

Build Your Own Fuel Rig

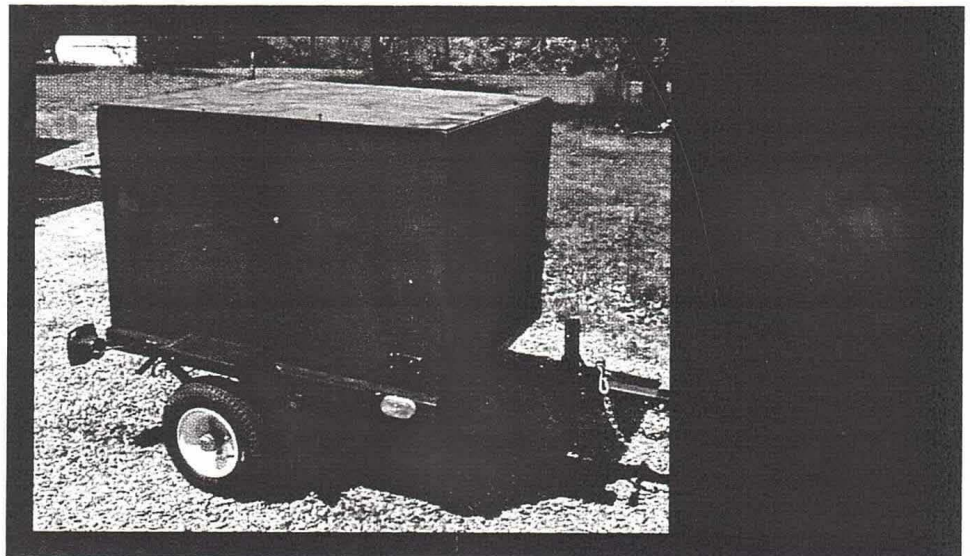
**If you can burn auto gas,
you can save \$1 per gallon.**

BY JIM WEIR

What if I could save you enough on your next tank of gas to subscribe to KITPLANES® again next year...and thereafter a savings of about a buck a gallon forever? Can you handle that? Somehow I thought you could. As this is written, the price of avgas is hovering between \$1.60 and \$5.25 (www.airnav.com, Paulo Santo's wonderful aviation site, shows the nationwide average for 100LL to be \$2.43, and avgas at the local market is running around \$1.39). The difference is close to a buck a gallon, and the differential is only going in one direction as lead is phased out of all fuels including 100LL.

Most of my articles say something like "I'll show you how to make an aviation microphone out of two bubble gum wrappers and a paperclip." But this one is a general idea of how to build a fuel trailer and where to buy the parts at the best prices. Finding the best prices on components took the better part of three years, but it was worth the effort.

Several design constraints were in mind when I started this project. It had to be inexpensive, of course. But safety came first. Thereafter, I wanted the trailer to be highway licensable and completely independent of the tow vehicle electrical system for pumping the gas. It should be weatherproof and as rugged



The completed fuel trailer should save its parts cost in a few years, especially if used by more than one aircraft owner.

and reliable as possible within the constraints of weight and cost.

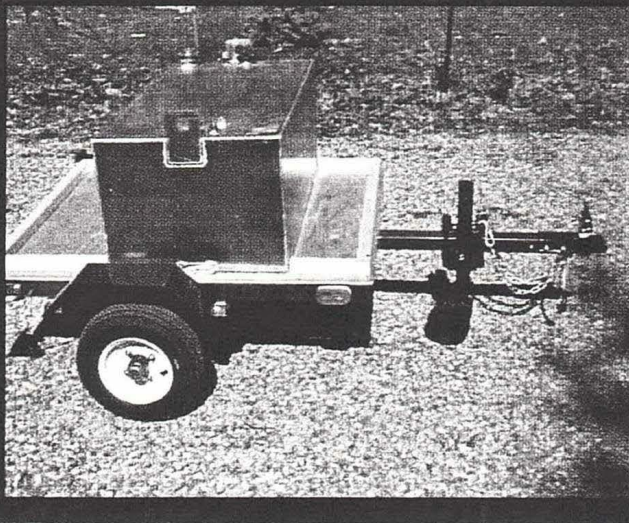
What's in It?

