



Apollo Historical Series – Crawler Transporter

Model Designed by: Alfonso X. Moreno
<http://www.axmpaperspacescalemodels.com/>

Adapted to 1/480th Scale: Michael Burke

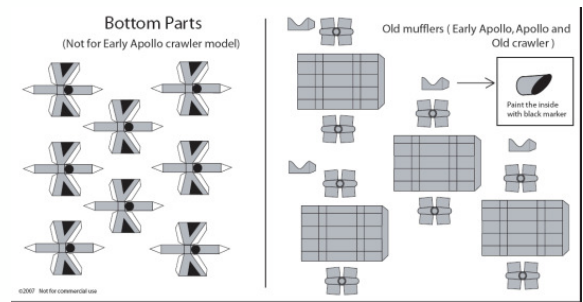
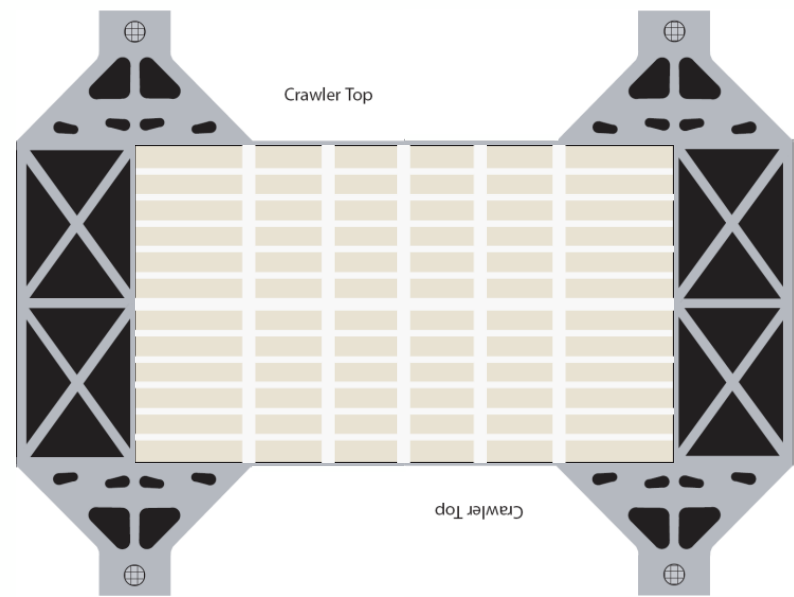
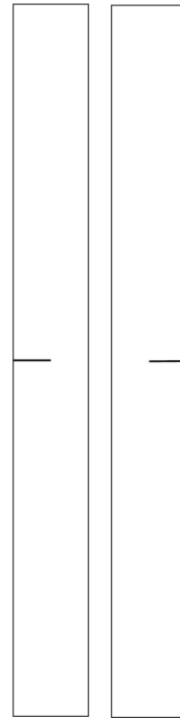
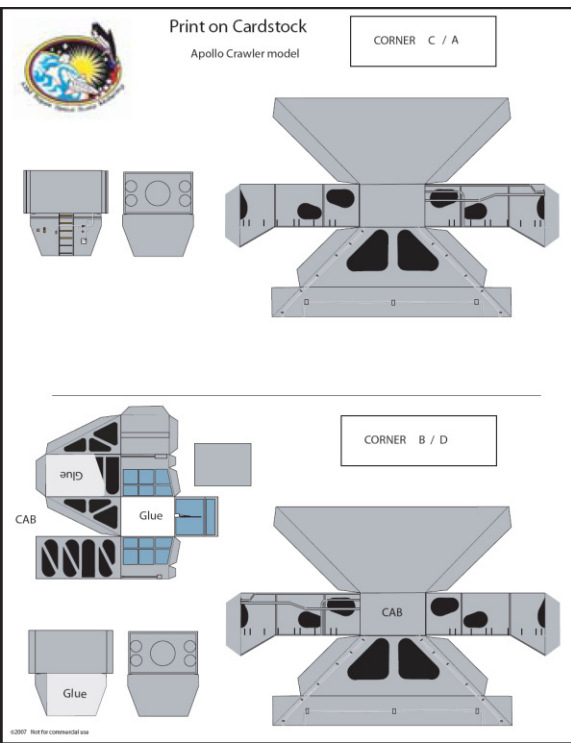
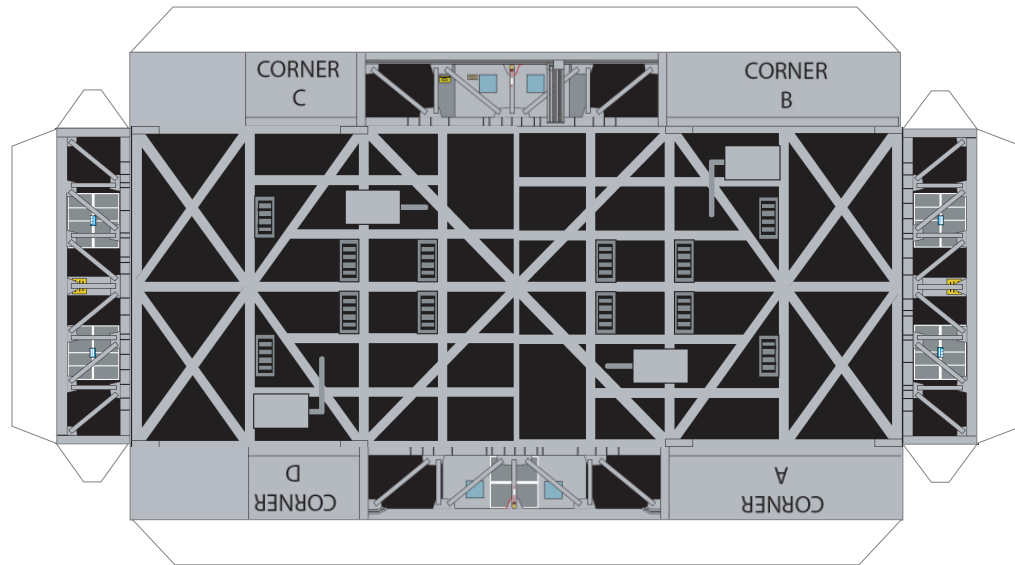
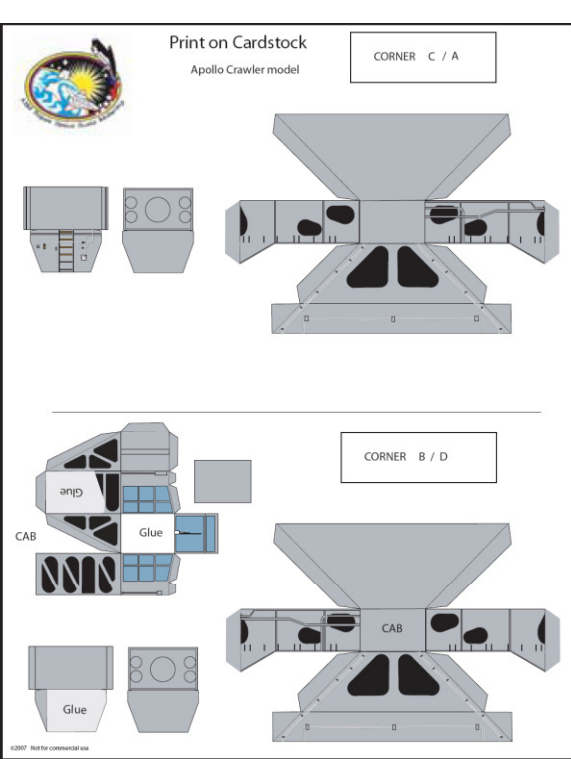
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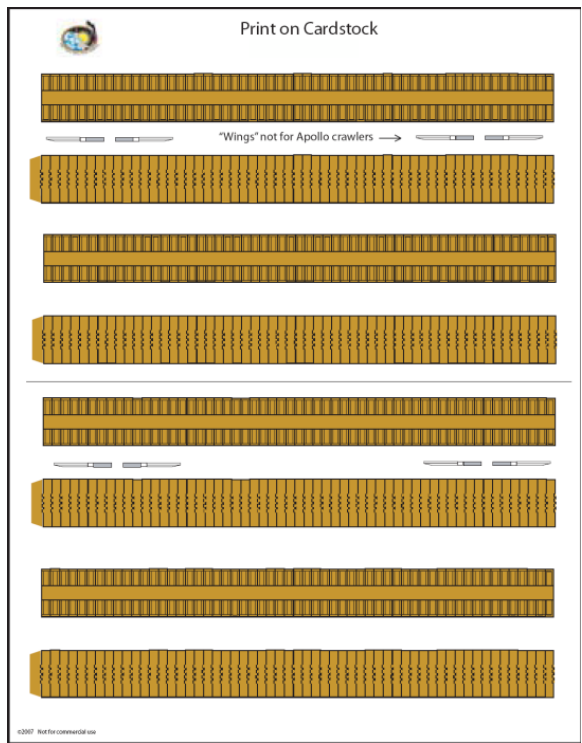
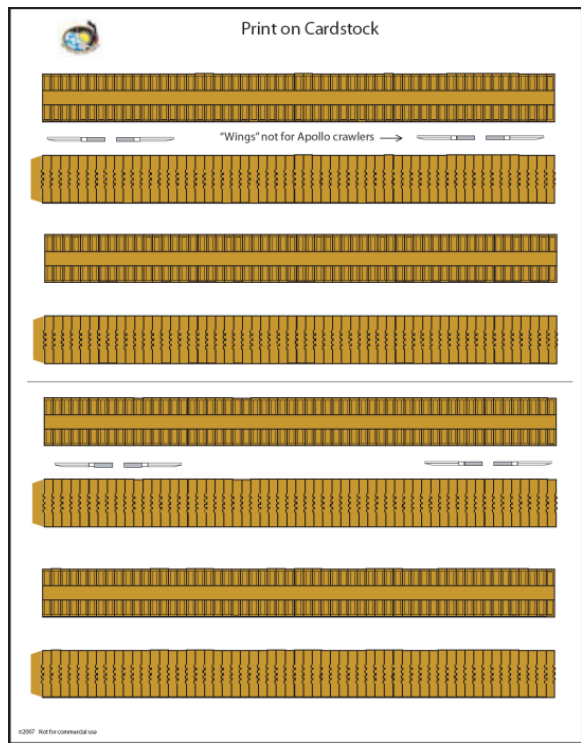
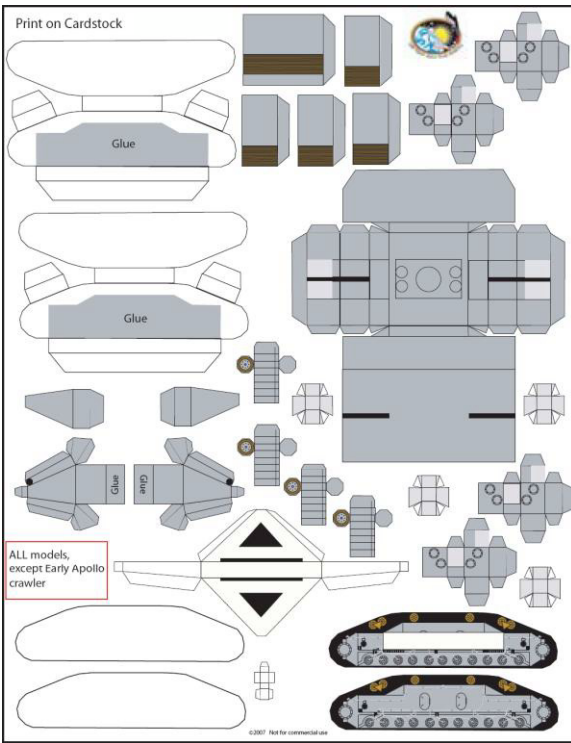
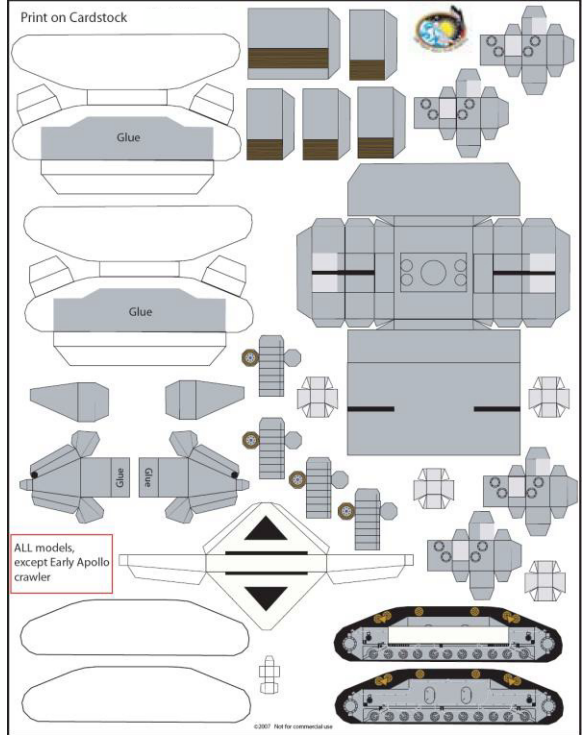
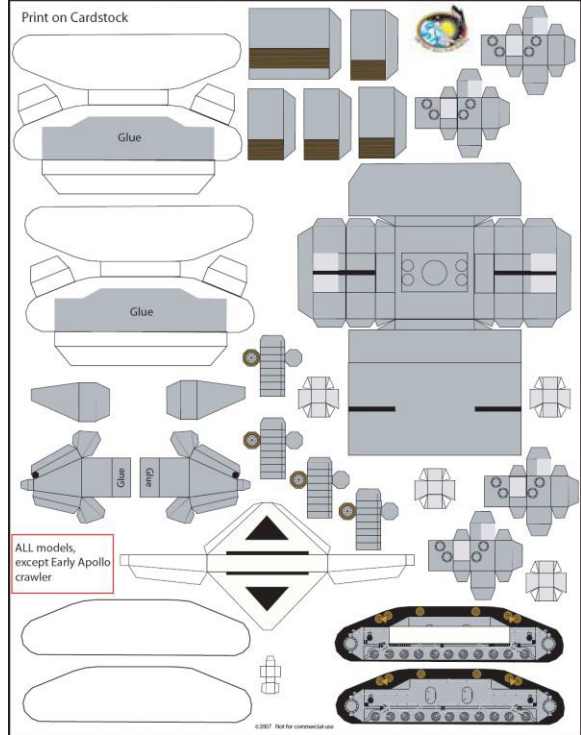
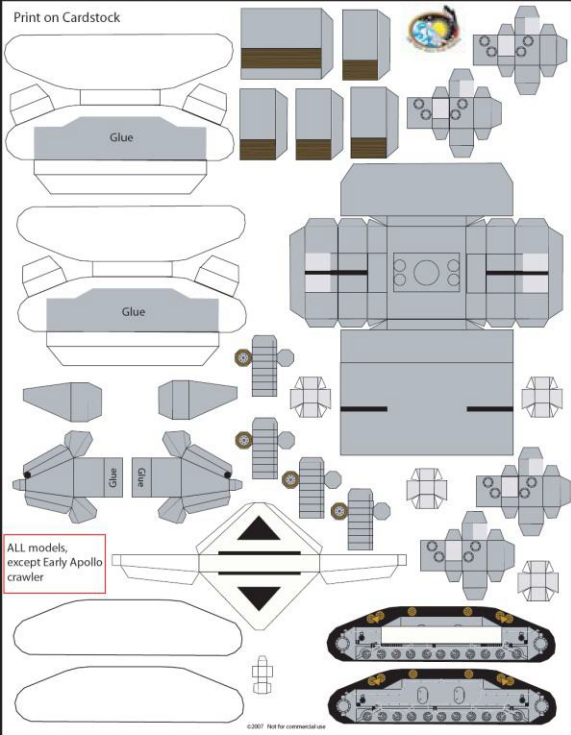
This is a scaledown of the Crawler/Transporter model found at AXM Paper Scale Modeling and is used with the designer's express consent. All rights to this model are owned by Mr. Alfonso Moreno. (Thanks Alfonso -- I'm happy you're aboard!)

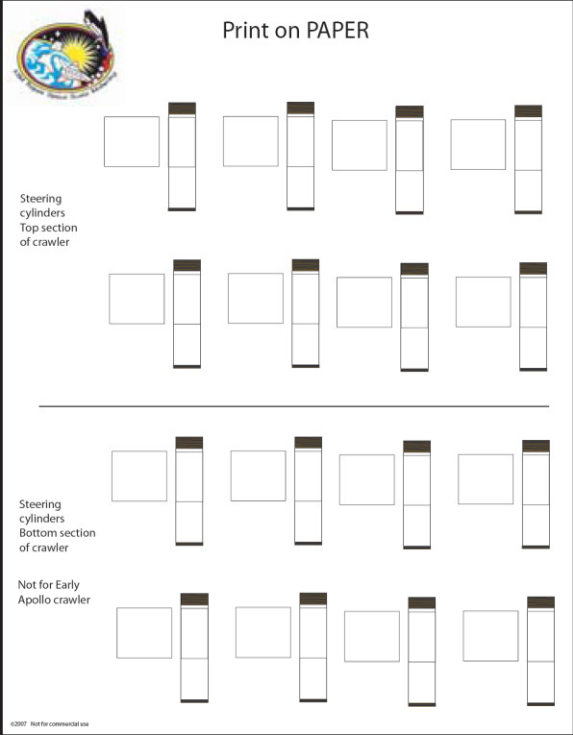
In sizing the model to 1/480th scale, I took the liberty of combining a few of the parts in order to simplify construction at this scale. This will hopefully become obvious as you look at the parts in comparison to the instructions. Any problems resulting from this are purely the fault of the Adapter.

