PDF and Video by Bruce Philpott

Details about the DIY dolly and track system shown in Bruce's YouTube video about video jib booms

I'll start with a quick definition of terms so you know what I'm talking about in this article. The wooden part of the dolly forms a capital "T," so I'll refer to the two sections as the **upright** (which has one set of wheels at 90 degrees to the wood at the bottom) and the **crossbar** (which has two sets of wheels – one at each end – aligned with the wood). I'll refer to each of those three sets of wheels as a **truck**.

Building the dolly platform

I bought a quarter sheet (2 feet by 4 feet) of 7/16" shop plywood for the platform of the dolly. I cut it into four six-inch strips 4 feet long. I left one of them full length (for now) for the upright of the T, and cut another of them in half for the two halves of the crossbar. I cut three spacers four inches wide (shown in green) from the third strip, and cut the remainder in half (about 18") for braces.



On a flat work surface (table or floor), I put the upright in place between the crossbar pieces (only as a precise spacer). I put the two crossbar pieces in place against the upright and put a plywood brace from one side of the crossbar to the other. I glued & screwed the brace to the two crossbar halves, being careful not to get any glue on the upright. I flipped this assembly over and glued & screwed the other brace onto the back side as shown.

I drilled two 1/4" alignment holes through both braces AND the upright (at the same time, while still assembled) and then clamped



and glued the stop to the upright (*against* the upper brace but not gluing it to the brace) and THEN removed the upright from the crossbar assembly. I sanded the wood beyond the stop (which inserts into the crossbar) smooth and rounded the edges.

When the glue dried, I was able to reassemble the upright and crossbar and secure them with 1/4" machine screws through the alignment holes. I don't even bother using nuts – the screws act as pins. Alignment holes are drilled all the way through while the upright is still assembled.

I designed this platform to be easily assembled on location, then taken apart into these two components which fit in my compact car.

These measurements worked for the jib stand I own. Yours will vary. Please consider this article to be only a rough guide.

Building the dolly trucks

I bought two pair of inline roller skates at a thrift store for just under \$10. Their wheels didn't show too much wear. I removed the wheels for use with this dolly. Sixteen wheels is four more than I needed for the project. I could've used three wheels per truck, but I used four.



I used eighth-inch thick aluminum angle stock to mount the wheels. I thought stock an inch and a half wide (as you see in this project) would be wide enough. It does work, but I suggest you get stock two inches wide if you can find it. The wider stock (shown on the right in the picture above) will permit you to mount your wheels farther from the angle, thereby giving them a better grip on the PVC pipe track. Be sure there's enough room for the head of the bolt or machine screw (that holds the truck to the plywood dolly) to clear the top surface of the pipe. I cut three 8-inch trucks out of a 24" piece of aluminum.

Having mounted my wheels on the angle stock, I realized I would need a spacer between the aluminum and the plywood platform. I cut plywood spacers for each truck (shown here as green). These will be held by the bolts which secure the trucks to the plywood.



About those bolts that attach the truck to the platform: I found it's next to impossible to drill a hole at the point of the aluminum angle, not to mention how hard it would be to do it accurately.

I found that grinding the angle flat where I wanted to drill my holes did enable me to mark the spot with a center punch, but the drill bit still slid around and the hole wound up being off-center. I realized that these holes would not be able to be used to align the trucks to each other. I just made sure that my off-center holes were true quarter-inch holes, not sloppy, oversized odd shapes. Tight bolt holes will hold the trucks in place accurately (without creeping).

Installing the trucks in alignment

Since the trucks will have such a fragile connection with the track, it's especially important to install them so they're aligned with each other. Otherwise, they'll tend to wander off the track which would be disastrous.

I had planned to use my 10-foot lengths of PVC pipe to align the trucks with each other, but I noticed each section of pipe had a tendency to bend in one direction or another. Instead, I looked around for something perfectly straight that would sit in the "V" formed by the wheels on each of the trucks.

I had some 6-foot pipe clamps, and those pipes are perfectly straight.