Let's start with a description of the major components and build from the bottom up.

The foundation of the trailer was...a trailer. These little utility trailers can be bought by mail from a dozen suppliers, all at about the same price. They come unassembled, which is good because you will know how the trailer was built.

The next part is the plywood deck. The trailer comes without a floor, so a half sheet of half-inch plywood bolted to the trailer frame becomes the floor. Then the 55 gallon tank is mounted with big bolts and big washers through the floor to the trailer metal frame.

Now comes the least fun part of the project. A wood frame needs to be made so we have something to screw the sides and top of the trailer onto. I used plain 2x2-inch furring strips and built a frame an inch shorter than the trailer to allow for half-inch plywood



The 55-gallon aluminum fuel tank, plywood floor and wood framing have been added to the built-from-a-kit basic trailer.

front and rear panels. The frame was built 29½ inches high to allow for a half-inch plywood top on 30-inch-high sides.

Why are the sides so high? You will find, when mounting the pump onto the tank, that you have an inch or two of freeplay above the top of the pump, and I wanted to avoid an interference fit between the top of the trailer box and the pump. Giving myself a few inches of clearance was comforting.

The framing has half-inch gaps on the top and sides for the top and side plywood panels. Note the pump and water/sediment filter mounted on the tank with a grounded hose from pump to nozzle. The vent is on the right front of the tank along with the ground wire.

We need to vent the tank but keep water and little crawlies from getting into the tank through the vent, which is a simple arrangement of PVC water pipe in a J configuration with some fairly tight-weave fiberglass in the end. The PVC pipe lets air into the tank through the glass weave, but the glass keeps critters and dirt out.

Some thought was also given to venting the box itself. That led to a series of four little aluminum panels punched out with screen door cloth between them and the plywood. These are the little black rectangles in the photo of the finished trailer—one vent on each plywood side of the trailer. Also visible in this photo is the grounding bolt. The solar cell charg-

er had not been installed when this photo was taken.

After lifting the top on and off a few times to put fuel into the tank and pump it out, I added sturdy strap hinges on the front and top of the trailer box, making it much easier to use.

Volts and Amps

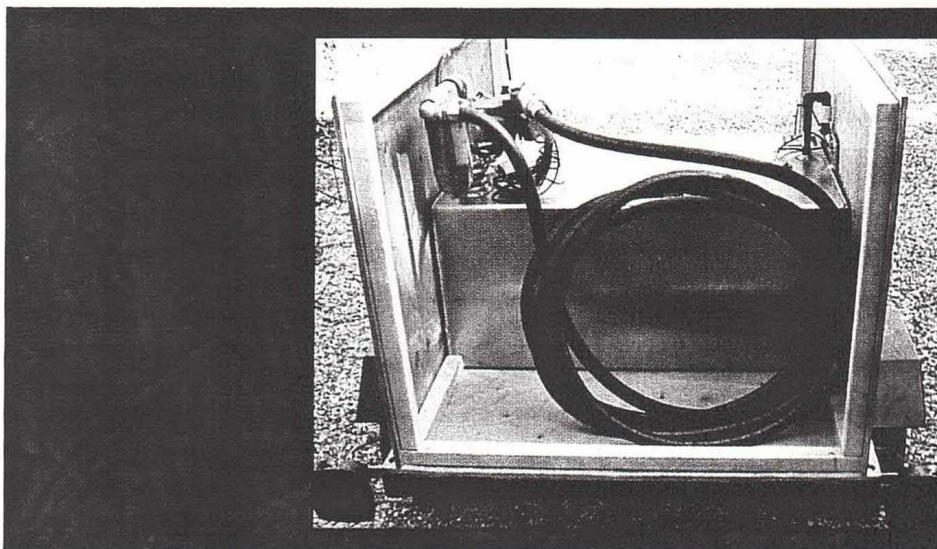
Now that we have a good handle on the mechanicals of assembling the trailer, we move on to electrical.

and the trailer has to be connected electrically to the tow vehicle to operate.