All of the parts of the original Apollo Crawler kit are included here for completeness. Given the smallness of the parts, some of the details could reasonably be left off at the modeler's discretion.

Mike

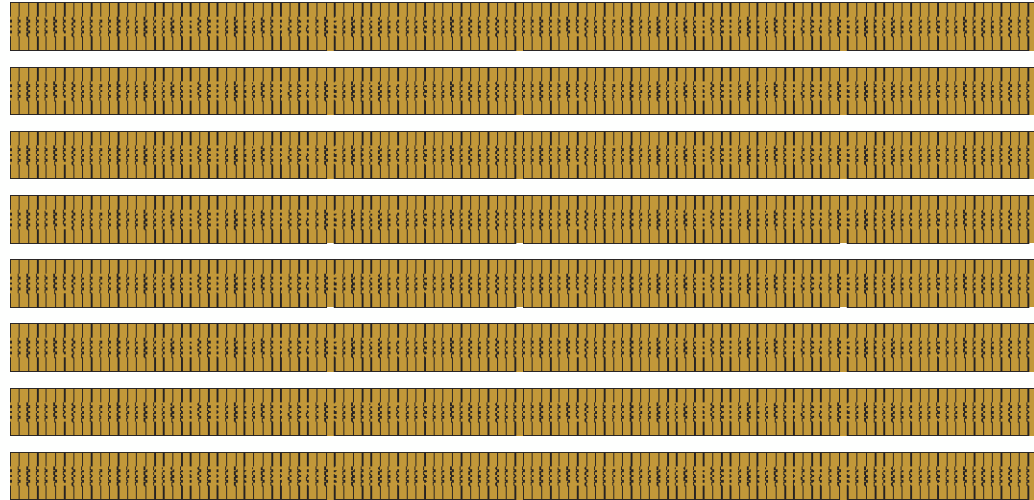




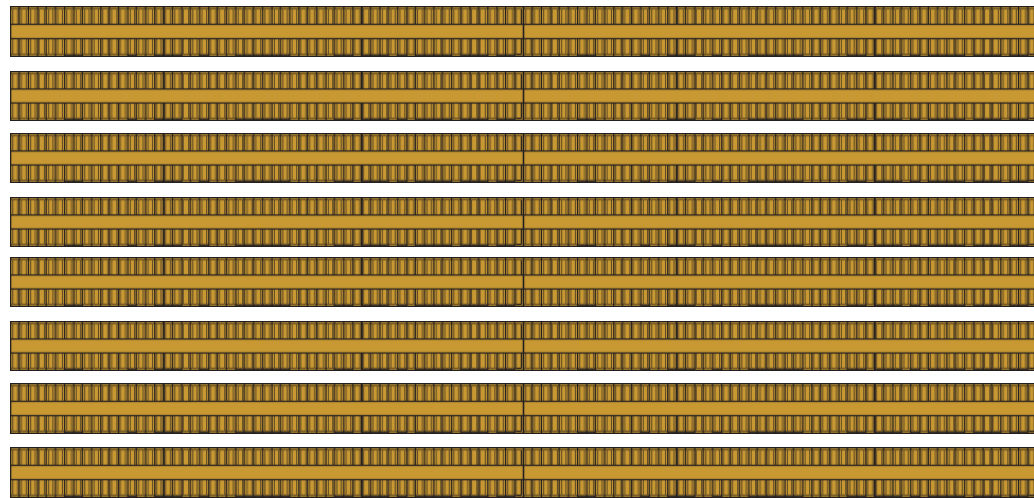


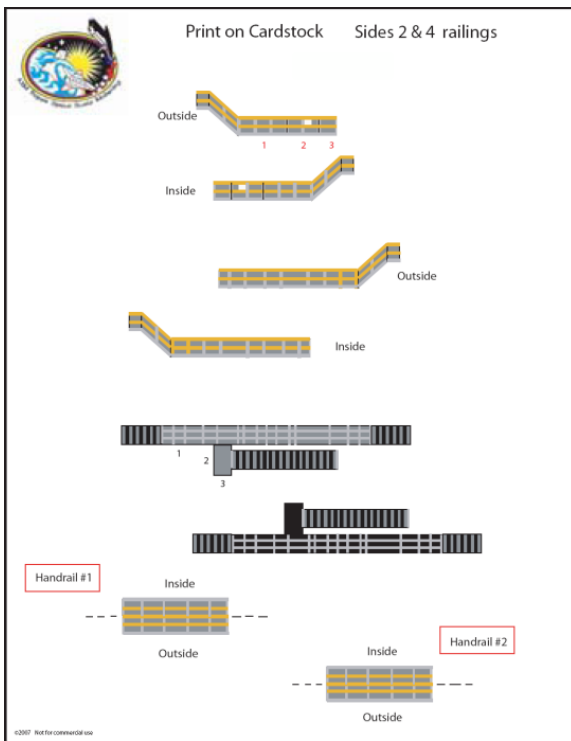
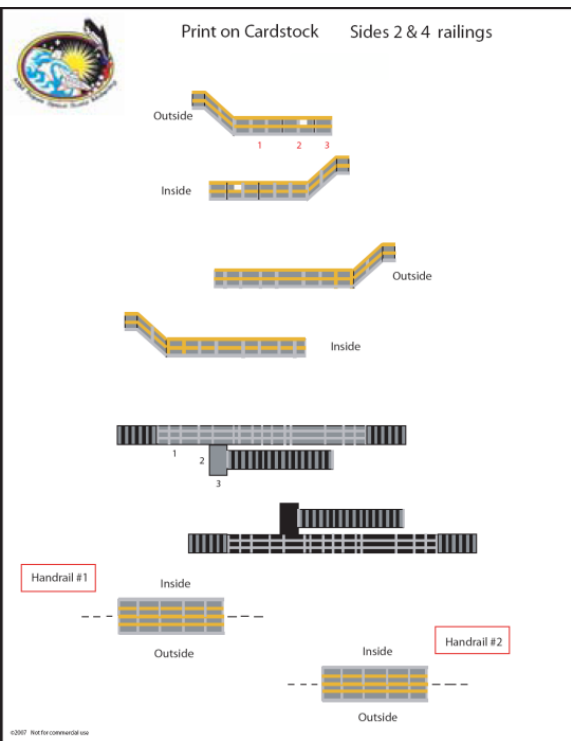
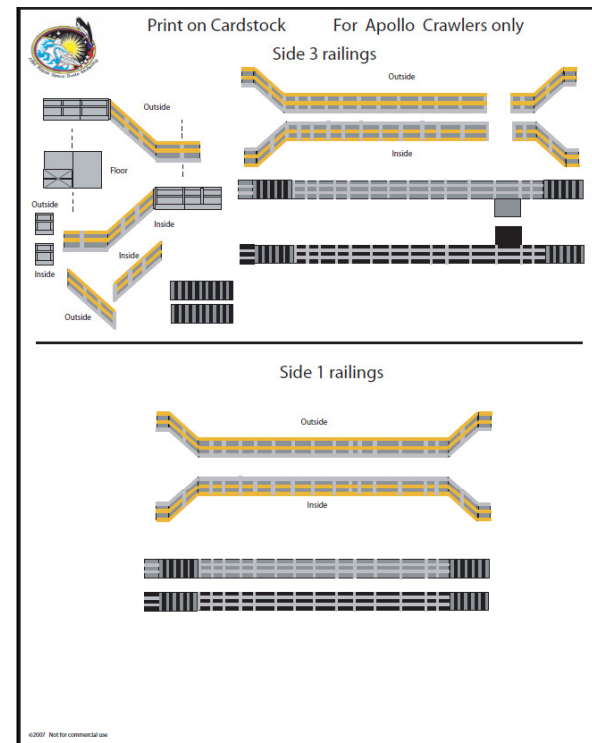
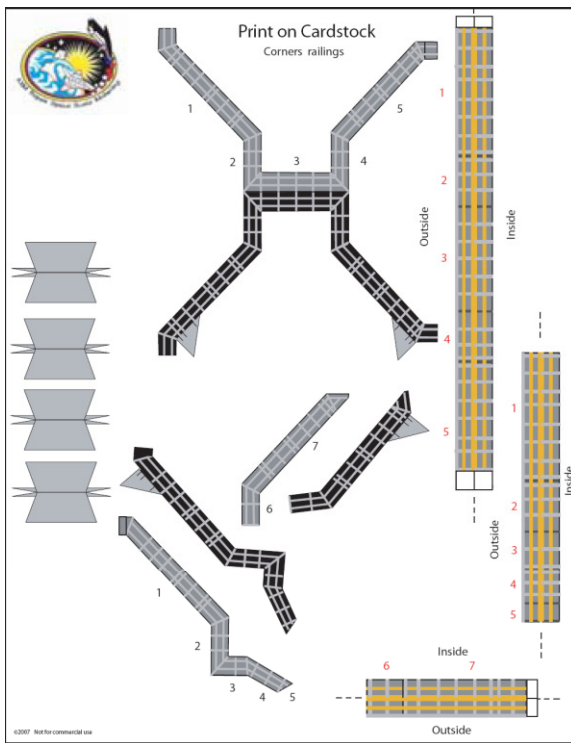
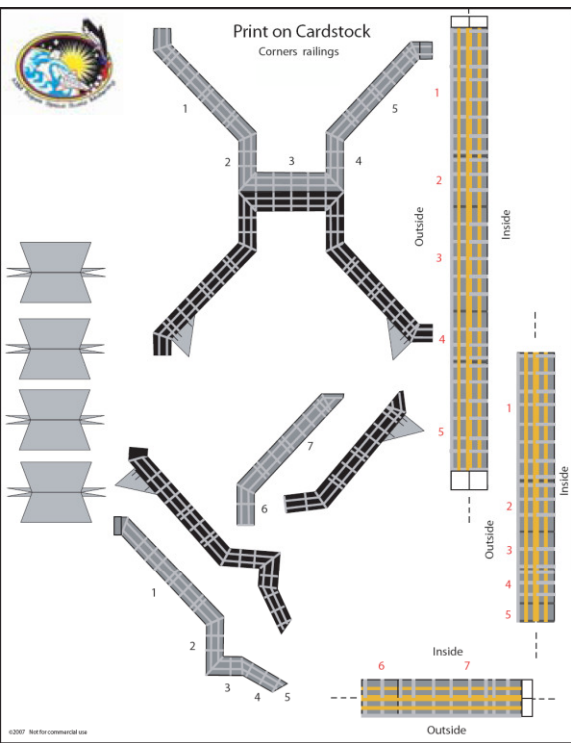
Print on PAPER

Alternate 1-piece Outer Tread
Trim to fit



Alternate 1-piece Inner Tread
Trim to fit







The Apollo Historical Series

Crawler/Transporter



The crawler-transporters are a pair of tracked vehicles used to transport spacecraft from NASA's Vehicle Assembly Building (VAB) along the Crawlerway to Launch Complex 39. They were originally used to transport the Saturn IB and Saturn V rockets during the Apollo, Skylab and Apollo–Soyuz programs. They are currently used to transport the Space Shuttle. The crawler-transporters carry vehicles on the Mobile Launcher Platform, and after each launch return to the pad to take the platform back to the VAB.

The two crawler-transporters were designed by Bucyrus International and built by Marion Power Shovel using components designed and built by Rockwell International at a cost of US\$14 million each. They are the largest self powered vehicles in the world. When they were built, they were the largest tracked vehicles in the world.

The crawler-transporter has a mass of 2,721 tons – 3,000 short tons (2,700,000 kg; 6,000,000 lb) – and has eight tracks, two on each corner. Each track has 57 shoes, and each shoe weighs 1,984 pounds (900 kg). The vehicle measures 131 feet (40 m) by 114 feet (35 m). The height from ground level to the platform is adjustable from 20 ft (6.1 m) to 26 ft (7.9 m), and each side can be raised and lowered independently of the other. The crawler uses a laser guidance system and a leveling system to keep the Mobile Launcher Platform level within 10 minutes of arc, while moving up the 5% grade to the launch site. A separate laser docking system provides pinpoint accuracy when the crawler-transporter and Mobile Launch Platform are positioned in the VAB or at the launch pad.

The crawler has 16 traction motors, powered by four 1,341 horsepower (1,000 kW) generators, in turn driven by two 2,750 horsepower (2,050 kW) Alco diesel engines. Two 1,006 horsepower (750 kW) generators, driven by two 1,065 horsepower (794 kW) engines, are used for jacking, steering, lighting, and ventilating. Two 201 horsepower (150 kW) generators are also available to power the Mobile Launcher Platform. The crawler's tanks hold 5,000 US gallons (19,000 l; 4,200 imp gal) of diesel fuel, and it burns 125.7 gal/mi (350 L/km).

The crawler is controlled from two control cabs located at either end of the vehicle, and travels along the 3.5 miles (5.6 km) Crawlerway at a maximum speed of 1 mile per hour (1.6 km/h) loaded, or 2 miles per hour (3.2 km/h) unloaded. The average trip time from the VAB along the Crawlerway to Launch Complex 39 is about five hours. Each Crawlerway is 7 ft (2 m) deep and covered with Alabama and Tennessee river rock for its low friction properties to reduce the possibility of sparks. In 2000, NASA unearthed and restored an Apollo-era segment of the Crawlerway to provide access to a high-bay building in order to provide protection from a hurricane.

Kennedy Space Center has been using the same two since their initial delivery in 1965. In their lifetime, they have traveled more than 2,500 miles (4,000 km).[2] NASA planned to use crawlers when the Space Shuttle is retired in 2011 and the Ares I and Ares V were to take its place. Due to their age and need to support the heavier Ares V (with its launch umbilical tower), NASA planned to modify the crawler's engines to have the ability to carry the heavier loads envisioned for the Ares V for both its lunar and, later, planetary roles.

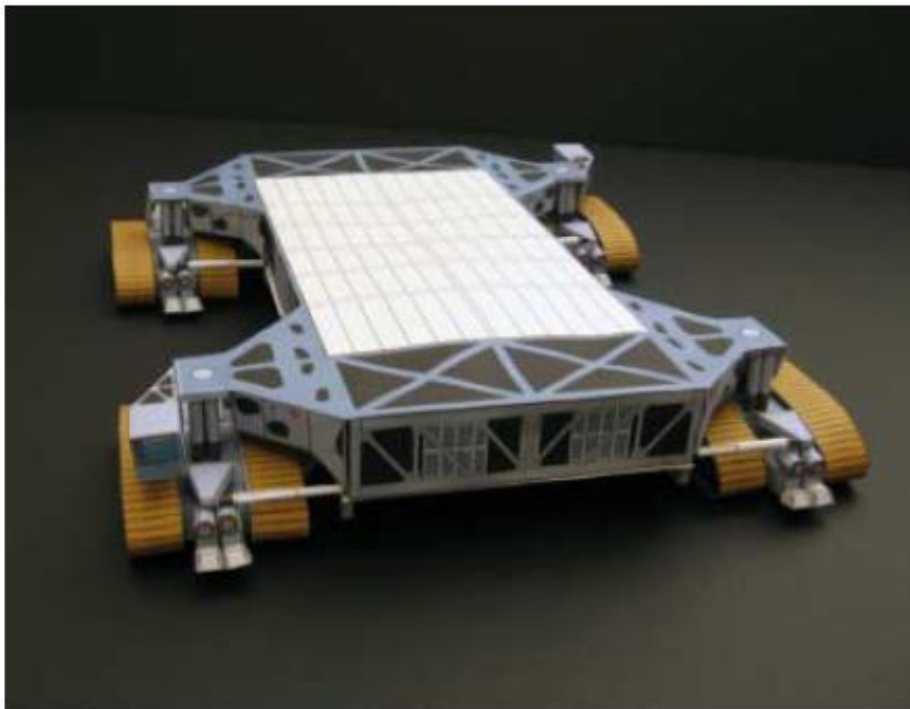
This model is an adaptation of the Crawler/Transporter model designed by Alfonso Moreno, which can be found at his fabulous website, axmpaperspacescalemodels.com. This model is included with his express permission.

