The Modeler's Journal

A Free Journal for Today's Modeler

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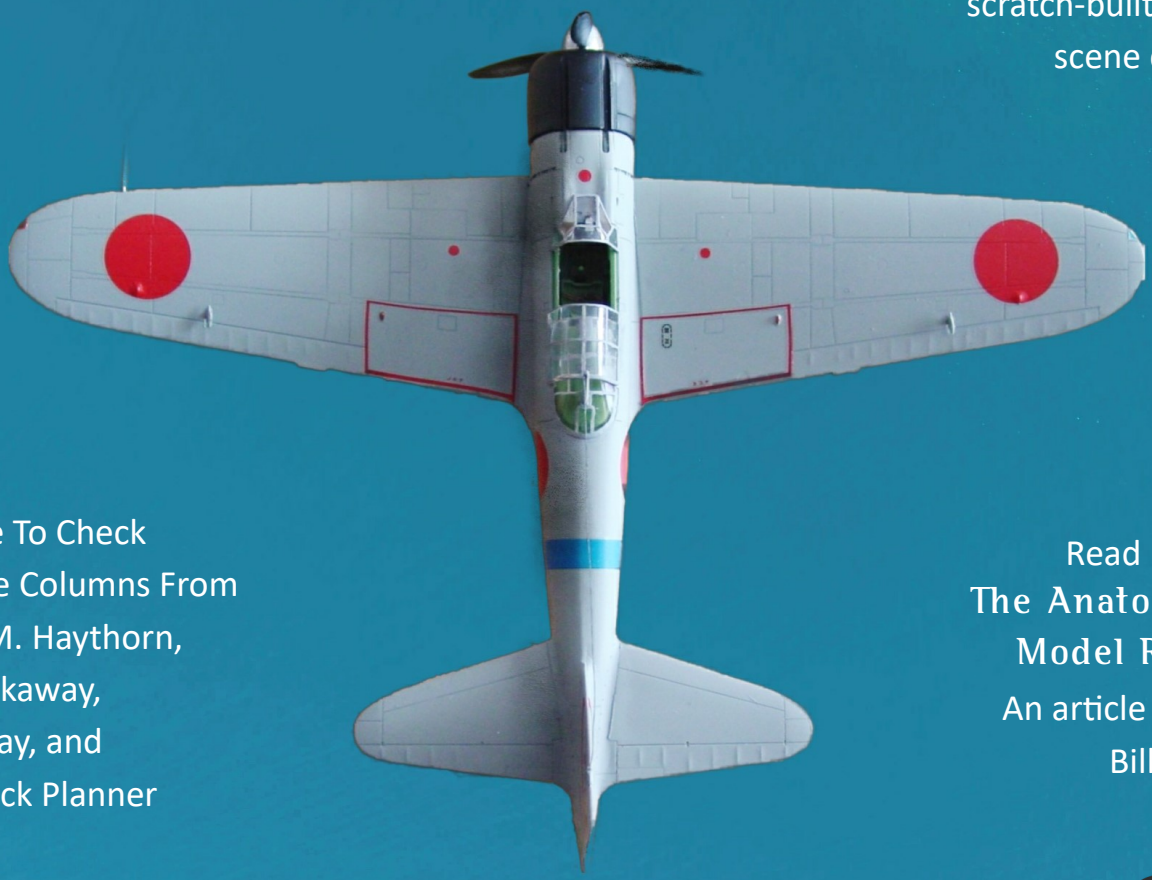
Modeling with a Passion

Featuring David Kopielski

Read how Lloyd Henchy scratch-built a winter scene diorama!



Be Sure To Check Out The Columns From Harry M. Haythorn, Jack Hykaway, Dazzy Jay, and The Track Planner

Read Part III of **The Anatomy of a Model Railroad** An article series by Bill Beranek

Cover Photograph Courtesy of David Kopielski

Editor's Note...

In this issue of *The Modeler's Journal*, we feature the detailed modeling work of David Kopielski. In his pictorial essay, David shares his love and passion for building highly-detailed models of ships and planes and shares photos of some scratch-built sections, fiber-optic and LED-based lighting, and custom decals he uses in the construction of his models. You can check out all of his modeling work on his blog website, *David's Scale Models* (you can find the link in the article).

In his article "Setting Realistic Goals," Bill Beranek discusses the need for planning and setting realistic and achievable goals. He advises on the importance of setting standards for selecting era vs. space, selecting industries, double-track mainlines, train lengths, and warns that by ignoring standards, modelers are setting themselves up for failure. Some very sage advice!

In part two of his essay on computer and remote-assisted model railroading operations, Darren Johns (aka Dazzy Jay) details his use of the TrainController™ software along with the use of Wi-Fi and CCTV cameras to accomplish virtual operations on his model railroad. Find out the details of how Darren set up his virtual train operations to allow guest operators to remotely operate trains on his layout.

In his pictorial essay, Lloyd Henchy shows how he scratch-built and kit-bashed together a beautiful winter scene diorama for his HO scale layout. Harry M. Haythorn takes us on a mini vacation with his family to the Atchison Rail Museum in Atchison, Kansas. He shares a bit of the museum's history and photos of the many pieces of equipment and displays there.

In part three of the multi-part series entitled The Anatomy of a Model Railroad, Bill Beranek describes, through pictures and commentary, the wiring standards (such as gauge and color coding), terminal blocks, and the use of well-thought-out command centers his client Jim Kalenowski utilized to simplify the powering of his large N scale layout. Be sure to check out the clean and meticulous work Jim has done.

They say that all good things must come to an end, and so must the eloquently written and engaging column Jack's Junction. Since its inception in 2015 (when Jack was just 14 years of age), Jack's Junction has had a great run, entertaining readers with the history, stories, and photographs of many different types of prototype engines from around the world. But, it is now time for *The Modeler's Journal* to shift gears and focus on other topics related to the modeling hobby. Don't worry - Jack is not leaving us. He will continue to serve as a Senior Content Editor and help develop new content for this publication.

In his final installment of Jack's Junction, aptly entitled "Looking Forward to the Future," Jack Hykaway discusses how Canadian Pacific and BNSF are experimenting with and pioneering the use of hydrogen fuel cells and battery-electric technology as alternative fuel sources to power their trains. Their goal is to not only reduce emissions but also become more sustainable and fully carbon-neutral.

We hope you enjoy this issue.

Happy modeling!

– **JD (Loggin' Locos)**
Editor-In-Chief

Table of Contents...

The Modeler's Showcase

About the Cover

One can imagine how a Japanese Zero might have looked flying over the emerald-blue waters during a battle in the Pacific.

This model is one of the first David Kopielski built when he got back into the hobby after serving in the US Navy. It is a Tamiya 1/48 scale model of the A6M2 Type 0 (Zero) Model 21 fighter plane used in the Pacific by the Japanese during World War II.

Learn about David's passion for building models and much more within this issue of *The Modeler's Journal.*

The Workbench

The Modeler's Journal Team:

Editor-in-Chief	JD (Loggin' Locos)
Senior Content Editor	Jack Hykaway
Content Editor	Hailey C.
Media Ambassador	Harry M. Haythorn - UPHS #4043
Photographer	Jack Hykaway

Contributing Authors:

Jack Hykaway
William (Bill) J. Beranek
Harry M. Haythorn - UPHS #4043
Darren Johns (Dazzy Jay)

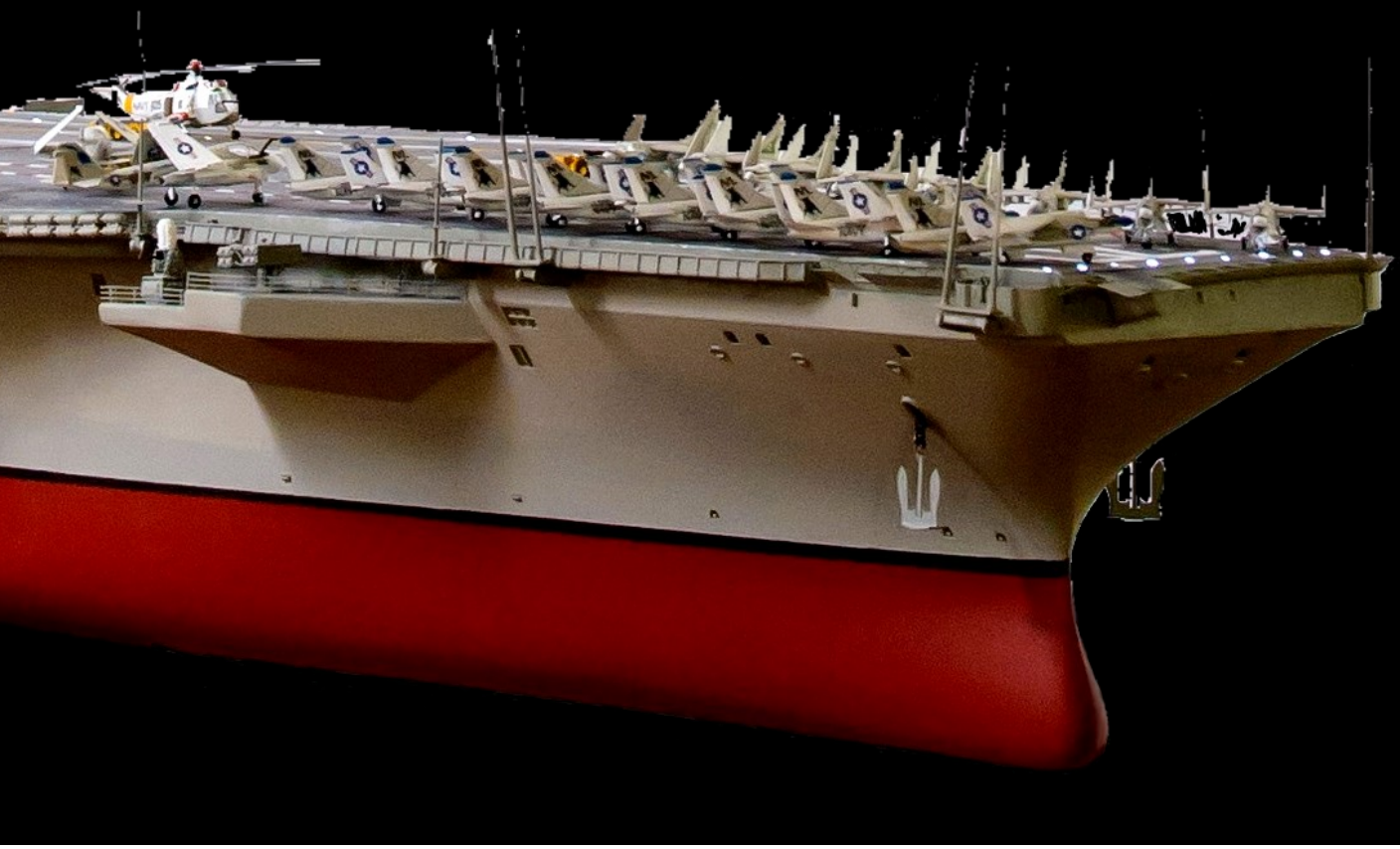
A Passion for Building Models

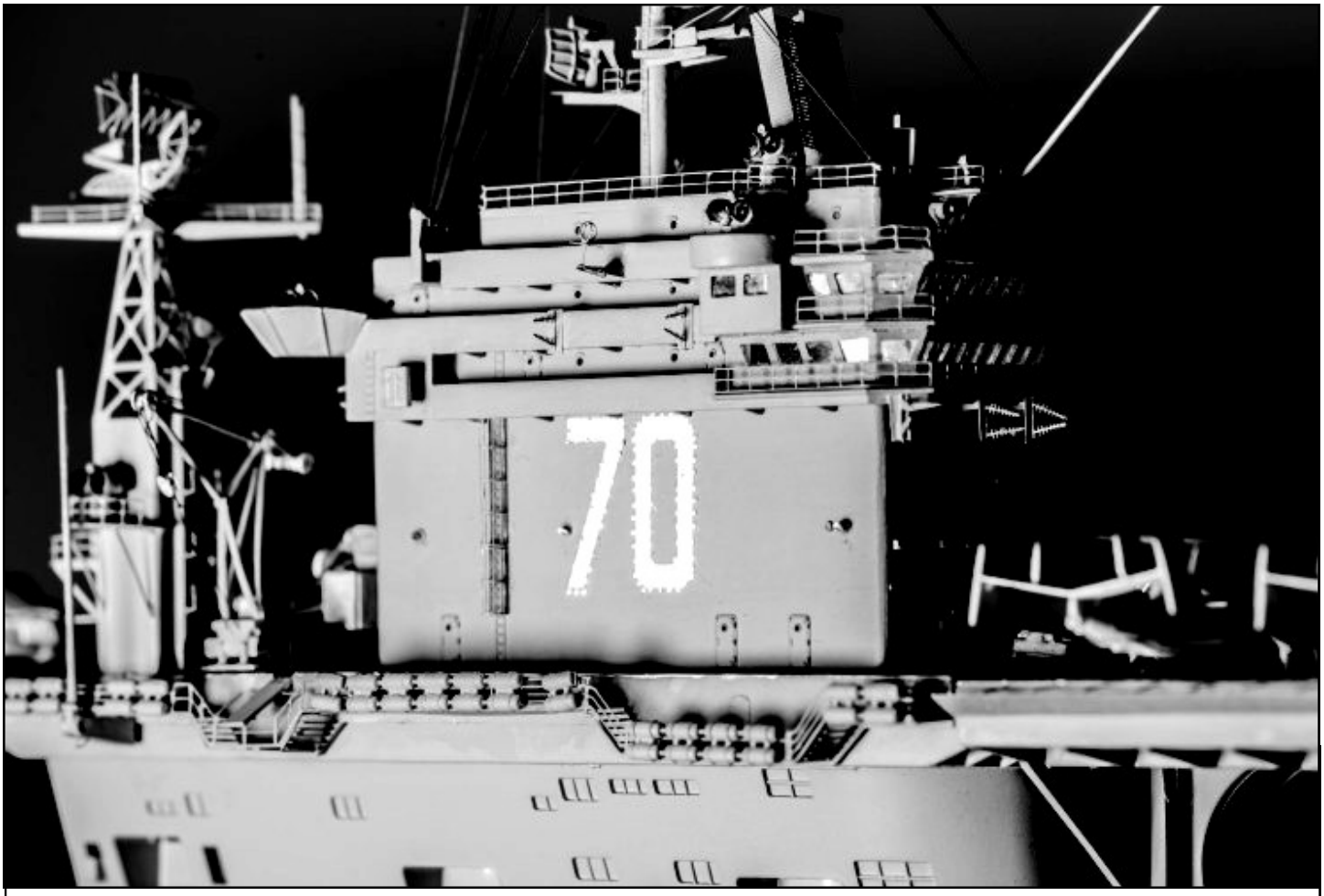
Modeling Ships and Planes

By David Kopielski

All photographs by David Kopielski

My passion for model building started back in the early 1970s. On my eighth birthday, my parents signed me up for a Model of the Month Club which was sponsored by Aurora Models. Once a month, they sent out a model kit for members to build. The subject of the kit varied each month, although I especially liked building the aircraft and ship models. The kits inspired me, and soon after I was collecting and building lots of aircraft and ship models. My passion for military aircraft and ships are what led me to enlist into the United States Navy right out of high school. In the Navy, I ended up attached to an A-7E squadron which served aboard the USS *Carl Vinson* Aircraft Carrier. My passion for aircraft and ships was now my lifestyle.





Between my enlistment and starting my career afterward, building models went to the back burner. In the early 1990s, I had moved into my own place and moved some boxes out of my parents' house that had been stored there for years. One box had a few models, some model magazines as well as building supplies. This reignited my passion for building models. I mostly built them straight out of the box, though that began to change after joining some model forums on the internet. I started to learn the many different details that could be added to the models; I would research a particular technique and then I would build a model to practice that technique. Once I was happy with the results, I moved on to the next model. With each successive model, I would incorporate a new technique to improve my modeling skills. Over time,

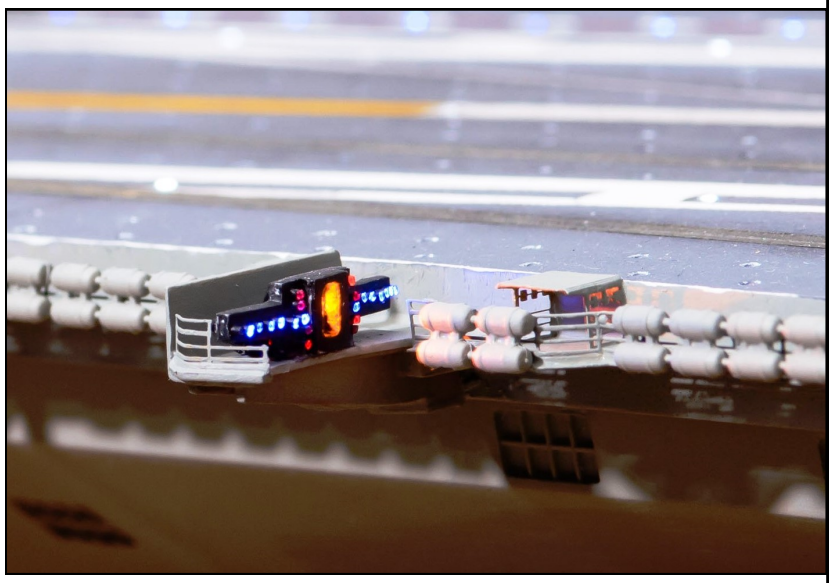
this became my best motivation. I always wanted to improve the next model over the previous one with a different technique. Many models later I was building very detailed models at a rate of one every two months.

After studying and practicing many techniques, I started to challenge myself by super-detailing my models. One of my most challenging experiments was taking a 1/350 Trumpeter USS *Nimitz* model and converting it to the ship I served on, the USS *Carl Vinson*. I started with super-detailing the hangar bays. By using photos from my collection supplemented with images from the internet, I used Evergreen Models styrene to scratch build the entire hangar bay. One of the problems I en-

countered was how to capture the signs and logos used in hangar bays. To model custom signs and placards, I taught myself how to make my own decals. Using reference photos, I was able to recreate all the hangar bay decals.

However, this solution led to another problem: how do I show off the hangar bays once the model was built? A quick search showed that some modelers were incorporating lighting in their hangar bays. This quickly opened a can of worms. I figured that if I was to illuminate the hangar bay, then why not illuminate the entire ship? With many hours of sketches and designs, I came up with a plan. I ended up using over

500 feet of fiber optic cabling and over 40 LEDs to illuminate the hangar bays, the island, and the flight deck. One of the most difficult parts to make were the Fresnel landing lights. Typically, when you hear Navy pilots say "Call the Ball," they are referring to the lights on the port side of the carrier. It consists of a yellow round light and multiple colored lights. The lenses on the yellow light (the Ball) are focused to a certain angle. When the pilot approaches, they align themselves so that they can see the "Ball" brightly. This is a visual reference that the aircraft is on the correct glide slope for landing. Due to the very small size of this scale, I ended up trying to build it many times. I was able to finally make one on my fifth attempt. You can see the completed assembly in the photo on the right.



With all the lighting added, I then filled the hangar bays and flight deck with all the aircraft that were onboard. I also had to create sets of aircraft decals for each squadron to replicate the exact aircraft squadrons. After 777 hours of work over a nine-month span, the ship was mounted into a display case as a completed model.

After posting the completed model on some model forums, I was commissioned to author a step-by-step tutorial CD for Flagship Models called "Lighting Ship Models". The tutorial covers how to use LEDs and fiber optics to illuminate models with detailed photos of the entire pro-

cess. It even includes a section on basic electronics so the reader can wire it all up. Once the ship was completed, I was encouraged by members of our local IPMS (International Plastic Modelers' Society) chapter to enter it in a local model show. The ship won first place. I then traveled to Chattanooga, Tennessee for the IPMS National Convention in 2019 and the ship won another award.

I then started building highly-detailed aircraft models. One of my projects was to build a 1/48 scale E-2D Hawkeye. There are no kits in 1/48 scale for this version, and so I began building my own. I chose to replicate the Northrop Grumman prototype designated as “Delta One”. I used the Kinetic E-2C 2000 kit and began cutting out sections of the fuselage and scratch-building prototype-specific parts to address the visu-

al differences between the two aircraft. This included the side and upper scoops, as well as the rear fairing. I then used reference photos to make the specific decals. The model was then mounted in a display case.

Another project I worked on was adding lighting to aircraft models. My first attempt was illuminating a 1/48 Eduard F6F-5N Hellcat Night Fighter. I used fiber optics for the navigation and formation lights. I used one LED for the landing light. The instrument panel was the next challenge. To recreate the lighting effects, I made a miniature light box be-

hind the panel. The instruments were drilled out and I made a decal of the instrument faces. Using red LEDs, I placed the panel on the front. When illuminated, the red light illuminates the backside of the decal, giving the gauges a red glow which is used on the real aircraft at night. The wiring was run down the landing struts and through a resin base that replicates a World War II carrier deck. I made a nameplate holder for the front, and this is where I hid the battery and switch to power the aircraft.

The next aircraft that I illuminated was a 1/48 Tamiya A-10 Thunderbolt II. Again, the navigation lights, the landing lights, and the instrument panel were installed and illuminated. The next challenge was to replicate the greenish glowing formation lights. I practiced using LEDs and different colored plastics to match photos of the real aircraft. I then stumbled upon Spacebeams brand of glow-in-the-dark acrylic paint. This is a very thick paint, which when dried has a cream color, just like the unlit formation lights on modern jets. With a quick "charge" of light, they now glow the slime green color of the lights on the actual aircraft. To supply power to the onboard lighting, I used a Hasegawa USAF test cart to hold the battery. This was then routed to a coax cable with a male connector. A female coax connector was then mounted on the model where the ground power is on the actual aircraft. Simply plug in the test cart and the lights turn on.

