Building a Transportable Layout

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I have been into American Flyer Trains for most of my life. When a group at my church decided to have railroad themed vacation Bible school program, I offered to create a layout to match the theme. The space was limited as was access. The layout had to be no more than 8 feet long and 5 feet wide to fit into a storage room and still allow space for kids to move around it. Since it all had to fit in my van and make it through standard sized doors, a modular approach seemed ideal. It also needed to be light. Seeing a challenge, I took the opportunity to experiment with some different construction methods.

Since the church had plenty of folding tables, for simplicity I designed it to sit atop one of these, eliminating the need for legs, which would add weight and could pose stability problems. I wanted the setup to be fast and foolproof to include alignment devices so as to make it impossible to misalign the modules. I also wanted the scenery to be seamless across the module joints. This was a tall order, but I had about 6 months to do the work and thought this was ample time to work out the details and get it done.

Framing and Connections

First was the design of the modules. In order to make them a manageable size, I cut the layout in the short direction to make 2' x 5' modules. I decided to make the modules using 1-by wood framing and EPS foam deck to be rigid and light. I screwed and glued the frame connections, to enhance durability against rough handling from repeated set up and transit. I decided to recess the foam topping for rigidity and to provide seamless butt joints between modules. I recessed the cross braces ¾" on the top to support the foam board.

Figure 1 Basic Module Frame

Framing the modules was fairly simple, but then came the work on developing the alignment and connection method. It came to me when I was putting the leaves in our dining room table for Thanksgiving that I could use a similar approach of pins and cam locks to hold the sections together. A unique arrangement of alignment pins (bolt sleeve connectors) between sections would enable the unique one-way fit-up that I was looking for.

The parts are available on Amazon and woodworking supply sites and consist of bolt sleeve connectors, alignment plates, and table buckles (leaf locks). I wanted to make sure the connection was solid enough, so to demonstrate proof of concept, I made a mockup, which helped a lot to refine my process.

I decided to recess the leaf locks to avoid interference with the surface and landscaping. I cut notches in the cross members for the lock and latch pieces for the leaf locks. I clamped the module frames together for perfect alignment and then marked the notch locations. I also installed small blocks of wood to provide a level place for easy mounting of the leaf locks. These were set at the same level as the cross braces so they would be not interfere with the foam board installation (Figure 2). I then installed the leaf locks and alignment plates so that the modules were held tightly.

The next issue was the installation of the bolt sleeve connectors. One of the challenges with this is the level of precision necessary to assure alignment of both elements on the adjacent

modules, where a small error would create a misalignment. It was then that I realized a simple solution.

The solution was to drill through the sides of the panels when they were clamped in alignment. Since the exposed hole on the back side would not be visible, it did not matter. This freed me