Text taken from Wikipedia, <http://en.wikipedia.org/wiki/Crawler-transporter>



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Assembly Instructions for Shuttle Crawler –Transporter (Part 1)



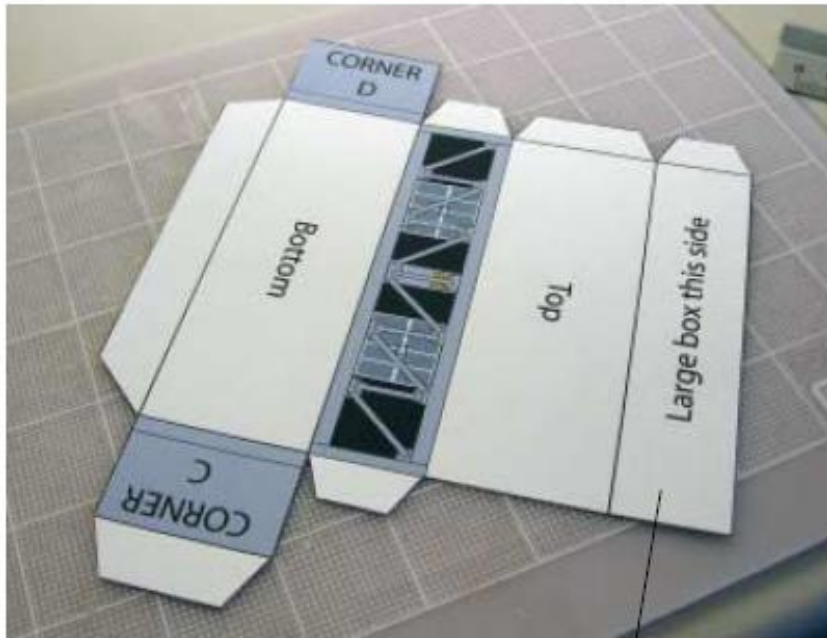
Building the main crawler body



Top photo has indications where other parts will be located and glued. The bottom photos show where the other parts are glued.



These parts will be glued as photo shows and will prevent the box from collapsing. A larger white part will be glued on top of this completing the rectangular crawler body.

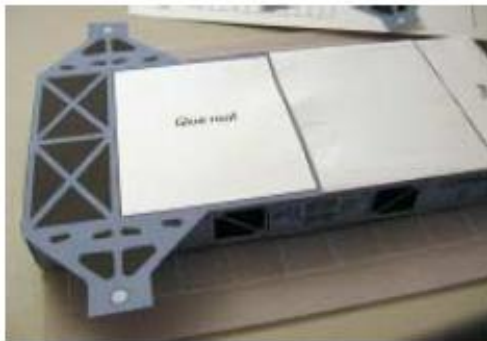


Top photo shows the small box that will be glued to the main rectangular box already built. Both boxes will become the main body of the crawler.



This photo shows how the crawler floor will look like once the floor sections are glued together. Note how the pattern of the beams goes in order to glue both parts.

IMPORTANT: The red circle shows how both the floor and the sidewall will go together. This is actually the engineer control room. Note that the floor of this room has no beams. This is SIDE 2 of the Crawler.



Now the top sections of the crawler are glued on top of the main body as both photos show.

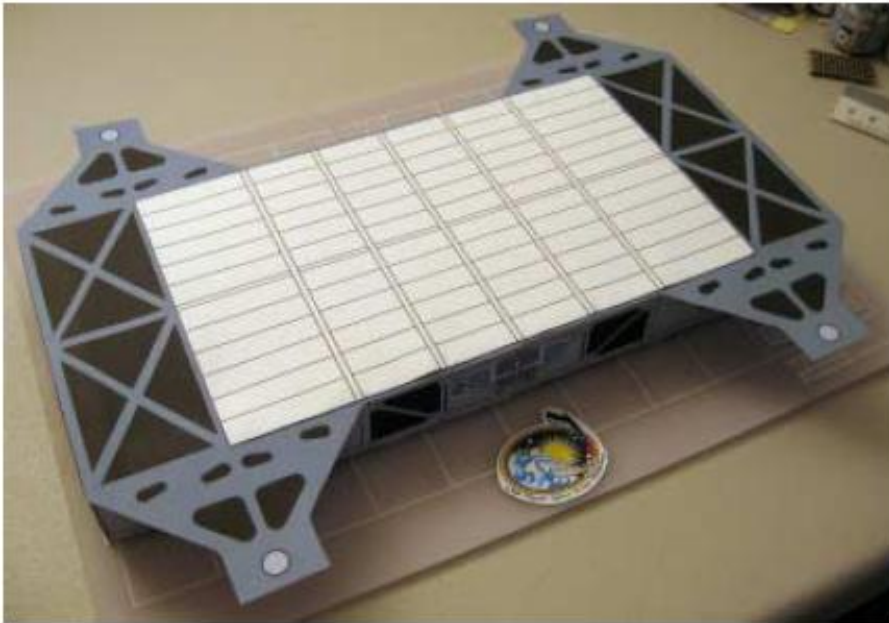
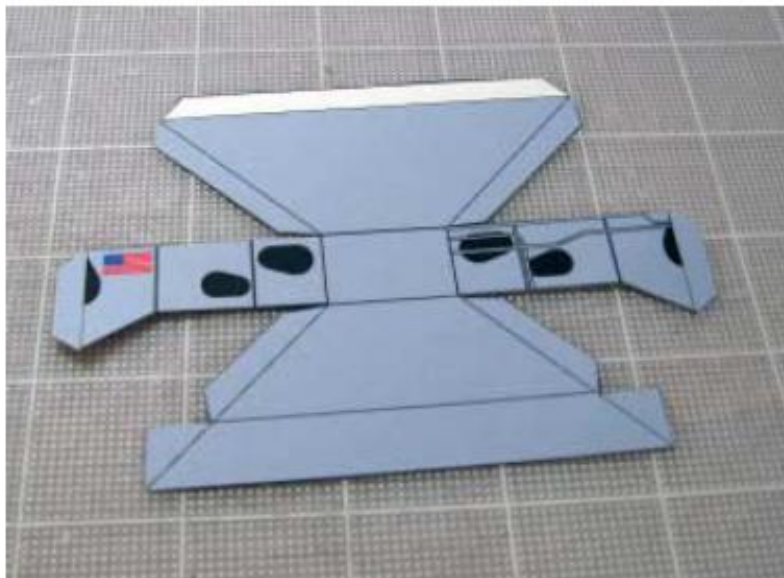


Photo shows main body with roof on top.

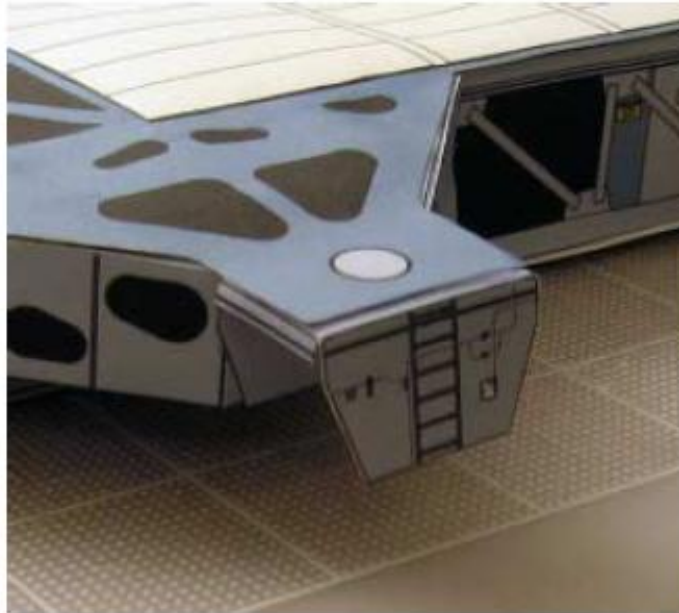
Building the Crawler Corners



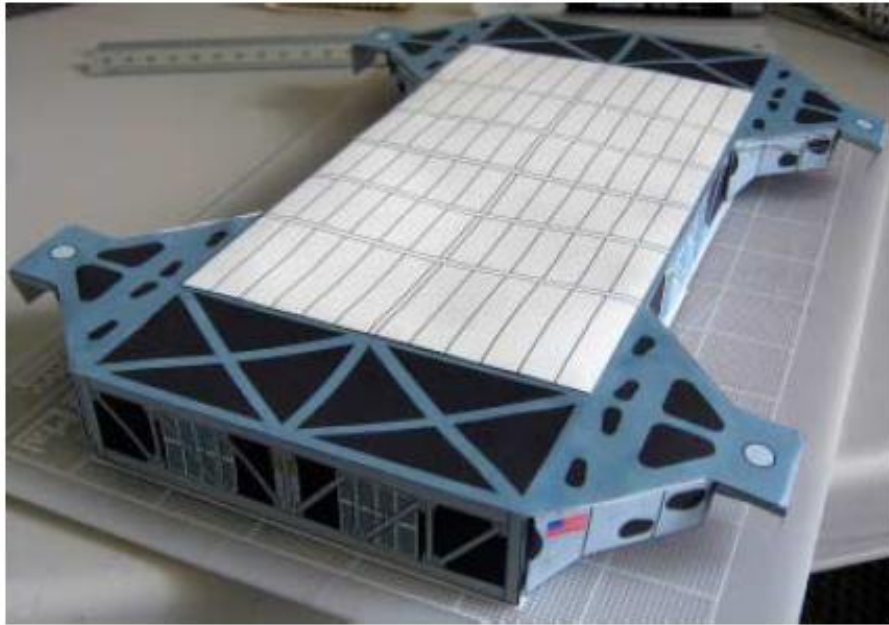
This part will vary in details depending which corner you are building.



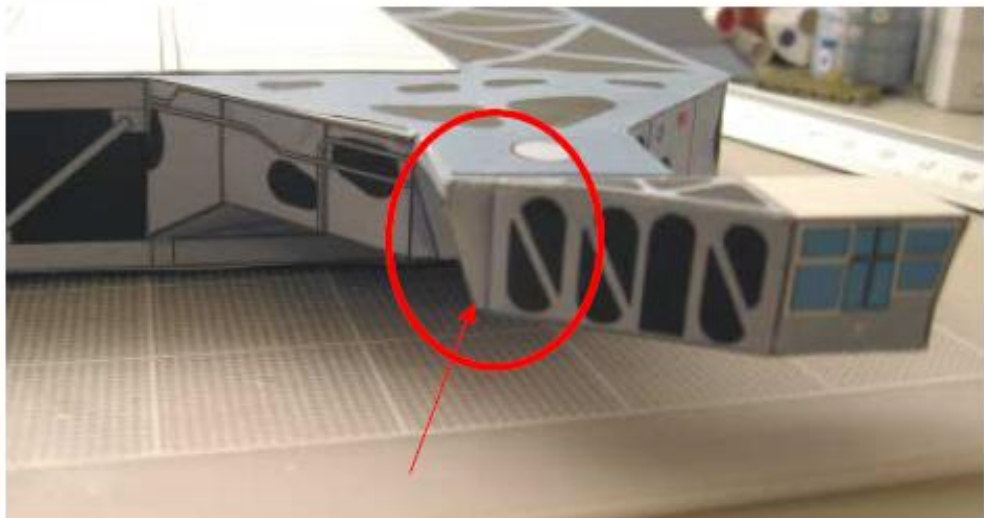
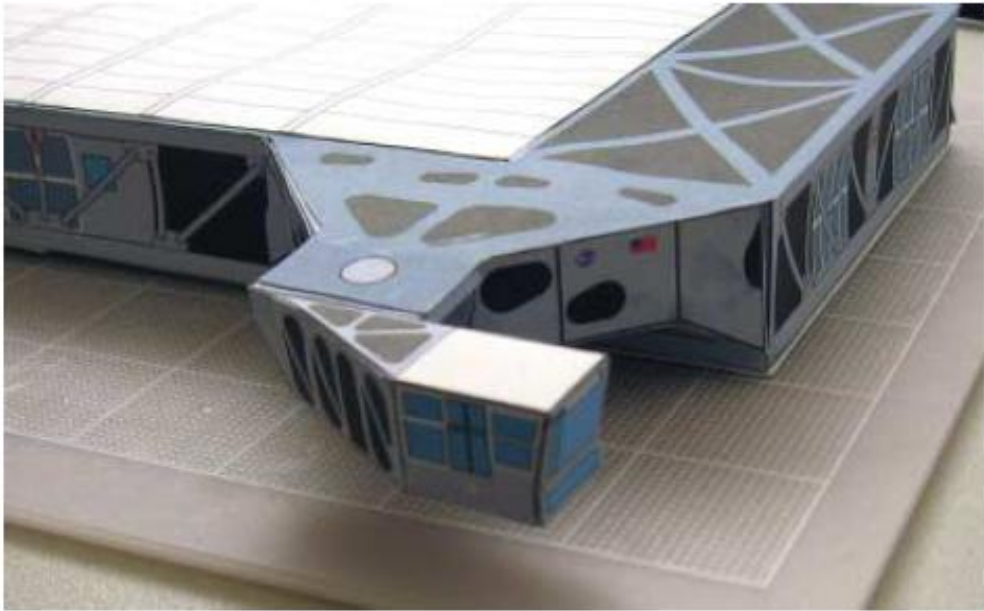
Top photo shows how the corner is shaped. Bottom photos demonstrate how the tip of the corner is made. This part will hold the guiding tube and cylinders for each "truck".



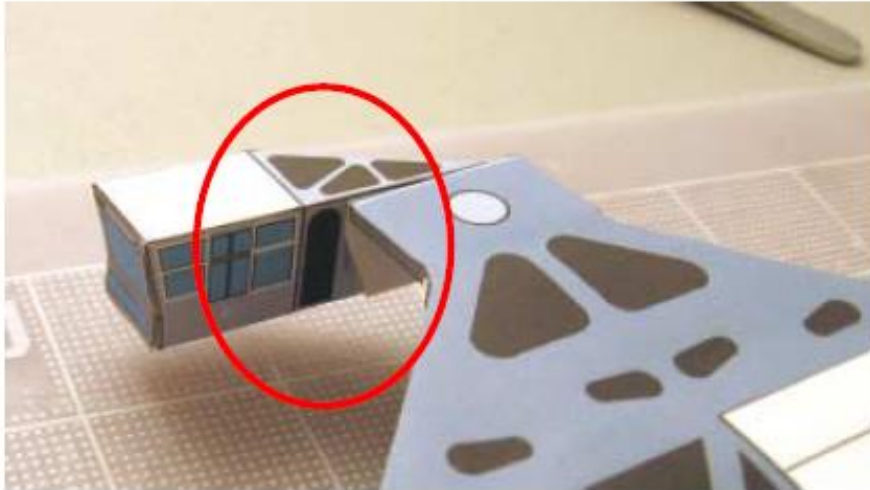
A close up of the corner (top) and how the underside of the crawler looks like after all 4 corners are glued. At this point is very **IMPORTANT** to let it dry well before moving on to the next step.



Only 2 corners of the crawler will indicate where to glue the Cab. Bottom photos show how the Cab is built. There is a part that goes on top of the Cab

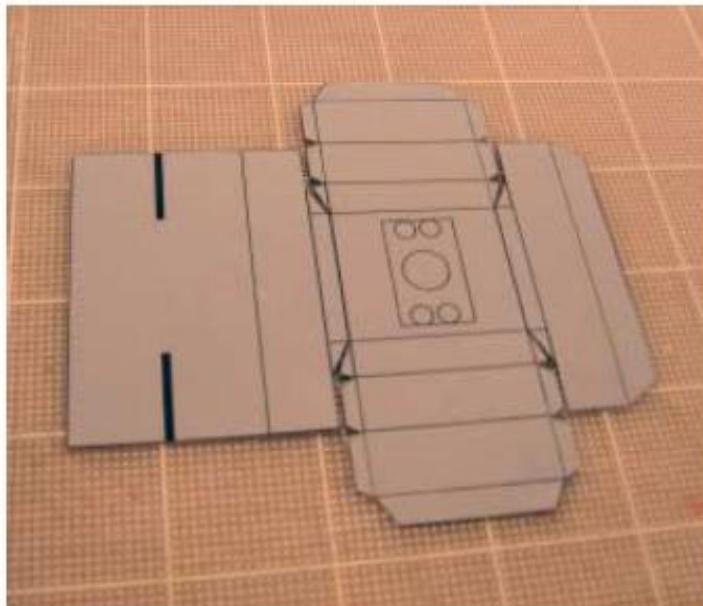


Note how the Cab is glued to the corresponding corner. **IMPORTANT:** The red circle shows how both parts are glued starting in the angle where the red arrow shows.



The black "door" has to show up on the internal part of the Cab.

Building the "truck"



This is the main part as the base for each "truck"



This is how the base of the truck is shaped. It looks like a car.



Photos show how the sides of the truck are shaped and glued to the side of the truck.