I then challenged myself to build diorama scenes for my super-detailed aircraft fleet. My latest completed diorama project was a 1/48 Airfix JU-87 Stuka Dive Bomber being serviced on an airfield in France. The model itself required lots of modifications to mount some of the panels


70

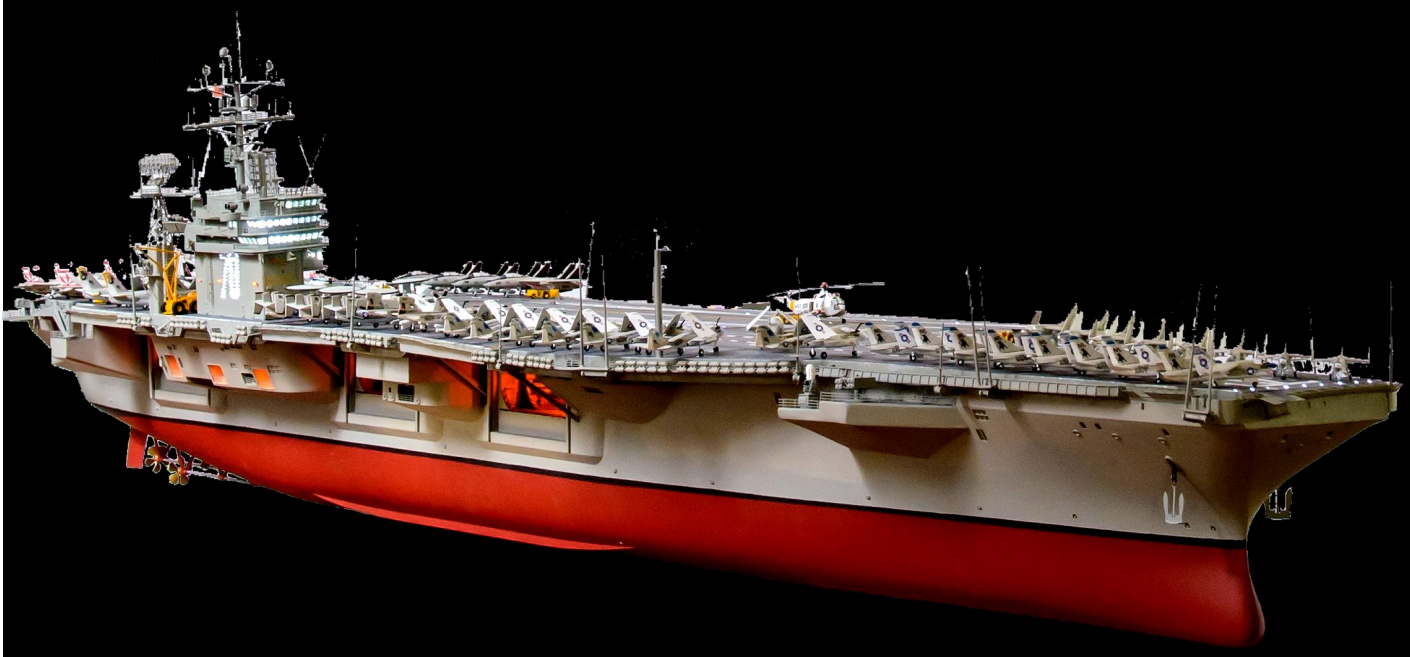

CARL VINSON

and leave other panels off the aircraft. This allowed the highly detailed engine to be seen. I scratch-built the maintenance ladder and used Tamiya and ICM figures and accessories.

Two years ago, I started my own website for my models. (https://davidsscalemodels.com/) While there are many websites and internet forums, the one thing that I noticed was that many show you their completed works but rarely show how they achieved the final results. I started my website to fill this gap – I have a running log of every one of my builds from start to finish. Each log for every model includes the details of each build and several photos of the build process. It also includes many of the techniques I use so that others can add details to their models. There is always something new to learn for those just getting into the hobby or even those who have been building for many years.

Building models has been an interesting and satisfying hobby for me. I also find it to be a great stress reliever. When I am building, I typically have either music or a DVD playing in the background. With the many subjects and techniques available, I plan on building well into the future. I am always looking to try new ways to modify and display the models I create. I am currently researching 3D printing, and I believe this will be the next logical step for me and a future asset for many model builders. I have already printed a few small parts using files others have created. I am looking forward to designing and printing my own parts. I hope you have enjoyed this article and hope that it has inspired you to always try new techniques and enjoy our hobby!

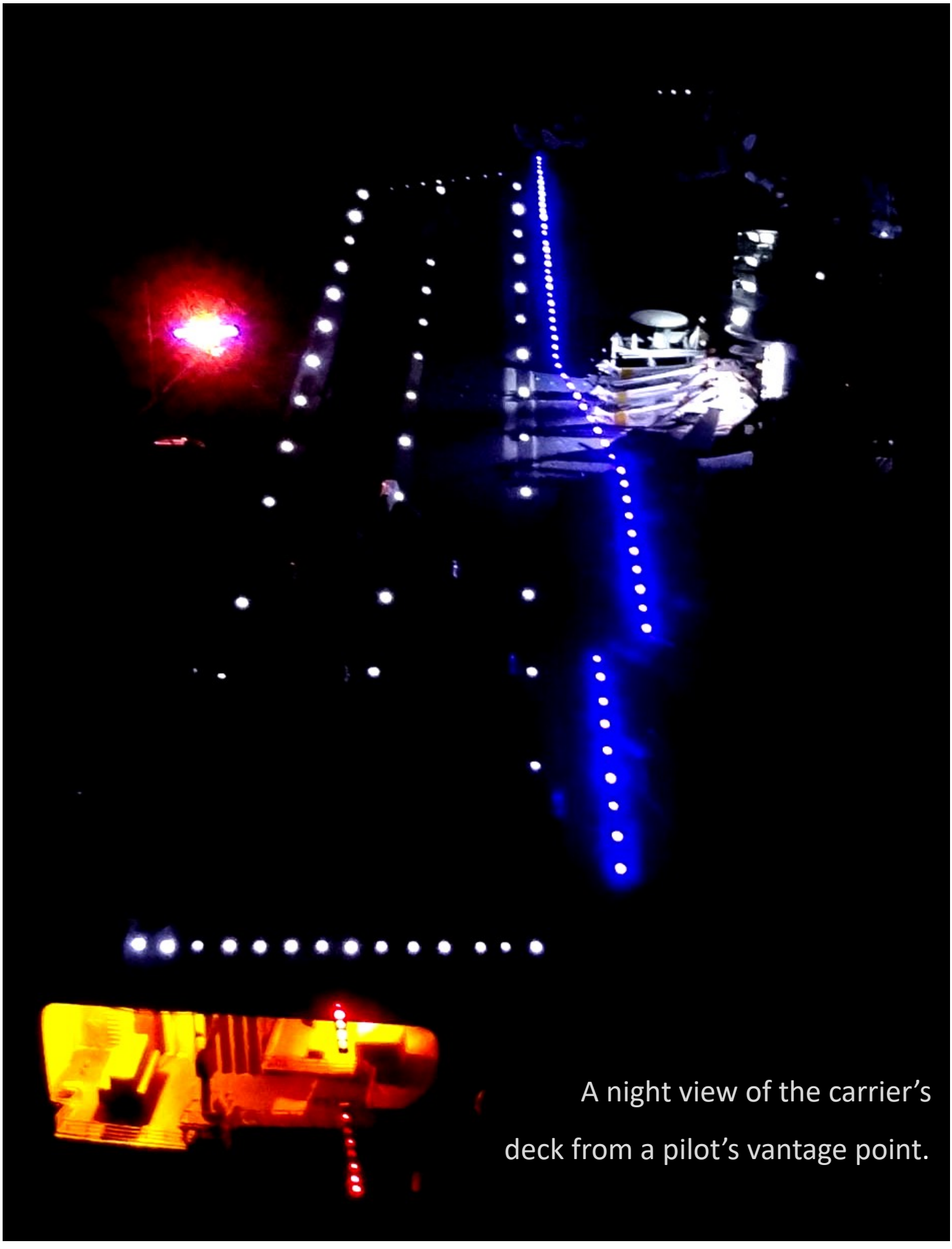
Featured Models...



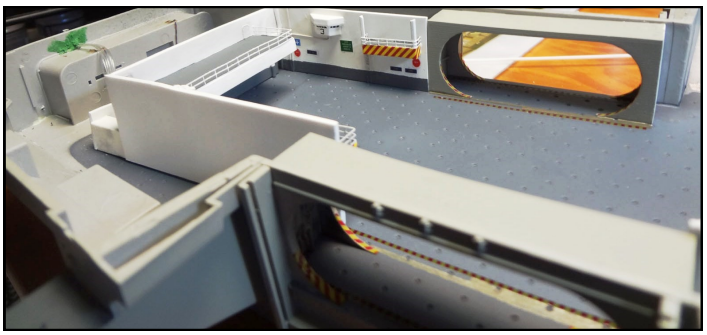
A 1/350 model of the USS *Carl Vinson* aircraft carrier.

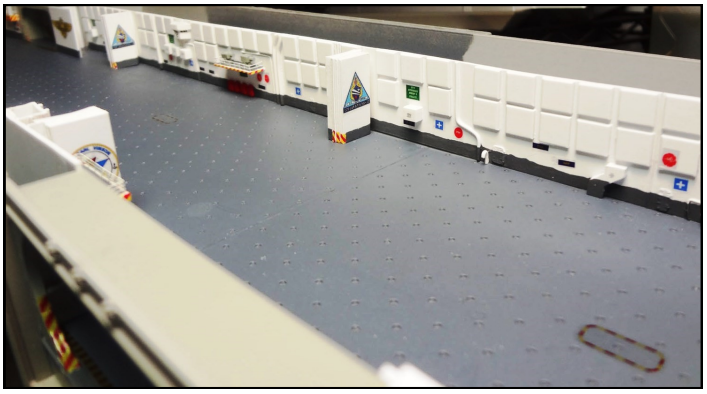
This model represents how she sailed on her maiden deployment on March 1, 1983, which started in Norfolk, Virginia, and ended in San Francisco, California.

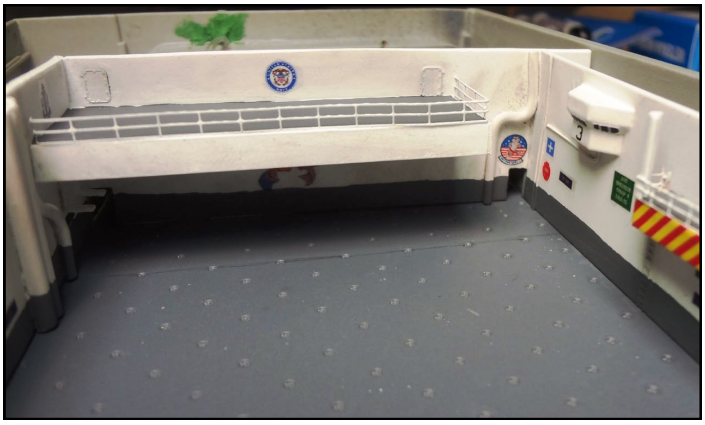
I converted Trumpeter's 1/350 scale USS *Nimitz* kit into the USS *Carl Vinson*. The project took nine months and 777 hours to complete. It has over 500 feet of fiber-optic lighting and is illuminated with 40 LEDs. The hangar bay and air wing decals are homemade. I also used resin, 3D printed, and photo-etched accessories to detail it.

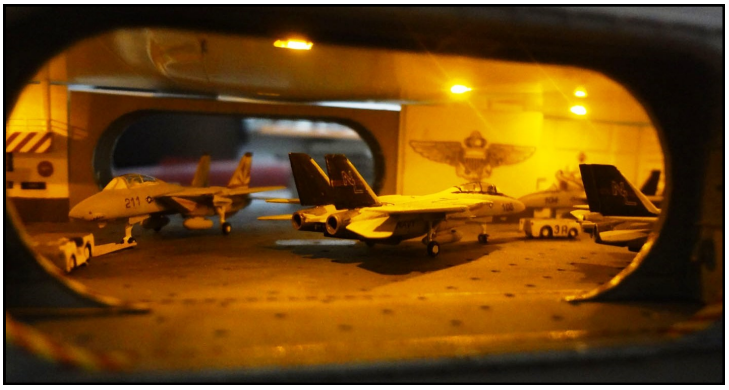


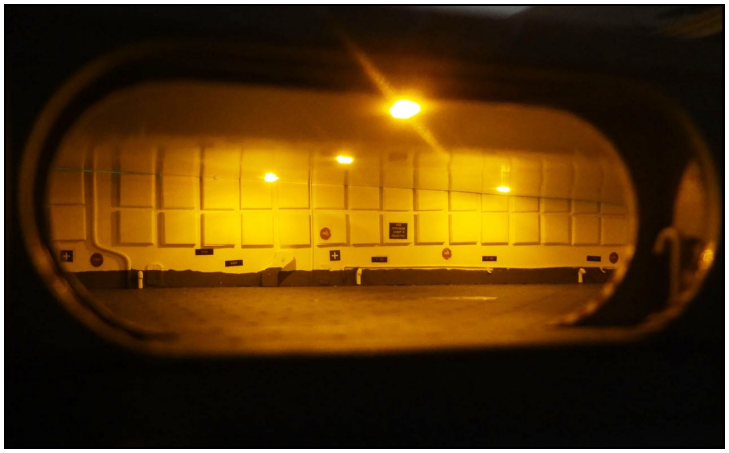
A night view of the carrier's deck from a pilot's vantage point.







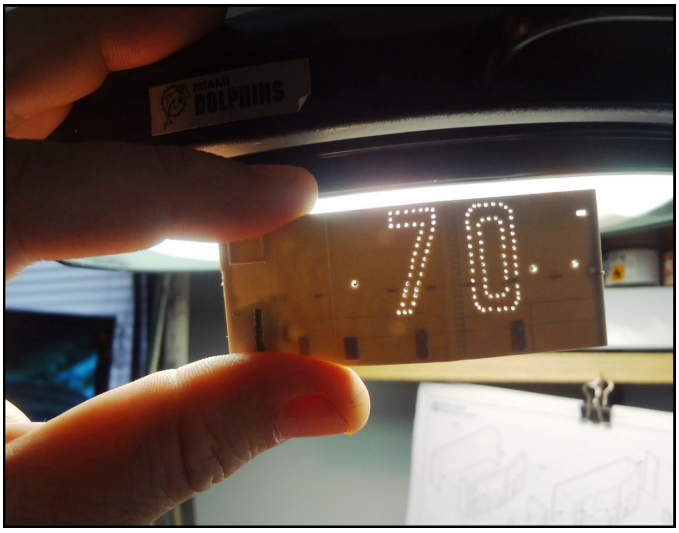


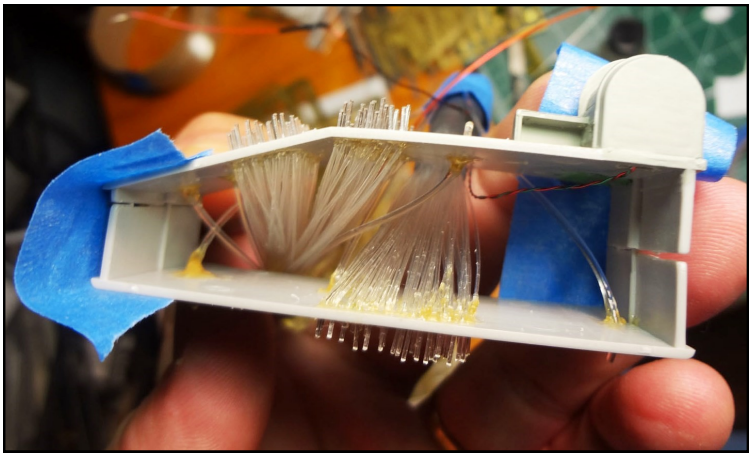


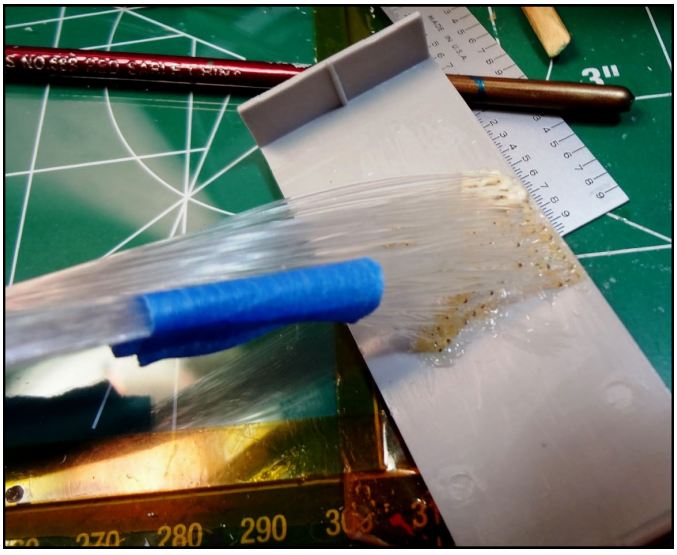
Left: *The custom styrene walls of the hanger bay. Custom-made decals and photo-etched details have been applied to the bay walls.*

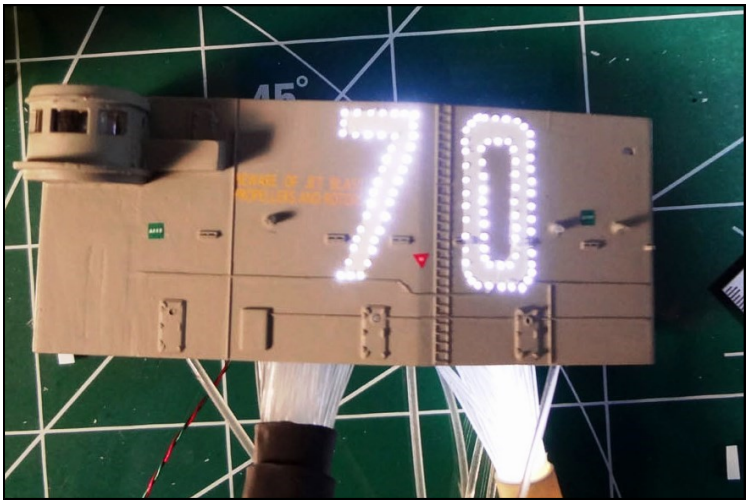
Bottom Left: *Wiring the hanger bay lighting.*

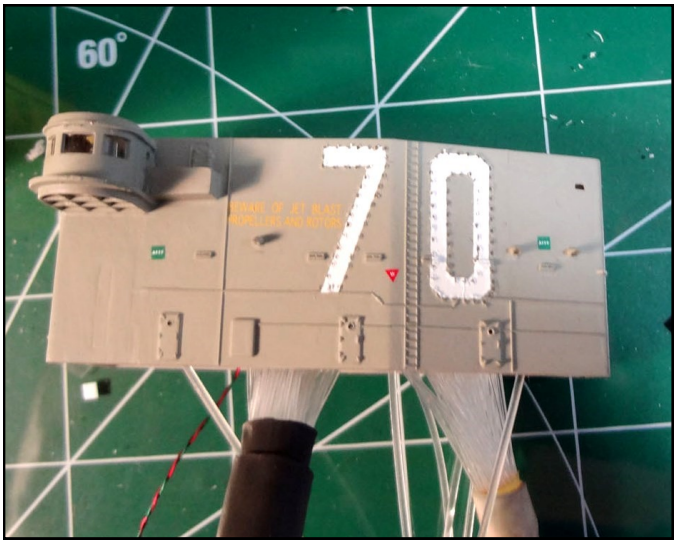
Above Right: *Checking the hanger bay and aft lighting.*

