed to be about 50 percent. There's been research, but there are some major safety issues, since large quantities of hydrogen and oxygen stored in close proximity has a disconcerting property of going "boom" at the wrong times.

There are very small fuel cells available to power laptops and cell phones, that use mini-bottles (like the mini butane torch bottles) or cartridges for the oxygen and hydrogen. There's not enough hydrogen to cause problems, and the power output doesn't have to be high. The cost is high though.

Last but not least, there is a real push for "community" fuel cells that would power a few dozen homes. You can also get a fuel cell that will power a house using natural gas (a cracker is used to separate the hydrogen and oxygen from methane). Carbon buildup in the cracker is the primary maintenance issue, and the membranes in the cells have to be replaced after a number of years. These are very promising units, and I would expect them to do well as remote power units once the cost comes down. Here in Texas farm country, they would be perfect for running oil wells or remote households (an oil well needs a 30 KW power supply for the pump motor, and your electric bill can exceed \$3,000 per month). Natural gas would be the fuel, and that is easily transported and stored (LNG or compressed). So, there's interest and a market -- cost is the problem.

Hope this is useful information :-)

I apologize to everyone for the lengthy comments....I kinda get going on this stuff :-)



**bricabracwizard** says:

Apr 21, 2011. 9:10 PM [REPLY](#)

Thank you for your swift response. You say you are not an expert but I loved the wealth of information you have given me. What is your field of endeavour? How did you come by all this information?



**sdobbie** says:

Apr 15, 2011. 3:16 PM [REPLY](#)

Its just so sad that environmentally friendly solutions are just so impractical.



**mmeadway** says:

Apr 16, 2011. 2:37 PM [REPLY](#)

I respectfully suggest that there is an error in your suppositions.

In the long term, environmentally-friendly methods are very practical. However, you are talking about changing the distribution of work and the energy conversion points, and retrofitting existing engine technology to work with different methods of energy transport. All of that takes time, money and engineering, and there has to be a market incentive to make it happen. Methanol, for example, is a very easy fuel to make using several methods (including catalytic reactions with steam and carbon), and it could replace gasoline so long as we are willing to modify existing engines and fuel systems. The biggest problem is infrastructure; you cannot just pump methanol down a pipe that used to be used for gasoline; the seals, pumps and valves have to be modified. Methanol is just one of the possible solutions though. Just as solar power is another for baseload power, if you can figure out a way to economically operate when it's dark or cloudy. A lot of people believe that nuclear is a horrible thing, but there are other reactor designs and nuclear fuels that do not pose the dangers of uranium; these have not been pursued for thirty years, and perhaps now it makes sense to do so. Take a look at using thorium instead of uranium as an example.

I think we need to concentrate on solutions that require only incremental technological changes, not wholesale changes to as-yet unavailable technologies. Hydrogen is an enormous change; a cleaner liquid fuel is much more viable. So, I'm optimistic about environmentally safe power (both electrical and vehicular), but I get a little irritated when a solution is promoted without thought to

costs, consequences or infrastructure. That's why I don't like batteries -- all technical reasons aside, most batteries contain large amounts of toxic chemicals and require a lot of energy to make (and the industrial waste produced is terrible). Something like an alcohol-based fuel would be far preferable, and its costs would be affordable even for the hobbyist. But, there are other possibilities too; butanol, esterified vegetable oils (so-called "biodiesel"), and so on. What we need is for one of these alternatives to become economically and technically viable given our current infrastructure. Remember, you've probably got twenty years of changeover in the works once something is settled on. It will take that long for much of the existing fleet to wear out and get replaced by newer vehicles using the new fuels.

Here's a thought: Why not do a project to convert a four-cycle lawnmower engine to the use of methanol or ethanol, and publish the results here? Include a way to handle the aldehydes in the output (ethanol-based engines produce different types of pollution than hydrocarbon-based engines). This is a far better way to go about things, and I think it would be informative for everyone here. Remember, many modern products and technologies started as a backyard idea that someone messed with for a long time before it became viable. Even the bicycle was a tinkerer's project before it became the number one form of individual transportation. In short, if you have a PRACTICAL solution that you can demonstrate, it's worth investigating and duplicating.