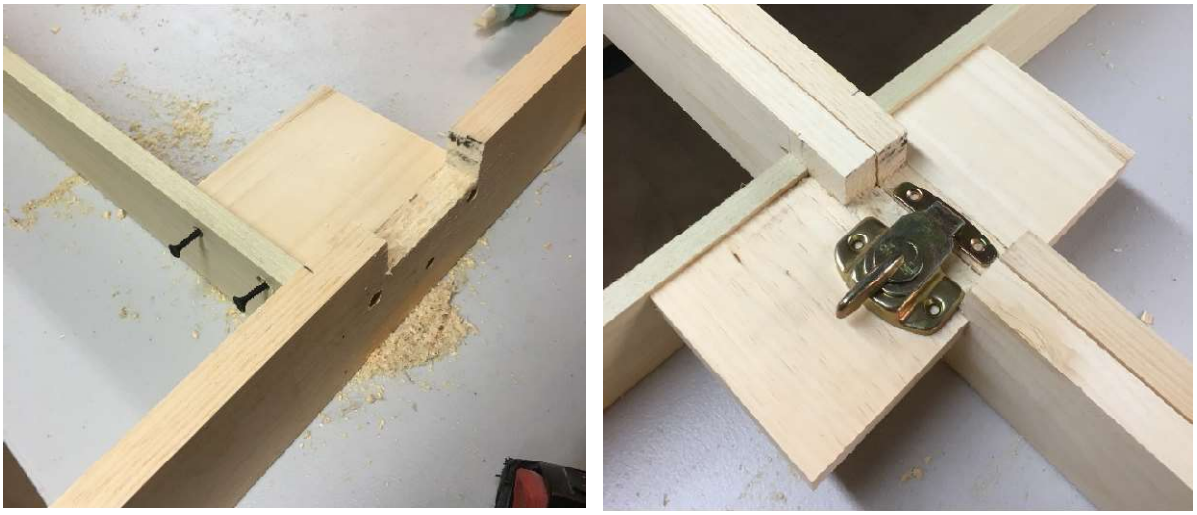

Figure 2 Leaf Lock notch and support: left: notch and support block installation, right: installed leaf lock

from the need to have uniform spacing an allowed easy construction of unique connections for each module interface. After installation of the bolt sleeve connectors, I filled the hole behind the connector with silicone caulk.

I then painted the entire frame a neutral green color (Figure3). The fully assembled frame with four modules is shown in Figure 3. You can see the alignment plates at each joint. These act as

Figure 3 Fully assembled modular frame

a guide to get the pins of the bolt sleeve connectors aligned when attaching the modules. Note that I angled the corners on one end to accommodate closer viewing and to make for better passage in the small room in which this was initially planned for display.

Deck

The next step was to place the foam deck. I cut ¾" notches around the perimeter of the foam board so that it would into the frame for a solid connection and to stiffen the frame (figure 4). I also cut openings to expose the leaf locks for easy access and connection from the top. This is essential, since the layout will be supported on a table top and the bottom will be difficult to access during assembly. I attached the foam to the frames using beads of adhesive caulk along the top of the frames and cross braces.

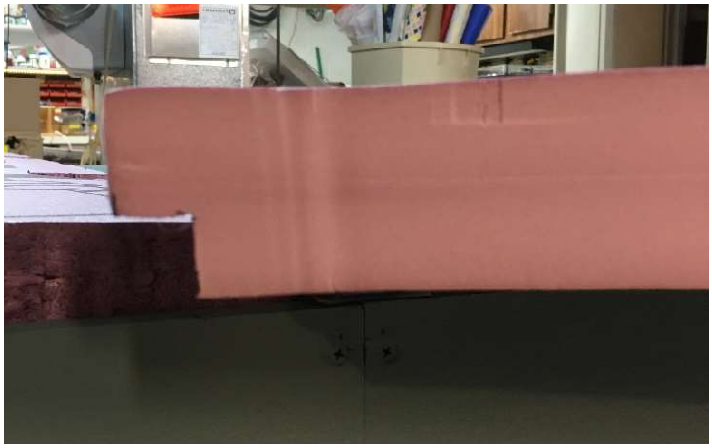

Figure 4 Notching of the foam board perimeter

Part of my rationale for this structure, was to provide a clear deck upon which to construct the layout without restriction using standard American Flyer track. I had fun creating multiple track arrangements on the deck in an attempt to see just what would work and how it would fit. I considered, passing track arrangements with and without sidings and others, but I ultimately decided on two separate loops. My thinking was that for a display that would be left running continuously for casual viewing, that operational movements