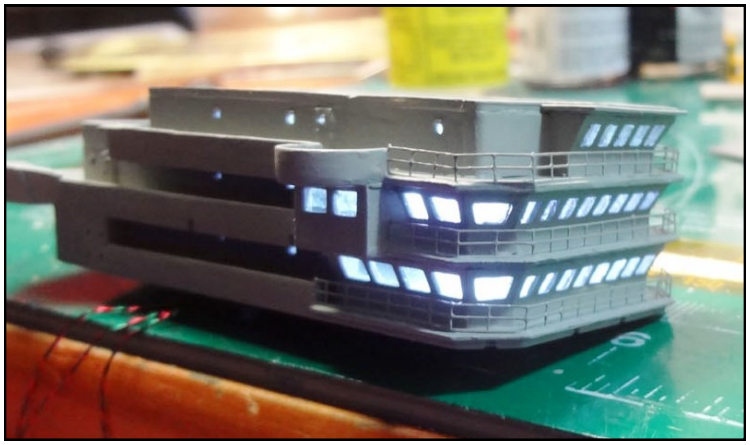








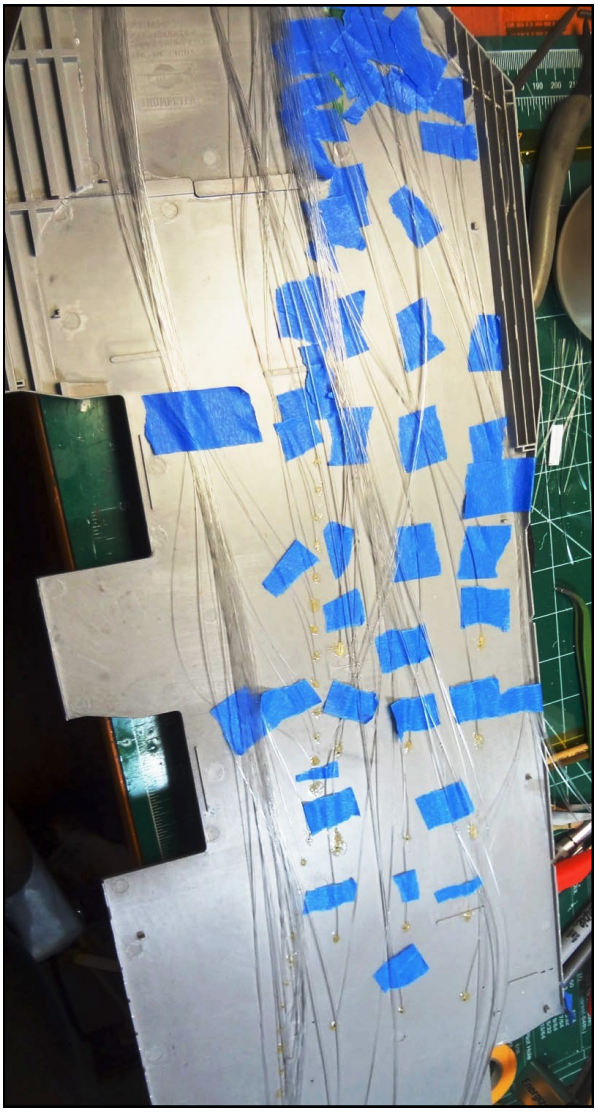


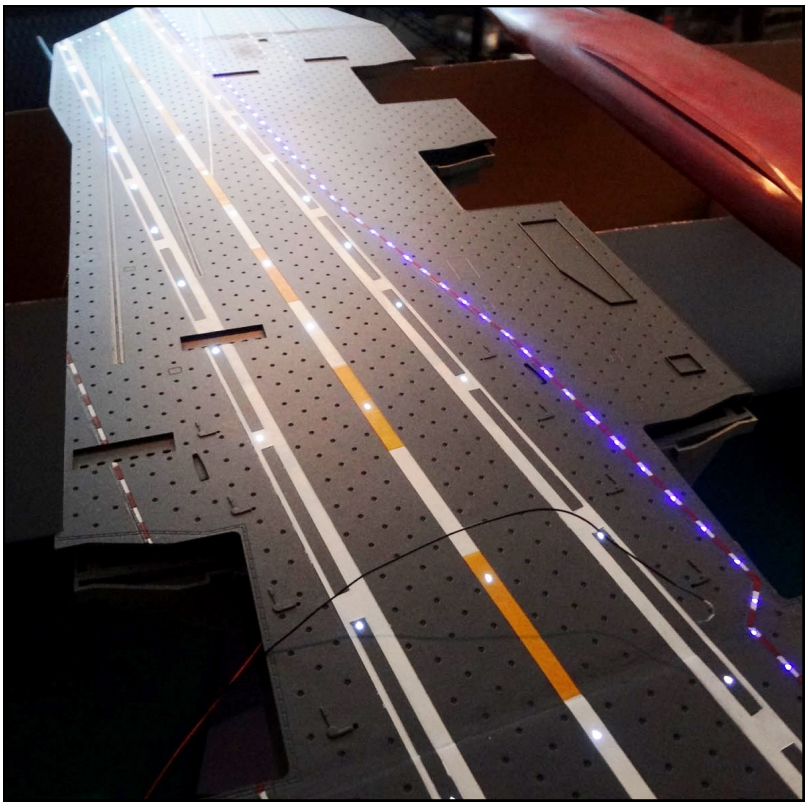


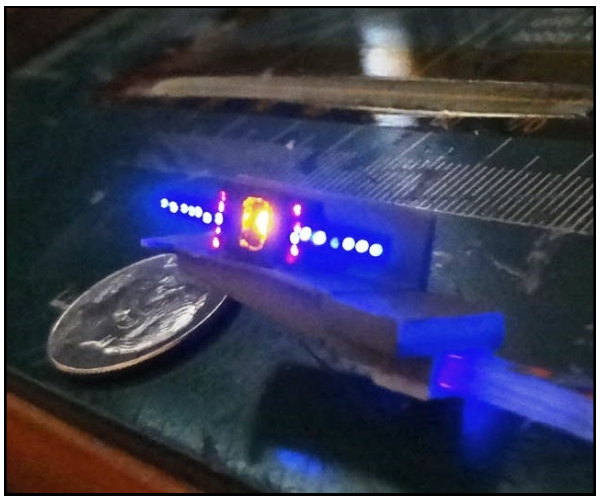
Above: *Lighting the island numbers with fiber optics.*

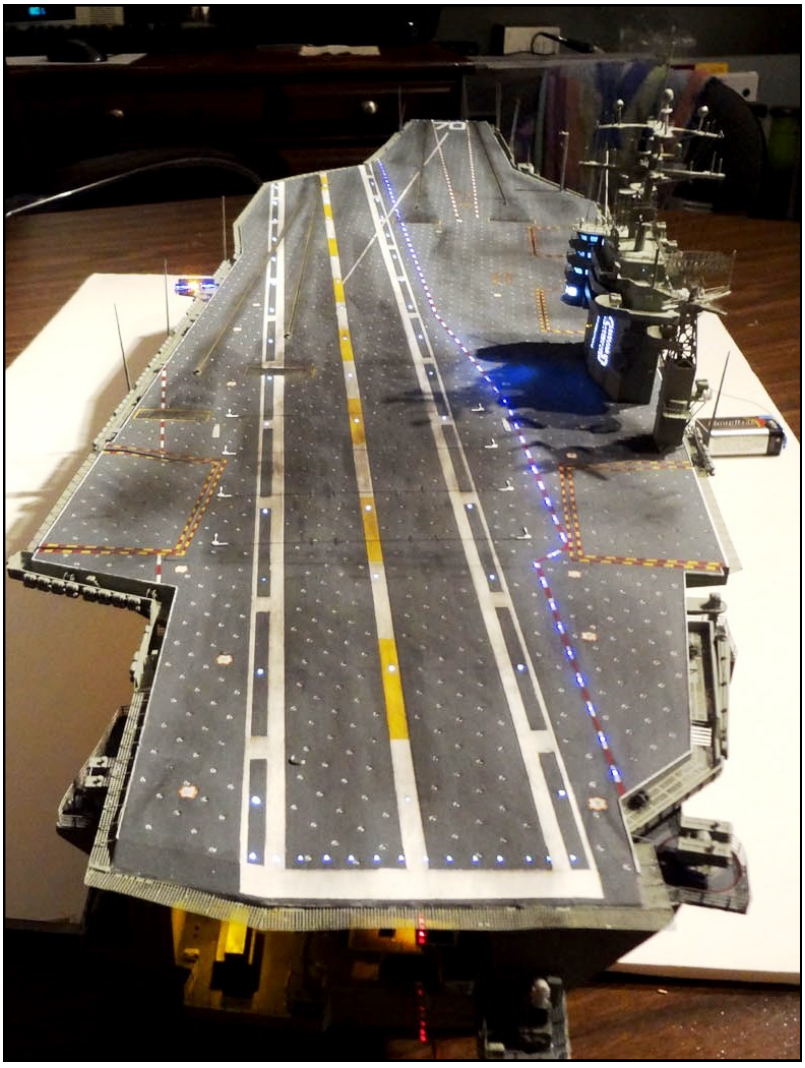
Middle Right: *Checking the bridge lighting.*

Bottom Right: *Custom-made decals applied to the F-14s.*





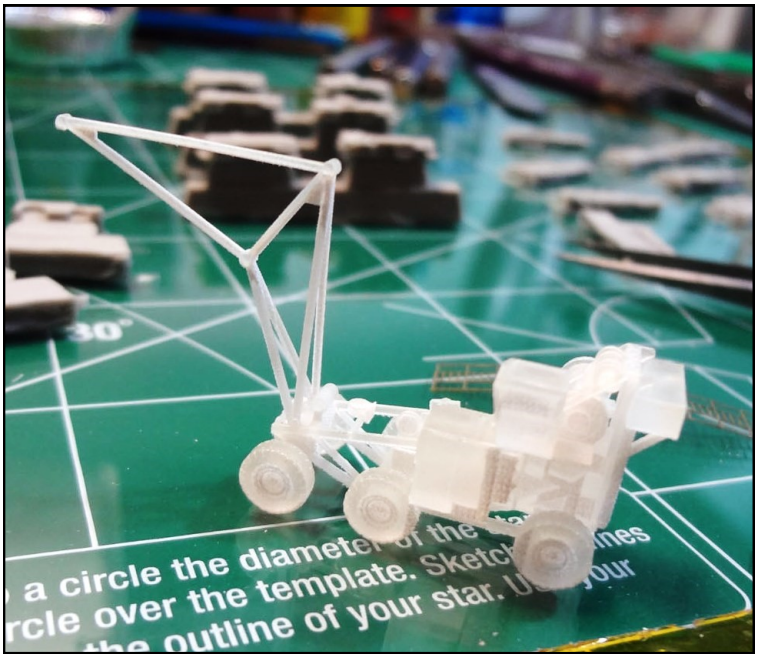


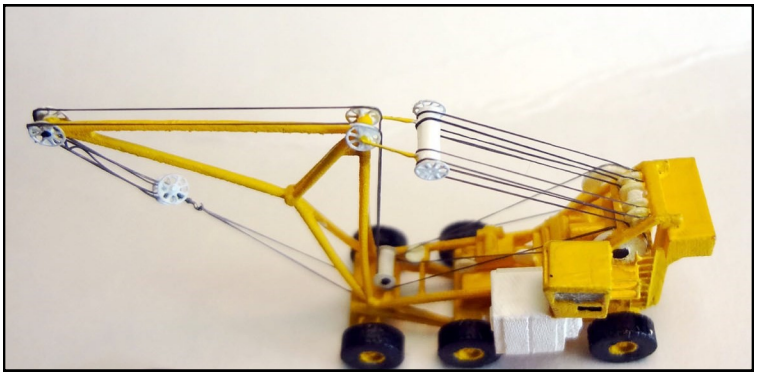


Top: *Deck fiber optics are laid out. Testing the deck lighting.*

Above: *Checking the Fresnel light.*

Bottom Right: *The carrier's deck is weathered and ready for the jets to take off and land.*





Top Left: *Shapeways 3D-printed Tilley crane.*

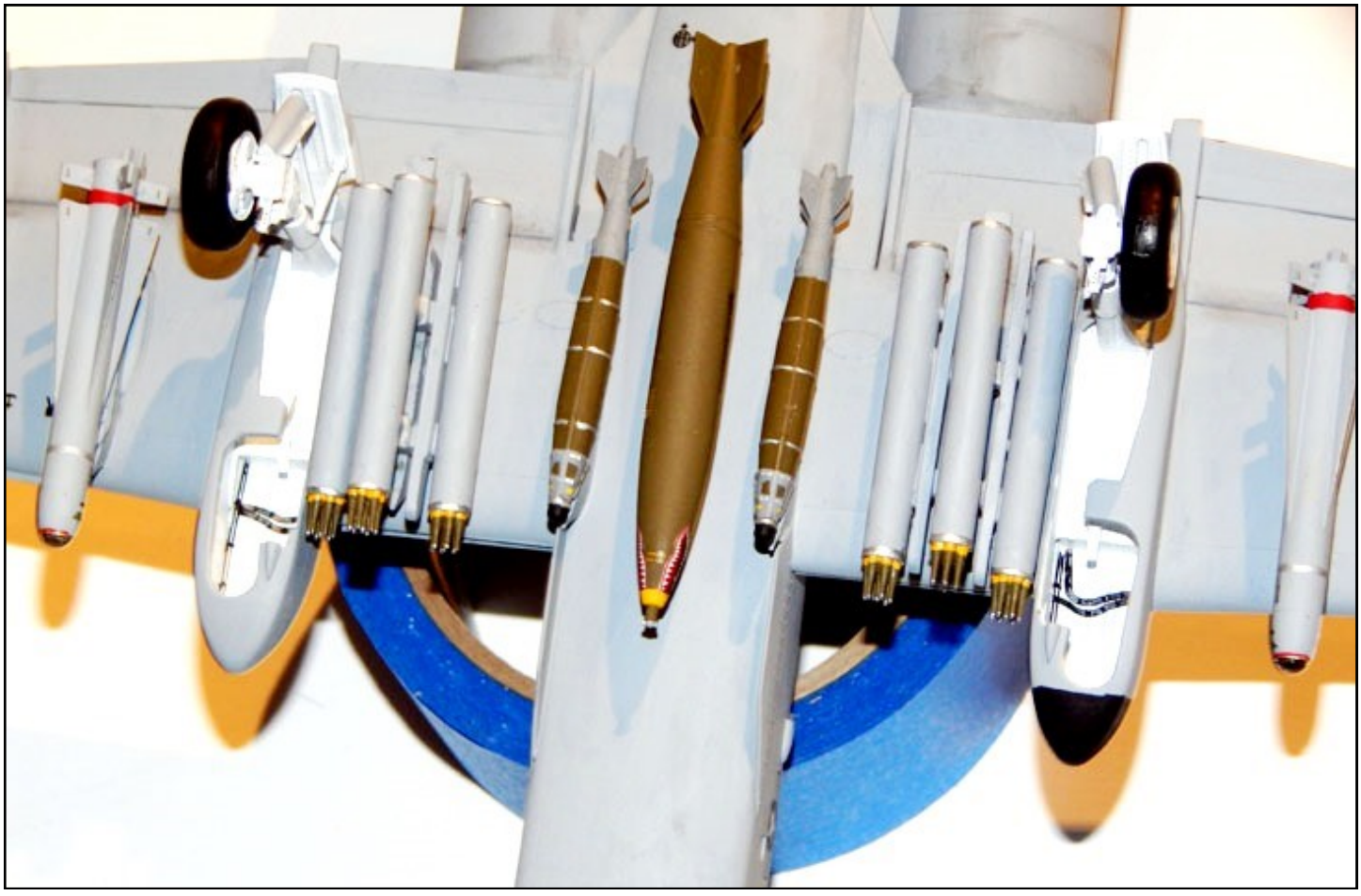
Top Right and Left: *The crane has been detailed. Notice the size when compared to the dime.*

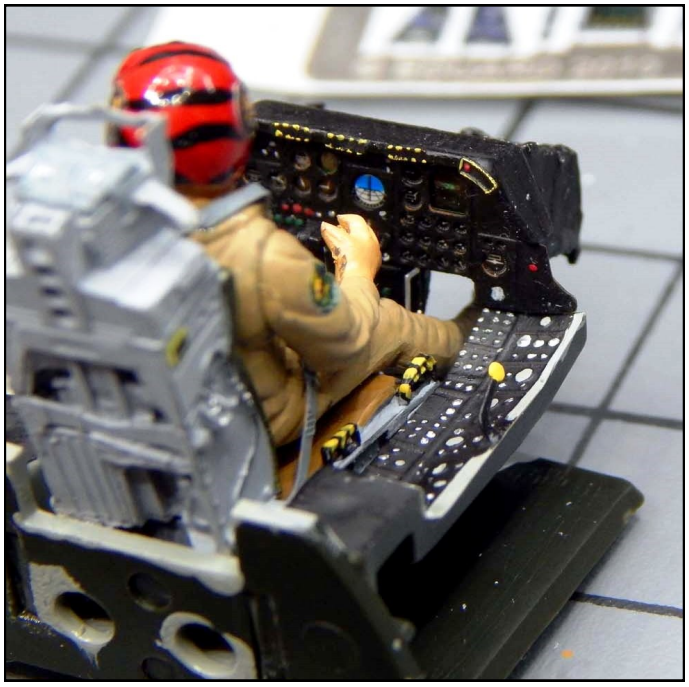
Left: *A-7E, VA-37, and VA-105 jets have custom decals applied and are ready to populate the hanger bays and the deck of the carrier.*

I built this A-10 to represent one of the aircraft that flies in an online flight simulator called Digital Combat Simulator. I homemade the scheme-specific decals, and for reference, I used the digital "skin" files that were used to design the simulator aircraft.

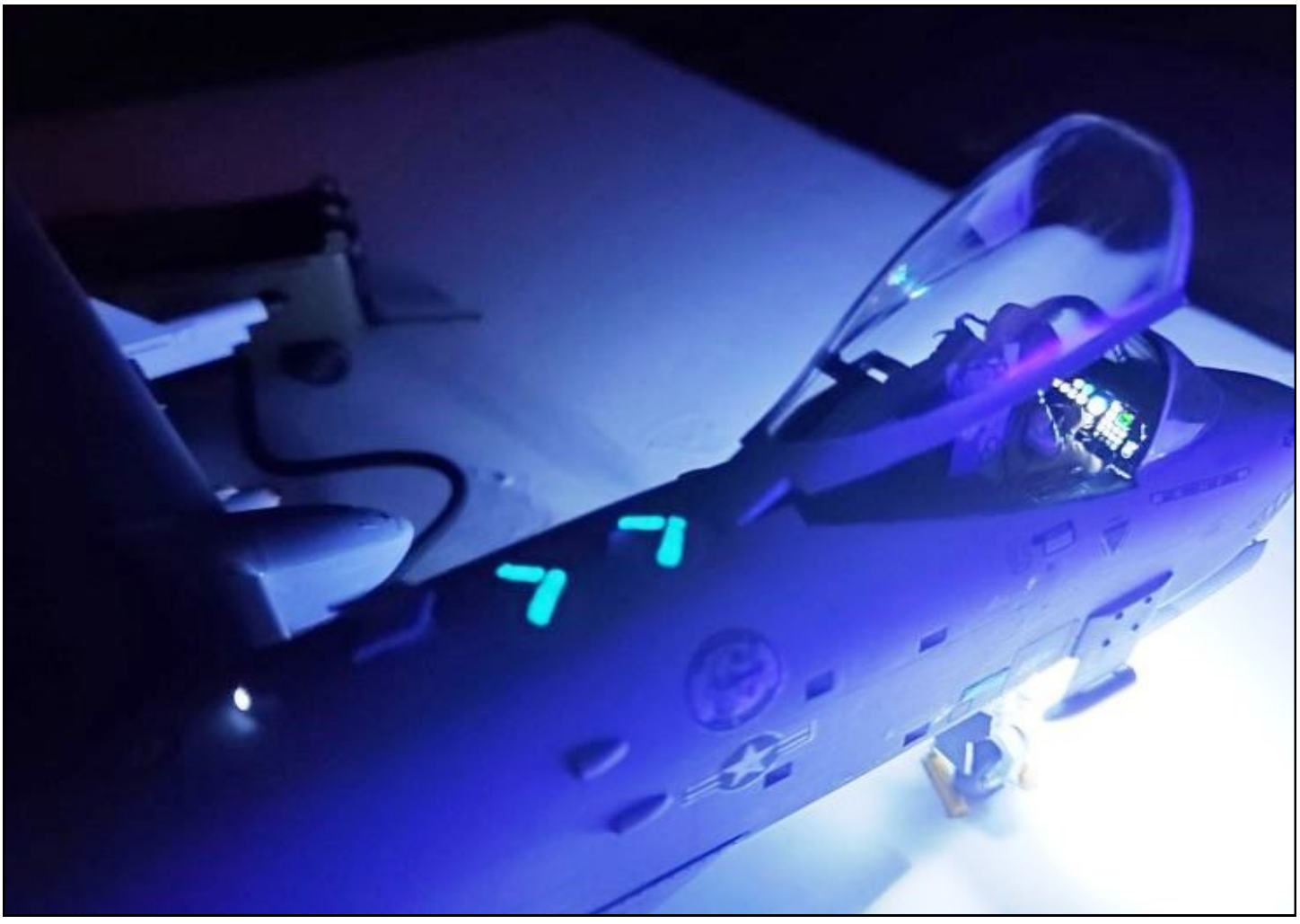
The weapons and pods are a mixture of resin and 3D-printed accessories to match the load on the simulator aircraft. I also added LED and fiber optic lighting for the instrument panel, landing light, taxi light, and navigation lights. The formation lights were accomplished using glow-in-the-dark paint to replicate the aqua glow of the panels. I also used Hasegawa's 1/48 USAF TTU-228 hydraulic test cart, which houses the 9V battery and connects to the aircraft ground power panel with a coaxial connector supplying the power for the six LEDs used in this build.

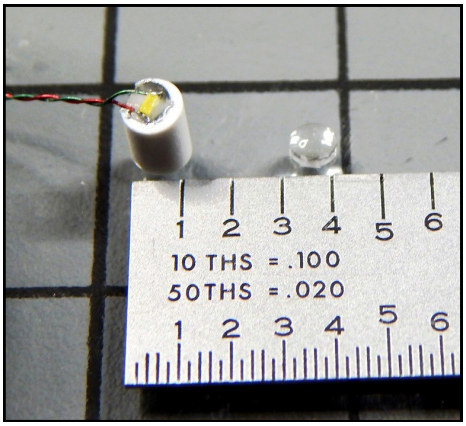
Tamiya's 1/48 version of the A-10 Thunderbolt II.

