



Foundation FTL Ship

by Changhui Yang

2024 IPMS Nationals - Best In Show

I have always been a fan of science fiction and the fantastic and unusual shapes of spaceships like those found in Star Trek and Star Wars, those that have dramatically broke away from the traditional pointy rocket ships from the 1950's. As a modeler who loves to scratch-build, these unusual shapes and configurations always appealed to me as they challenged my abilities.

One such vessel is the Foundation FTL Ship which is loosely based on Issac Asimov's book series of the same title. The FX designers for the Foundation show are superb sci-fi visionaries. The set design, costumes and, heck, even the language font evoke a view of tomorrow that is elegant, stately and futuristic.

One of the first interstellar ships to appear in the show is the faster-than-light (FTL) civilian ship. In my opinion, this ship is the most beautiful sci-fi ship in recent memories. It is tall and slim like an angelfish. Its curves are all well-proportioned to convey practicality and elegance at the same time. The center circle conveys a level of future engineering confidence we don't yet have in real life.

Shortly after the show started airing, I had just completed my scratch-built 1/144 scale Blockade Runner (IPMS National 2023 San Marcos Best of Real Space winner) and I was searching for my next big project. This Foundation ship design really appealed to me and making it my next project was a no-brainer.

TRANSITIONING FROM SCRATCH-BUILDING TO SCRATCH- PRINTING

After several weeks of web-surfing I started collecting as much information about the ship as possible and taking screen shots of the ship as seen in the show. I used this time to get familiar with the design so that I could visualize how to parse the ship into components for construction.

During my research I learned that the studio built a 6 ft model of the ship, and I found it reassuring to know that physical models still have a place in today's movie industry.

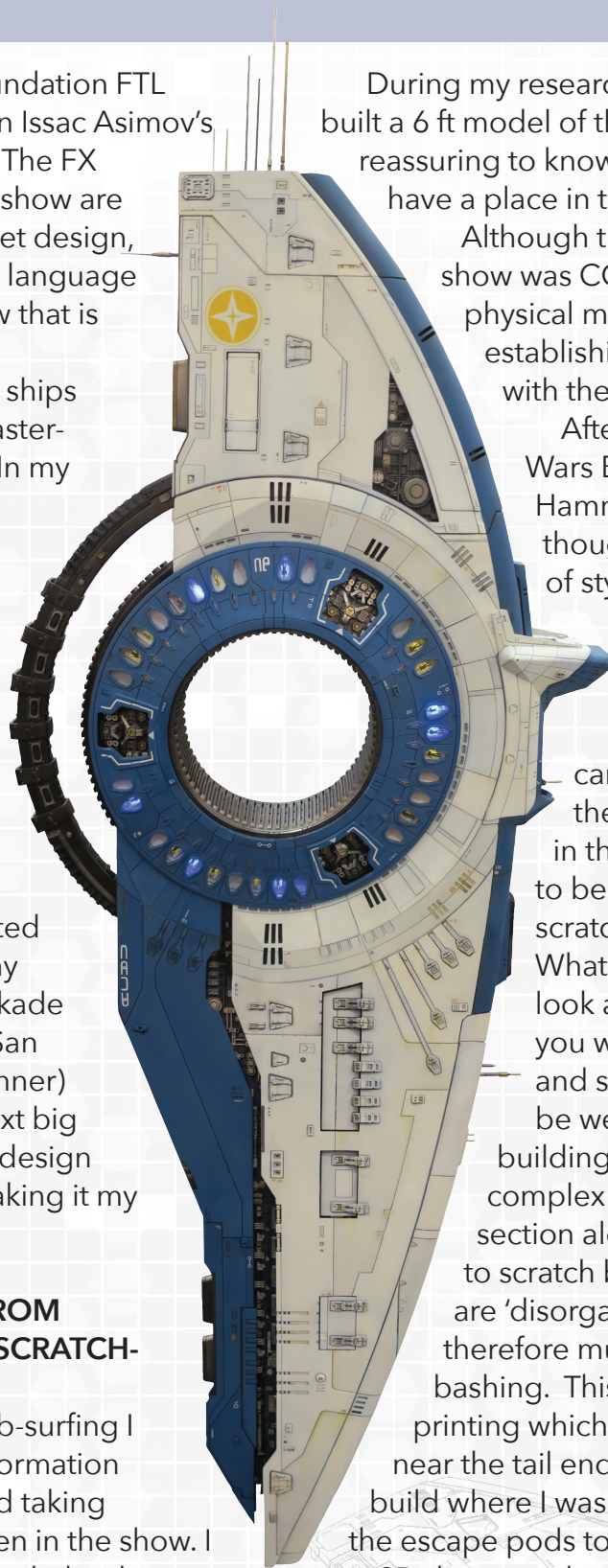
Although the footage used in the show was CGI, I suspect that the physical model was helpful in establishing how light will interact with the ship in real life.