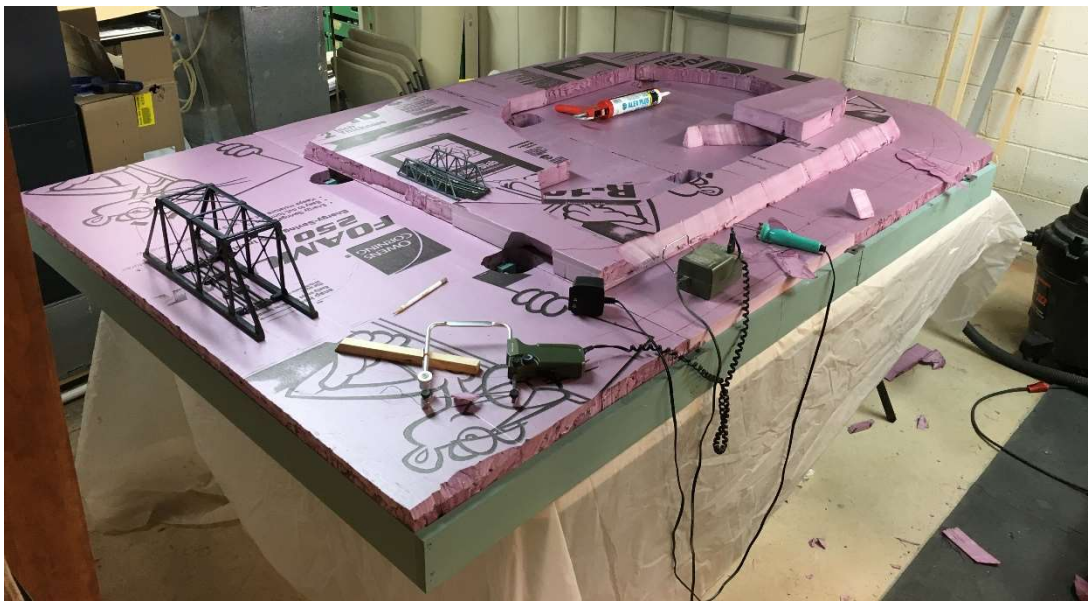

Figure 5 Creating the second level for the upper loop

would create a level of unnecessary complexity and potential for derailment. So, I kept it simple, though I did decide to put the loops on different levels to make the terrain more interesting. I got an idea to have a river and waterfall feature to add interest as well and figured to use a couple of truss bridges I had on hand (Figure 5). The larger one is a plasticville truss and the smaller one is a modified HO scale bridge I widened to accept S gage track.

In order for the stream to cross under the lower/outer loop, I had to cut away the foam beneath it and installed a ½" thick foam panel I scavenged from some packing material (Figure 6). I will discuss the construction of the water surface later in this article. I created some removable land forms shaped as hills out of additional foam to cover the latch pockets. In the center area, I used a 3' x 4' piece of foam as a base and built mountains using layered blocks of foam. I created keyed in rock structures on the modules to accept the insert and assure alignment for continuity of the scenery.

Figure 6 Cutout for River

Wherever possible, I tried to carve features from the base foam rather than add separate structures. I carved bridge abutments from the foam, using a hot knife to cut and score the face to appear as stone blocks, Similarly, I scored vertical faces of the foam with a hot knife to give the appearance of stone walls where there was not sufficient room to create a natural looking slope. I like natural looking landscape, even with American Flyer trains.

Water Features

I added a lake atop the mountain as a source for the waterfall and stream below. I discovered an interesting way to make water surfaces from a YouTube site by MarklinofSweden. They showed, how to make ocean water, but I figured, there is no reason why other water features could not be made this way. The first step is to create a surface that parallels the finished water surface. This I did by carving with my hot knife and adding rock shaped features where they seemed appropriate. I put a layer of white glue on the surface and covered it with sheets of single ply bathroom tissue. After the sheets become saturated with glue, the surface is roughened and molded using a soft bristle paintbrush. I used a couple of different sizes depending on the effect I was trying to create. The beauty of this system is that it can be manipulated and reworked for a long time. The desired finish is created by adding layers of additional glue and tissue to build up peaks. I ended up adding rocks and creating eddies

around them based on photos of real streams. The first application is visible in the stream be in Figure 6.

The final finish is achieved by painting and over-coating with another layer of white glue. The white glue dries clear and creates a translucent effect giving the appearance of depth. To get a realistic effect requires multiple colors including black, white, greens, blues, and browns. Also painting deeper water areas darker and topping the white water with white helps a lot.