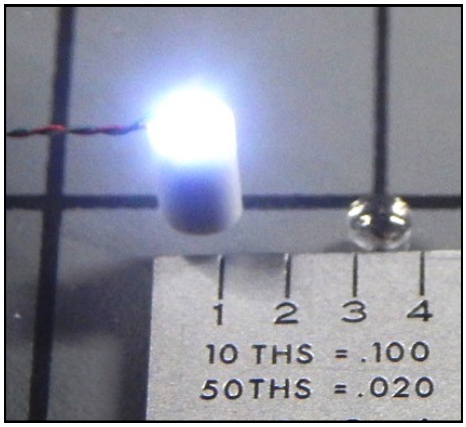


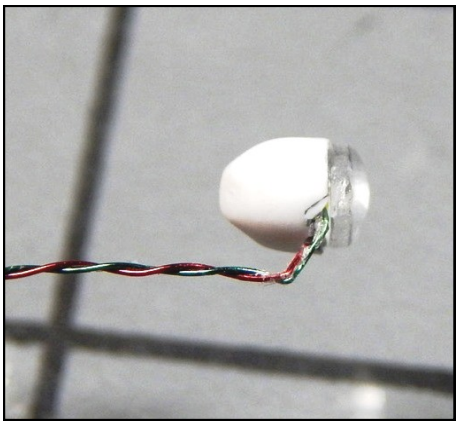


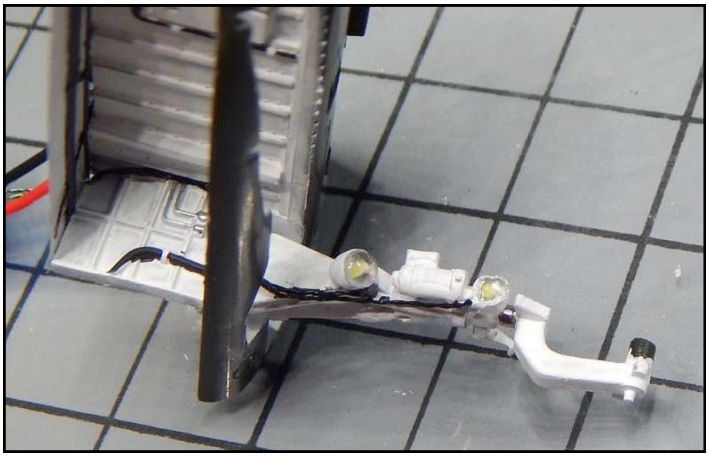
The highly-detailed cockpit is complete and installed. It lights up perfectly!







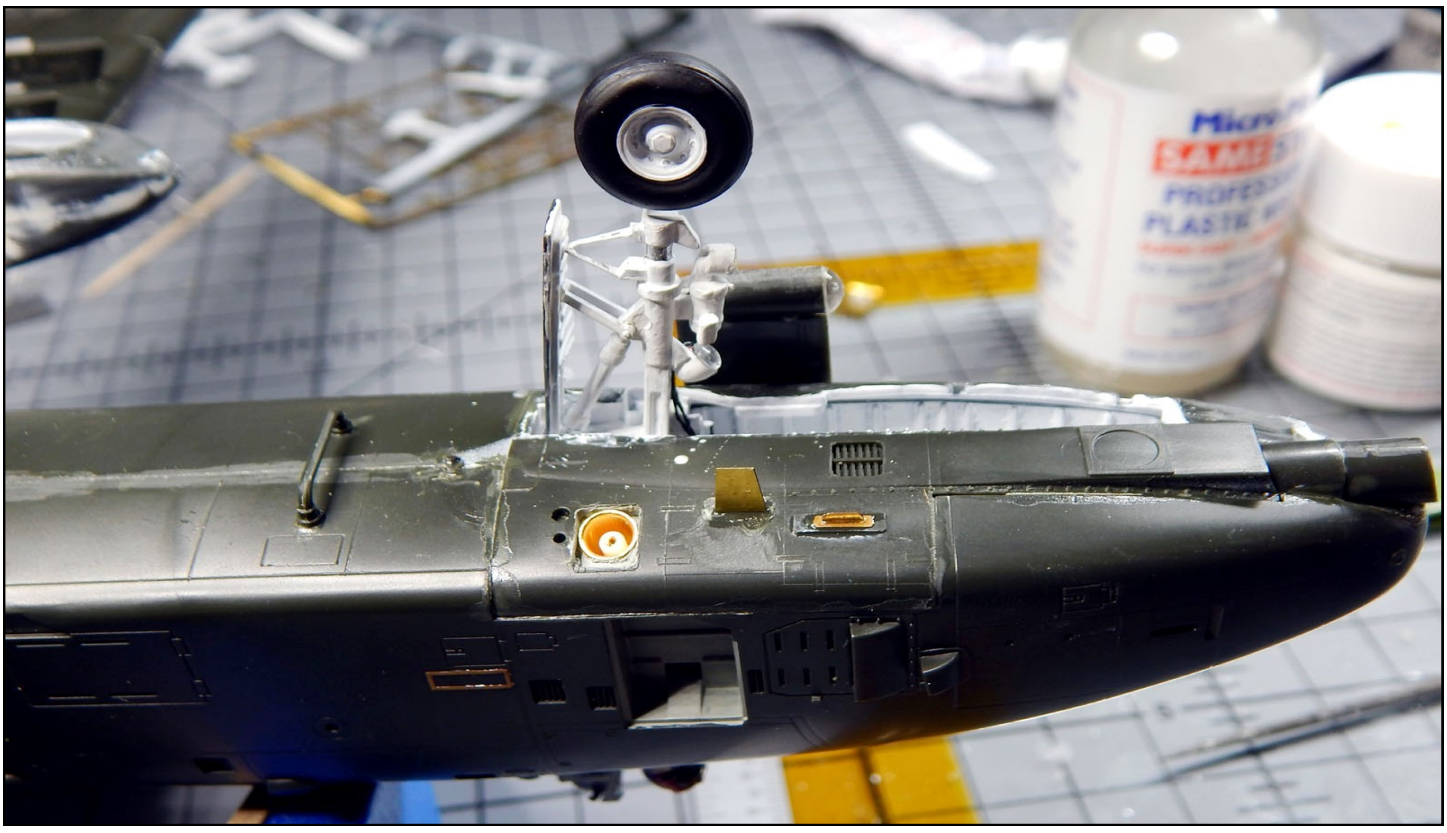


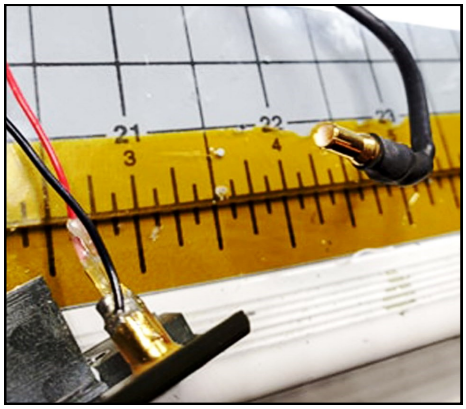
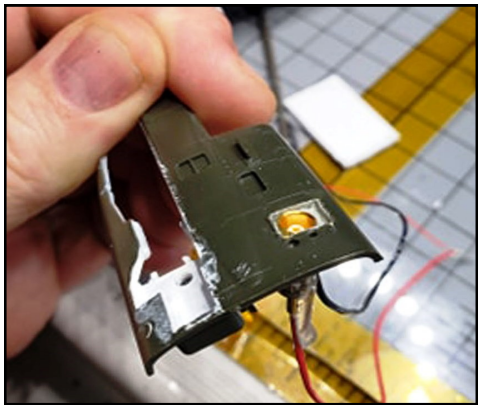


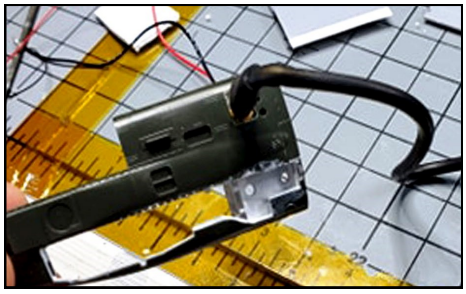
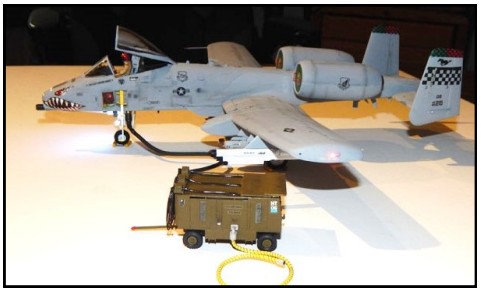
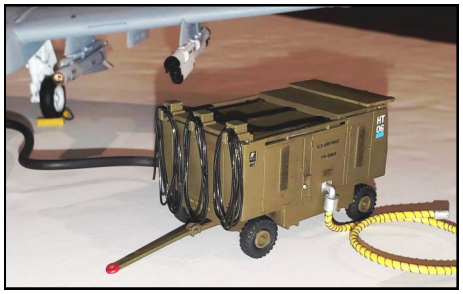
Top: *Pico LEDs are mounted in the landing lights and tested before final assembly.*

Above: *The nose gear is assembled and the landing lights are tested.*

Bottom: *The nose landing gear assembly is installed into the fuselage.*



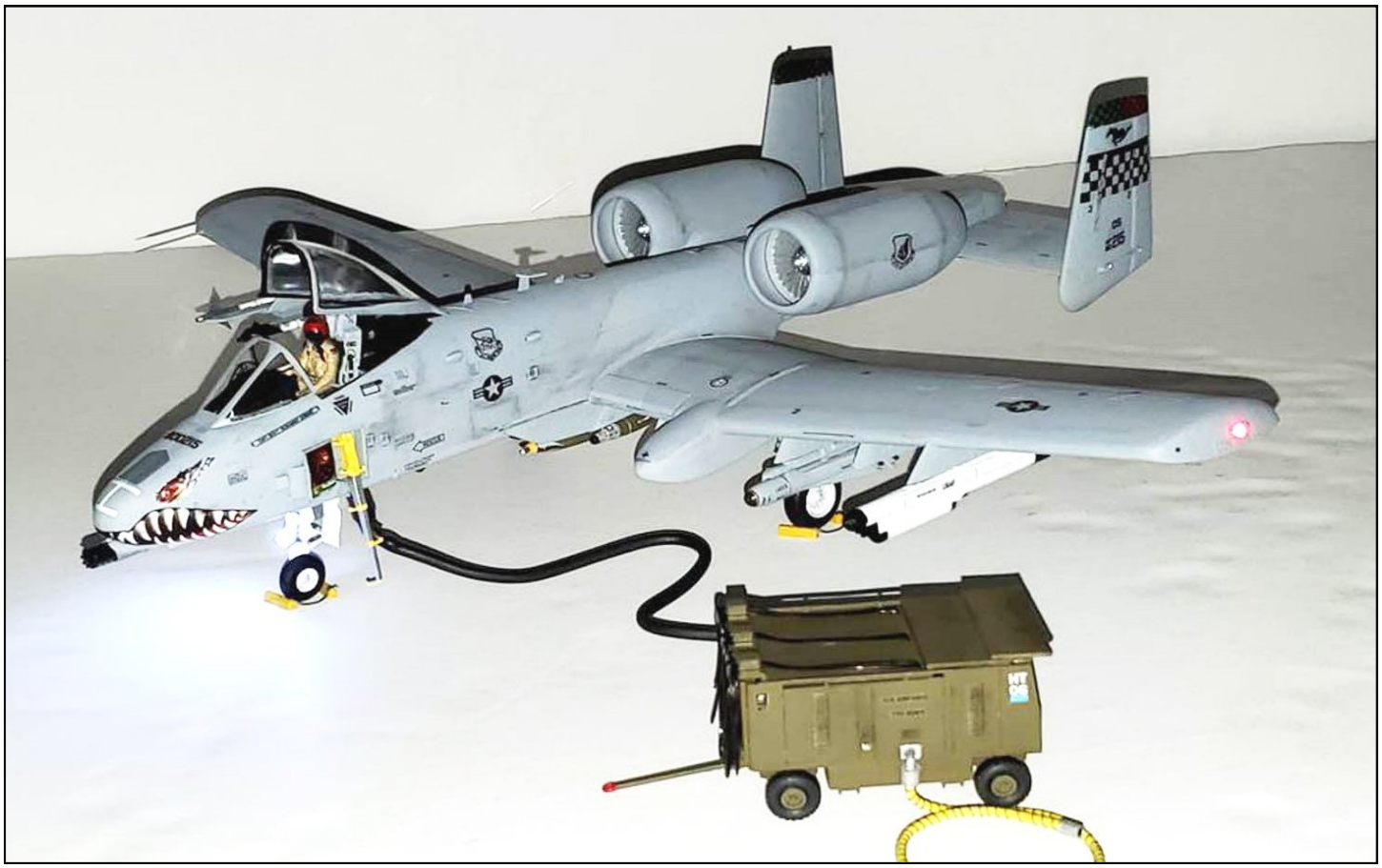




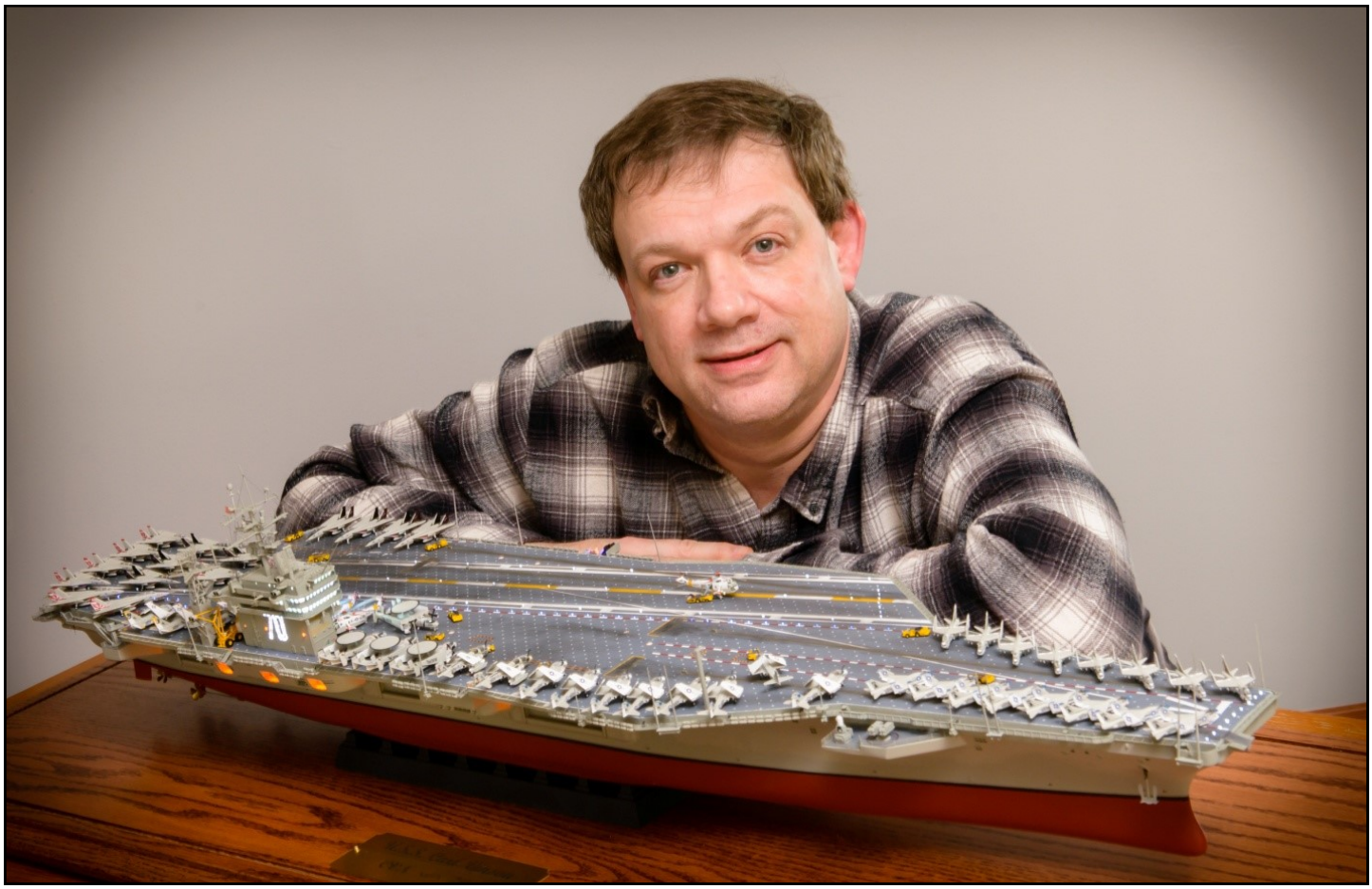
Top Left and Middle: *The coax connector is assembled and fitted into the fuselage.*

Top Right: *The 9V battery is fitted into the test cart.*

Above Middle/Right and Below:

The test cart will provide the power for all of the on-board lighting via the coax cable.





About the Author

David Kopielski has been building models since the early 1970s. He is a member of the IPMS McKinstry Chapter in suburban Chicago and enjoys building 1/48-scale aircraft and 1/350-scale ships. Dave has always had a passion for military ships and aircraft, leading to his service in the United States Navy as an Avionics Technician. After the Navy, he continued his still-active career as an electrical engineer for a major defense contractor. In between work and model building, Dave likes to spend his time with his wife and three children. His second passion is fishing during the warm months with his favorite fishing partner, his wife, Joyce. As Dave gets closer to retirement, he is looking forward to many more builds and many more lakes to fish. You can follow all of his past, current, and future builds and also check out his tips and tricks on his website at https://davidsscalemodels.com/.

Read the Latest Article Series

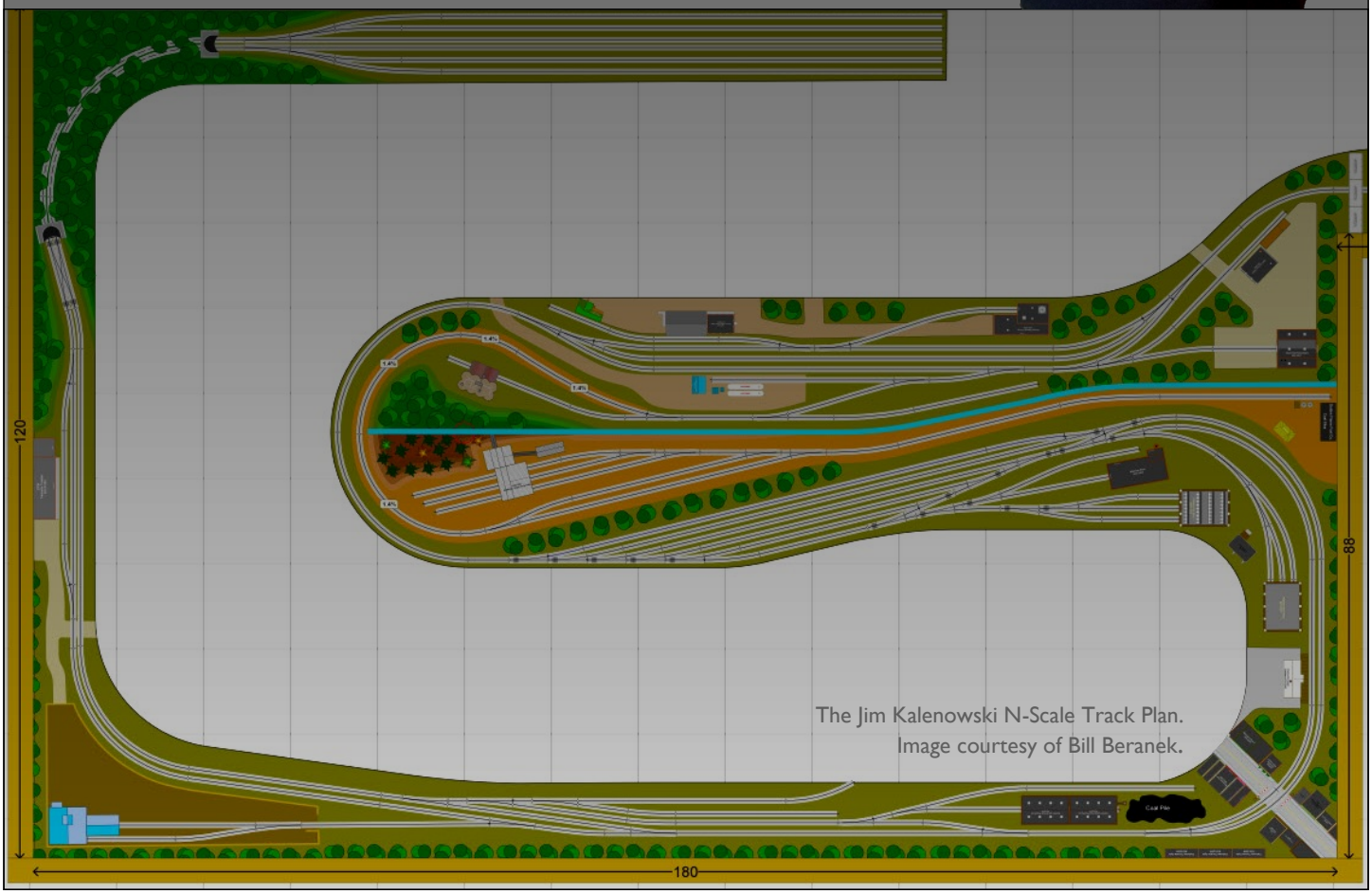
The Anatomy of a Model Railroad

By William (Bill) J. Beranek - The Track Planner

Follow along as Bill Beranek takes you from start to finish of a point-to-point N-scale layout he designed for prototypical operations. The series will be presented in a pictorial essay format with photographs of the progress and commentary covering:

- ✓ Layout Design Process
- ✓ Benchwork and Trackwork
- ✓ Control Panel and Wiring
- ✓ Facia and Backdrops
- ✓ Scenery

Read Part III in this issue of *The Modeler's Journal*.



The Jim Kalenowski N-Scale Track Plan.
Image courtesy of Bill Beranek.

A Perspective On Track Planning

By William (Bill) J. Beranek - The Track Planner

Setting Realistic Goals

In the last issue of *The Models Journal*, I discussed how to accurately measure the available space for your model railroad. The reason I devoted an entire column to taking accurate measurements was simple: without accurate measurements, everything else is compromised. Getting accurate measurements from clients has become a significant problem.

While some clients do not understand the importance of having accurate dimensions, many do not understand the importance of setting realistic goals. Therefore, I am going to devote this column to the setting of realistic goals and some of the common mistakes that result from setting unrealistic ones. There is a small group of modelers who know their limits and can set realistic goals. Unfortunately, there is a larger group who have an awful time setting realistic goals for their layout. Why would that be?