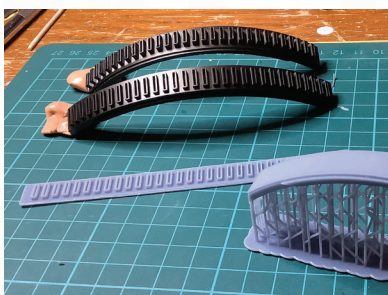
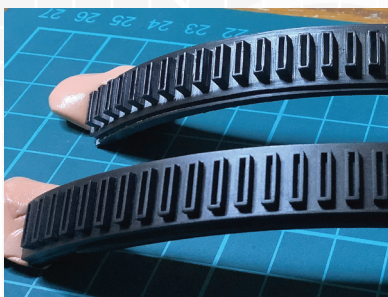
After building the Star Wars Blockade Runner and Hammerhead Corvette, I thought building this ship out of styrene would be possible, but three weeks into the build process, I realized how naïve I was. After several styrene failures, I

came to the realization that the curves and complexities in the ship design were going to be too much for styrene scratch-building to handle. What do I mean by that? If you look at Star Wars ship designs, you will find a lot of flat surfaces and straight edges that can be well handled with scratch

building. But in comparison, the complex curves in just bridge section alone were near impossible to scratch build. Star Wars designs are 'disorganized' and random, and therefore much more amenable to kit bashing. This required me to turn to 3D printing which I started learning about near the tail end of my Blockade Runner build where I was able to design and print the escape pods to my satisfaction.

3D design and print have some significant advantages, and the technology has matured to the point where you can print at 35 microns





(1.5 mil or 1/5 human hair width) resolution with a just \$200 machine. Moreover, learning to 3D draw and print basic shapes only took me only 30 mins to learn using Sketchup. Now, being able to draw and print allows me to iteratively optimize a design, thus eliminating many scratch-building challenges.

SCRATCH-PRINTING PROCESS

I use an Anycubic Mono 6K 3D printer which has a 20 cm x 12 cm (9 inch x 5 inch) print area which means that I needed to design my model pieces small enough to print and easy enough to assemble into a whole. The Anycubic Mono 6K 3D is about \$300 for a refurbished model from eBay.

I chose Anycubic ABS-like pro resin as it is less brittle than the basic resin and has promising longevity properties even after a year of exposure, with no appreciable increase in brittleness or

warping. One of the disadvantages to 3D resin is that it tends to be very brittle compared to usual styrene or plastic parts as they tend to break almost like porcelain.

Seeing that the Foundation ship at 1/350 scale would measure out at 2.5 ft tall and 1 inch wide, I was very mindful that the model could very well collapse under its own weight.