Instead, I decided to carry an on-board garden-tractor-size battery and charge it with an inexpensive solar panel. The thought is that you use the trailer once or twice a week, and the solar cell has many hours to bring the battery back to full charge. Yet I knew that on occasion the trailer would be in fairly constant use, and I wanted a way to charge the battery faster.

KITPLANES® comes to the rescue once again. If you refer to the September '99 issue ("Keeping the Bats Bating"), you will find a nifty 1-amp regulated battery charger circuit. In the article, I used a "wall wart" power supply, and for fast charge of the trailer battery I use the same one. If I unplug the wall wart and plug in a solar charger to the same port, the regulated charger will use the power supplied by the solar panel to keep the battery topped up without overcharging it.

From left to right in the electrical system photo, you can see the battery charger (being fed from the other side of the trailer box), and the terminal



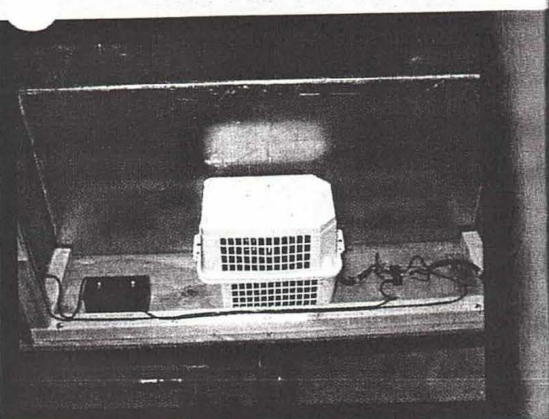
The pump, filter and hose are arranged like this.

Much consideration was given to powering the pump. Most designs I've seen use "ship's power" via the taillight to run the pump. But this means the vehicle headlights have to be on during the pumping process,

strip and fuses are on the far right side of the photo. The plastic dishwasher tray serves as a battery box. The heavy black wire coming down the side of the frame is the pump wire going to the terminal strip.

Fuel Trailer

CONTINUED



The electrical system includes its own battery charger (left) and a dishwasher-tray battery box.

Although I saved money on the battery box, I didn't spare the horses inside the box on the hold-down bracket. In the event of an accident, I wanted the tank, which is bolted securely to the trailer frame, and the battery (bolted securely with big washers to the plywood) to keep from coming into contact. Having a 10-amp-hour battery creating heat and sparks close to a tank full of gasoline isn't my fondest desire.

Finally, we need to ground everything to a single point and then tie that point to the aircraft being fueled. It isn't so much the aircraft carrying a static charge from flying or the trailer carrying a static charge from being driven around town, nor is it a problem with battery voltage differences between the airplane and the trailer. The problem is a dielectric (fuel) being rapidly moved across another dielectric (hose). Think of the old third-grade science trick where you rubbed a plastic comb with a silk hanky and then whapped some poor unsuspecting student on the nose with the charge on the comb.

In third grade, that's funny. In an environment of 15:1 air-to-gas ratios, it is less funny. More like deadly. However, what we have on this trailer is double grounding between the trailer and the airplane. The silver bolt (in the

photo of the completed trailer) is wired to a grounding tab on the metal fuel tank, which is parallel-grounded to the minus (-) lead of the battery, which is grounded through the fuel tank to the pump. There's a hank of very flexible test lead wire with heavy alligator clips on the end. One clip to the bolt, one clip to the exhaust stack of the airplane, and we are grounded.

But I don't trust single-point failures for anything that can kill people. As a redundant grounding mechanism, the fuel hose has an internal woven wire ground from end to end, so that even on the off chance that the ground wire breaks or falls off, a secondary ground is from the fuel tank, through the hose's internal woven wire, to the aircraft fuel filler. Or to the

airframe through the person holding the metal fuel nozzle into the filler.