In my opinion, individuals who can set realistic goals have three common traits:

1. They are good at visualizing.
2. They can conceptualize a given space.
3. They think through what they want from their model railroad.

If need be, they will leave things out of the design if it hurts the realism.

About 75% of my clientele have problems setting realistic goals. The challenge comes with being able to visualize and conceptualize a space. When evaluating space, they tend to ask themselves "How can I get everything to fit?" when they should be asking themselves "What can I leave out?" Trying to decide how to fit everything in becomes extremely difficult for some modelers and leads to frustration. This can ultimately result in serious design flaws. Deciding what to leave out is hard if you do not set realistic goals from the beginning of the layout building process.

Setting realistic goals is multifaceted, and as I said earlier, it requires the ability to conceptualize, visualize, and understand what you can include and what you need to leave out.

It Starts with Planning

I believe the need to get trains running as soon as possible is a contributing factor to the downfall of many model railroads. If the model railroader has not done the necessary

planning, the layout could be doomed from the start.

Some modelers think the sooner the benchwork is up, the tracks are laid, and the trains are running, the happier they will be. If your main goal is to sit back and watch trains run around the room, fine. That modeler certainly has a place in this hobby. The upside is that it does not take a lot of planning nor any realistic goal setting, and these types of modelers can take their layout in any direction they please. Recreating a particular scene from the real world may not be one of their goals with the layout. The downside is watching trains traverse a room over and over, can get old very quickly. When that happens, and it usually does, where does the modeler go next?

If you want to take advantage of today's DCC capabilities, make serious use of high-quality equipment available, and you want your layout to represent a mini-transportation system where trains have actual jobs, then that type of model railroad takes a lot of planning. More importantly, it takes an understanding and discipline to know what to keep and what to leave out.

If the previous paragraph describes you, then setting realistic goals should be your number one priority. The popular T-shirt phrase "I play with trains" really should not apply to you. While you might like to play with trains, in your case, the T-shirt should say "I operate trains."

Setting Standards

Having a realistic plan requires setting standards based on the scale you are modeling and the type of railroad you want to model. Standards include:

a. The correct minimum radius for the era you are modeling.

b. Reasonable grade percentages.

c. Minimum size frog turnout numbers, based on the type of equipment you are going to operate.

d. Designing benchwork that is easy to build and does not cause major reach-in problems.

By ignoring standards, you are certainly setting yourself up for failure. Not developing standards and adhering to them has been the death of many model railroads. New modelers and even some seasoned modelers can get so entrenched in what they want they unwittingly start to ignore standards.

On my website (www.TheTrackPlanner.com), I have a questionnaire that all potential clients fill out. The questions are designed to extract information in such a way that I get a reasonably good picture of what the clients want. More importantly, the results from this questionnaire demonstrate whether or not the clients are being realistic in their wants. It is interesting and insightful to read the answers and see how clients (without knowing it) will contradict themselves.

Below are some of the main elements that modelers tend to ignore because they do not fit within their vision of the layout. If you ignore these elements, understand that you are potentially setting yourself up for a lot of frustration.

By ignoring standards, you are certainly setting yourself up for failure. Not developing standards and adhering to them has been the death of many model railroads.

Era vs. Space

When a modeler decides to build a new model railroad, choosing an era is one of the first things he or she needs to determine. In most cases, there is a direct correlation between the modeler's age and the era chosen. Very few of my clients under the age of forty will choose the transition era (1940s - 1960s). The under-forty group will overwhelmingly select the modern era (1970s - Present).

Very seldom do I see a modeler choose an era based on available space. By the time a modeler has decided to build a model railroad, he or she has already decided on the era. I doubt many realize choosing the wrong era for the available space can be a major mistake.

Over the years, a high percentage of my clients have wanted to model the modern era. The percentage modeling the transition era is considerably smaller and usually restricted to older clients. Many of my clients grew up during the 80s and 90s. That is the era they remember and this has influenced their modeling interests. Very seldom, if ever, do I have a cli-

ent ask me "I don't think I have enough room to model a modern-era railroad. So, what should I do?"

When discussing potential track plans with my clients, I talk a lot about the "believability factor." The question I always ask myself and the client is, "Based on the available space, can we design a model railroad that will incorporate the client's wishes and still maintain a high degree of believability?" Linking space with the ability to build a believable model railroad does not register with some clients. If you want to model a modern Class I railroad in a 12' x 12' room, you are going to have an extremely hard time making it look realistic and believable.

Double-Track Mainlines

If a client contacts me to design a modern-era track plan, it is an even bet that the client will also want a double-track mainline. Many modern-era modelers do not understand how much real estate a double-track mainline requires. Very seldom do I hear, "I need a double-track mainline because of how the prototype operated and I want to be able to operate like the prototype." I believe that their desire for a double-track mainline is because they like watching trains as much as they like to replicate prototype operations.

When a design includes a double-track mainline, one of the major considerations for prototype operations is the locations of the crossovers. Crossovers are an important design element. The placement of crossovers is critical to the successful operation of any double-track mainline layout.

Besides location, you must consider the amount of linear space a pair of crossover takes. On an HO scale layout, for proper operations, you should use #8 turnouts. As an example, if you are using Peco Code 83 #8s and you use 2" spacing between tracks, you will need over two feet (25 9/32" to be exact) of linear space to accommodate a set of crossovers. In a limited space, that is a lot. When a #8 turnout is too long, what is the modeler's first thought and remedy? If you guessed to go with a smaller numbered frog, you would be right. Sometimes #6 turnouts will work, but if you want to run passenger cars with long wheelbases at scale passenger-train speed, you could have issues. In addition, long passenger cars always look better running through #8 turnouts or larger.

The moral of this story is that if you are thinking about building a new layout and considering double-track mainlines, make sure you have the space to accommodate the extra real estate double-track mainlines require.

Long Trains

As many of my clients have grown up watching 100-to-150-car trains, it is only natural for them to want to run long trains in their miniature empires. I have seen a 100-car HO scale train run. It was impressive, but it was being run on a 10,000 square-foot layout! Even at 10,000 square feet, the 100-car train overpowered the layout and surrounding scenery.

A good example of unrealistic is when you see 30-to-40-car trains running on a medium-sized layout. If you do not care about realism and your main interest is watching long trains travel around the layout, go for it. It is your railroad, run long trains if that makes you happy.

However, if you want your model railroad to have the look and feel of a real railroad, you need to think about the believability factor. I think everyone can agree that it is not very realistic or believable when a train's locomotive is entering a town before the same train's caboose or end-of-train car has left the previous town.

This is a common, but an unrealistic practice that many modelers refuse to abandon. Is there a reasonable solution? Absolutely! Instead of trying to model a large Class I railroad, design your layout as a Class II or a branch-line railroad, where trains are shorter and look realistic running on a medium-sized layout. Besides, in my opinion, modeling a branch-line railroad is a much more interesting type of model railroading than trying to model a large Class I railroad.

Modern Industries

Today's modern industries can consume large amounts of real estate. A good example is intermodal operations. If a client wants to model the modern era, it is a 50/50 chance that the client will want to model intermodal operations. For a small-to-medium-sized layout, a normal intermodal yard operation would quickly overpower the rest of the layout. If you want to realistically model an intermodal operation, you will need approximately 12 to 15 feet of linear

space, and 16 to 18 inches of width. It quickly becomes apparent that your intermodal operation is using up a lot of benchwork space.

I have designed small versions of an intermodal yard, but the believability factor suffers. It is hard to create an intermodal look and feel if the yard only holds three or four autoracks - not a very convincing representation of a modern-day intermodal operation. Likewise, if you want to model a modern paper mill operation, you will need a lot of benchwork space. The same is true for the not-so-modern industries, like a sawmill operation or a major coal mining operation. It is important to consider the types of industries and their spatial requirements on your layout.

Staging: The Ultimate In Realism

If you want your model railroad to operate realistically, the best way to do this is to add hidden staging. When I suggest adding staging, I get two common retorts:

a. I do not have enough room, and

b. I do not want to have to build a helix.

A common misconception is that staging takes up a lot of space. Not true! My standard comeback is, "Almost all of the space above and below your layout is **free** space." If not used, it becomes wasted space. Even if it takes a little money and effort to build a helix, to be able to access the free space seems like a great bargain to me. The best part is that you are using the same amount of space with which you started.

> The hardest thing to replicate on a model railroad is time and distance.

If you have a small-to-medium-sized layout and you can find room for even two hidden staging tracks, you have exponentially increased your operational options. As an example, just having a two-track staging yard will allow you to prototypically run four additional trains on your layout. Two trains will leave staging and two trains will enter staging. Think of staging as the "world beyond your layout." With staging, your trains have places from which they come and go. Your railroad now becomes part of a larger nationwide rail system. In my opinion, staging adds an amazing amount of realism to a model railroad at a very low cost.

Switching Between On-Layout Industries

I feel that one of the least realistic model railroad operations is switching cars between on-layout industries because very few home layouts are large enough to justify it. An example of an on-layout industry is using a boxcar to move lumber from a lumber company to a cabinet maker. Why would that not be realistic, you ask? On an average-sized layout, the distance between two industries is too short to realistically justify moving commodities between the two industries by rail.

Here is an experiment you can try on your layout. Let us assume you model in HO scale. Determine the HO scale distance between two of your industries that interact with each other. Then increase that distance by 87 times - HO is 1:87th the size of the real thing. In almost every case, you will find the distance would be too short to justify using rail service. In the real world, products would be transferred by truck unless there were specific reasons such as size, weight, etc.

The hardest thing to replicate on a model railroad is time and distance. So, how do we solve this time and distance issue? Simple, you add a staging yard. I will repeat what I said earlier, you do not need large staging yards to create realistic operations. When you add staging, you no longer need to switch cars between on-layout industries. When designing track plans, many times I deliberately do not include industries that could interact with each other. I suggest to my clients that commodities received by an on-layout industry come from off-layout staging and commodities shipped by an on-

layout industry, get shipped to off-layout staging. You are now replicating exactly what the full-sized railroads do every day.

By implementing this type of realistic operation, you create the illusion that your trains have real jobs to perform. No longer are they running in circles setting out and picking up cars between industries. When a train disappears into staging, not to return until the next operating session, you have solved the time and distance issue that plagues all model railroads.

Final Thoughts

With this installment, I hope that I have you thinking about how various elements interact with each other to form a more realistic and believable model railroad.

If space is limited, abandon the idea of building a large Class I railroad. Think smaller and build a second-class or third-class railroad, perhaps even a branch-line or short-line. It will be easier to build, it will look more realistic, and you will have a lot more fun operating it.

Think of your layout as a mini-transportation system rather than just a model railroad - a system that is a small part of a much larger nationwide rail system. My idol in model railroading is Allen McClelland and his famous Virginia & Ohio (V&O) layout. Allen very seldom spoke about his layout as a model railroad. He normally referred to it as a mini-transportation system. When you think in those terms, I feel it changes your perspective from "playing with trains" to "operating trains."

Bill – The Track Planner

About the Author

Bill Beranek - The Track Planner has over forty years in the model railroading hobby. Bill enjoys golfing, traveling, and of course designing "prototypical operations" focused track plans.

He has previously served twice as the president and twice as a board member of a local 135+ member model railroad club.

Bill is currently working on his latest triple-deck HO scale layout depicting the SP&S (Spokane, Portland & Seattle Railway) in southern Washington and the OTL (Oregon Trunk Line) on the upper level in northern Oregon in the mid-50s.

You can find out more about Bill—The Track Planner at www.thetrackplanner.com.

Computer and Remote-Assisted Model Railroad Operations

Is it the way of the future?

Part II: Virtual Operations

By Darren Johns

All images courtesy of Darren Johns

In Part 1 of this series, I started to discuss my journey into computer-assisted control of my model railroad. I posed a hypothetical scenario where one could run an operations session on a miniature transportation system when there are not enough operators available to assist. I discussed that on a personal computer (PC), prestaged trains could be sent anywhere on a model rail network with a few clicks of some buttons. At this point, I introduced TrainController™, a German-based software that has the mantra: Software for [a] perfectly controlled Model Railroad. I then walked through a brief synopsis about TrainController™ and how it works.

In this Part 2, I am going to take this concept a few steps further. I believe this is cutting-edge model railroading utilizing off-the-shelf components and software to achieve desired results. The remote dispatch on a model railroad is not a new concept; modelers have been doing this for several years. So, what is cutting edge about this approach?

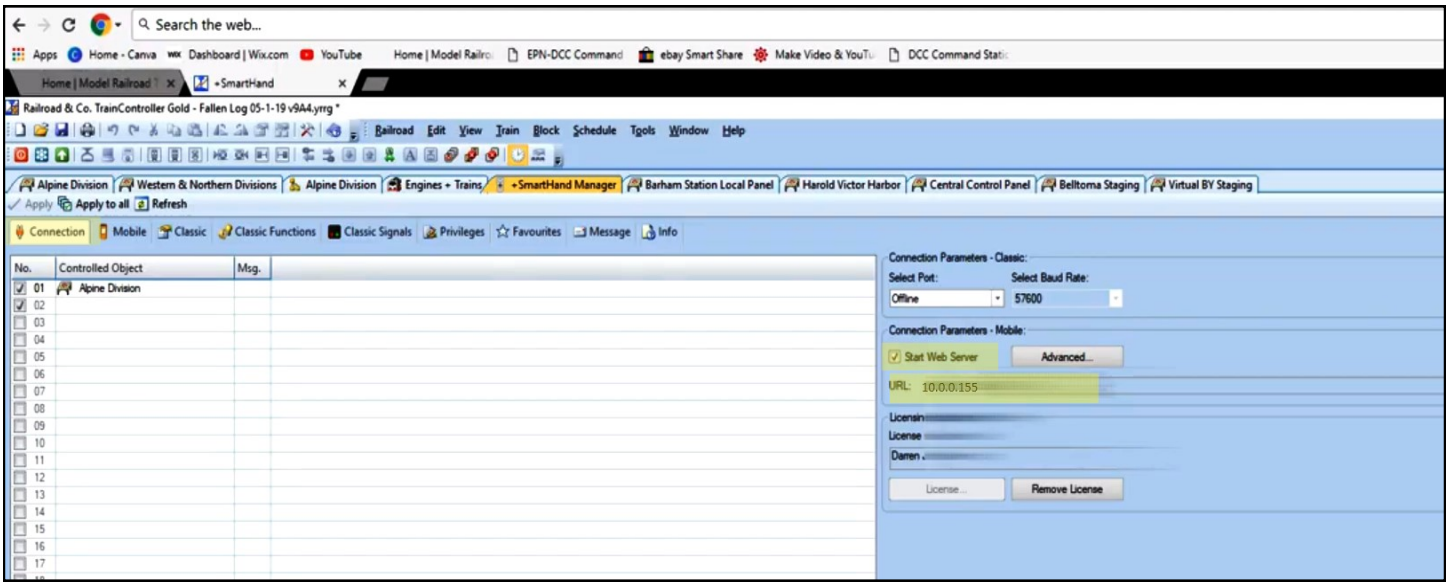
In recent times, I have been investigating the development of virtual operations or remote model rail operations. In short, this concept uses current software like TrainController™ and JMRI (Java Model Railroad Interface) to control the trains and monitor the model railroad. However, modelers have recently started to use Wi-Fi cameras to monitor the trains remotely.

What do I mean by remote or virtual monitoring? Several modelers have been installing small Wi-Fi cameras onto a flatbed wagon or in dummy locomotives, which provides a driver view of the train traveling across the railroad. Modelers are also positioning Wi-Fi cameras at rail-fanning locations across the layout to monitor the location of the trains. In these systems, TrainController™/JMRI and the CCTV (Closed-Circuit Television) video feeds work together so that trains can be operated and monitored from anywhere in the world.

I believe these concepts are some of the most exciting in model railroading since the introduction of Digital Command Control (DCC). Furthermore, I believe I am one of the first modelers using TrainController™ functionality to achieve this form of model railroad operations. So, why am I looking into virtual operations? I don't want to dive too deep into the current pandemic situation, but group gatherings have become more and more problematic throughout the world for health reasons. This concept of virtual operations has been born out of necessity and has allowed us to still run our trains with other fellow modelers and model railroad enthusiasts.

The use of virtual operations may not be for everyone. I initially did not think I would be interested in using this technology either. What I am about to discuss is not designed to replace our current operating sessions at our home or club layouts. Instead, I see these concepts as an enhancement of the more traditional operating sessions. Post-pandemic, the biggest plus to this technology is the ability to include more people in the operating ses-

***Figure 1**. The +SmartHand webserver settings screen.*



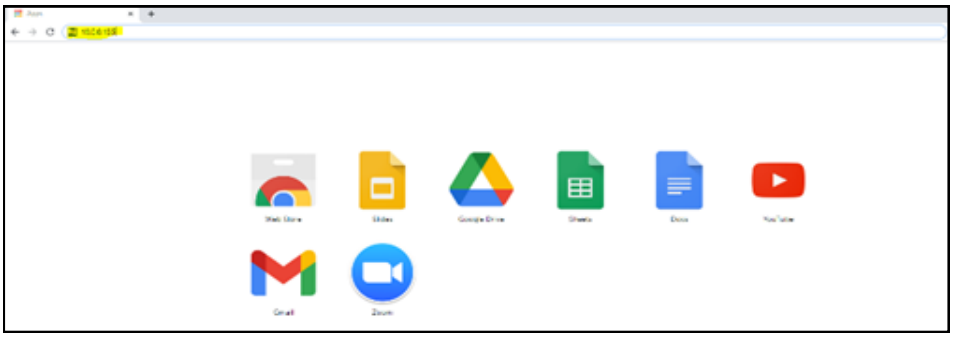


Figure 2. *To access +SmartHand on my PC, I enter the IP address of the computer running TC into the web browser's (Google Chrome) URL window.*

sions where they would not have been able to be included before.

What Is Needed?

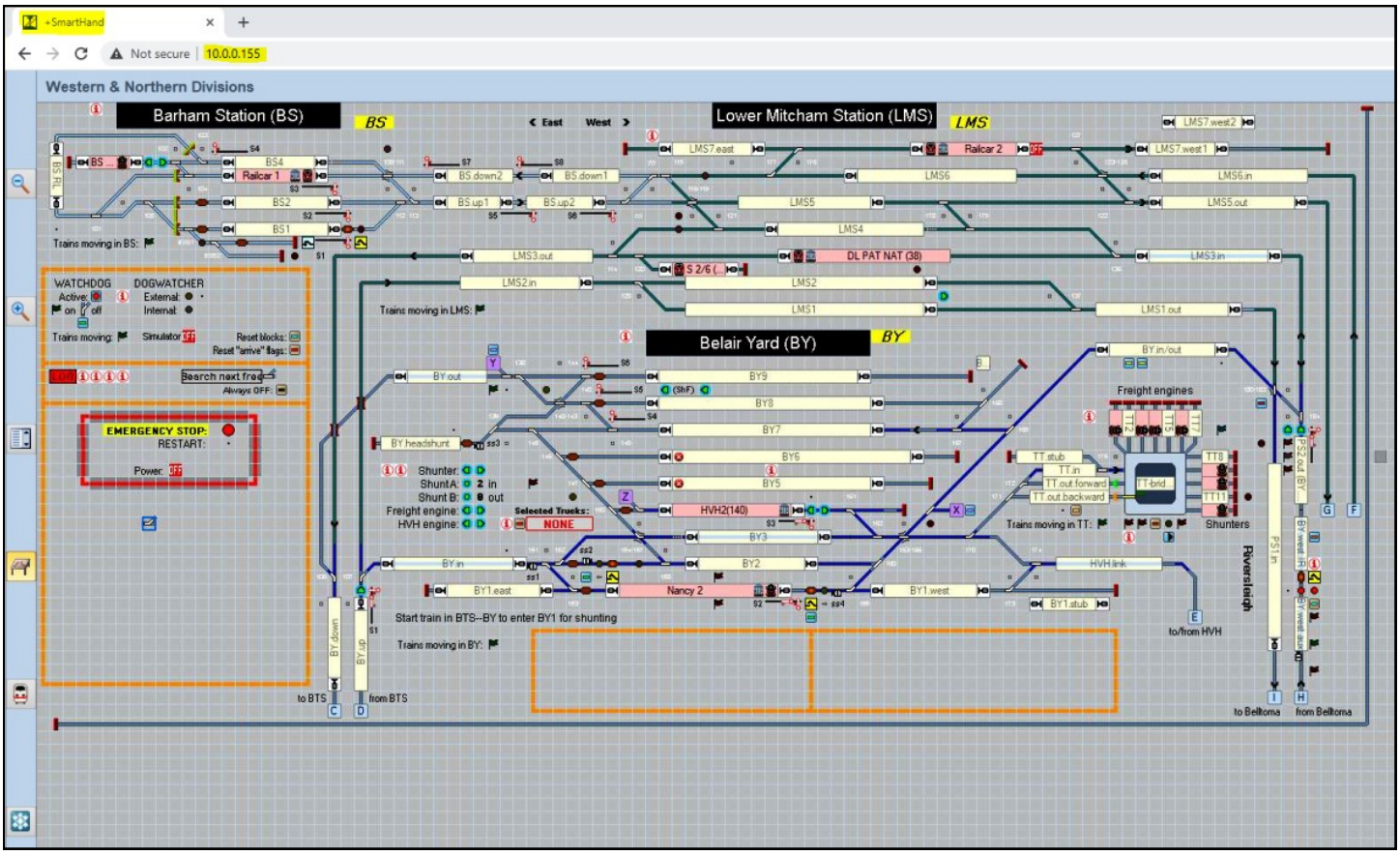
For these types of operations to work, you need the train control software to be accessible via a web browser, which TrainController™ (TC) and JMRI can do. What is a web browser? Web browsers are what we use to access the internet. Examples include Google Chrome, Firefox, Internet Explorer, and Microsoft Edge for PC users. TC has a built-in web server that delivers its interface via the web browser. This allows you to access your switchboards/control panels in TC. Switchboards in TC control a myriad of functions - from switching turnouts and signals to starting schedules, to name a few.