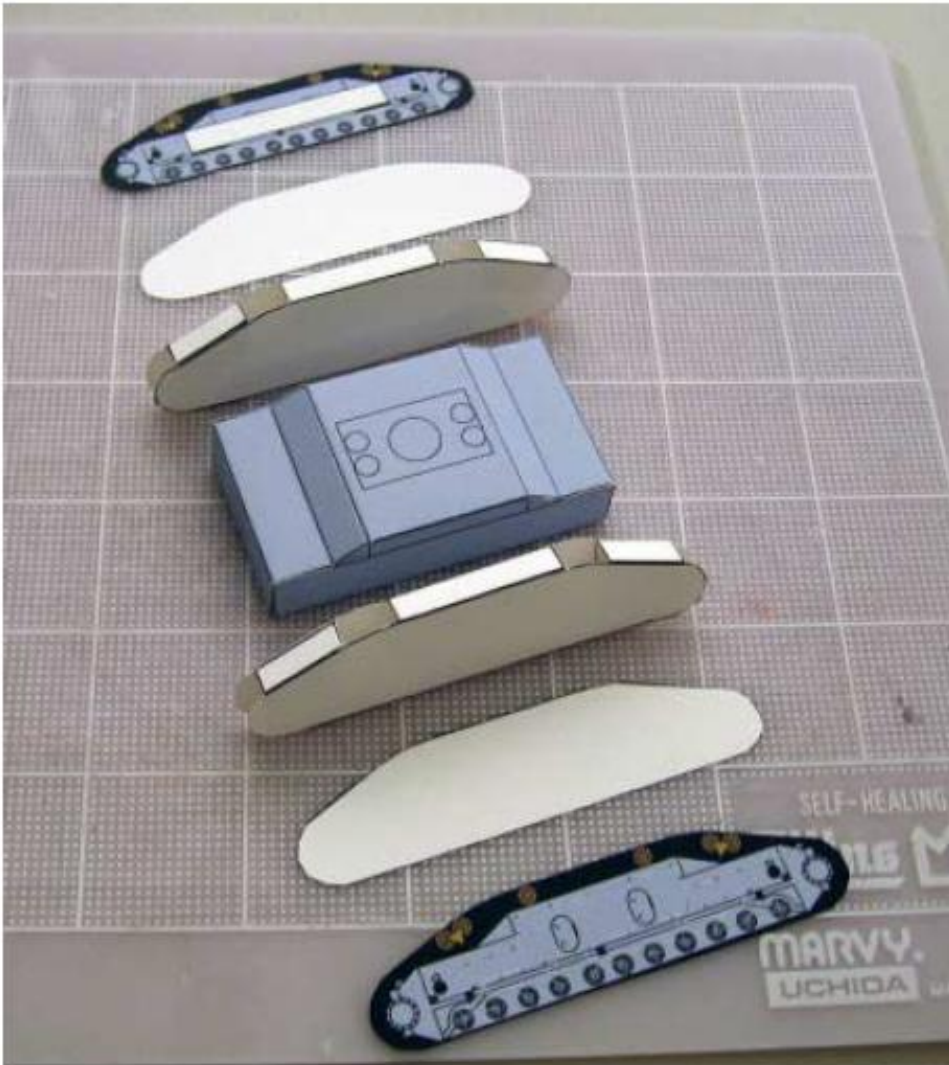
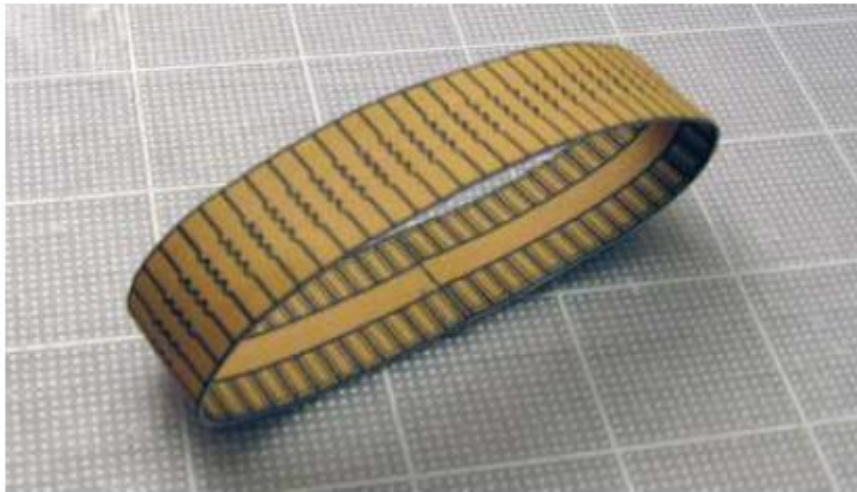


Photo indicates the sequence to follow, and how the parts are glued to each other.



IMPORTANT: Let it dry well before putting the caterpillars.



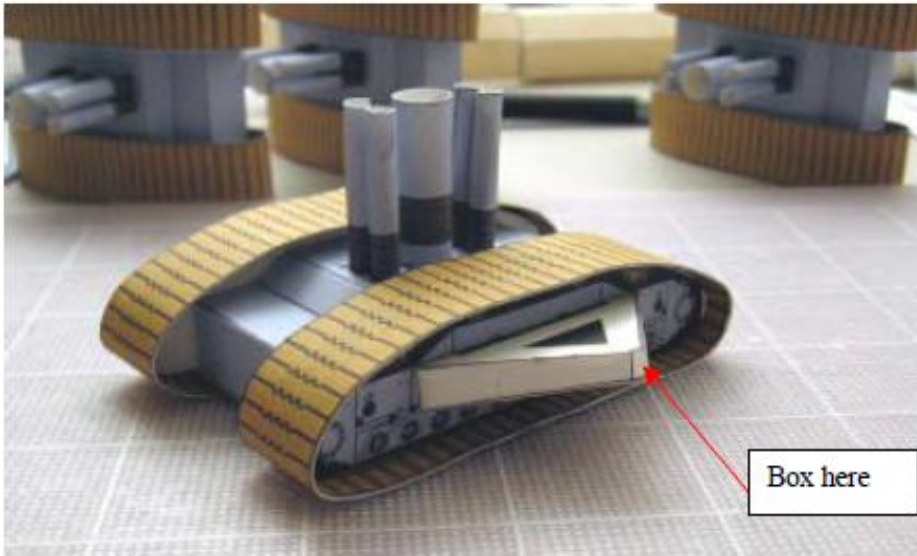
This is a crawler caterpillar. Is made out of 2 parts that are glued to each other. Try giving it a shape in order to be easy to install. Each caterpillar has 57 cleats just as the real one.



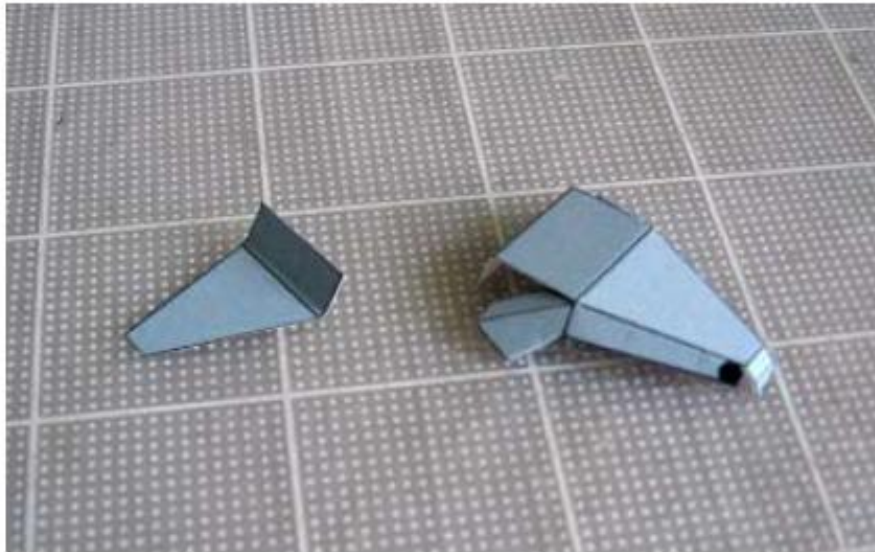
This is the truck showing both caterpillars in place.



Photos show the guiding tube and cylinders in their corresponding places.
IMPORTANT: Let the tubes dry well before gluing it to the crawler's corner.

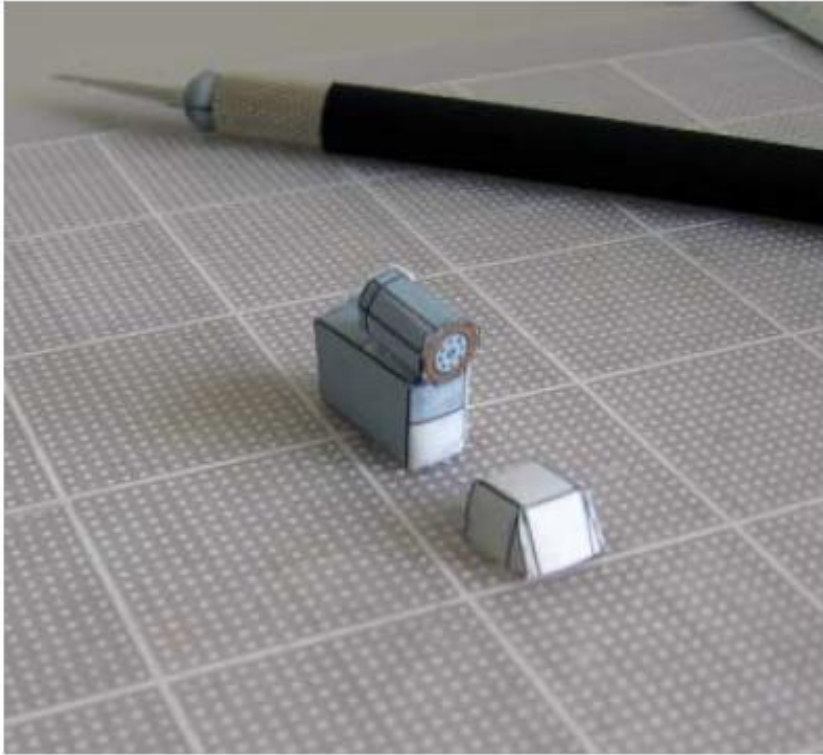


Note how the truck looks with the steering arm in place. The steering arm has a small box that is glued to the tip.



This is another steering arm that goes on top of the truck. Each truck has 2 steering arms on top. Each one is asymmetrical. The side that has the black dot will face inwards towards the tubes. The black dot indicates where the steering cylinder is glued.

Building the propel motors



These 3 parts will form the propel motor block. The main rectangular box has indications where the other parts are glued. The top cylinder is an octagon. Each truck has 2 sets of motor blocks on each end; in total there are 4 motors for each truck.



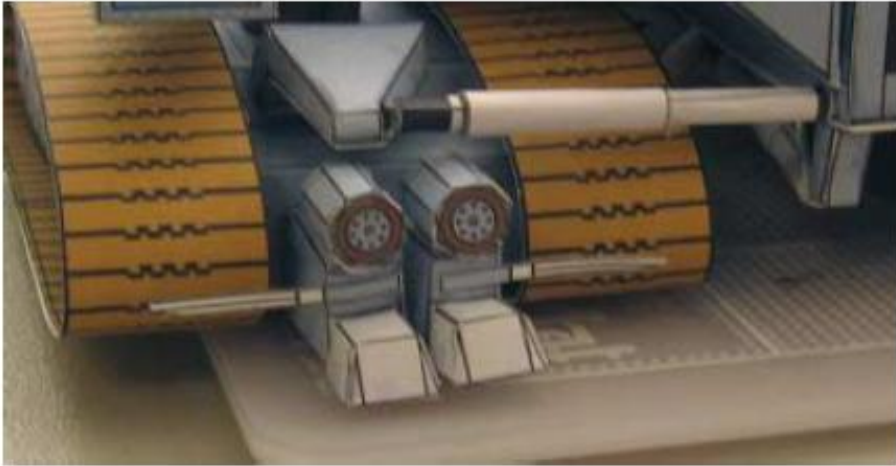
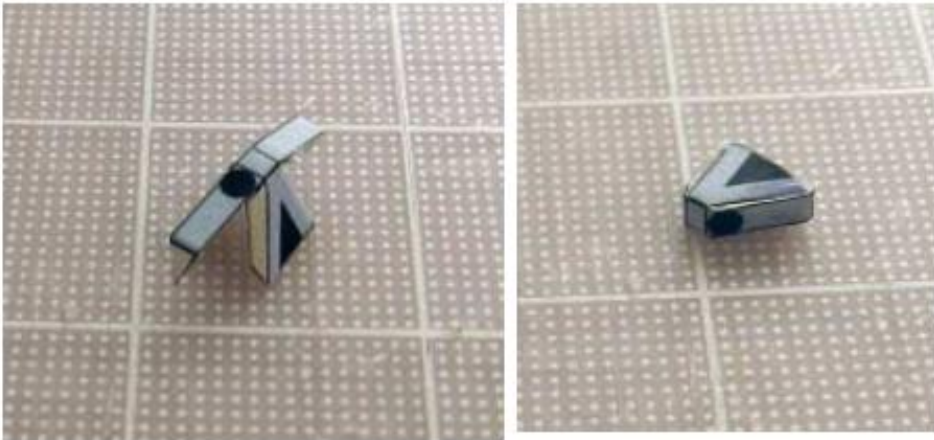
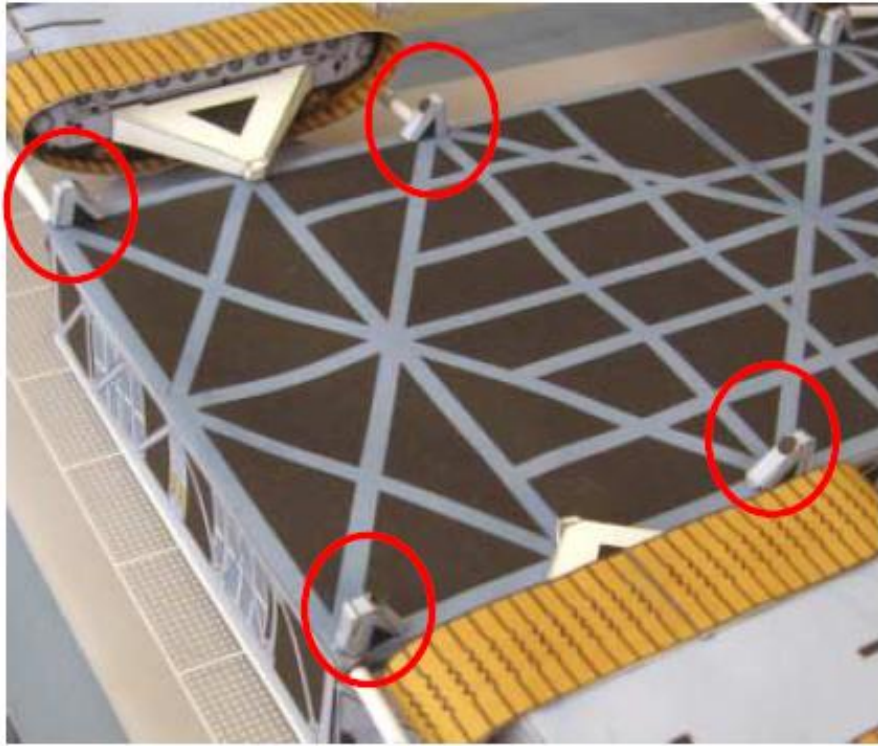


Photo shows where the “wings” are located for each motor block.

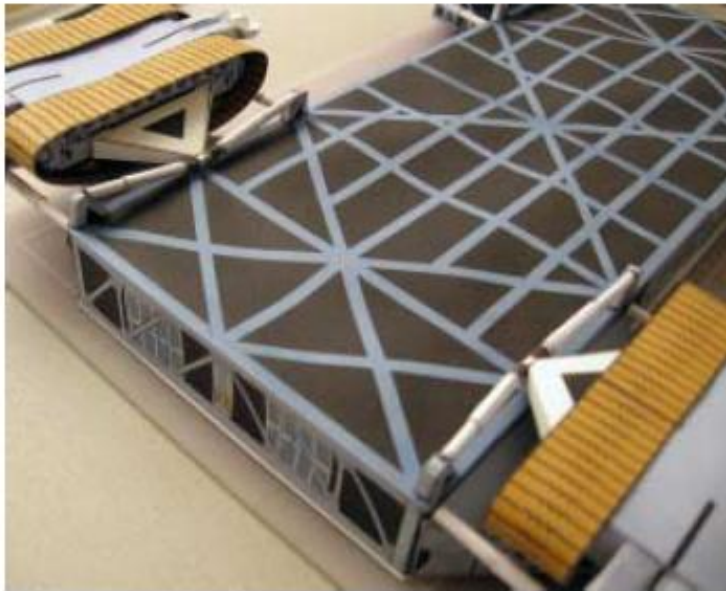
Adding other elements



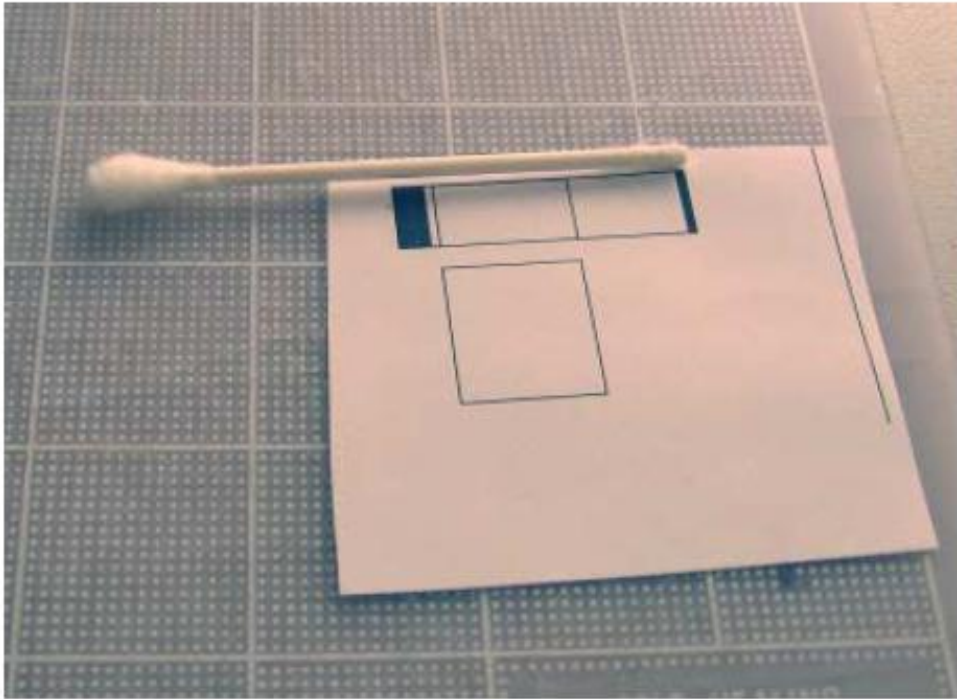
This is how this part is shaped. This will go on the underside of the crawler. This part is where the steering cylinder is glued (black dot).