First I put the plywood platform on the floor upside down. The braces I'd installed to receive the upright section made it unstable, so I put scraps of plywood under the three ends of the platform.

Working first with the crosspiece, I positioned one truck at each end (see the photo on the next page) and then placed one of my steel pipe clamps on the two trucks with a plywood spacer (shown as green) between the platform and each truck.

A little wiggling of the trucks made them line up with the pipe. Since they're both aligned with the pipe, they're aligned with each other. With the pipe still in place, with a pencil, I carefully marked around each spacer on the plywood platform and made alignment marks on the aluminum and the spacer, so I'd be able to see if anything went out of alignment. I carefully removed the pipe clamp and VERY carefully clamped each truck to the platform with small woodworking clamps.

After checking my marks to be sure that nothing had moved out of alignment, I drilled through the holes in the aluminum, straight down through the spacer and the platform of the dolly. I put 2.5" bolts through the holes from the truck side and secured a washer and a lock nut to the other side.

I put the pipe clamp back on the trucks to doublecheck that those two trucks were aligned with each other.

Measure from the INSIDE of one pipe to the OUTSIDE of the other pipe This alignment is vital to keeping your dolly on the track. These ments These ments The SAME The SAME The SAME The SAME The SAME The SAME

to the OUTSIDE of the other pipe

I then put a truck and spacer on the end of the upright. I put another pipe clamp atop this truck and carefully measured between the clamp pipes. I twisted the un-attached upright truck until, at the farthest ends of the pipes, the distance between them was EXACTLY THE SAME. This measurement **minus one inch** is exactly how far apart you'll want your 3/4" PVC pipe track rails.

Again, I carefully marked the position of the spacer on the upright and the position of the aluminum on the spacer. I removed the pipe clamp and clamped the truck in position (with a smaller clamp) and drilled holes down through my holes in the aluminum, through the spacer and the platform of the dolly.

As before, I secured the truck with bolts, washers and locknuts. I put the steel pipe back in position and checked once again that the two

steel pipe clamps were perfectly parallel with each other. This showed me that all three trucks are aligned with each other. If anything had been misaligned on any of these tests, I'd have gone back a step and made sure I had good alignment.

Securing the jib stand to the dolly

At first I thought I'd put a piece of plywood on end next to each leg of

the stand, supported by a triangle of plywood behind it. I'd use a U-bolt to clamp each leg to these upright supports.

Then I figured that any catastrophe which would jolt the stand off of the plywood would also pull the dolly trucks off of the track, so I might as well make the leg holders more simple.

> Frankly, I hadn't noticed before that the rubber feet of the stand didn't actually have their



bases sitting flat on the floor – they're at a 60 degree angle.

> To corral these oddly angled feet, I decided to make three things I call "stirrups" for want of a better name.

I made the three 3-sided stirrups out of some of the remaining plywood. I angled the sides and back 60/30 degrees as you see here. You might also take a look at the photos on the cover page.

A stirrup

I'm not giving you measurements for these stirrups since the feet of your stand will most likely be different. Just cut some of your remaining plywood to fit the feet of your stand. Glue and nail

Glue and nail the three pieces together and let them dry.

While the stirrups dried, I put my stand on the assembled dolly. Now was the time to decide exactly where the feet of the stand would

See the cover photos, too.

be secured. Naturally, they would be very near the locknuts and washers which hold the trucks to the dolly. The feet don't have to be perfectly atop the trucks, but I felt it was good to get them close.

As you can see in photos on this page, the truck bolts

on the trucks at the ends of the crossbar were half inside of the stirrups. I had to grind the underside of those two stirrups to accommodate those washers, but I found the feet of the stand fit perfectly.

You'll probably have to find some other compromise to position your stirrups. Drill pilot holes for wo**od screws** Having found good positions for my stirrups, I numbered them (so I'd get the same stirrup back in the same place) and marked their positions with pencil on the dolly . Then I removed the jib stand and the stirrups. I drilled 1/8" pilot holes (red dots on photo below left) down into the platform for wood screws which will eventually attach the stirrups to the platform. I then put the stirrups back on and clamped them (dry)



into their positions on the platform. Then I drilled UP through those pilot holes in the platform into the stirrups, creating pilot holes in the stirrups themselves, to prevent the screws from splitting the wood.