On my model railroad, my switchboards are accessed via a PC (separate from the computer running TC), tablet, or mobile phone that is connected to the train room Wi-Fi network. The beauty of this is that I don't have to physically wire any of the switchboards on the facia of my layout. Instead, switchboards are accessed via the Internet Protocol (IP) address of the computer running TC.

To allow access to TC via a web browser, you need to use an application within TC called +SmartHand. Within TC, there is a limited setup to access the webserver that +SmartHand uses to allow remote access to its controls.

I will draw your attention to the top left of Figure 1. The **Connections**

Figure 3. *+SmartHand view of the switchboard within the web browser.*



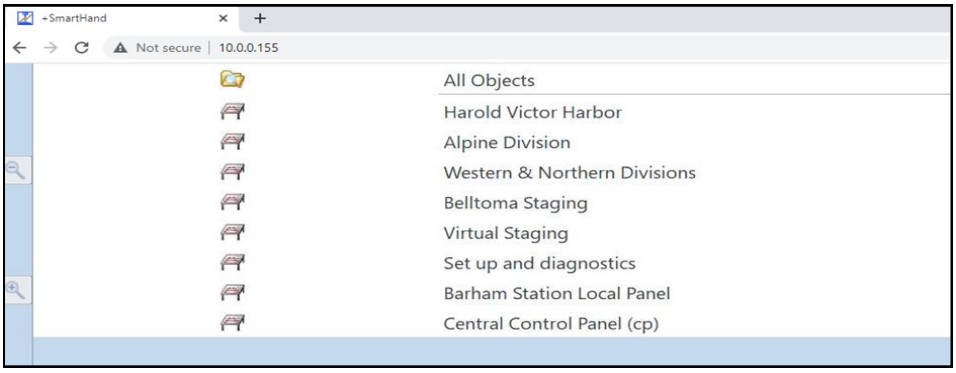


Figure 4.
The +SmartHand switchboard selection screen.

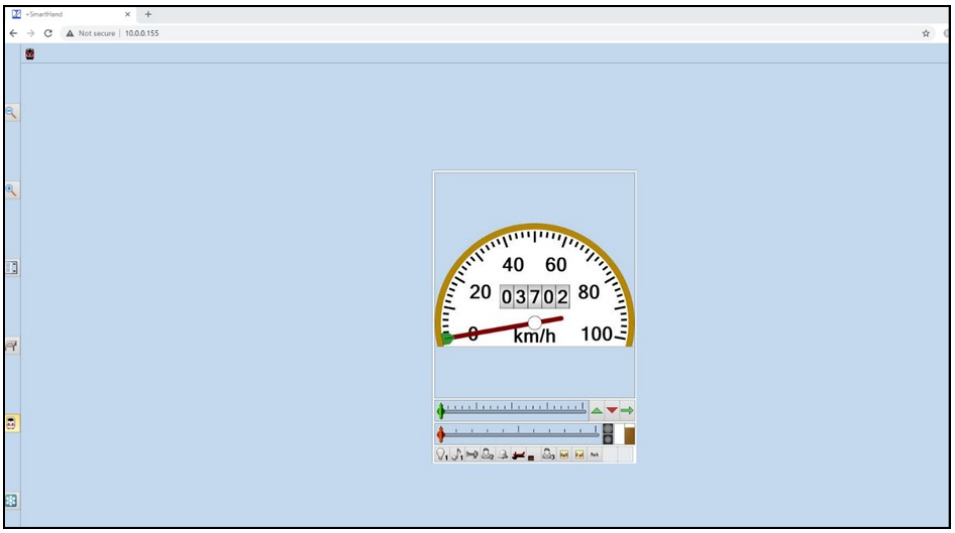


Figure 5.
The +SmartHand train controller screen.

button is highlighted. This button takes you to the settings page for +SmartHand. Make sure the **Start Web Server** check box (highlighted on the right) is marked. In the URL box, there is space for an HTTP address. In my case, it is 10.0.0.155, which is the local IP address of the computer running TC and is needed to access +SmartHand on my devices. Yours may be very different than mine. I do not change any other settings within +SmartHand at this point.

To access +SmartHand on a PC or another device, I type the address of http://10.0.0.155 into a web browser and hit enter. On my train room PCs, I use Google Chrome for my web browser.

If the system is working correctly, a little TrainController™ icon will appear in the browser tab. (See the extreme upper left corner of Figure 3.) Either a switchboard or train control dial will appear on the main screen. Whether a switchboard or dial first appears is dependent on which application was last used on the system. (See Figure 3 and Figure 5.)

In one of my YouTube videos (TrainController Gold V9: How to +SmartHand), I go into more detail on how +SmartHand functions and how it can be customized. Here is the link: https://youtu.be/ub0RVz8KdTE.

In Figure 3, the switchboard screen, you will notice that there are six icons on the left-hand side of the switchboard. The two magnifying glass icons are used to zoom in and out of the switchboard to precisely set train routes. The fourth icon from the top is used to access the various switchboards on my layout. Selecting this icon opens up the switchboard selection screen. (See Figure 4.) For example, I can toggle between the switchboard for Belair Yard (as shown) and the switchboard for Alpine Division. To select a train to control, click on the fifth icon down. It is an easy task to scroll between the various locomotives entered in TC.

To operate my layout truly virtually, I need operators to be able to access my train room Wi-Fi network from the outside world. If you simply type in 10.0.0.155 into a Web Browser on a remote PC and press enter, nothing will happen because that particular IP address is a part of a Local Area Network (LAN), not a

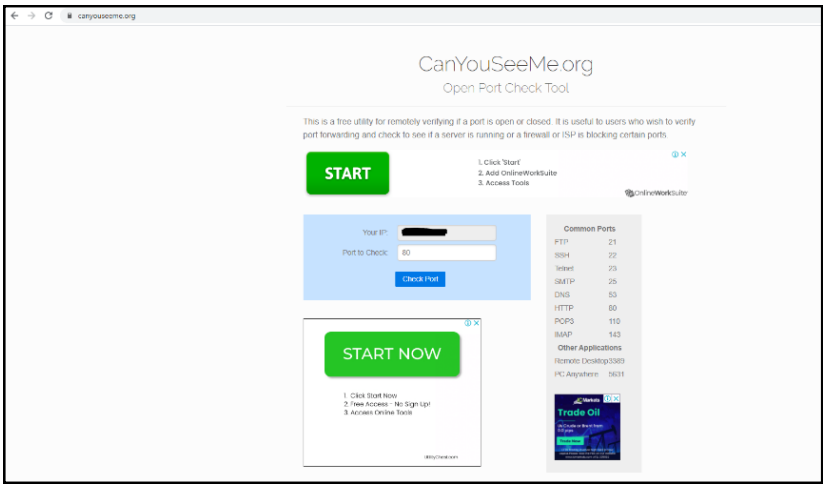


Figure 6.
The CanYouSeeMe.org webpage.

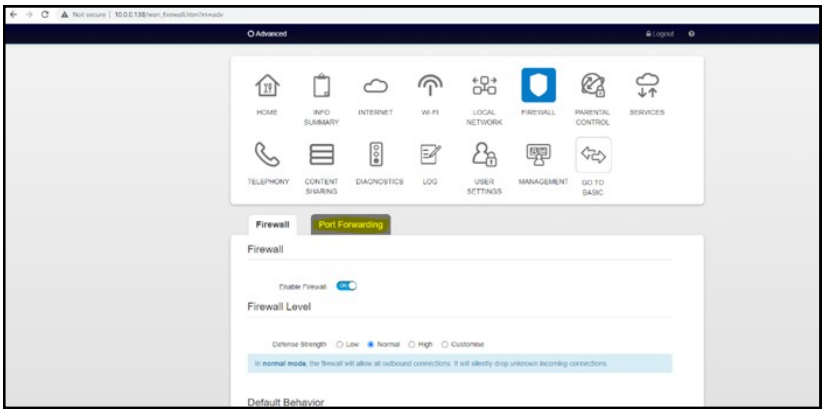


Figure 7.
The Port forwarding selection tab for my router.

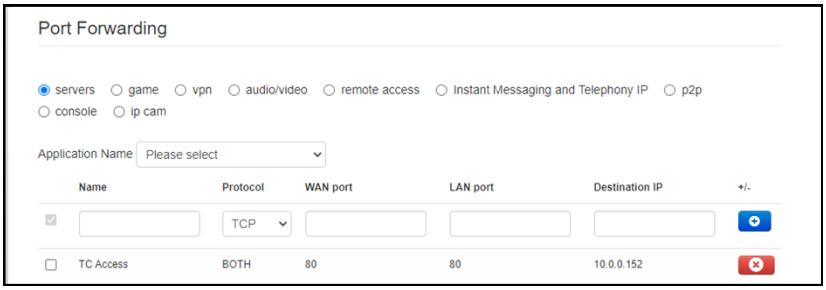


Figure 8.
The port forwarding settings for my router.

part of a Wide Area Network (WAN).

What is a WAN? Think of this as the outside world coming into your train room via the internet. In my part of the world, I have an internet modem and router combined into one unit. This allows me to wirelessly access the internet via a Wi-Fi router within my train room.

So how can you access the LAN from a WAN? You need to understand that your WAN has a unique address. *Do not under any circumstances give this information away, as doing so could compromise your internet safety!* If you do not know your WAN address, it can be located on the following web page: www.canyouseeme.org.

As you can see in Figure 6, I have blacked out my WAN address for my internet safety. The format of my address is XXX.XXX.XXX.XXX (X represents a single digit). In my case, the address is not permanent. My internet provider does not supply me with a static public IP address, meaning it changes regularly. Despite the frequent changes to this address, it is best to keep this information strictly to yourself.

One way of achieving access to a LAN from the outside world (WAN) is to set up a router with port forwarding. Port forwarding is a technique that is used to grant external devices access to computer services on a private network.

How does one enable port forwarding? Each router has a different way of achieving port forwarding, so I will not go into too much detail here.

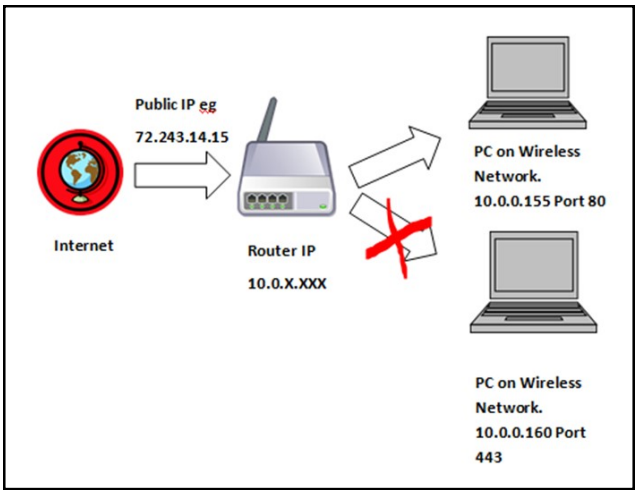


Figure 9.
A diagram showing how port forwarding works.

All I can suggest is to refer to your user manual or contact your internet provider for assistance. In essence, the process is similar on all routers, but the interface will vary drastically depending on which type of router you have in your home.

A LAN router has a unique IP address that is accessible from the LAN called the default gateway. Once this address is known, you need to get into the settings of your router to complete the setup. The next step is to enter this IP address into a web browser and press enter. In my case, it is 10.X.X.XXX and my port forwarding option is buried deep within the advanced firewall settings of my router.

It is then just a matter of entering the settings within the port forwarding tab. In effect, you are telling your WAN address to point the traffic towards a particular IP address which in my case is the train room LAN.

Theoretically, a remote operator should be able to type your WAN address into a web browser to access the TrainController™ PC. As you can see by the diagram in Figure 9, by entering 72.243.14.15 (an example public IP address) into a browser, the request arrives at the router which then forwards it to 10.0.0.155 (the train room PC) via Port 80.

Hang on a minute! Didn't you say not to give the WAN address out to anyone? Yes, that is correct - **DON'T**! To get around this, I assigned the WAN address to a domain name. Therefore, all a remote operator needs to do is enter this domain name into a web browser to access the train room PC. I have used the following domain name: http://mrtvirtualops.com. The setup process could make up another article in and of itself, so I will not go into the details here.

I have gone one step further and have applied the above link to a button within the member area on my website. Once clicked, the button will direct the remote operator to the PC running TrainController™. I have tested the link remotely via a WAN, and it is working well. I am still experimenting with embedding other software into these web pages, such as CCTV feeds.

It is all well and good to have access to remotely view TrainController™ switchboards, but this only allows someone to see where trains are on the switchboard. It will not pinpoint the exact location of a train on the layout. One could install a ridiculous amount of occupancy detection to pinpoint a train's exact location, but this would require detection every few feet or less, which is infeasibly expensive. I believe that ultimately, virtual operations will require the operators to physically see a train and its progress on the layout to properly operate the trains and have a more robust experience. Many other modelers dabbling with this concept are developing it at a far greater rate than me. They seem to agree that building a camera car rig is one way of achieving this.

A camera car is usually a modified flatbed wagon that can support a wireless camera on its deck. This wagon is then placed in front of the locomotives and is pushed around the layout to provide a driver's view of the train making its journey. Incorporating live first-person views on the layout has two benefits: it shows the operator where the train is at any given time, and it looks awesome. Of course, there are limitations. For example, it would be very difficult to do any type of shunting operations with the camera car, as there is no ability to change the field of view of the camera unless the camera car is physically turned around.

Here enters CCTV. Installing multiple CCTV cameras at prominent rail-fan locations, terminals, and yards could help solve this problem. I have been experimenting with a Raspberry Pi Xero W (W for Wi-Fi compatibility) and a small CCTV camera.

Figure 10. *My MRT website Virtual Ops Portal screen.*

The Raspberry Pi is a tiny computer that can be programmed to do various functions. After some programming to the flash drive, the Raspberry Pi video footage from the camera car can be viewed from a URL via an IP address, in a similar fashion to how the TC switchboards are viewed as explained above. Silicon Valley Lines have been doing some very nice work in this space. On their website, they provide a step-by-step guide on how to load the program onto the Raspberry Pi. Here is the link to The SVL CabCam Project: https://siliconvalleylines.com/page/2/. Thank you to Bernhard Beck, the club president, for allowing me to reference and use his work.

If this is of interest to you, but you do not run TrainController™, all is not lost. I have seen some very nice applications using Java Model Railroad Interface (JMRI). Brad Anderson, a fellow Australian, has written a how-to guide utilizing JMRI for NMRA. This can be accessed at http://www.nmra.org.au/mainline/2020/Sept_oct/PDFF_A7T7XS/PDF-Flip/index.html?fbclid=IwAR3TFE7KhZ6FvVIqpOhYTaFR8BOuG0VcLymUb5OspWajH-QduMI0Q80Ypal#pdfflip-PDFF/19/. Thank you also to Brad Anderson for allowing me to reference and use his work.

What Is Next?

My plan moving forward is to use Stream Labs' OBS software to act as a hub to pull all the video feeds (from car-mounted cameras and/or rail-fanning/yard cameras) into one piece of software. Once the video feeds are brought into OBS, I will be able to stream this footage into video conferencing software such as Zoom. It will also preserve some of my internet bandwidth.

Once this is developed, I will be able to share this capability with my virtual operators anywhere in the world. There is a small delay in the video feed, so a virtual operator will need to use both of the supplied feeds to follow their train around my layout: the CCTV video feed via OBS and electronically via the TrainController™ occupancy detection. Unfortunately, the resolution of the video currently is not that great. With time, my video streaming quality will be increased as the quality of my internet improves and as I purchase new cameras which require less bandwidth to broadcast a higher-quality video feed.

As you can see, I have developed my train running software (TrainController™) to be used virtually, but I am still experimenting with the CCTV side of the operations. I believe that in the current world we live in, virtual operations is the next big thing. I am one of many who are working towards this outcome. Of note, there is a great community on Facebook called Remote Model Rail Operations who are more than willing to help.

Do not hesitate to email me at modelrailroadtechniques@gmail.com if you need technical assistance with your installment of TC and remote operations. Once I am up and running, I will need some operators to help me run my large layout and now it does not matter where in the world you live!

About the Author

Darren Johns grew up in South Australia (a state in the southern region of Australia), where he became a railfan with his grandfather from a young age, of the then SAR & ANSouth Australian and the Australian National Railways.

Darren has been a model railroader for 30+ years. He is currently working on his third layout - The Fallen Log Railway, which is a proto-freelanced railroad predominately modeling Eras I - III European locomotives and rolling stock. Darren posts weekly how-to and product review videos on his YouTube channel, Model Railroad Techniques, and can also be found on Facebook @modelrailroadtechniques or his website: www.modelrailroadtechniques.com.

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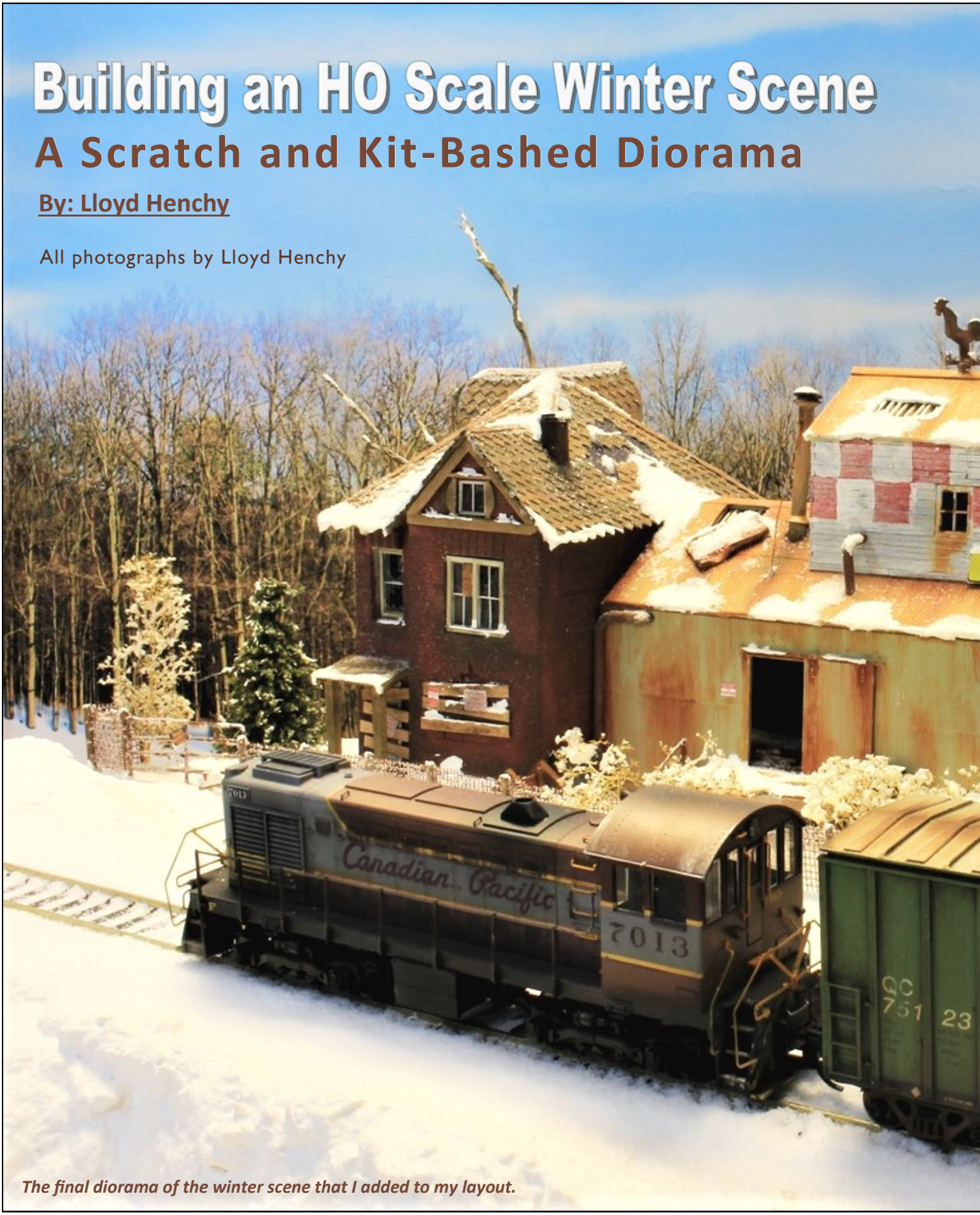
Building an HO Scale Winter Scene

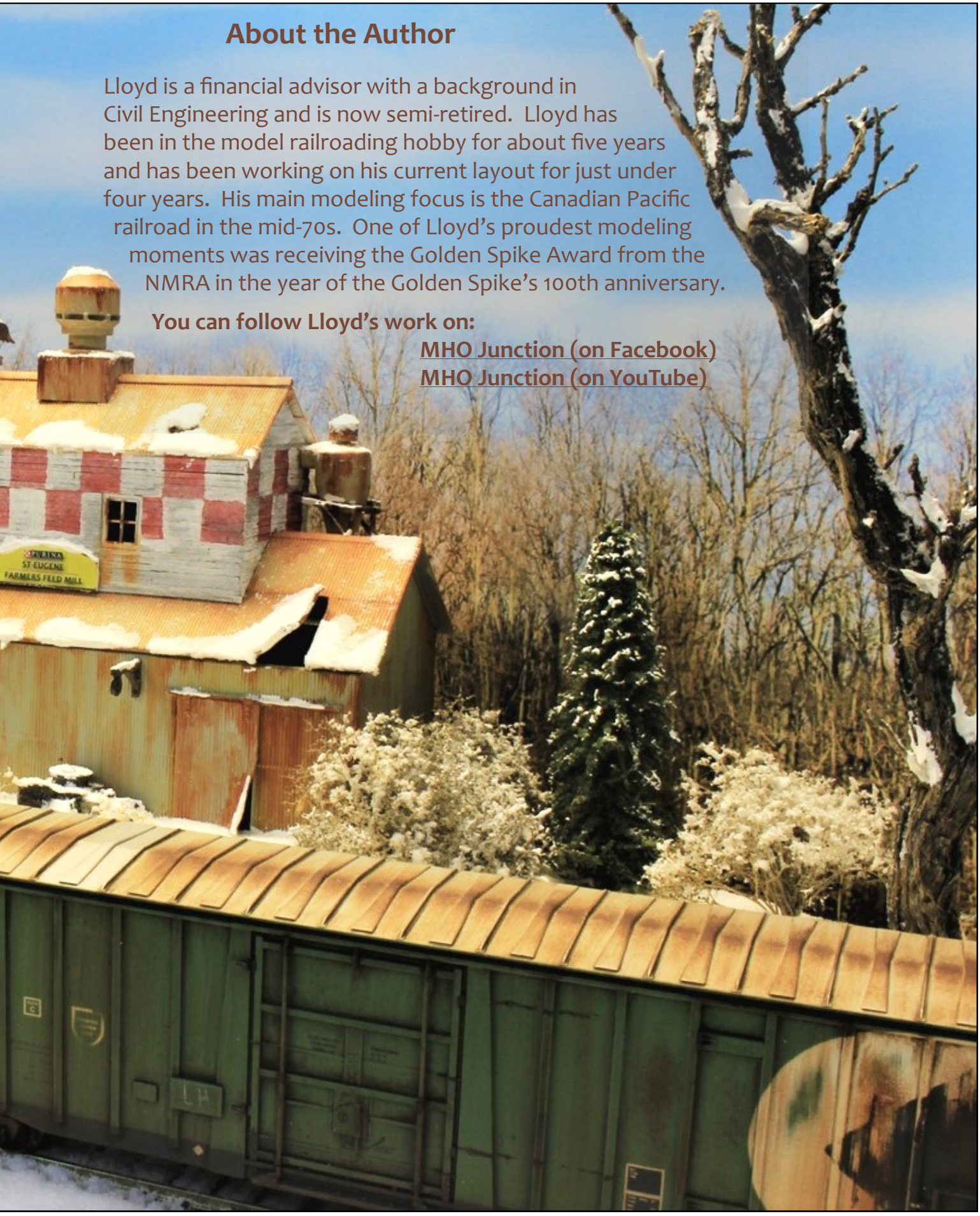
A Scratch and Kit-Bashed Diorama

By: Lloyd Henchy

All photographs by Lloyd Henchy



The final diorama of the winter scene that I added to my layout.