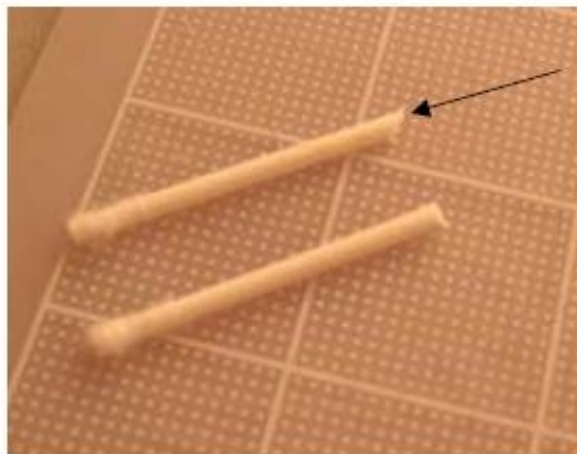
This is the underside of the crawler showing the triangular beams that will hold each steering cylinder. This is repeated to the other end of the crawler.



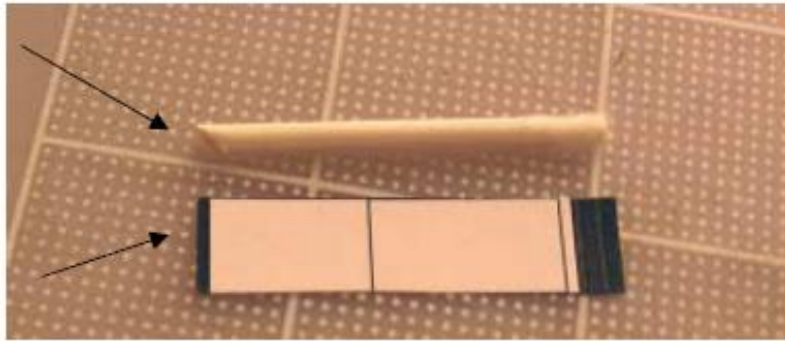
Building the steering cylinders



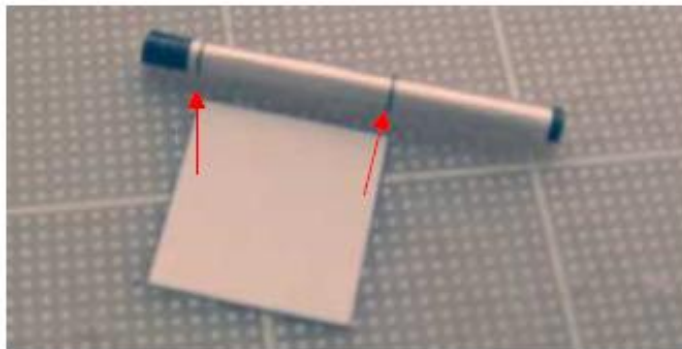
Use a cotton swab to make a steering cylinder; the same way the Robotic arm is build for the AXM Shuttle payload.

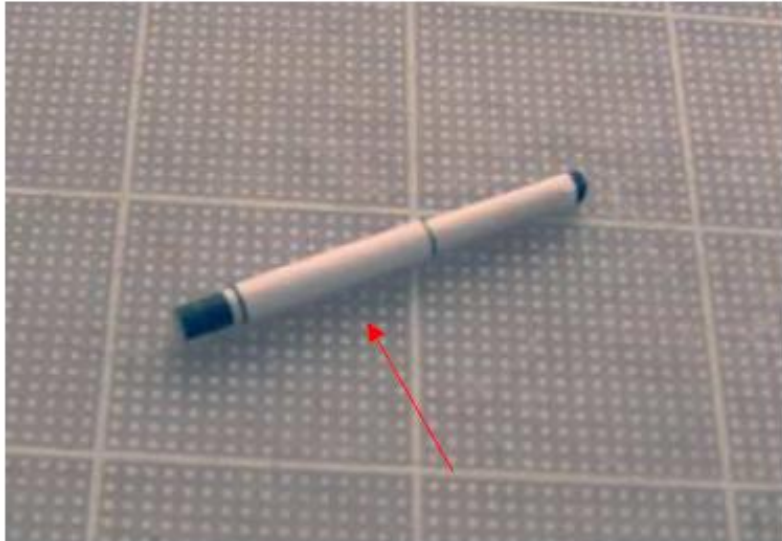


Arrow shows how the swab is cut at the tip in an angle. **This is done for the steering cylinders that will go on the underside of the crawler only.** The bottom swab is for the upper part of the crawler.

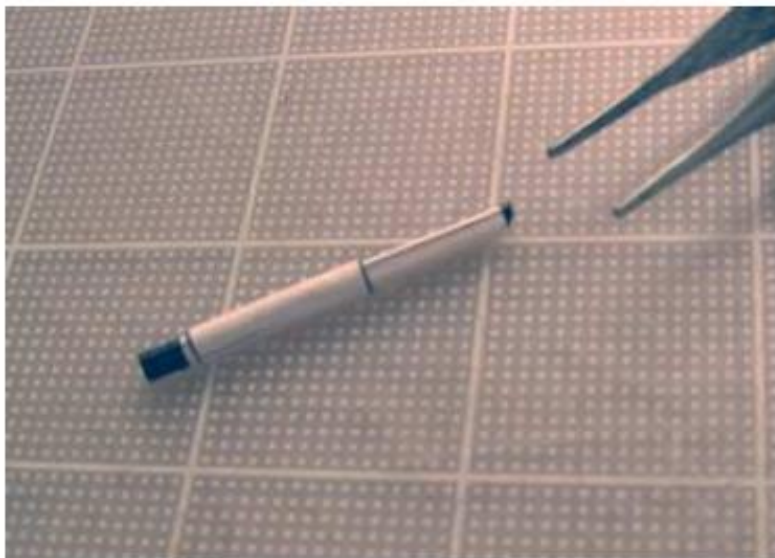


IMPORTANT: Note how the swab is positioned on the paper. The angled tip goes to the paper area with the thin stripe.





The red arrow indicates the thick part of the steering cylinder after the rectangular paper is rolled and glued.



For the steering cylinders that will go under the crawler, try shaping the angled tip so it will fit better when glued.
TIP: If things don't come out perfect you would need to cut the tip as needed in order to make the perfect length.

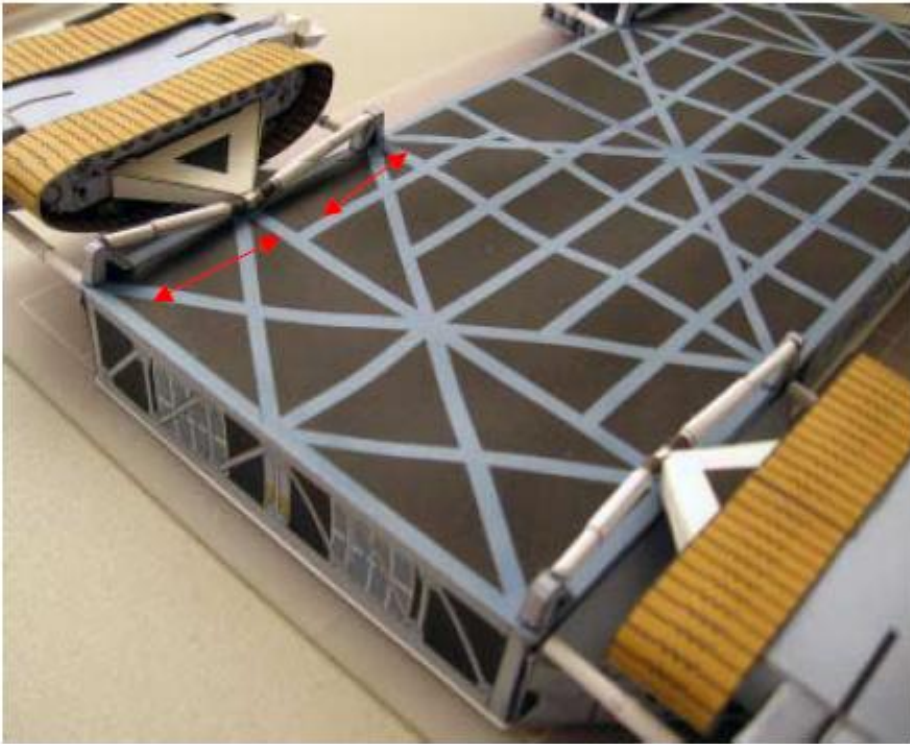
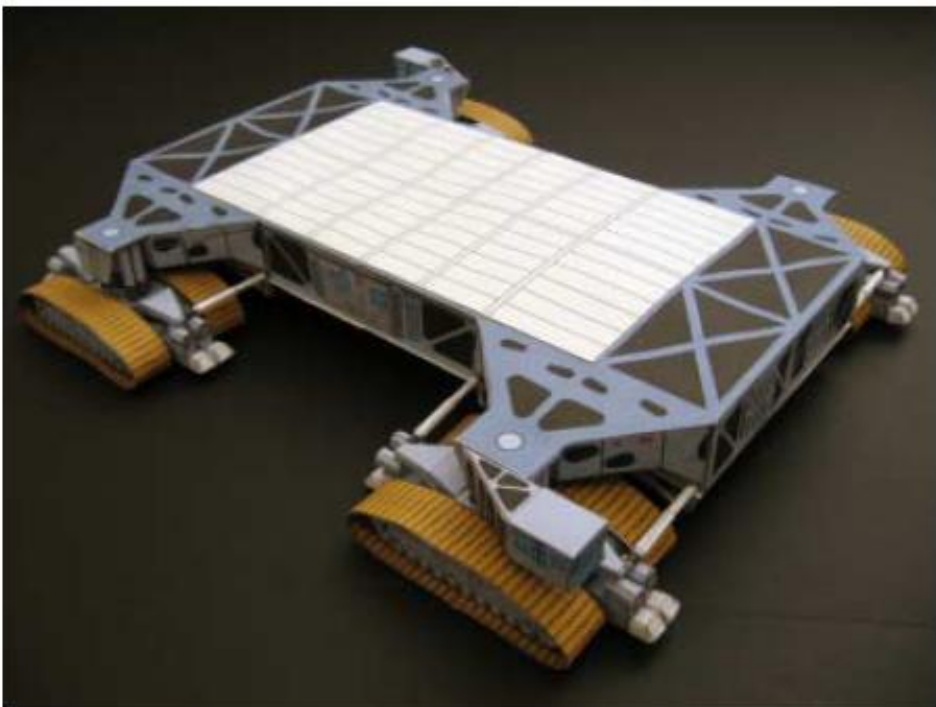
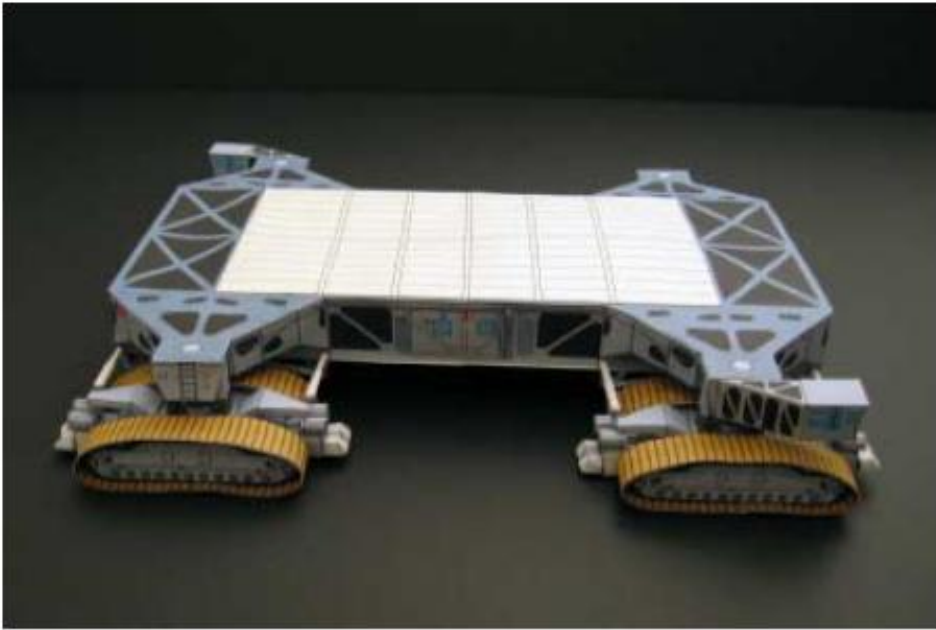
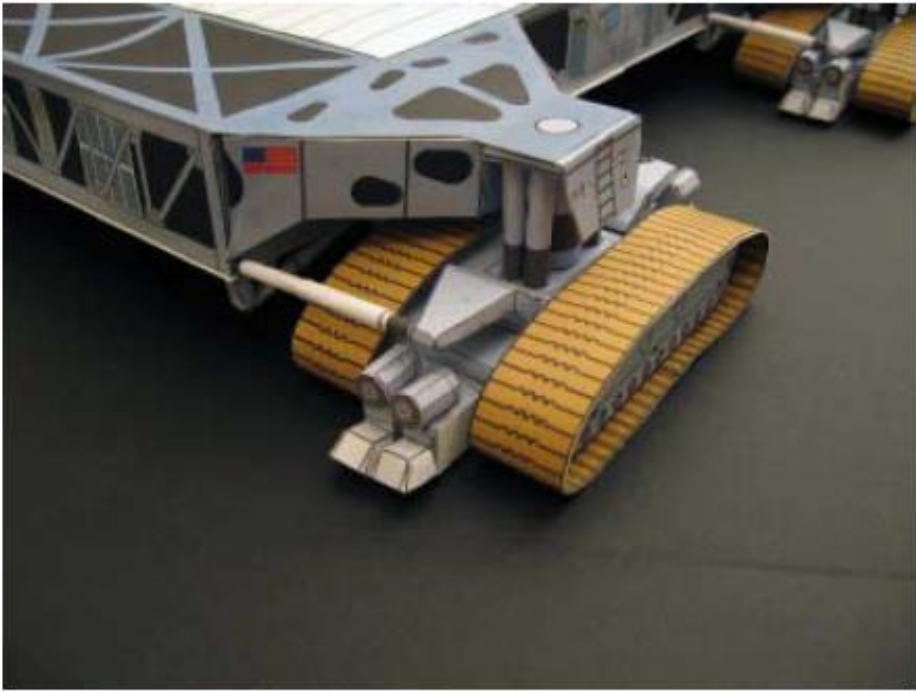


Photo explains it better. The red arrows indicate that the cylinders are not equal in length. If that happens, you would need to cut the outer tip at will.