**sдобbie** says:

Apr 17, 2011. 1:42 PM [REPLY](#)

I can see where you are coming from there. But i have never seen an electric or alcohol powered car in my life. They are working on nuclear fusion in France i think but I am not sure if that one would ever work. To be honest this whole discussion has come about because I absolutely despise fossil fuels. The hovercraft is very cleverly made though.



**hawgrider1200** says:

May 22, 2011. 7:20 PM [REPLY](#)

U MEAN TO SAY U NEVER SAW ANY RACE CARS? Like alcohol dragsters?



**mmeadway** says:

Apr 18, 2011. 6:56 AM [REPLY](#)

Fusion is a long-term solution that is at least ten years if not twenty years down the road. It's a worthwhile goal, but there are some major headaches to solve (like neutron flux) aside from the general confinement and temperature issues. I'm sure it will eventually happen, but we need solutions for the short term.

Alcohol powered cars are used for the Indy 500, as an example. These are fueled by methanol, which permits extremely high compression ratios and therefore more power per cubic inch. The other advantage is that methanol fires are water-extinguishable. In fact, aside from the problem that methanol causes nerve damage if ingested, it's one of the safer fuels out there. Ethanol of course is also relatively safe (lower nerve toxicity), but more difficult to make in bulk, and ethanol production competes with food production.

My suggestion is that if you despise fossil fuels, start working on a solution! I got interested in alternative fuels because I'd like to see the U.S. obtain energy independence, a goal that I think is very achievable. I may not be the guy that makes it happen, but I can at least contribute something to the effort. And again, it is usually the hobbyist that comes up with the first implementation of something that is practical and inexpensive, albeit unrefined.

Here's a thought for you: All of us, tinkerers or simply commuters, have to deal now with \$4 per gallon gasoline, and likely \$5 per gallon by the end of the year. If methanol (for example) can be used at a lower price, what would be required to convert a small engine to use it? If that is a reasonable project to pursue, I'd say go for it. If it can be presented as a way to reduce the cost of operating things like this hovercraft, then so much the better. Methanol is available for about \$3.30 per gallon in 55-gallon drums; that's cheaper than even discount unleaded here in Texas (\$3.65 per gallon), and far less expensive than diesel (\$3.90).

It would be a shame to build something like a hovercraft or a boat (or anything else that requires an I/C engine) and not be able to use it except once in a while because the fuel costs are so high. Perhaps all of us collectively can come up with ways around that, while promoting environmentally positive technologies. As I said before, there has to be a market incentive. With petroleum climbing out of sight, perhaps now is the time.



**Cubie2** says:

Apr 26, 2011. 9:40 AM [REPLY](#)

my main concern about using natural resources is if we use our food for car fuel what about eating it? And even if the food is unfit for US to eat what about food for livestock? World hunger has drastically increased since the common use of "eco friendly" fuel.

Yeah, it's eco friendly. But isn't the whole point of eco friendly to keep the earth in good shape and thereby keep us around longer? This is not a people friendly solution- not an eco friendly solution.

Don't get me wrong, I appreciate the people working on less environmentally taxing fuel- I just think there's a better way.



**sдобbie** says:

Apr 18, 2011. 8:28 AM [REPLY](#)

I can see that we will eventually have to try something else because fossil fuels will eventually become too expensive for most of us to afford. Petrol in scotland is around £1.30 per litre now. So we are either all going to have to get on our bikes or get the horses and carts out if this continues without a solution for everyone.



**sдобbie** says:

Apr 15, 2011. 1:46 PM [REPLY](#)

Did you know that on You Tube someone ran a petrol generator completely on hydrogen and oxygen that the generator made itself from water? I am not completely sure if the video is fake or not but they claimed to have powered a 200 watt load with it. No use for hovercrafts but its just a thought that maybe this technology does have some uses.



**mmeadway** says:

Apr 15, 2011. 2:37 PM [REPLY](#)

Unless someone verifies those claims through a testing lab, I would refuse to believe it. You cannot get something for nothing, which is what they are claiming if I understand things correctly. There are no easy solutions to the energy question.

I doubt very much that the video shows anything legitimate. Most of the time these "breakthroughs" turn out to be measurement errors, a lack of understanding of the results, or someone fudging things behind the scenes.