Triple redundancy. The odds of fuel being pumped at 15 gallons per minute having significant static charge buildup on black rubber hose and metal fittings are slim. The odds of the ground wire breaking or falling off are even slimmer. And slimmer yet are the odds that the internal wire mesh on the hose will fail. Consider this: How many automobiles each year blow up during refueling at the gas station, even without the ground wire?

So long as we are on the safety track, let me remind you that one of the essential components that I didn't show in the parts list is a good fire extinguisher. Mine is rigged to ride

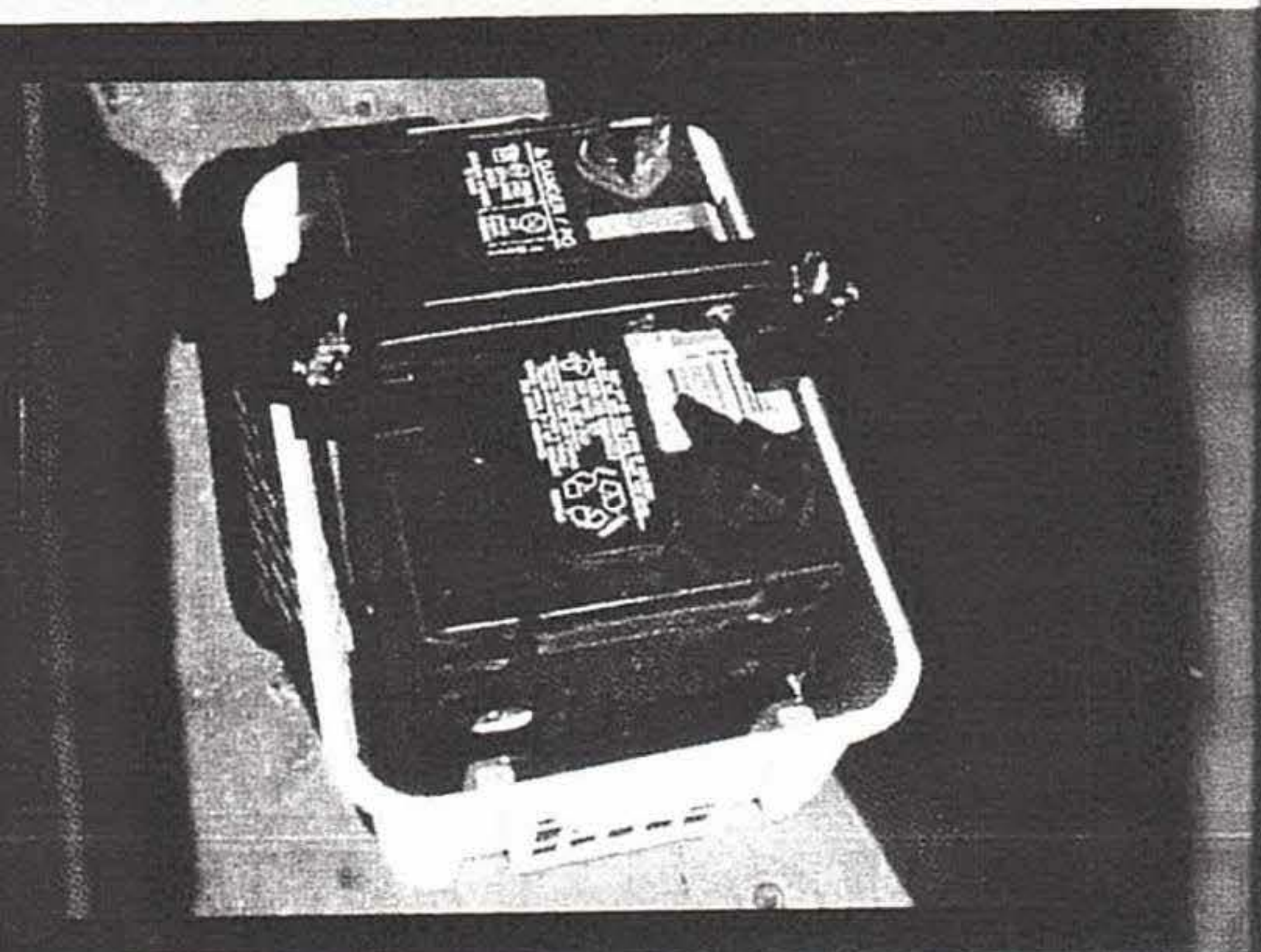
Component	Manufacturer	Distributor	Part #	Price
Trailer, utility	Long Chin	Harbor	42708	\$160
Fuel Tank	RDS	RDS	71109	\$178
Fuel Pump, 12v	Tuthill	Great Plains	109577	\$180
Fuel Filter	Dutton	Great Plains	170306	\$22
Fuel Nozzle	Tuthill	Great Plains	15520	\$20
Extra 20' Hose w/ ground	Northern Tool	Northern Tool	15503	\$22
Tractor Battery	Any	K-Mart	x	\$15
Solar Charger	Harbor	Harbor	44768	\$9
Clips, terminal strips, wire	Radio Shack	Radio Shack	x	\$5
GRAND TOTAL				\$611