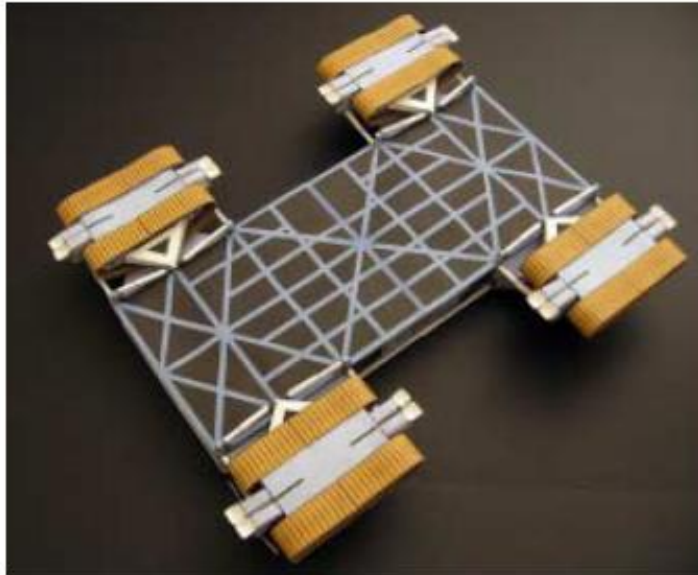
This will complete Part 1 of the Crawler.
Part 2 will demonstrate the assembly of the stairs and catwalks that go around the crawler, plus other minor details.

Reference photos









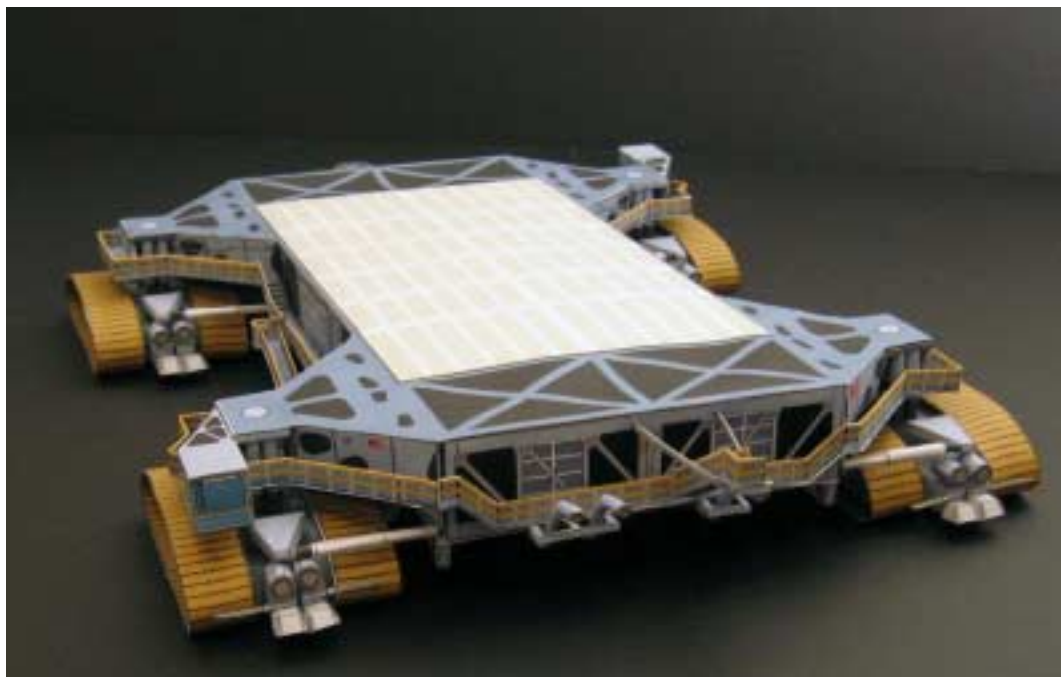
Enjoy this model!

<http://www.axmpaperspacescalemodels.com>



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Assembly Instructions for Shuttle Crawler –Transporter (Part 2)



Introduction

This Part 2 Crawler Manual will cover the assembly of all crawler variants, the difference between all crawlers, the assembly of the walkways and stairs and the old and new undercarriage. **Very important is to identify all sides of the crawler.** The photos below show the real Shuttle stack with the Mobile Launch Platform and Crawler from all sides. Numbering applies to both MLP and Crawler.



Side 1



Side 3

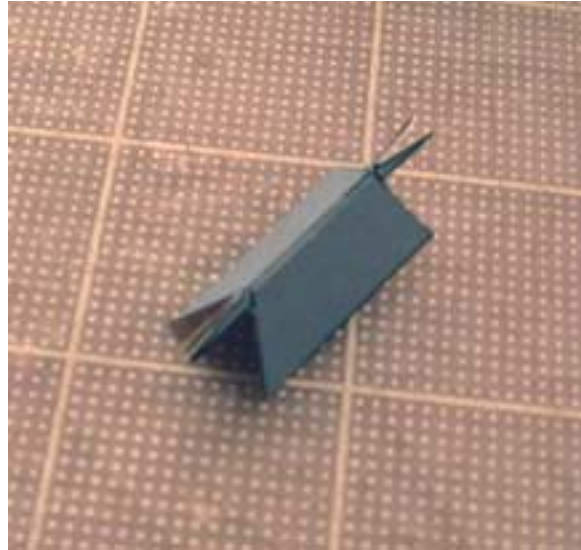
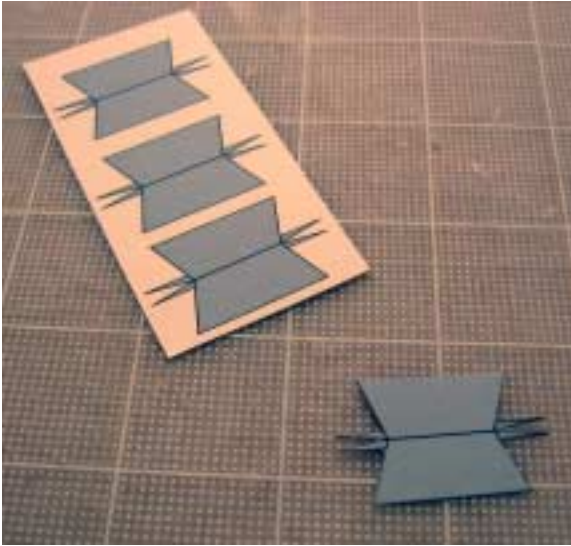


Side 4

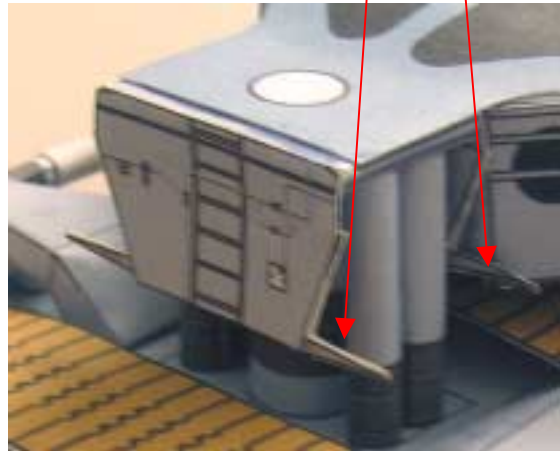
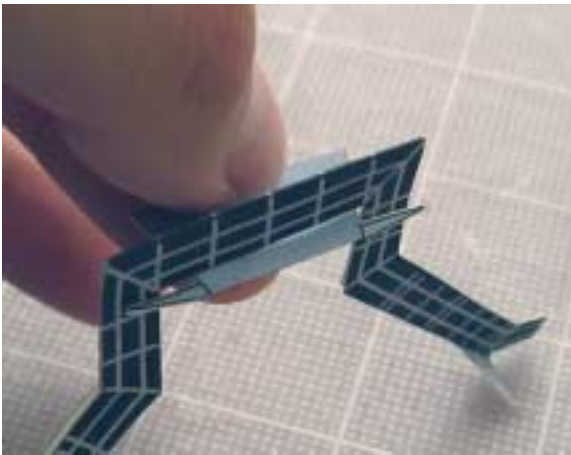


Side 2

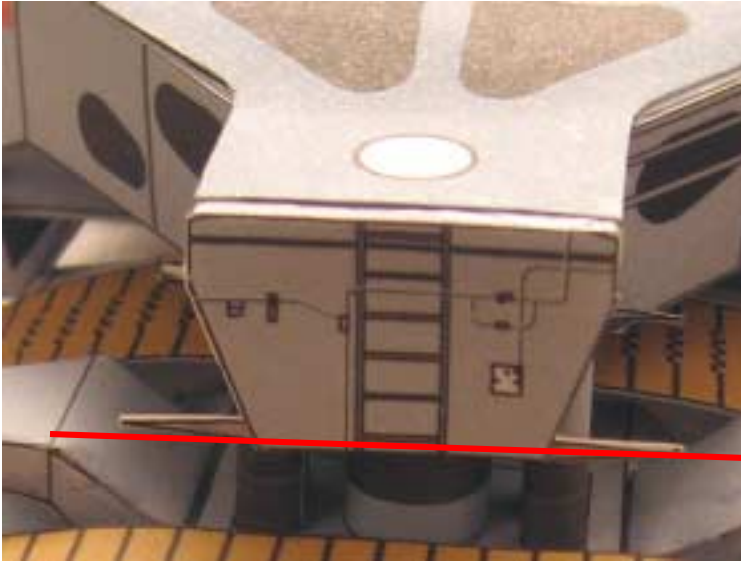
Building the Crawler corners walkways



These are the **most important** parts needed to assemble the walkways. These are the walkways support parts. There are 8 in total for the model, 2 for each corner. Glue each one to both corner walls, as indicated by the arrows.



This photo is only to demonstrate the purpose of this support part.



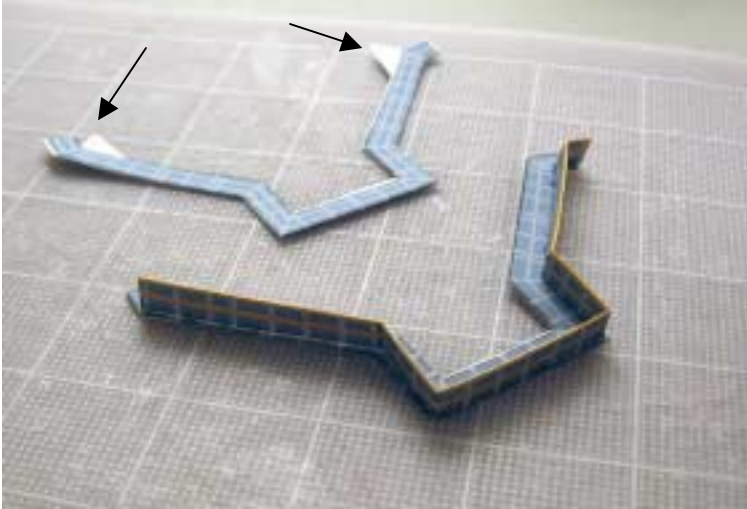
Close-up of how the corner will look after the support parts are glued. Let it dry well. The red line in the photo indicates that both the wall and the support part are at same level.



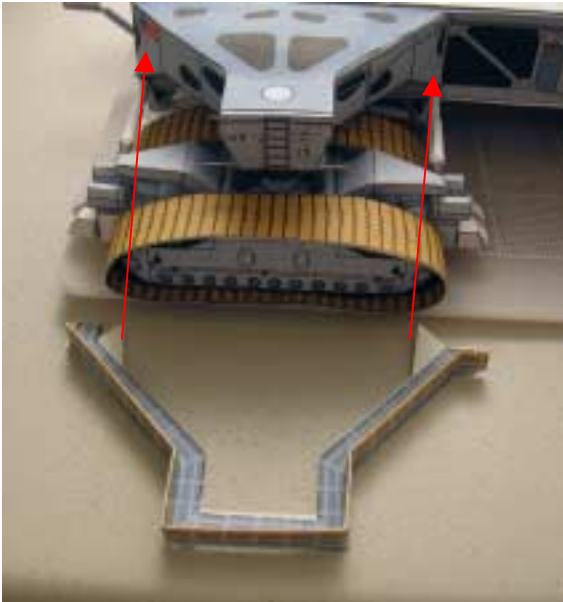
Each walkway has 2 mirror sides, one is the walkway floor (gray) and the other is the underside of the walkway floor (black). This photo shows the walkway for **corners A and C** (corners that have NO cabs)



Each railing has 2 mirror sides as well, indicated as OUTSIDE and INSIDE in the parts sheets. Photo show how a railing is folded before is glued to the walkway floor.

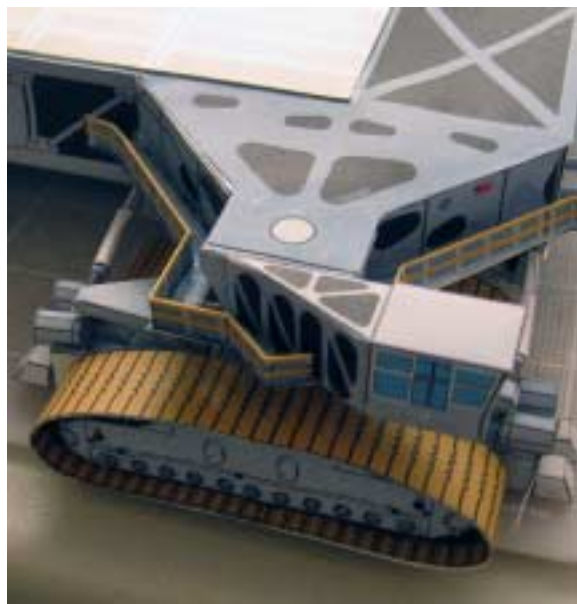
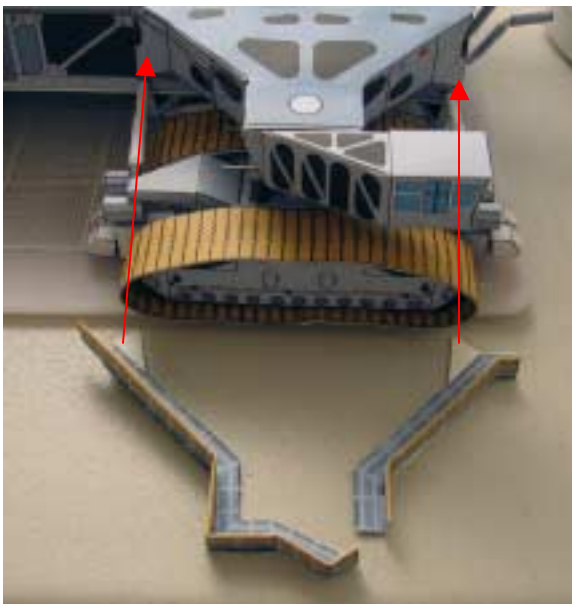


This is how each railing is glued to the correspondent walkway floor. Each corner walkway has 2 triangular faces that are glued to the crawler. (arrows)

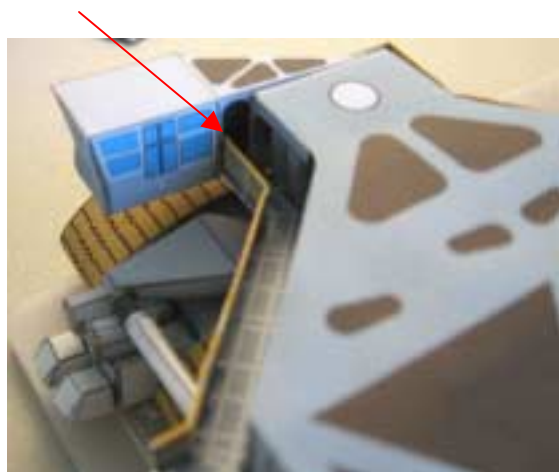
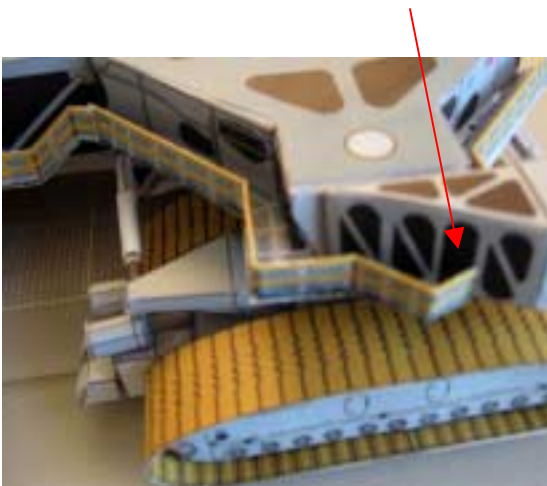


Red arrows indicate where the triangular faces are glued to the crawler.