I would love to be proven wrong, but very few of these "inventors" have ever submitted to rigorous third-party verification of their claims, and those that have discovered they'd made mistakes.



**sдобbie** says:

Apr 15, 2011. 3:37 PM [REPLY](#)

Water itself contains latent energy so i am sure that's got something to do with it. They must have a very efficient hho drycell and pwm controller. Or they are just messing about. Funnily enough, when I asked them about it, i recieved no reply so that makes me suspicious.



**mmeadway** says:

Apr 16, 2011. 2:05 PM [REPLY](#)

Water is an extremely stable compound, and that's why you have to ADD energy to the system to get it to split. There have been attempts to make this happen a bit easier, from heating the water (extremely hot water electrolyzes easier) or using various catalysts. The bottom line is that water is a very impractical source of hydrogen for anything but a fixed installation precisely because of the amount of energy needed. You would be better off avoiding the conversion losses and using the original energy source itself.



**mickydee** says:

Apr 15, 2011. 9:09 AM [REPLY](#)

I am overwhelmed by all the comments that have arisen over my little project using a fossil fuel engine. In all honesty my craft probably won't use as much gas as the average lawn mower will use in one month. I try to answer most of the comments directed to me, but I am going to stay away from these types of subjects. Since the average tinkerer doesn't have access to other types of propulsion at this time I think I will just muddle around with what I can get. Someday when the battery technology improves I would love to move into electric cars and such. They are just now offering airplane kits that are electric powered. I think you gave us a compliment but I am not quite sure.  
Regards mickydee



**grt57** says:

Apr 16, 2011. 5:11 AM [REPLY](#)

Mickydee,  
Keep on keepin' on Mano! Great project, thanks for sharing your experience and expertise.

Peace

Gill



**Galt** says:

Apr 15, 2011. 4:24 PM [REPLY](#)

T'was that. Sorry for the diatribe. Something of a conditioned reflex to evidence that the money handlers propoganda machine is so effective at promoting their next fiasco at our expense. The image of Arnold driving up to open Cali's newest hydrogen station in a million dollar H powered Hummer, and 'W' stumbling and bumbling around to come up with something as profound as "this hydrogen stuff is good" just sets me off on the rant path. Proponents of ethanol have the same effect.

As to hovercraft not having a very practical use, I beg to differ. They are tough to beat for amphibious landings, should you have any plans to invade a neighboring land, and they do make a dandy means of rescue on a variety of surfaces that are inhospitable to traditional water craft. Other than that they just look like they'd be a blast to run around in. Great job Mickey! In the end, the shared process and the resultant fun that you and your grandson will enjoy are I'm sure priceless.



**sдобbie** says:

Apr 15, 2011. 1:47 PM [REPLY](#)

It was not really a complement or insult. It was more food for thought really.



**Bartboy** says:

Apr 15, 2011. 11:47 AM [REPLY](#)

It is ridiculous.

I believe that anything that is considered a "toy" doesn't need to be efficient, as it's a luxury and whatever amount you want to spend on it is your choice, and however responsible you want to be with the environment is your own choice too.



**amaineman57** says:

Apr 16, 2011. 3:11 PM [REPLY](#)

Go hug dirt if you want and live the lie its a semi-free country for now.  
But get a life and let a father enjoy doing something with his son. That alone makes it very worth while. and Until Obama the First drives around in a prius and ditches Air FOrce One for Commercial. Dont expect everyone to get caught up in your zeal. Petroleum and coal used to be green.



**sдобbie** says:

Apr 17, 2011. 1:44 PM [REPLY](#)

They were never green because they produce GREENHOUSE GASES which KILL the OZONE LAYER! So, you get a life. Nice hovercraft by the way.



**amaineman57** says:

Apr 23, 2011. 6:31 AM [REPLY](#)

another brainless koolaid drinker try researching a bit for yuorself and see that the ozone layer naturally thins in cycles based on solar activity GLOBAL WARMING DOES NOT EXIST



**Bartboy** says:  
Why'd you reply to my comment?

Apr 17, 2011. 11:03 AM [REPLY](#)

Accident, I hope.

There is no such thing as a "free country", but it is what it is.

I never said anything about this being bad. I meant it's ridiculous the people saying it is.

Re-read my comment.

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