NOTES:

1. Harbor Freight (800/423-2567) www.harborfreight.com. Wait until you get one of their catalogs with the "free freight" offer and save almost \$50 in shipping charges on the trailer.
2. RDS Manufacturing in Perry FL (850/584-6898). Bobby English in customer service has promised this price to all KITPLANES readers. It is 20% off the regular jobber net price and includes a fuel-tank float gauge.
3. Great Plains Tool & Equipment (800/525-9716).
4. Northern Tool & Equipment (800/556-7885).
5. Some optional goodies you may wish to buy are: spare trailer tire, autoshutoff nozzle for the pump, spare filter element, another 20-foot section of hose, heavy-duty tarpaulin to cover the trailer for winter.

Fuel Trailer

CONTINUED



Removing the top half of the battery box reveals the hefty battery hold-down strap.

inside the trailer (keeps it from getting ripped off and keeps it out of the rain), but I also rigged a bracket so that I can mount it on the outside of the trailer while I'm fueling.

One other "safety" thought: Some airports have regulations regarding self-fueling. As I've heard over and over from FAA people I've talked with, if the airport has a dime of FAA money in it, airport managers can't prohibit self-fueling or make it so onerous as to prohibit it. However, they can make reasonable rules such as the size of the fire extinguisher and not permitting fueling inside your hangar.

A question remains: What if you get too much fuel at the gas station for the airplane? I just make sure to buy an octane high enough to run my car, tractor, lawn mower, and everything around Casa de Weiro that uses motion lotion to convert gasoline into noise and useful work.

The List

The parts list is really the guts of this article. Most of us could figure out how to get moderate quantities of gasoline from the service station to the airport, and the majority could figure out a way to rig up the pump. What took time was the research to find all these parts at the best prices

and then assemble them to make sure that there weren't mistakes.

I'd appreciate getting photos of your trailer either by e-mail attachment or posted on your web site for download. My e-mail address is tech@rst-engr.com.