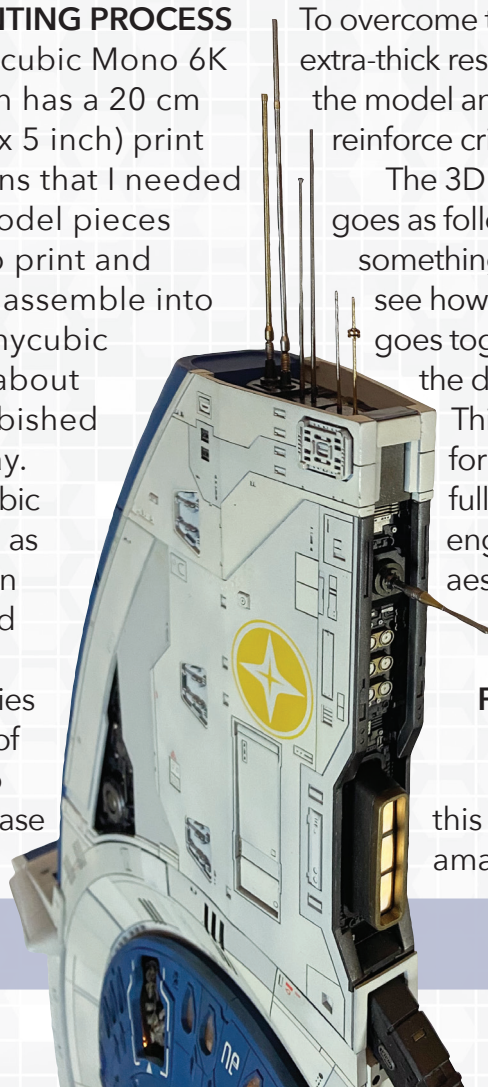
To overcome this, I designed extra-thick resin supports within the model and used Milliput to reinforce critical points.

The 3D design process goes as follows. First, I design something, then print it out, see how well the whole thing goes together, then tweak the design and repeat.

This process went on for two month until I was fully satisfied with the engineering fit and the aesthetic look.

THE ACTUAL FOUNDATION FTL MODEL MAKER

It was about this this time that I had the amazing opportunity



to meet the miniature model supervisor of the Foundation show, Ian Hunter who is an Academy Award winning FX artist. Knowing Ian was a frequent customer of my favorite hobby store, the Burbank House of Hobbies, bumping into him was not a total surprise. I learned a lot about the ship design during our chat such as the blue and white color scheme was intended to mirror PanAm's colors, because this was a civilian transport ship of the future. He later surprised me by sending me a link to unreleased studio photos of the model photos which answered many questions on various parts of the ship. If you ever visit Burbank House of Hobbies, check out the 'movie accurate' models that Ian built for them.

BUILDING AND LIGHTING THE SHIP BRIDGE

Sci-fi modelers are sometimes considered the red-haired stepchildren of the modeling community, and one defining weirdness that we have in common is that we love wiring our models with lights and sounds. True to my red-haired stepchild nature, lighting the Foundation ship was not an option, it was absolutely necessary.

Lighting the bridge posed many challenges such as ambient ceiling and control panel lights of different colors and intensities in addition to the limited amount