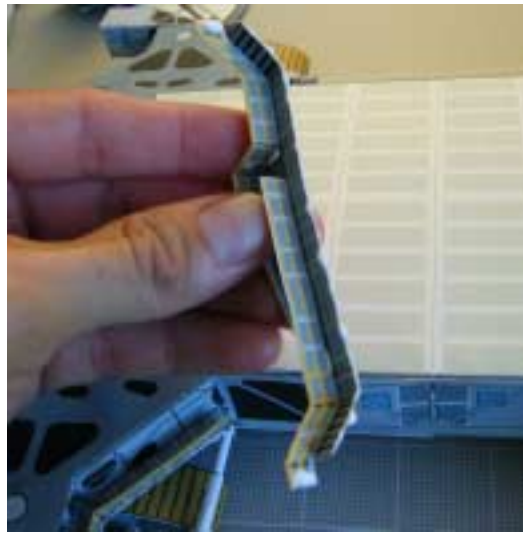
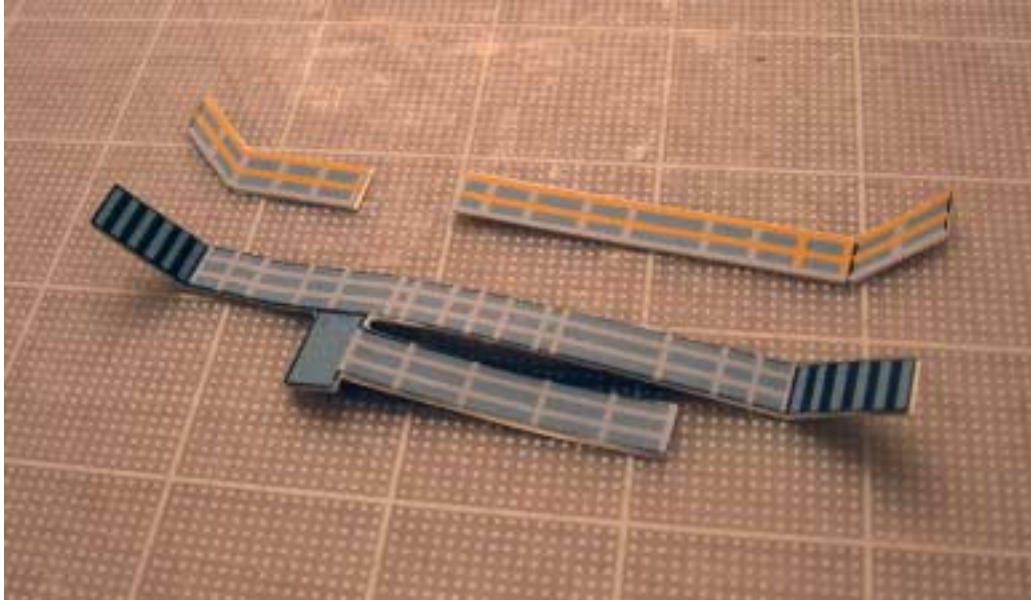




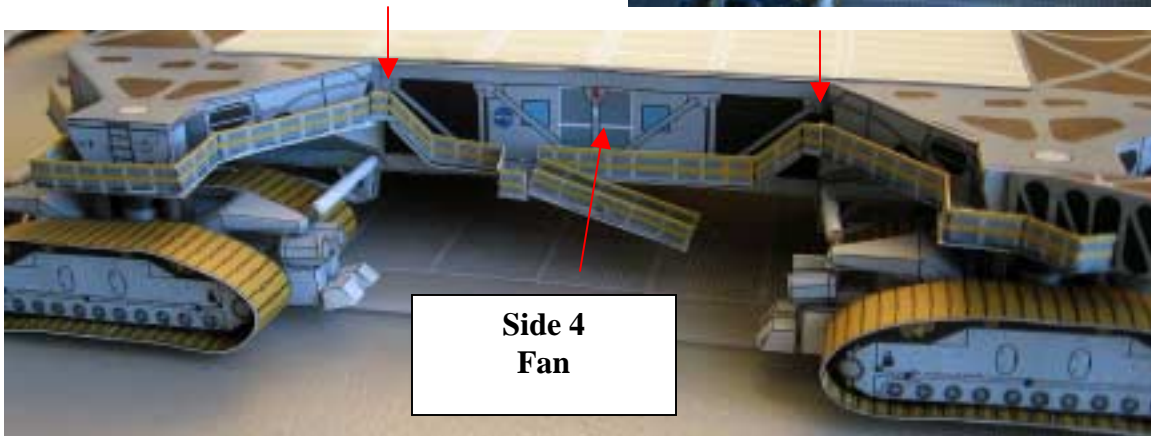
These photos show the corner with the cab (**corners B and D**). Use the same procedure to glue the walkway. Notice reference points indicated by arrows where the parts should be glued.

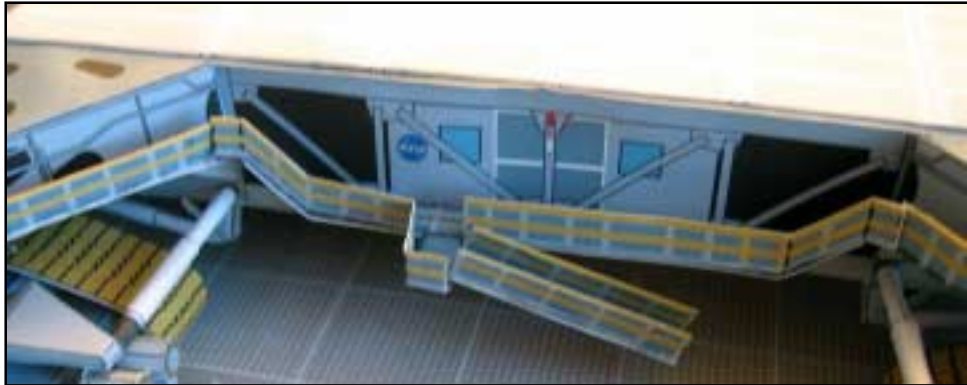
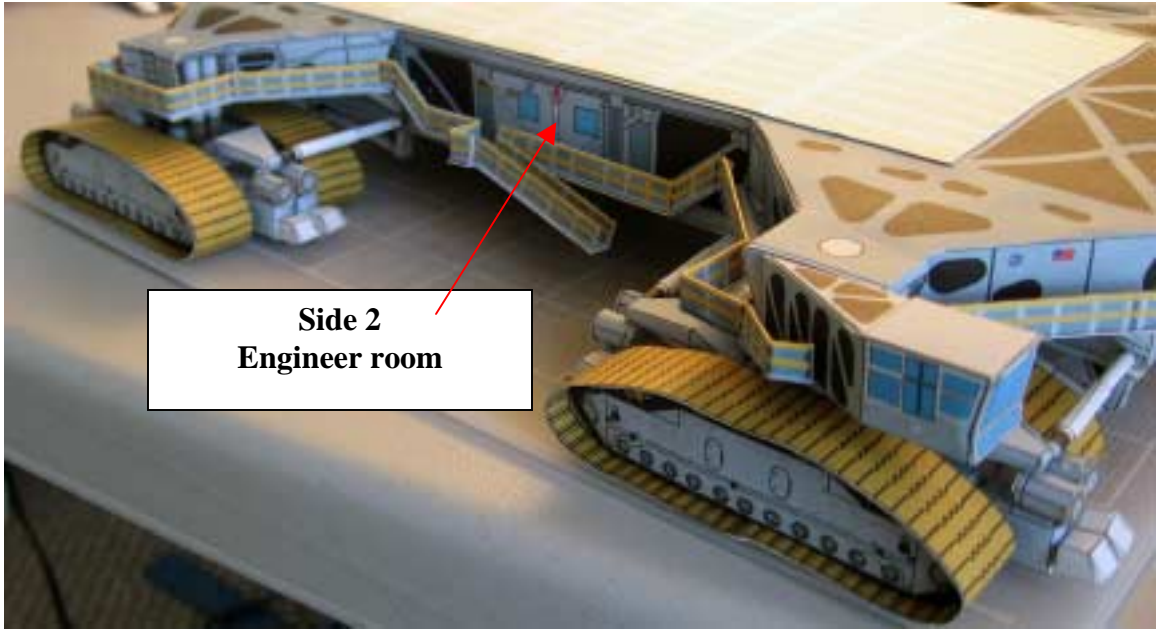


Building Sides 2 and 4 walkways and stairs (walkways are identical)



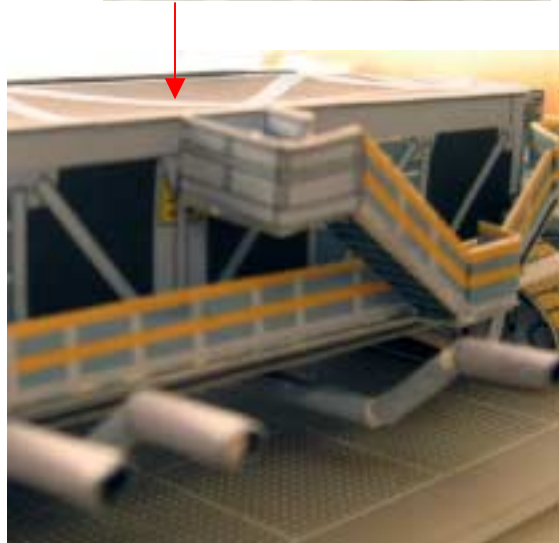
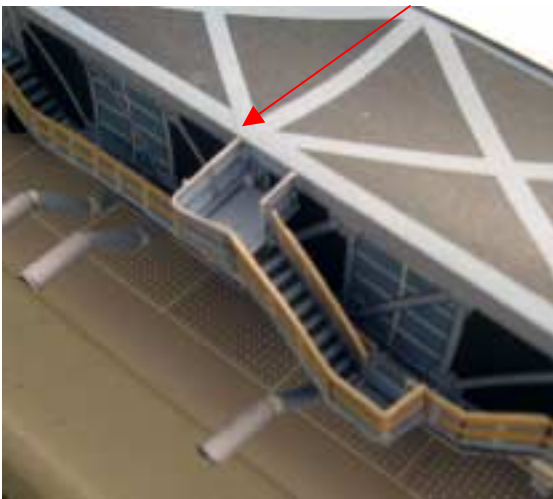
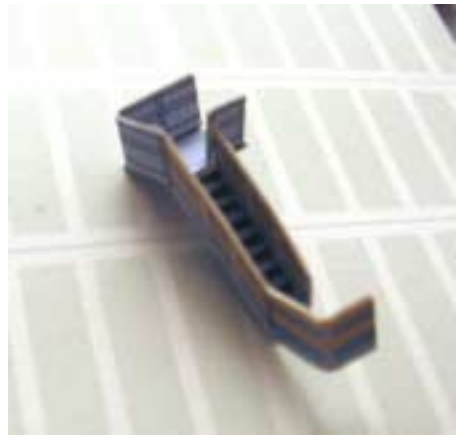
Arrows indicate where railings are connected to each other



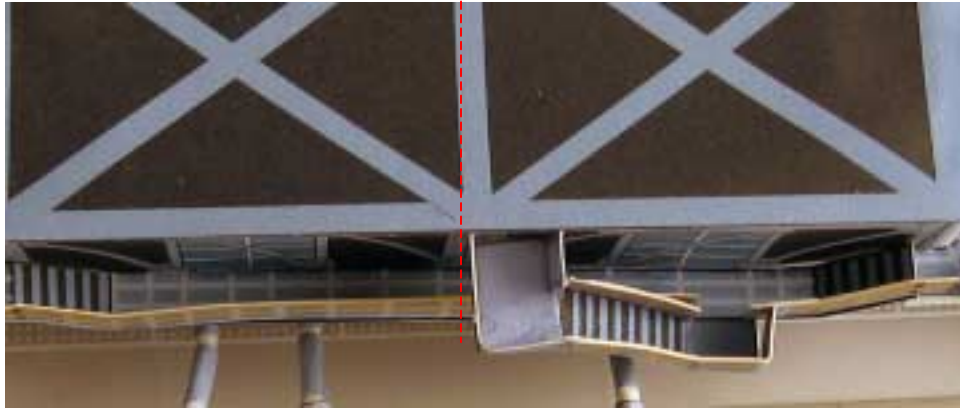
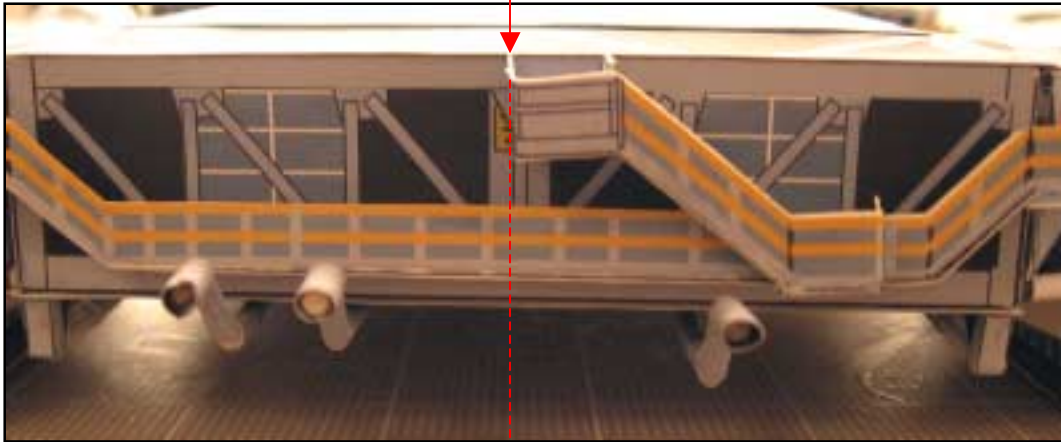


The access stair can be positioned as photos show.

Building Sides 1 and 3 walkways and stairs (different)

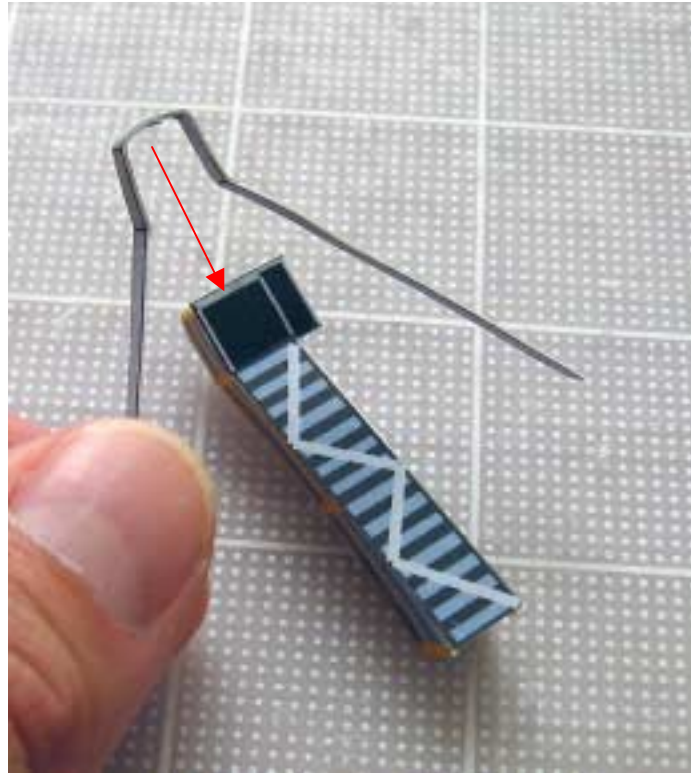
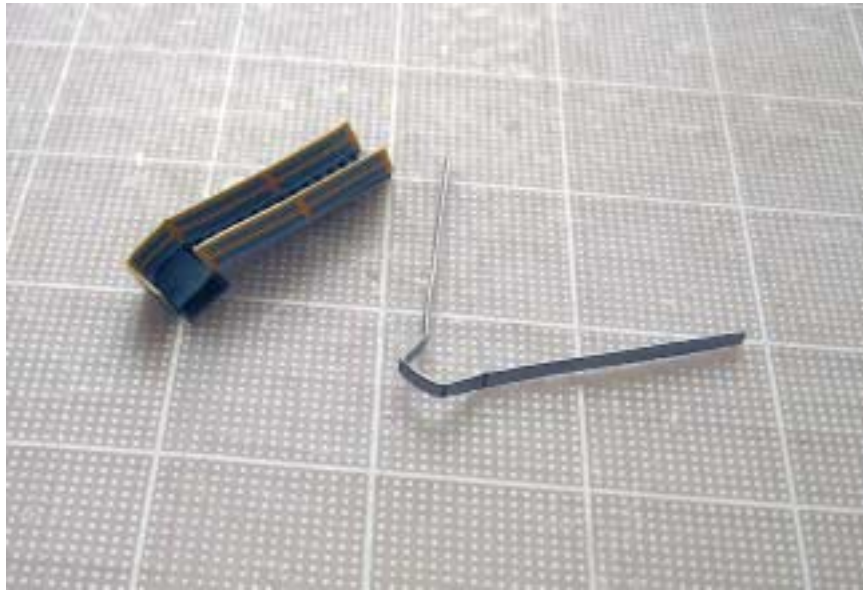


Arrows indicate reference points where to glue.



Side 1 walkway and stairs





Arrow indicates where the support beam is glued to the underside of the stairs floor.