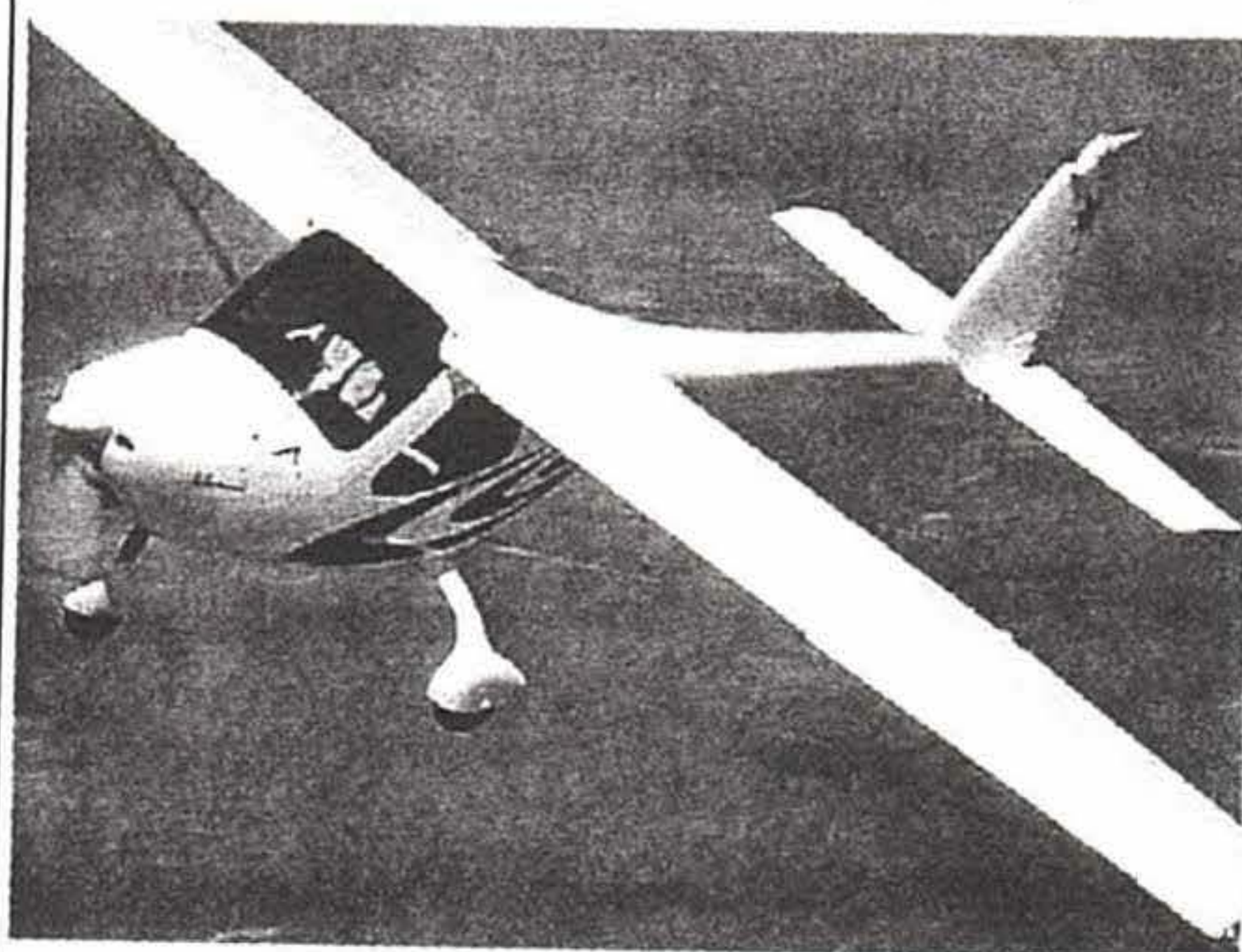
Maintenance

A question to consider is how to drain the debris out of the tank once a year. When you install the pump, mount it so that the pump intake pipe comes to within about half an inch of the bottom of the tank. Once a year, jack the right tire a foot off the ground and pump the tank dry. This will take the level down to where there is a quart or so of water and crud left in the bottom.

After you've pumped the last liquid out of the tank, all the other junk will have collected in the filter. Replace the filter element and you have completed the annual inspection on your trailer. You might consider servicing the battery while you are at it.



IKARUS C42 quick-build kit or factory-built aircraft
sturdy design - exceptionally stable



REMOS G-3 composite design - excellent handling
folding wings - top German quality

RLSA
Rollison Light Sport Aircraft, Inc.

Bloomfield, IN
812-384-4972
info@RLSAir.com

www.RLSAir.com