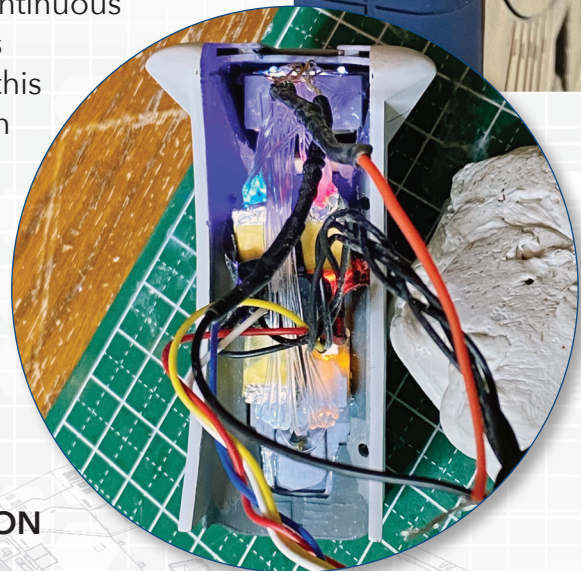
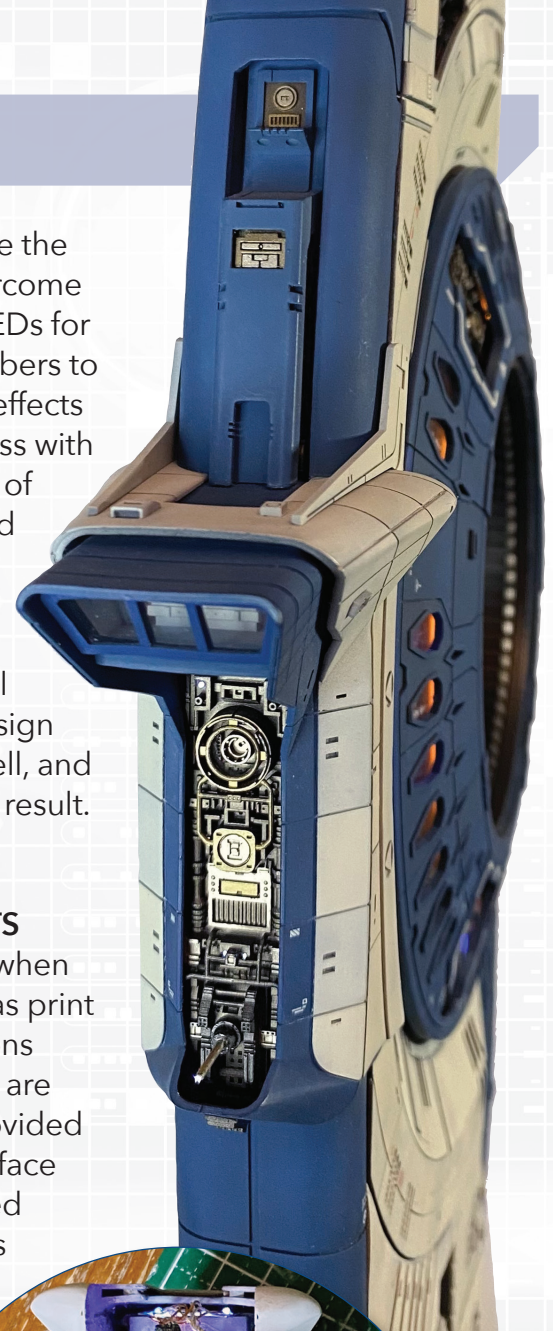
of space available to house the lighting elements. To overcome this, I used tiny microLEDs for ceiling lights and optical fibers to channel to create back-lit effects attached to photoetch brass with pinpoint holes at the back of the bridge. Later I tweaked the lighting levels by changing the values of the LED resistors. The entire process took several months and numerous design iterations to implement well, and I was quite happy with the result.