Then I applied glue to the stirrups and screwed six wood screws (two per stirrup) up through the platform into the stirrups. This completed the dolly. While the glue dried, I worked on the track.

Making an adjustable-length dolly track

This dolly is four and a half feet front to back, so using a pair of tenfoot lengths of PVC pipe as my track rails gives me only five and a half feet of travel for my jib. That's barely worth the effort of building the dolly. A 20-foot track would be too long for many situations.

I wanted maximum flexibility in length, so I cut two **additional** 10' lengths of PVC into three pieces which I calculated would give me seven optional (additional) extensions. I cut a 17-inch piece off of each of the two additional lengths, then I cut 34" pieces from the remaining two lengths like this:

First pair of 10' lengths of PVC (do not cut these)



Now we're faced with two pretty obvious challenges: How do we connect these sections and how do we keep the long sections parallel with each other?

Shaping the track connectors

1/2" schedule 40 PVC pipe is about the same *outside* diameter as the *inside* diameter of my 3/4" PVC pipe track – just a little larger. I reasoned that I could just sand down a couple of feet of 1/2" PVC and have six 4" connectors which would almost seamlessly join my four pairs of track sections when desired.

I quickly realized that the seemingly small difference in diameter would take practically forever to sand down evenly by hand.

If only I had a lathe, I thought, and some way to chuck this 2-foot section of PVC into it.

So I invented the Poor Man's Lathe. (See safety disclaimers on page 8.) I rummaged around in my drawer of things that fit into The "Poor Man's Lathe" possible with these three pairs of extension sections of track. You can increase the length about 17 inches at a time. 120 07 29, ¥ 21 94

In addition to the pair

of ten-foot lengths

of track, there are

seven extension

combinations

drills and found an 18" drill bit extension which didn't quite fit into the 1/2" pipe, but *woul*d with a bit of persuasion. Anything

that will chuck into a drill on one end and will be a tight fit into the PVC pipe on the other end should



work. I just firmly tapped my drill bit extension into the pipe until it stuck, and started taking off material as my electric drill spun the PVC. I started with a coarse rasp on the outside of the 1/2" PVC.

I found that I could sit comfortably in a chair, put the drill motor on the ground pointed upward and operate the trigger with my toe as I applied the rasp to the outside of the spinning vertical PVC pipe. I looked pretty silly, but it worked far better than trying it by hand.

I didn't want to take down too much plastic or it would be a terribly loose fit, so I kept attempting to slide a piece of 3/4" pipe down over the 1/2" pipe attached to the drill. I switched to 80 grit sandpaper after starting out with the rasp. I worked to make a very slight taper from the end away from the drill motor. After a while the 3/4" pipe fit over the 1/2" pipe about one inch of the 24 inches. I kept at it until my 3/4" pipe would snugly slide down 4". With the pipe still attached to the drill motor, I cut off that first 4" section. Five more to go!

Whenever I got bored and restless, I reminded myself I'd get years of use out of these custom connectors and I kept at it.

Finally, I had six 4" pieces which would fit snugly, but not *too* snugly, into the 3/4" PVC. I glued each of those pieces HALFWAY into ONE END of each of the six extension sections I had (NOT the 10' lengths). After getting

each connector piece glued into place, I quickly wiped away any



excess glue. If the dried glue prevents the pipe sections from abutting tightly, you're in for more sanding. We want to be able to assemble as many of these track sections as we need on location and take them apart again to bring them home.

It occurred to me that we might want to be able to use these additional sections *without* the 10' sections sometimes, so I added two 4-inch scraps of 3/4" PVC (with no connectors attached) to my array (to be used in place of the 10' sections). Now I can use the three longer extension combinations with or without the 10' sections, giving me a total of *ten* functional length options. I can now choose from a dolly travel of just over three feet to fifteen and a half feet. (There are actually 13 possible combinations, but the smallest three are are about the same size or smaller than the dolly.)