The waterfall was a new experience for me. The larger falls is in the removable top piece and lands in a plunge pool in the fixed module piece. The smaller falls is between two modules under the upper bridge. Creating the effect in a way that the parts could be removed and reassembled without having obvious seams, took a bit of thinking. What I decided, was to let the falls extend out from the face a little bit to overhang the lower piece to effectively shield the joint from view (Figure 7).

Figure 7 Waterfall and stream in progress. (note the layered foam used for rocks)

The falls themselves, were made in the same way as the stream with the exception that strips of rolled tissue dipped in white glue were applied to the vertical surfaces and massaged into place using a soft brush. This took a lot of patience and multiple reapplications to get the depth and appearance that I wanted, but the medium is quite effective and producing realistic water. The key is having the patience to wait for the white glue to dry between layers. That can make it take many days to complete a water feature.

The pond at the top, was simpler. I wanted it to be still water, so I wanted the surface to be flat. Since , this would be near impossible to achieve with a hot knife on foam, I used a piece of cardboard, like the ones you get on the back of a legal pad, cut the shape of the lake and glued into position to make the base (Figure 8). The water was created by repeated layers of white glue allowed to dry between layers. Again, painting creates the effect of depth by using darker colors in the center blending into lighter colors at the edges (Figure 9).

Figure 8 Lake base before water

Figure 9 Completed lake

Track and Wiring

I had a number of concerns with alignment and connections between track on adjacent modules and alignment of track joint with the edges of the modules. Since I planned to use original AF tinplate track, it would have meant a lot of cutting to get the joints to align. The joint alignment for curved sections would be especially challenging and would limit the track layout. Therefore, I decided not to permanently attach the track to the modules. Using AF track with rubber roadbed, the assembly would be fairly quick simple loops of track.

I did want constant speed around the loop and decided not to rely upon the rail joints alone. Power connections in each run of track on each module would make this possible. That also requires a means of transmitting power between modules. I did not want a lot of wiring and decided on a unique solution. I installed additional pairs of sleeve bolt connectors to which I had soldered wires (Figure 10). I tested this to be sure that the connectors would conduct well enough and found this work well. This eliminated the need for any manual wiring connections between modules during set up.

I wired the modules so that there was trunk line running the length of the layout with taps to track leads and a single drop from the center module to the transformer. The wires were all cut

to length to avoid excess slack that could get snagged during transport. I also secured the wires to the bottom of the foam deck with gorilla tape as an extra measure.

In order to make a simple power connection to the track, I soldered 18 ga leads 4 inches long to the center track section in each module (Figures 11 and 12). I used bullet connectors to enable plug in connection to the leads in recessed pockets beneath the track bed. The track can be installed in minutes and power connected at the same time. I powered both tracks from an American Flyer 12B dual control transformer that I had restored.