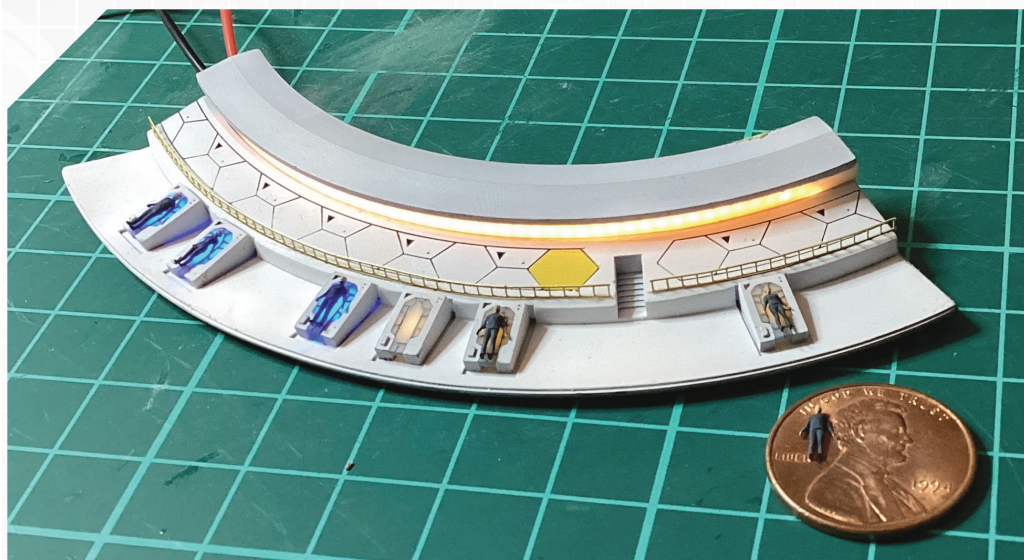
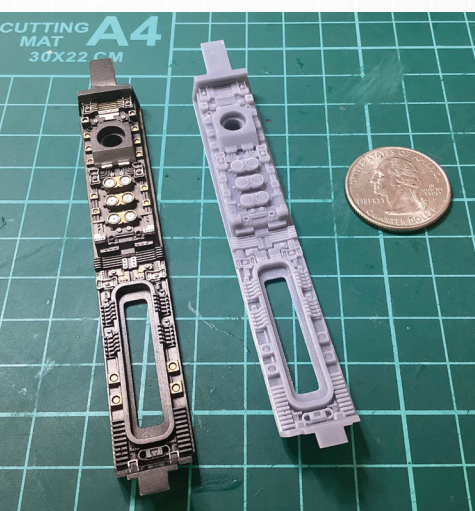
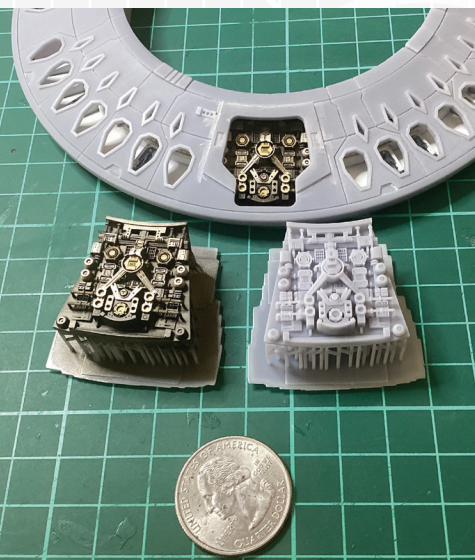
PRINT LINES AND CURVED PARTS

Sanding is a constant when working with resin prints, as print lines and print imperfections are inevitable. Resin prints are relatively easy to sand, provided you have a continuous surface to sand. As such, I designed my parts with a continuous surface as often as possible to aid in this task. These design considerations were common and had to be addressed at every stage so that I could stay ahead of the print line issue.

THE HIBERNATION RING

I started working on the hibernation ring by scratch





building the ring top with styrene. To ensure the windows looked uniform, I 3D designed and printed window fittings that can pop into the openings, and I was very pleased with this hybrid scratch-print and scratch-build approach.

I used LED filaments to provide ambient light and the Individual hibernation pods were lit by microlitz LEDs and to create the translucent bed effect, I printed the top of the bed with a mix of transparent and white resins.

Designing and printing the passengers was fun, although challenging. The arms on the 1/350 scale people were exceptionally thin, at about 100 microns (4 mils), and many arms were broken during the painting process. I was pleasantly surprised that my male and female passengers were distinct enough that you can tell their gender apart.

SCRATCH BUILDING

As the model took its final shape, I used my scratch building skills to add final touches to the

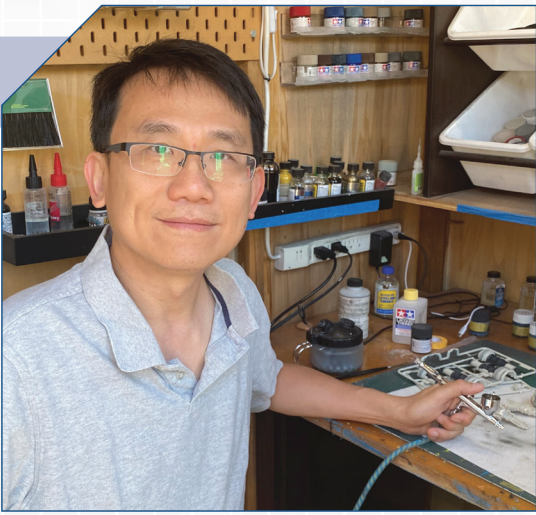
model. I scrutinized every inch of the model under different lighting conditions and covered up all trouble spots with greeblies.