Having made note of the measurement I needed between the rails (page 4), I cut two more pieces of PVC pipe to this length and connected them to the ends of the 20 feet of track with PVC elbows. (Don't do this yet.)

Connecting the two rails

I noticed that there was the possibility for the track to be wider or more narrow in the center. This could cause the dolly to de-rail. My first solution to this issue was to drill horizontal holes in some of the sections and connect/space the two sides with threaded rod (center).

The dolly wheels do clear the nuts that hold the track in position. Walking around between the rails, though, I realized that

I could easily trip over these rods (since they're half an inch above the ground) or even the end pieces of PVC while my attention was on camera and jib operation. Somehow I can keep the track rails in my mind and not fall over them, but those spacers and end pieces were something I wanted to have "disappear." It took me a while to come up with a spacer which would lie flat on the ground so I wouldn't be likely to trip over it. I found some flat bar zinc plated steel that was 1-3/8" wide and 1/16" thick by four feet in length. Using the measurement from page 4 (from the inside of one pipe to the outside of the other - *without* subtracting one inch), I drilled two 1/8" holes in the steel exactly that distance apart. This is where I want the centers of my PVC pipe to be secured.



I removed the points from 1.5" roofing nails and rounded their ends. These slide snugly into my 1/8" holes. Their large flat heads make them point straight up. To secure these pointless nail/ pins in place, I guess you could epoxy glue them in place, but my wife is a metal sculptor and she welded them to their holes. She made four of these brackets for me.

> Pins in brackets hold PVC track rails in position

I drilled 1/8" holes through both

ends of each of my PVC track pieces (shown above), and in the middle of the longer sections. Getting the multiple holes in each section lined up was easy. I drilled one hole towards the end of two pieces of track and installed them on one of my new metal brackets. This held those track sections correctly for me to drill the other needed holes straight down through the pipes.

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The earlier connectors could trip me.

Roofing nail "pins" point straight up through PVC track rails

These simple brackets were the solution to connecting the sides of the track.

I scrapped this

idea for an improved setup,

but I'm showing it

to you here in case it

works for you.

Trip hazard!

tee

Now I had my dolly complete and a track which could be, in 17" increments, any length I wanted up to 20 feet. There was one other issue that came to mind, though. In concentrating fully on the composition of the scene and putting the camera in just the right spot, I was afraid that I would run off the ends of the dolly track. That would probably end in disaster. I considered making stops which would attach to each end of the track, but thought if the loaded jib and dolly came to too sudden a stop, the very top-heavy jib would continue in motion and fall over.

Limiting the dolly travel

I attached some brightly colored cord to PVC pipe couplings at the ends of the track with eyebolts and attached a 2-foot bungee to that cord to absorb shock. With the dolly at the far end of the track,



Sandbags at ends of track rails

I attached cord from a loop up at the top of the stand legs (not down at dolly level) to the bungee so at its furthest end of travel on the rails, the cord would gently bring the jib to a halt. I had to put sandbags on the rails to prevent the cord from pulling up the track at the far end when I reached my limit of travel. I attached rings along the long cord so I could attach it to the jib when I was using any length of track. I made two of these limiter cords and I attach one to each end of the track. Now, regardless of what length track I'm using, this limiter system offers resistance as I near the end of the track.

I wrote this article to accompany my video tutorial about jib booms: http://youtu.be/RJdnZKJg-K0?list=UUgmtYdYZ8lv3rThSMmO-F8A You can find other articles and tutorials at brucephilpott.com/photos.

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DISCLAIMER:

There are probably as many ways to build a dolly and track as there are dolly builders.

I'm not saying this is the "right" way. It's just the way I built mine.

I've intentionally left out some of the measurements because your jib stand is probably at least a bit different from mine. You'll have to measure your own stand and figure out what angles and dimensions to use.

If you build your dolly and track following my suggestions and you injure yourself and it wrecks your jib, trashes your camera, sets fire to someone's building and causes death and famine throughout the land, it's not my fault, OK? You build at your own risk.

YMMV,

Bruce Philpott