About the Author

Lloyd is a financial advisor with a background in Civil Engineering and is now semi-retired. Lloyd has been in the model railroading hobby for about five years and has been working on his current layout for just under four years. His main modeling focus is the Canadian Pacific railroad in the mid-70s. One of Lloyd's proudest modeling moments was receiving the Golden Spike Award from the NMRA in the year of the Golden Spike's 100th anniversary.

You can follow Lloyd's work on:

MHO Junction (on Facebook)
MHO Junction (on YouTube)

Figure 1. *The Old Anderson Place Hydrocal building from Downtown Deco. This kit became one part of the foundation for the build.*

This project started with my participation in a live YouTube show where the topic of the tutorial series was how to build a Hydrocal structure. So, I had to pick one, but it had to fit my layout's era. The only suitable building I found was The Old Anderson Place from Downtown Deco. It is a decent model, but it needs a bit more to it so, I also bought the Brickworks Storage Building from Walthers. For my project, I decided to model an old abandoned feed mill building. The only thing missing from the kit was an extra level on the roof, which I scratch-built with basswood.

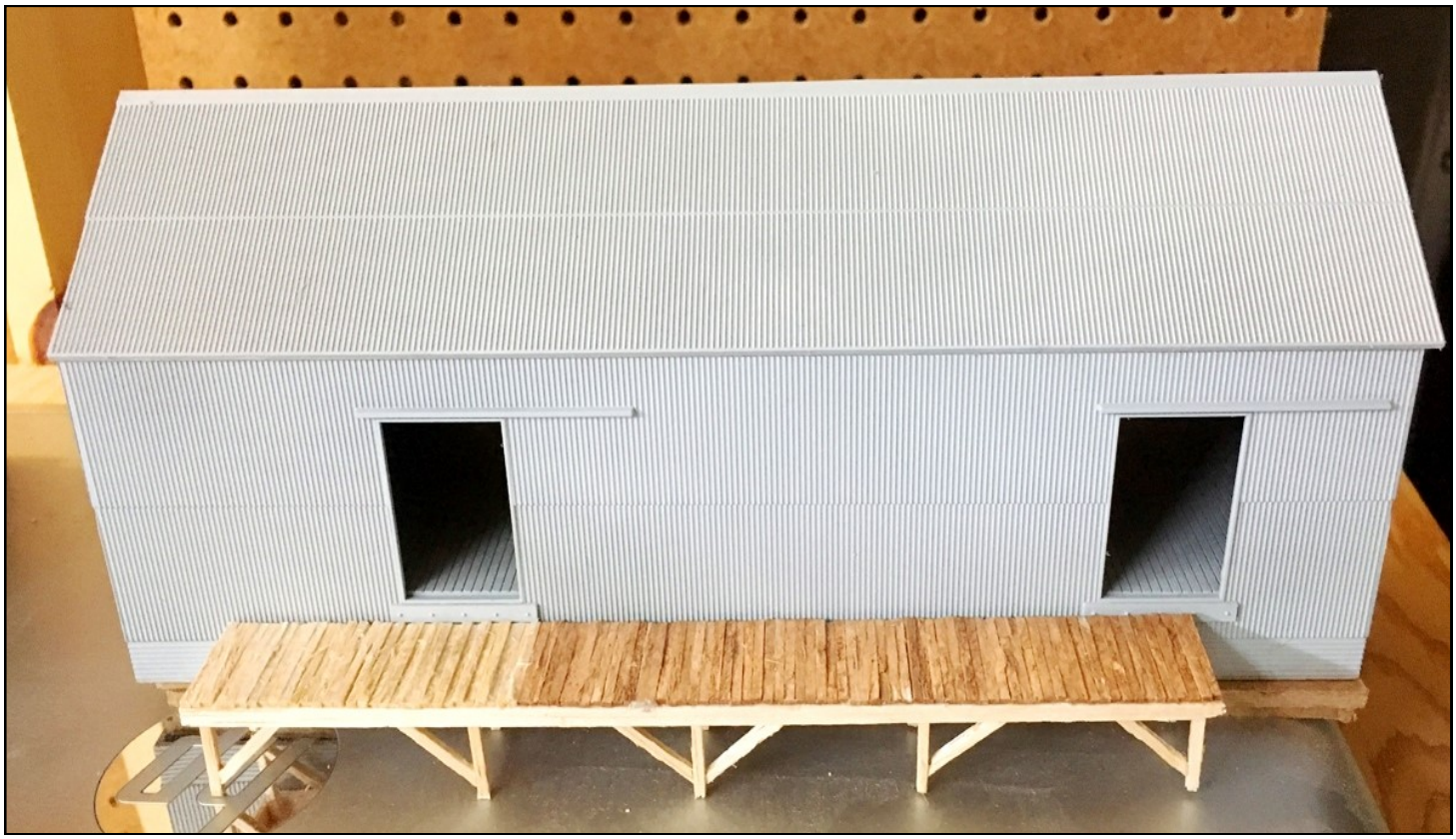


Figure 2 (Above). *The Brickworks Storage Building from Walthers.*
I added it next to The Old Anderson Place to complete the foundation for the build.

Figure 3 (Below)*. I added another structure on top of The Brickworks Storage Building and scratch-built it using basswood for the walls and styrene for the roof.*

Figure 4. *The mockup of all three sections of the feed mill in its final arrangement, along with the loading dock.*

Figure 5. *I weathered the styrene roof of the annex with acrylic paint. I then applied the same weathering technique to the main (Hydrocal) building.*

I started the project by preparing the walls of the Hydrocal building to make them properly fit. To hide the imperfect joints, I added a layer of plaster. I then applied a coat of grey primer on all of the buildings. While waiting for the following show, I worked on the metal roofs, adding rust with gouaches and PanPastel.

During that show, I learned how to paint Hydrocal and proceeded with the weathering. I then added the windows and details. Since this structure represents an abandoned building, I also made a broken window.

In between the shows, I made some progress on other parts. I added sliding doors and roof details, and I painted the top of the structure to resemble the pattern on the Purina feed mills. I also painted rust on the walls and added stairs leading up to the loading dock. See Figure 6. During the final show, I finished the roof by adding strips of roofing tiles and any extra details that I could think of adding.

I decided to turn the finished model into a winter diorama, and if the scene came out the way I wanted, I would then incorporate it in the winter section of my layout. To make the diorama complete, I added additional details such as a gate, fence, track, trees, a pulley, and an oil tank. With those details in place, I was ready to apply the snow. I started with a base made of plaster. Once it dried, I added Flex Paste from Woodland Scenics on top of it and wherever there was a ledge, such as the roofs, windows, and loading dock.

Finally, I added snowflakes from Woodland Scenics and additional details. I broke a few boards on the dock, added two skiers (see Figure 9), added a weathervane on the roof, and two hobos inside warming up near a barrel with fire. I created the fire using an Arduino to flash the

Figure 6 (Above). *The three structures have been completed and assembled to create a scene.*

Figure 7 (Below)*. Notice the details such as the fencing along the track, the tree on the right side, and the gate on the left side, to name a few.*

LEDs, which I mounted inside the barrel. The diorama was now complete and ready to incorporate into my layout.

Figure 8 (Above). *I added snow and ice from Woodland Scenics to complete the winter scene.*

Figure 9 (Below)*. The frigid scene as the final details are added, such as the skiers, the deer, and the signage.*

HARRY'S UP-HUB

Harry M. Haythorn, UPHS #4043

The Atchison Rail Museum

All photographs by Harry M. Haythorn

In this installment of the UP HUB, we go on a short vacation from the car and locomotive modeling to the hometown of Amelia Earhart and the namesake of the Atchison Topeka and Santa Fe Railway (AT&SF) - the town of Atchison, Kansas. It also happens to be my wife's hometown. This town has a great railroad museum with multiple pieces of equipment.

The museum has recently come under new management with an eye to the future of preserving and cosmetically restoring the cars and the steam locomotive on the property. There is a plan to build a trainshed to cover all of the equipment, protecting them from the elements. The trainshed will be reminiscent of the one that sheltered the station platform up until the late 1950s.

There are many interesting and unique pieces on display that date back from the late 1930s to the early 1990s. Displayed items include the AT&SF #811 (a 1920s Baldwin 2-8-0 with cab access) engine, a Missouri Pacific snowplow made from an old tender, multiple cabooses, passenger cars, freight cars, baggage carts, a derrick crane, and other items.

The museum is currently an open-air, unfenced property maintained by the Northeast Kansas Railroaders (NKR) club. The NKR club also has a small modular club layout and display of the Atchison Depot as it stood from 1940 through the 1950s, inside the Depot Museum. In addition, a 7.5 gauge miniature ride is open most weekends from Memorial Day through Labor Day.

So now, let us get to the photo essay portion.

Above: Street view of the open-air museum.

Below: An approaching view of AT&SF 2-8-0 #811.

The Missouri Pacific home-grown plow.

Sarah, my youngest of six, is checking out the cab of #811. It seems all the other kids avoided dad's picture-taking.

Below: Missouri Pacific's wide vision caboose and the arched-roof baggage car.

Some great modeling of the original depot.

The backyard of the depot.

Looking down the yard throat.

A few HO scale model trains at the depot.

Above: Sarah checking out the Missouri Pacific Eagle Service Express boxcar.

Below: Sarah and Elizabeth climbing up the stairs to take a peek inside of Missouri Pacific's arched-roof baggage car.

Above: The Missouri Pacific Eagle Express Service boxcar.

Below: A Union Pacific MoW Dining car in that nasty Kenefick green.

The freight derrick at the end of the former teamster track.

Above: Burlington Northern and Kansas City Southern cabooses.

Below: A fifty-foot boxcar and a Budd coach.

The Budd coach is a recent addition and in need of some serious tender loving care.

Here is the YouTube link to the video I took at the museum: https://youtu.be/nnbu03ZloRM.

I hope you have enjoyed this little vacation. We will get back to our regularly scheduled modeling in the next issue.

About the Author

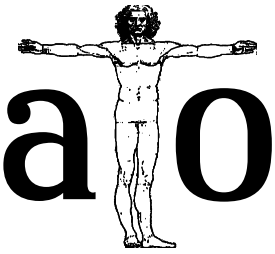
Harry is a rancer in Nebraska who works with his father and grandfather to help run their 22,000-acre, 1,500-head of mother-cow, ranch.

Harry has been model railroading for over 20 years and models the Union Pacific Steam era from the 1930s to the 1960s, in central and western Nebraska.

Harry is a Sustaining Member of the Union Pacific Historical Society and a member of the UPHS Streamliner 100 club. He is a National Model Railroad Association member currently working on his Master Model Railroader Certificate.

Harry regularly posts videos on his YouTube page. You can follow Harry as he works on his 7th layout at https://www.youtube.com/channel/UC6-MPHmYU3Cc2uEVfjZDIcQ.

The Anatomy of a Model Railroad



Part III

By William (Bill) J. Beranek - The Track Planner

Wiring the Layout

Welcome to part three in our series on the Anatomy of a Model Railroad. In part one, we discussed conceptualizing the track plan. In part two, we dealt with benchwork and trackwork. Here in part three, we will discuss wiring the layout. As with part two, part three is primarily picture-based with minimal comments.

Part three will **not** recommend which DCC system is the best, nor why Jim (the layout owner) chose to use the Digitrax system over other manufacturers. Since almost all DCC systems work well, selecting a system is more of a personal choice. We will concentrate on wiring the layout and how Jim used a wire color-coding system and lots of terminal blocks to make troubleshooting electrical glitches much simpler.

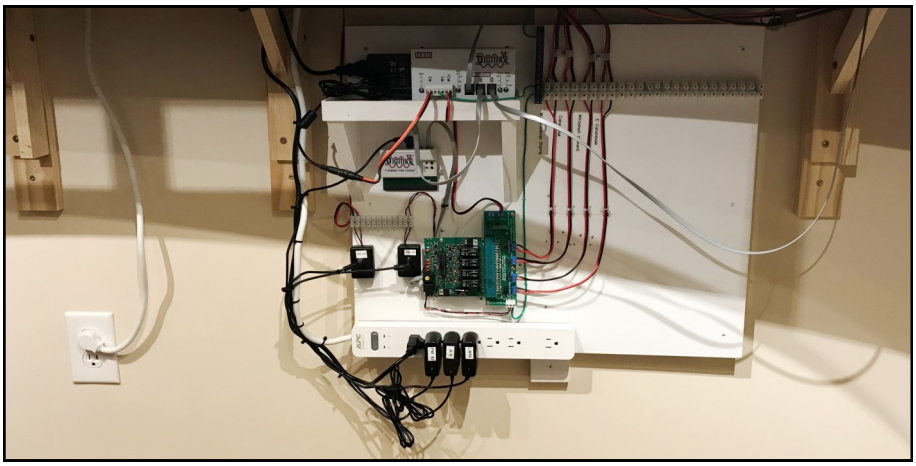
Jim formally worked for Verizon as an installer. That experience proved to Jim that it is necessary to have a well-organized and consistent color-coded system. Many modelers use whatever wire they have lying around instead of spending the extra money to keep things organized.

When modelers do not use a color-coded system, tracing electrical problems can become a total nightmare. At one time, Jim belonged to an N-Trak club where he witnessed a single bus line wire go from black to red to green!

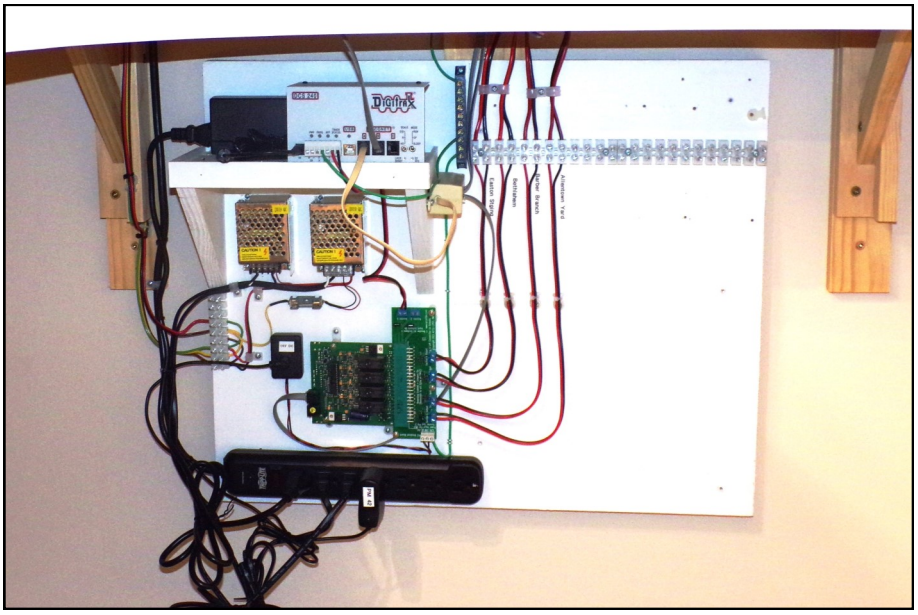
As the accompanying pictures prove when it comes to wiring, Jim is a neat freak. He made liberal use of terminal blocks, or what he calls breakpoints. According to Jim, breakpoints make troubleshooting an electrical problem easier. As Jim stated, "In the long run, the cost of adding additional terminal blocks pays off when you have to go back and troubleshoot a problem."

For example, Jim had a Tortoise switch machine that moved correctly in one direction but moved very slowly in the opposite direction. It

Jim and I want to demonstrate to the community that a fully functioning prototypical transportation system in N scale can be designed and built - a model railroad that can be enjoyed for many years into the future.

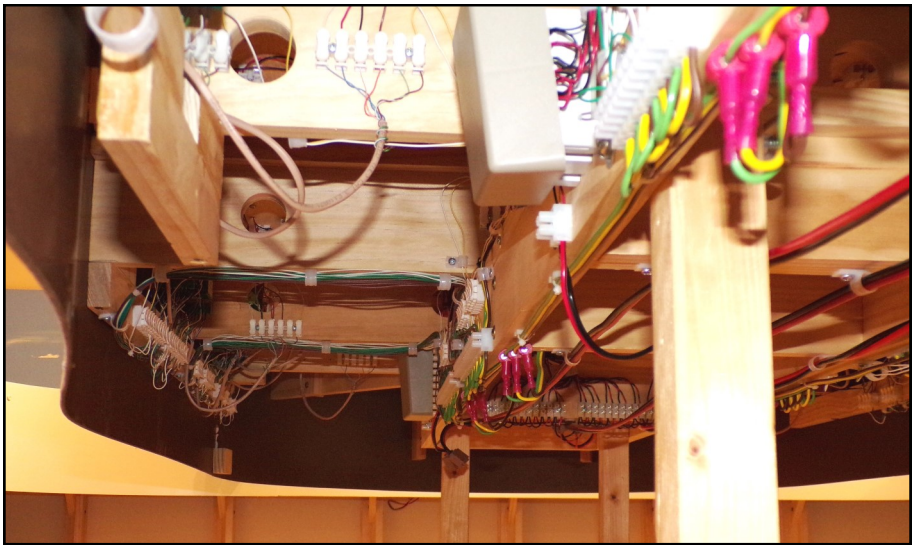


Picture 1.



Picture 2.

Pictures 1 and 2: *Every wiring system should start with well-thought-out command centers.*



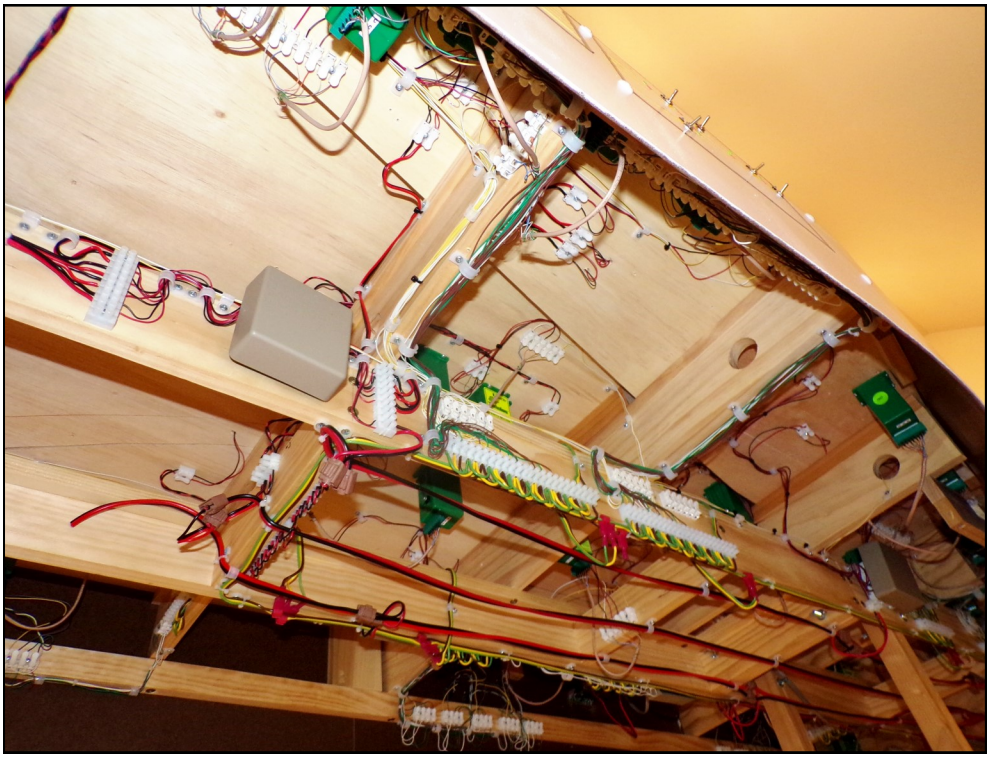
Picture 3.