I also cut and pasted different thicknesses of styrene pieces onto existing panels to add more panel thickness variations to the model. These vary from 0.13 mm to 0.25 mm as well as Evergreen styrene sheet variations. These are very subtle but at a 3-inch viewing distance, the viewers' eye will be able to stereoscopically pick up those variations - helping to convey scale.

PAINTING

The painting process took 3 months to complete. I did not prime the model because I did not want the heavy primer to obscure some of the finer features. Instead, I used Tamiya Nato Black as the base coat for the model, followed by a mix of Tamiya Deck Tan and White. The blue on the ship was a mix of different Tamiya greys and blues. The metallic parts were painted with Tamiya gloss black as base and different Alclad

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mixes for a range of metallic hues.

The weathering was done with oil paints and washes. Once the oil paints have dried, I would beat the contrast back by lightly airbrushing on the same panel colors. I would repeat the process multiple times to give the model a subtle weathered look.

BUILDING MINDSET

I genuinely love scale modeling for its build process. I like spending time concentrating on each small component and doing my utmost best with each segment. I call this my 'flow state', which is a welcome relief from a tough and hectic workday. The challenges presented by our hobby are joyful opportunities to innovate and find creative solutions. I like long projects because I love the journey more than the end point. The Foundation ship took 15 months to complete which was fast compared to the Blockade Runner that took 30 months to complete. I get sad when I am near the end of every build, because this means I need to go find another ship design that sparks joy for me.

Meet Changhuei Yang

by Bob Lomassaro

If you frequent IPMS National Conventions and IPMS regional model shows you may have already met Yang and seen his incredible models. For Yang is not only a gifted model maker, he is also one of the most likeable modelers you'll have the good fortune to meet.

Yang's model building story starts in Singapore, where as a young boy from a poor background, he was unable to afford many model kits. To satisfy his need to build he started building sci-fi vehicle models out of card stock, tape and glue, and would customize them using magnets and LEDs found in discarded appliances. On the rare occasions when he got his hands on a plastic model kit, he would spend months on a single build just to get the most out of every kit.

In 1993, at age 21, he immigrated to the United States to complete his education where he eventually obtained a PhD in Electrical Engineering from MIT. He now lives in South Pasadena with his 13-year-old son and wife, a medical practitioner. When not building models, Yang is a Professor at a California University.

Like many of us, Yang took several years off from building models to meet the demands of his career and family. It was not until six years ago after purchasing a Bandai Star Wars kit that he realized just how much he missed the hobby and the mental and social benefits of building models.

Yang's model building has now gone full circle with most of his builds now almost totally built from scratch, albeit this time from styrene plastic and resin instead of card stock. Yang found that what he likes the most of building models is what he calls the "Journey", which he described as the process of planning, building and finishing. He enjoys spending weeks designing and constructing each small part to the best of his ability, knowing that each component will contribute positively to the overall build. As an engineer this type of concentration on fine details comes natural to him and results in what he described as entering a 'flow state' of relaxation and micro-focus. One of his first big scratch builds was a 3-foot-long Star Wars Blockade Runner which took two years to build and earned him several First Place Awards.

He enjoys attending IPMS model shows as it allows him the opportunity to share his work with others and to see the fruits of his 'journey' being appreciated by those in attendance. But what he likes most about attending IPMS shows is the camaraderie of other modelers and seeing friends that he has made over the years. "Modelers are some of the most down-to-earth wonderful people. Going to a show is like going to a big happy family gathering," he says. He also enjoys seeing the models of other builders and asking questions as to how they achieved a special effect or a realistic paint finish. This type of interaction and exchange of ideas serves to push his creative envelope further and challenges him to new levels.

Yang is taking a break from 'big builds' right now and is working on detailing a Revell ARC-170 Star Wars ship while he searches for his next 'big build'. His last was the Foundation FTL ship from Isaac Asimov's Foundation Trilogy which earned him a Best of Show Award at the National Convention and took 15 months to build.

As fellow modelers we all look forward to seeing Yang again soon, not only for his fantastic model builds but also for his affable personality and his highly contagious smile.