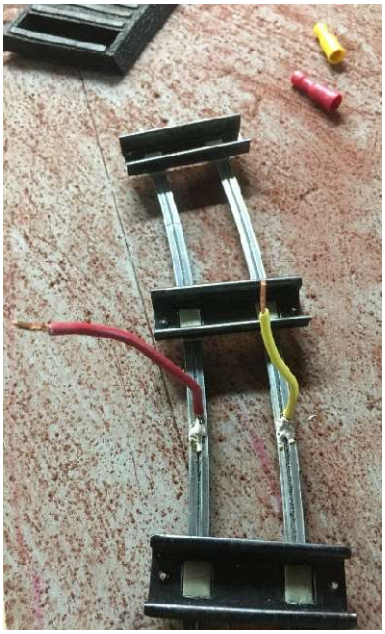

Figure 12 Power leads to track

Figure 11 Leads through roadbed with bullet onnectors

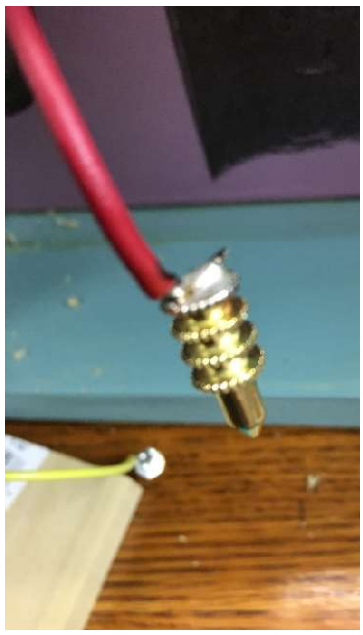

Figure 10 Power through sleeve bolt connector

Landscaping and Buildings

As described above, the terrain was all created with polystyrene foam. Some this foam was scavenged from packaging materials and some was purchased from a building supply store. To create the seamless effect I was going for, I designed the landscaping in separate modular blocks that overlapped the base module joints. I selected a generally rocky terrain to give a more realistic appearance for steep grades necessary to get grade separation in a small space. All of the rock features were carved from foam with a hot knife.

In many areas, the terrain was built up from multiple layers of foam. I found that adhesive latex caulk makes a great bonding agent. It holds foam rather well even when wet, but cures slowly enough to allow repositioning during construction. The caulk does offer some resistance but can be cut with a hot knife during carving of the built up foam.

I applied a base coat of latex paint over the foam. This levels and seals the surface, which is especially important to prevent the texture of beaded type foam from showing through the finish. I then use acrylic hobby paint diluted with water to create washes of different colors,

often achieved by blending several colors together. One of the interesting things about blending paint for terrain is that it is actually better if each batch mixed is a little different.

I used sand and white glue for roads, flocking for grass and then added various trees, lichen and brush. Twigs from the yard make great fallen dead trees (Figure 13).

Figure 13 Town scent with laser cut houses

Buildings were made from laser kits including several house, a church and a station. Cars and trucks from M2 Machines add life to the layout. I used some scale figures of campers, hikers and fishermen to complete the scene. The figures were glued in place, but the buildings I made removable, since I was concerned that they would be protrude enough to be damaged during transport and assembly.

Animations

In order to add interest and make the layout more interactive, I added some animations that could be activated by push buttons. For protection during transport, the buttons are recessed into the sides of the modules. The animations are varied and include a fish that jumps in the

river (Figure 14), a hawk that circles the mountain top, a campfire that smokes and lights (Figure 15), and a whistling billboard.

The details of how the animations were created will be presented in a future article.

Figure 14 Completed stream with animated fish

Figure 15 Campfire by the lake (smokes and lights up

Packing and Transport

The planning of the layout revolved around fitting it into my minivan with all of its parts and components and being reasonably simple to set up. The modules stand on their sides on a plywood base supported on workbench casters. The workbench casters flip up to let it stand in the minivan without rolling around. The sleeve bolt connectors are used to align and secure the modules in position by drilling coordinated holes in lengths of 1x4 screwed to the deck. A yoke over the top held in place by bungee cords keeps it all in place. The foam deck module rides on top of the framed modules.

The cars and engines are transported in a tool bag that has been modified to add foam lined dividers. I used foam roadbed material to line ¼" plywood dividers. This enables two full trains to be transported in a compact roller-tool bag (Figure 17). I made a tray from ¼" plywood and foam roadbed for padding that sits atop the rail cars in the tool bag to carry 2 AF Atlantic engines.

Figure 17 Car caddy: rolling tool bag with padded dividers

Figure 16 Top tray fits over cars in tool bag

The remainder of the components are packed into storage containers. I made a couple of trays from ¼" plywood to create protective compartments for transformers, houses and bridges.

Figure 18 Entire layout ready for transport

The entire layout and all of the kit fit into my minivan. The layout will stand on collapsible sawhorses or a folding table. I can fit those in the van as well if they are not available at the venue, so all in all it came out very well.

The only issue is that COVID 19 initially caused a delay and ultimately cancellation of the event I originally built if for. I am looking forward to new opportunities to set it up as the world reopens.