Picture 3: *Try counting the number of terminal blocks in just this one picture, if you can.*

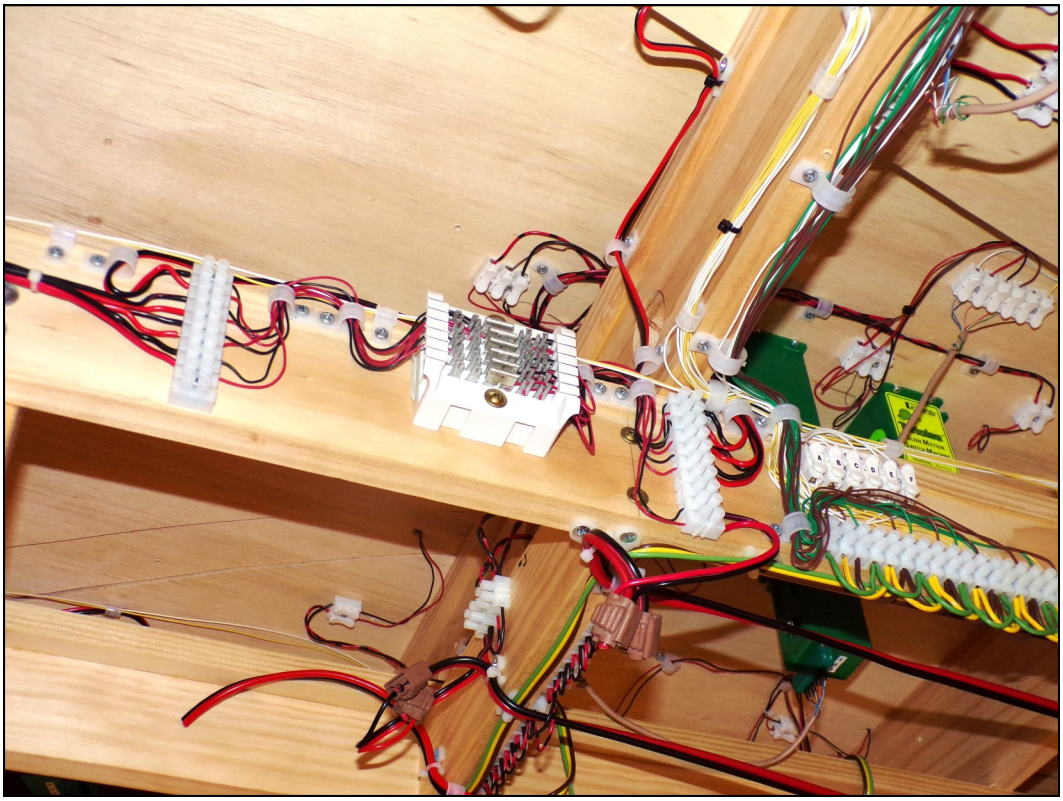
Picture 4.

Picture 4: *Notice every Tortoise switch machine is labeled and has its own terminal block.*

Picture 5.



Picture 5: *Notice the constant in color coding for different types and sizes of wires.*



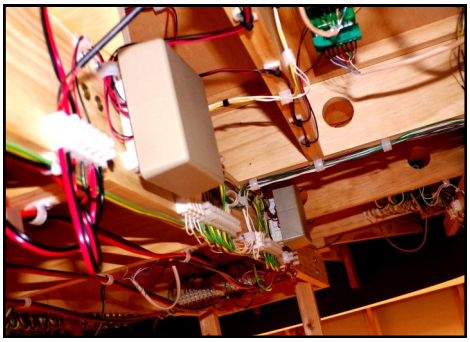
Picture 6: *Notice the use of commercial terminal blocks.*

Picture 6.

Picture 7.

Picture 7:

If you ever needed an example of wiring neatness, this picture ranks right at the top.



Neatness counts!

turned out to be a faulty LED on the fascia. By having multiple break-points (i.e., terminal blocks), the problem was quickly diagnosed and corrected.

Jim's advice: set up a color code standard for everything and stick to it! Never cross-color and spare no expense on the wire. This extra expenditure saves on headaches later!

Jim's Electrical System

- **Command Station:**
  Digitrax DCS 240
- **Booster:**
  Digitrax DCS DB 210 (For Ease of Wiring)
- **Protection:**
  Digitrax PM42 (8 Zones)
- **Radio:**
  Digitrax UR92 and UR93
- **WIFI for Throttle:**
  Digitrax LNWI
- **Power:**
  Digitrax 8 Amp Brick

Jim's Wiring Size & Color Code

- **Bus Wire:**
  12 Gauge Red and Black
- **Turnout Bus Wire:**
  16 Gauge Yellow/Green/Brown
- **Toggle Switch:**
  16 Gauge White
- **Terminal Block to Tortoise:**
  22 Gauge Telco Wire (Four Pairs)
  Pair 1: White-Blue/Blue White,
  Pair 2: White-Orange/Orange-White,
  Pair 3: White-Green/Green-White,
  Pair 4: White-Brown/Brown-White
- **12 Volt Accessory Bus:**
  8 Gauge Red & Black
- **Tortoise & Accessories:**
  Three 12-Volt, 2 Amp Power Supplies

While looking at the pictures, some readers will conclude that the way Jim wired his layout was overkill. I disagree. If you spent your professional career wiring phone systems, why would you not use the same procedures on your model railroad?

A well-designed benchwork is critical to providing a solid base for your modeled scene. Similarly, a reliable electrical system is essential to the smooth and enjoyable operation of all model railroads. If you take the time to study the pictures, I think that everyone can agree they have never seen a more organized wiring system on a model railroad.

Bill – The Track Planner

About the Author

Bill Beranek - The Track Planner has over forty years in the model railroading hobby. Bill enjoys golfing, traveling, and of course designing "prototypical operations" focused track plans.

He has previously served twice as the president and twice as a board member of a local 135+ member model railroad club.

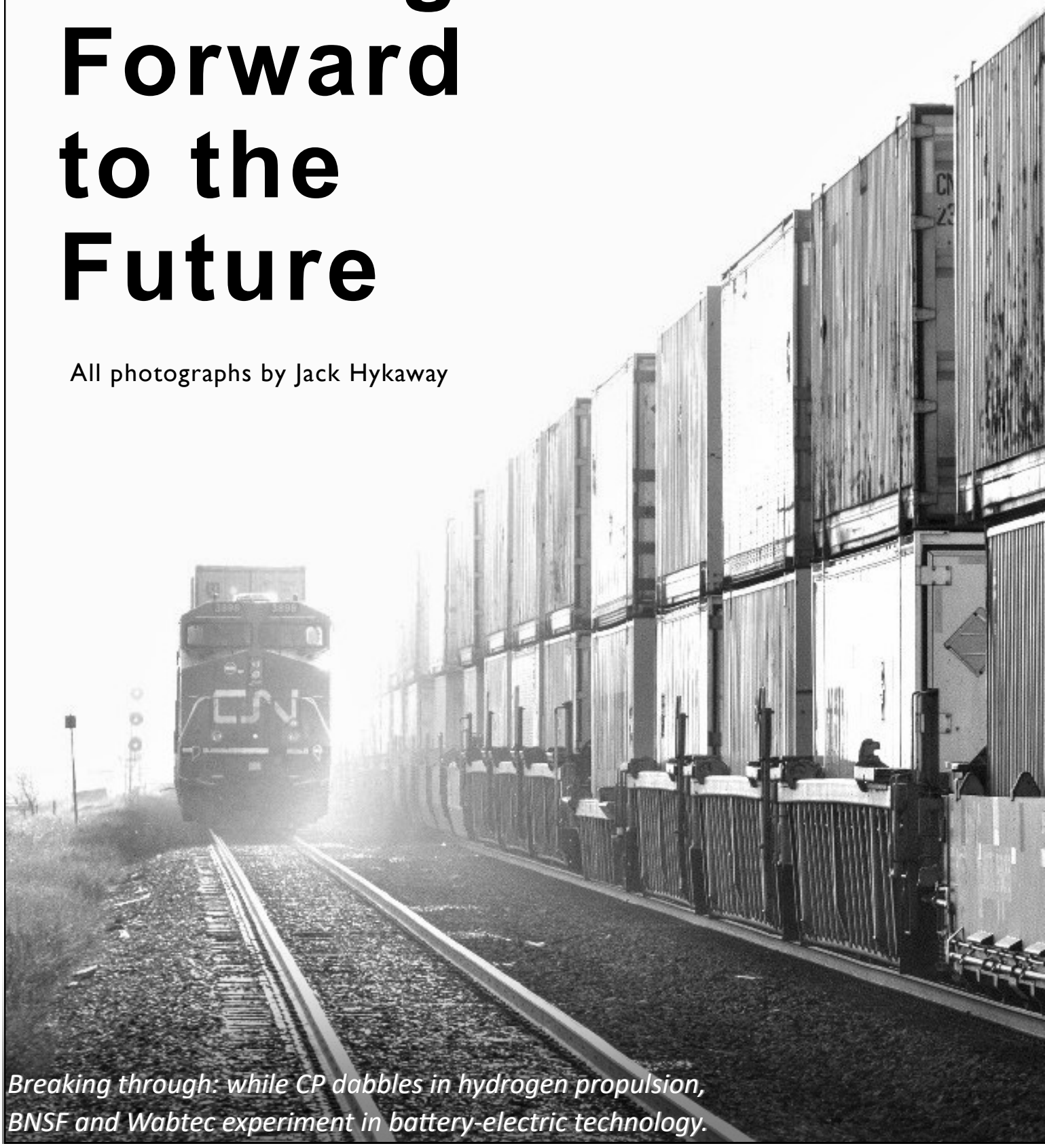
Bill is currently working on his latest triple-deck HO scale layout depicting the SP&S (Spokane, Portland & Seattle Railway) in southern Washington and the OTL (Oregon Trunk Line) on the upper level in northern Oregon in the mid-50s.

You can find out more about Bill—The Track Planner at www.thetrackplanner.com.

Don't miss the next installment of The Anatomy of a Model Railroad.

Looking Forward to the Future

All photographs by Jack Hykaway



Breaking through: while CP dabbles in hydrogen propulsion, BNSF and Wabtec experiment in battery-electric technology.

By Jack Hykaway

The future has always been uncertain. Our societies are flexible, and humans can quickly adapt as circumstances change. We adapt to change begrudgingly; we like to have a well-established routine, and sometimes change is unexpected and difficult to accept at first. *The Modeler's Journal* is adapting, too. With every iteration, the magazine is reviewed and optimized to be more captivating for readers. A significant point in the magazine's history was when regular columns were introduced, where professionals, savants, and modeling experts share their knowledge and advice within each issue. This column was also formed at that time, written by no expert, savant, nor modeling master - just some underqualified teenager who was thrilled to have his content displayed among the amazing talent and skill that is evidenced in each iteration of this magazine.

This issue contains the final installment of Jack's Junction. I do not normally write these pieces in the first person, but I think that this farewell makes for an exception. Over the years - yes, years - this column has become a part of my life. Writing this, I am looking at my corkboard on the wall across from my desk, where I have several pages of poorly kept notes, ideas, statistics, and websites that helped with the writing of each installment of the column. Producing this column has taught me how to do more proficient research and how to better organize my ideas for clarity and purpose. Subconsciously, my writing style was evolving and improving with each quarterly release - something that is especially noticeable while scrolling through previous issues.

While this column is ending, I am not cutting ties with this fantastic magazine. I intend to continue as a content editor, as I have been for many years, and I am looking forward to writing more content for the magazine in the future. I would like to thank all the readers for their continued support of the magazine - your feedback and your enthusiasm are appreciated.

With that, I thought that it would be fitting to discuss the future of railroading in this final edition of Jack's Junction. Railroads are always innovating and searching for a way to optimize their fleet, to ensure that they are poised to perform in the future. With the uncertainty of climate change looming, railroads are actively exploring motive power solutions to reduce emissions and/or to become fully carbon neutral.

Due to the design of a typical diesel-electric locomotive, retrofitting them to be more sustainable is perhaps more straightforward than one would expect. The diesel prime mover onboard does nothing more than generate electricity; there is no mechanical connection that propels the locomotive. Therefore, it is not necessary to redesign the locomotive from the ground up. The only hurdle is to find a way to generate enough electricity in a self-contained mobile powerplant. Today, two primary options are being considered: hydrogen-electric and battery-electric locomotives.

In late 2020, Canadian Pacific (CP) announced a hydrogen locomotive pilot project. CP engineers are stripping a diesel locomotive of its components, filling the now engineless space under the hood with hydrogen fuel cells and batteries. CP has chosen to use Ballard Power System fuel cells to form the main powerplant for this locomotive.

The fuel cells from Ballard use two electrodes, each plated in a thin layer of platinum acting as a catalyst. The anode and cathode sides are separated by an electrolytic membrane. Hydrogen fuel is injected at the anode, where the catalyst dissociates the fuel into free electrons and protons. The electrons are siphoned out of the fuel cell, creating a useable electric current that is used to drive traction motors and onboard systems. The dissociated protons move through the electrolytic membrane, where they gather at the cathode. The circuit terminates at the cathode, where electrons rejoin the dissociated protons. The protons and electrons combine with oxygen from the atmosphere to create water vapor, which is expelled from the system as exhaust.

Each cell can be combined to create larger fuel cell arrays, which makes them highly customizable for many applications with a wide range of electrical needs. In the case of CP's hydrogen pilot project, the locomotive will require 1.2 megawatts (1600HP) to be generated by the hydrogen fuel cells. Once complete, CP will press the locomotive into mainline service, evaluating its performance and viability as an option for the future.

While CP believes that the future is in hydrogen, locomotive manufactur-

The future is turbulent for diesel's reign on North American rails
Hydrogen-electric and battery-electric trials are gaining ground.

er Wabtec has developed a lithium-ion battery-powered locomotive. The FLXdrive locomotive is being tested this year on Burlington Northern Santa Fe (BNSF) trains operating between Barstow and Stockton, California - a distance of 350 miles.

Designed to be used in a hybrid consist made up of battery and conventional diesel locomotives, the FLXdrive battery locomotive will help reduce the railroad's dependence on fossil fuels. The prototype locomotive has approximately 20,000 battery cells, a sophisticated HVAC system to regulate the temperature inside the battery compartment, and an asset-monitoring system to monitor the performance of each battery unit. Wabtec's Trip Optimizer is also employed on the locomotive. This software is already in widespread use on long-haul diesel locomotives to optimize their fuel efficiency by considering factors such as fuel consumption, train speed, power output, and emission levels. Using Trip Optimizer, Wabtec can extend the range of the locomotive significantly.

Using the FLXdrive locomotive as part of a mixed consist, allows its battery power to be used selectively, for example, while cruising over flat terrain to maintain train speed. Following this operating plan, and utilizing Trip Optimizer software, the FLXdrive locomotive has the potential to save hundreds of gallons of diesel fuel in a single trip. With an ability to output 4400HP at full throttle, the locomotive's primary benefit is its ability to use regenerative dynamic braking to charge its batteries and extend its operating range enroute. Traditionally, the energy from dynamic braking on diesel locomotives is lost as heat, and while it is effective to slow the train, it is a wasteful process. On a full battery, the locomotive can operate at full output for 30 to 40 minutes. While this is a meager operating window compared to its diesel-powered counterparts, it is a definitive step in the challenging road to meet a carbon-neutral future on North American freight railways.

The transition from diesel to renewables will be a transformation on par with the shift from steam to diesel traction in the 1950s and the 1960s. New support infrastructure and a change in operations will ensue, however, it will take many years of careful planning and execution for this change to take full effect. While the sounds of V16 diesel engines may fade away from North American rails in time, it is certain that these futuristic locomotives will develop their own charm. I am very excited to see what the future has in store.

Further Reading:

1. https://www.cpr.ca/en/media/cp-to-employ-ballard-fuel-cells-in-hydrogen-locomotive-project
2. https://www.railway-technology.com/news/cp-ballard-hydrogen-locomotive-program/
3. https://www.wabteccorp.com/locomotive/alternative-fuel-locomotives/flxdrive
4. https://www.railwayage.com/news/bnsf-wabtec-advancing-the-future-of-motive-power/
5. https://www.ieee.ca/millennium/ballard/ballard_info.html#:~:text=Hydrogen%20fuel%2C%20which%20can%20be,the%20fuel%20cell's%20electrochemical%20reaction.

About the Author

Jack Hykaway is a student, currently attending a post-secondary institution in his hometown of Winnipeg, Canada. He is an amateur videographer and writer and enjoys exploring and documenting nearby railroads and railroad operations in both written and visual formats of his work.

Jack's main focus of late has been producing his column Jack's Junction for *The Modeler's Journal.*

Follow along with Jack's videography on his YouTube channel at https://www.youtube.com/user/WinnipegRailfanner1.

Jack Hykaway

The Trackside Photographer

If you are looking for a wealth of interesting railroad lore along the tracks: depots, freight houses, signals, interlocking towers, bridges, trestles, shops, turntables and other trackside structures and equipment, then look no further than *The Trackside Photographer*.

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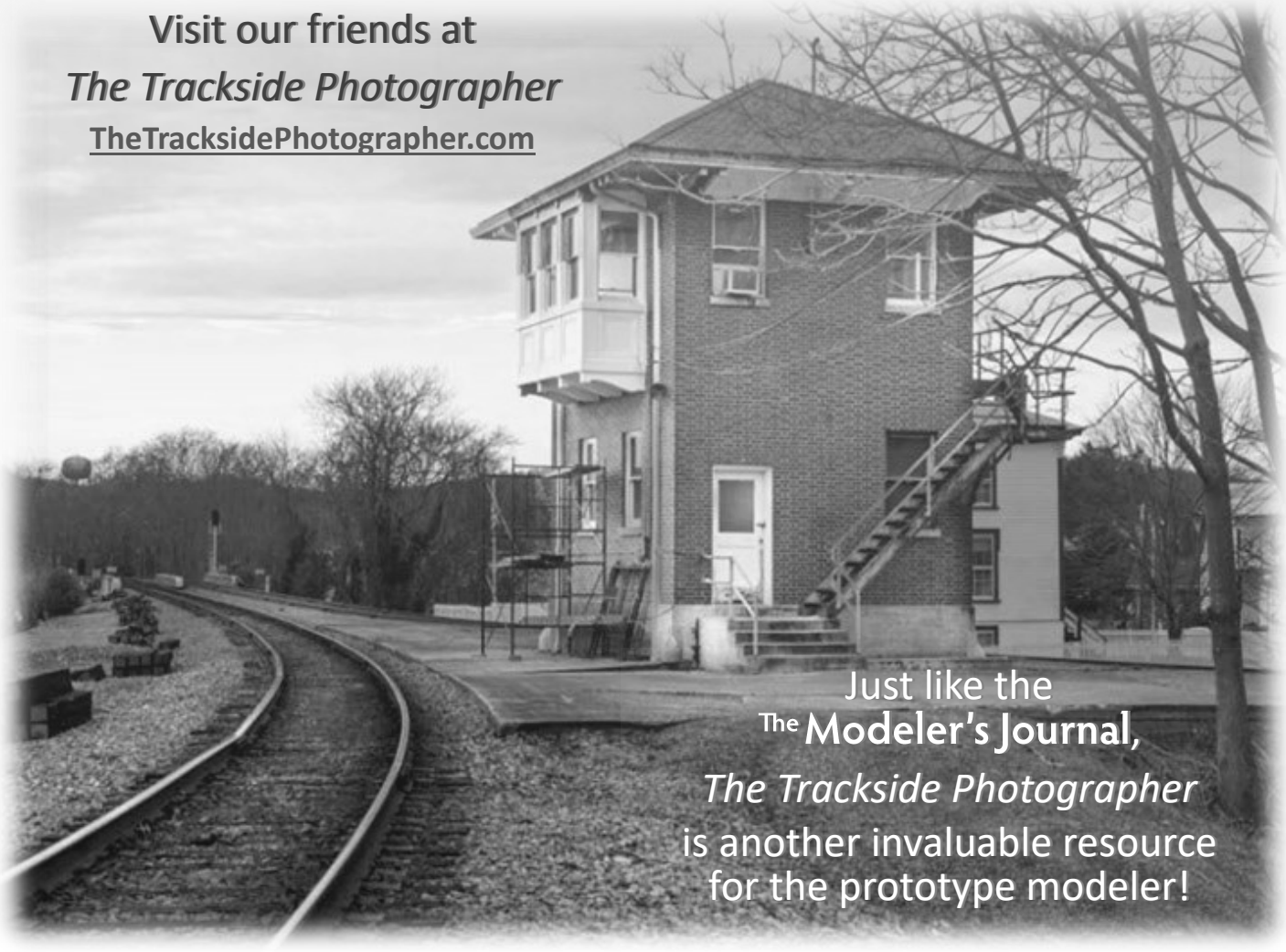

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A rear view of the USS Carl Vinson aircraft carrier model.
Photograph Courtesy of David Kopielski