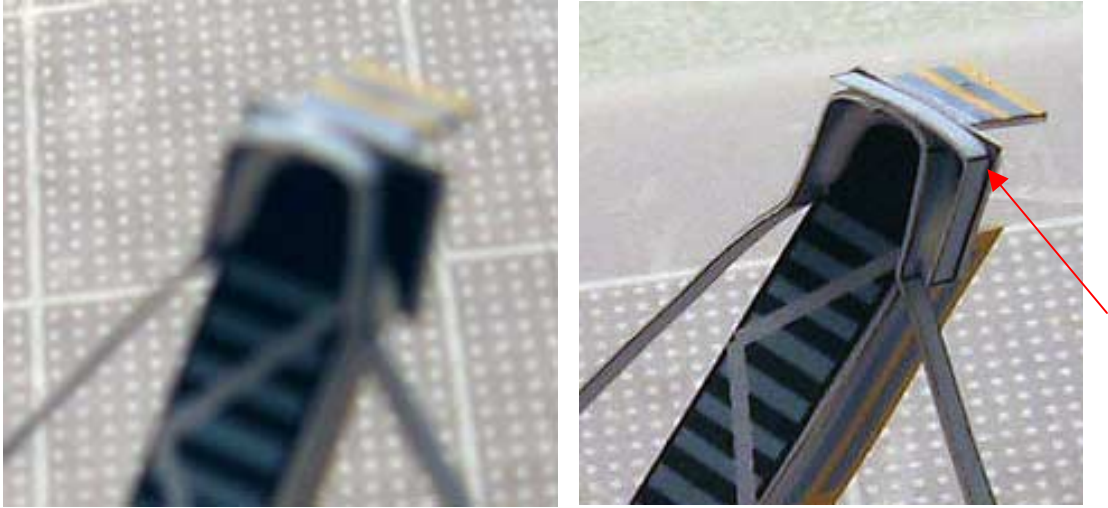
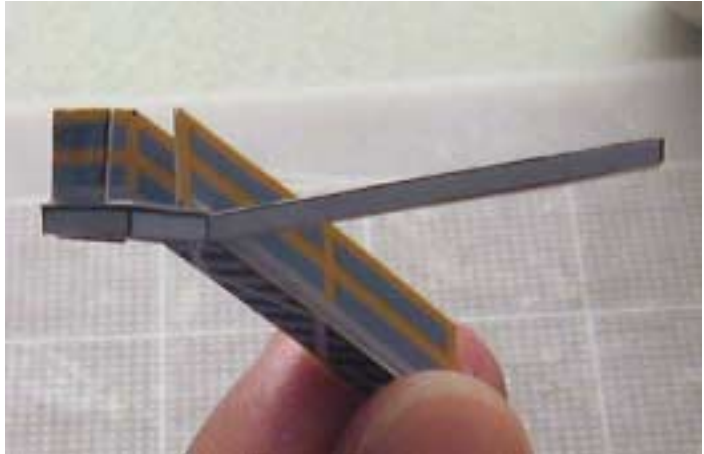
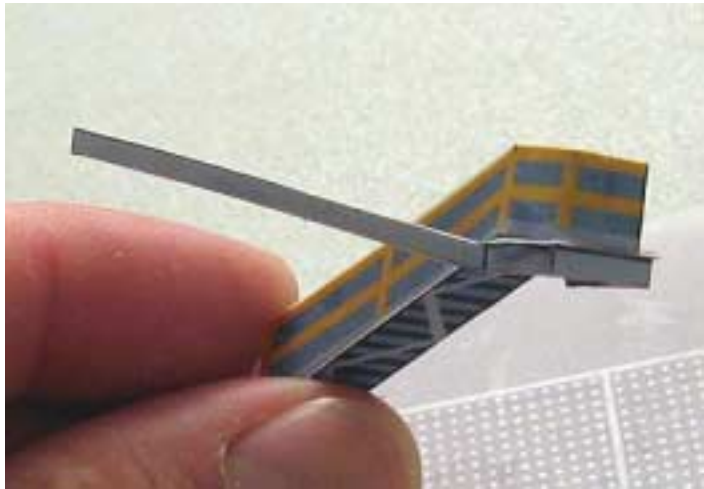
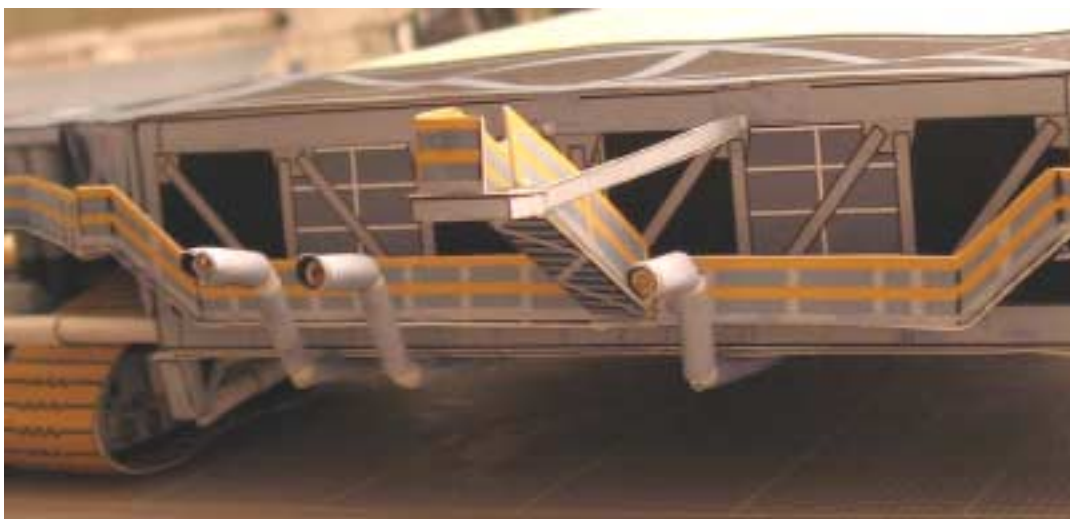
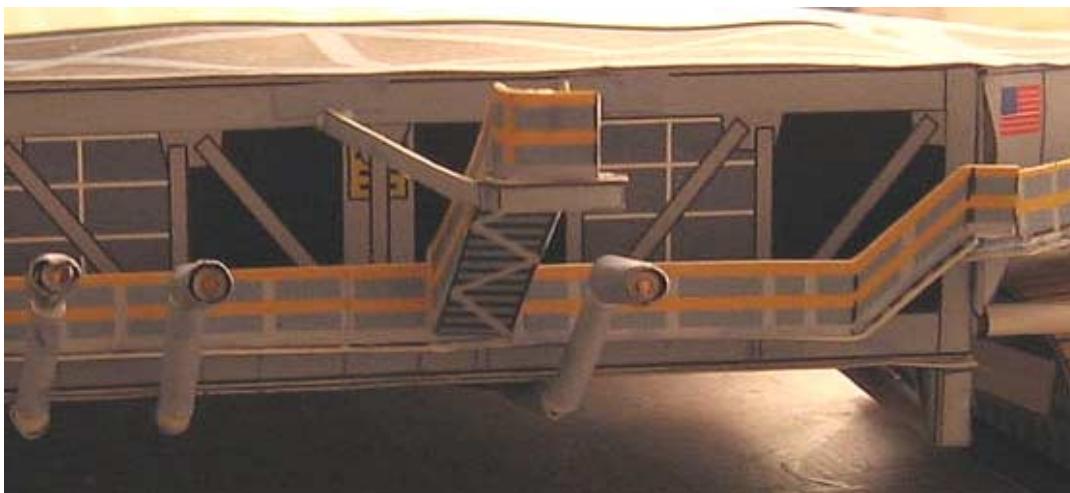
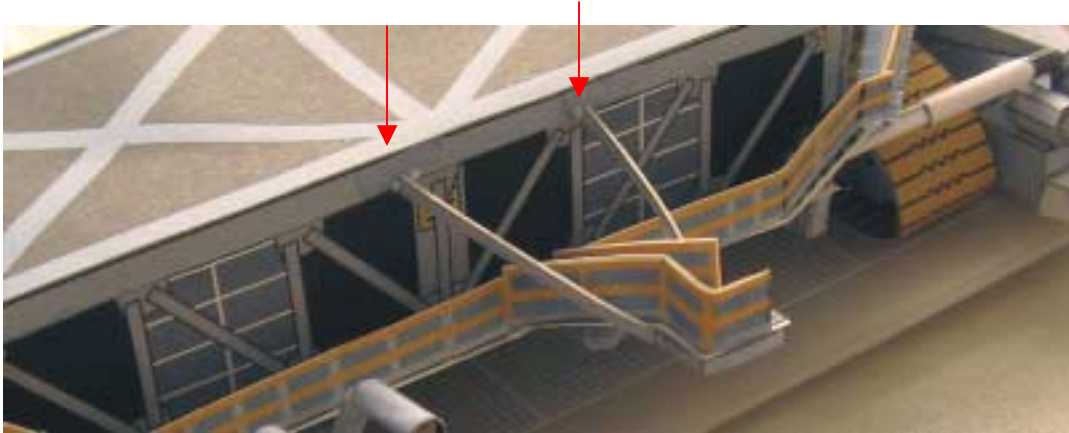


Photo shows extra part that will complete the sides of the floor.





Close-up photos of **Side 1** showing the access stairs to the Mobile Launch Platform.

Building the undercarriage

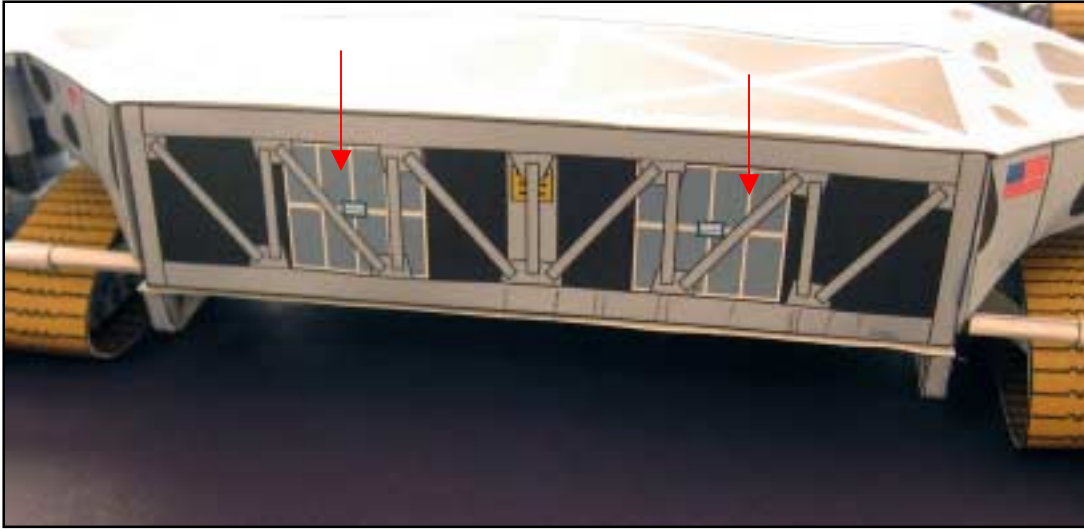
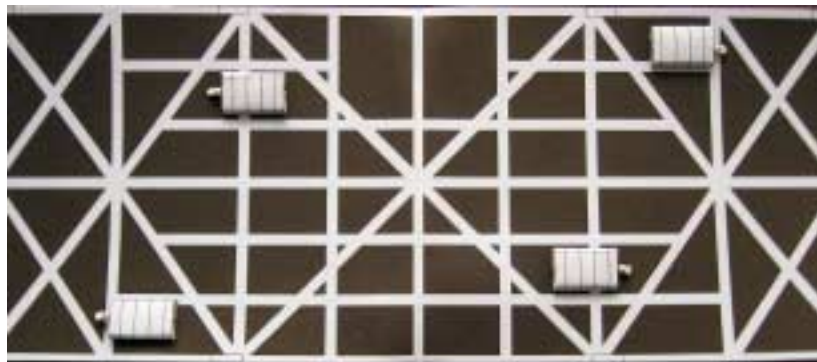
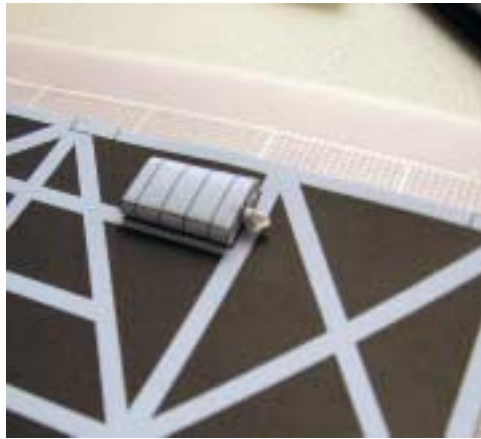
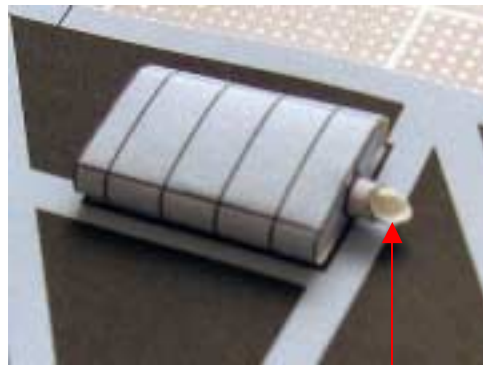
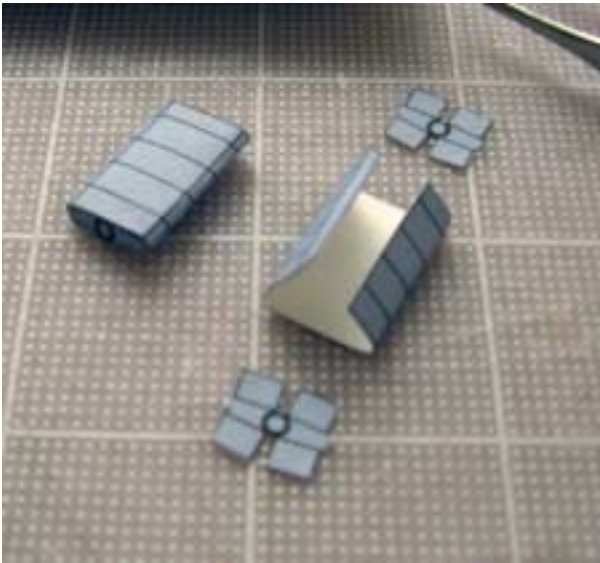
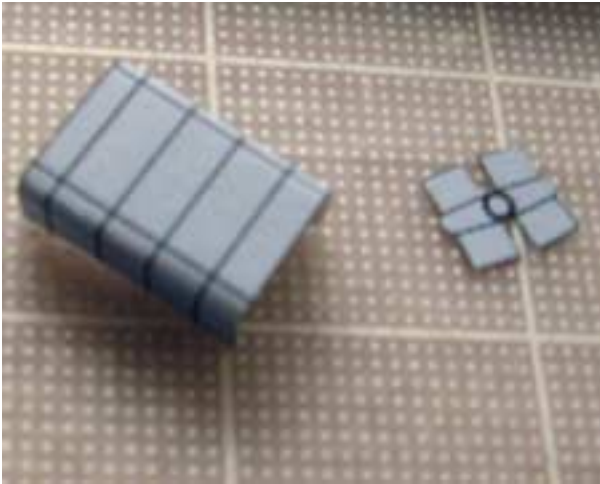
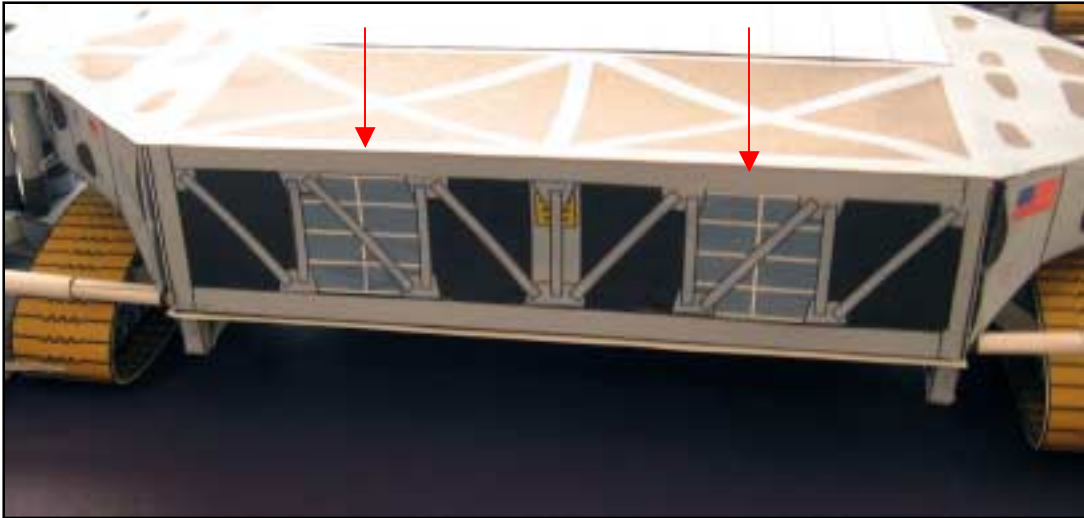


Photo shows how Sides 1 and 3 look like for the Apollo and Old Shuttle Crawlers. Notice the position of the fans (off centered). This serves as a reference for differentiating all crawler variants. The crawlers with these sides have the original old exhaust mufflers.

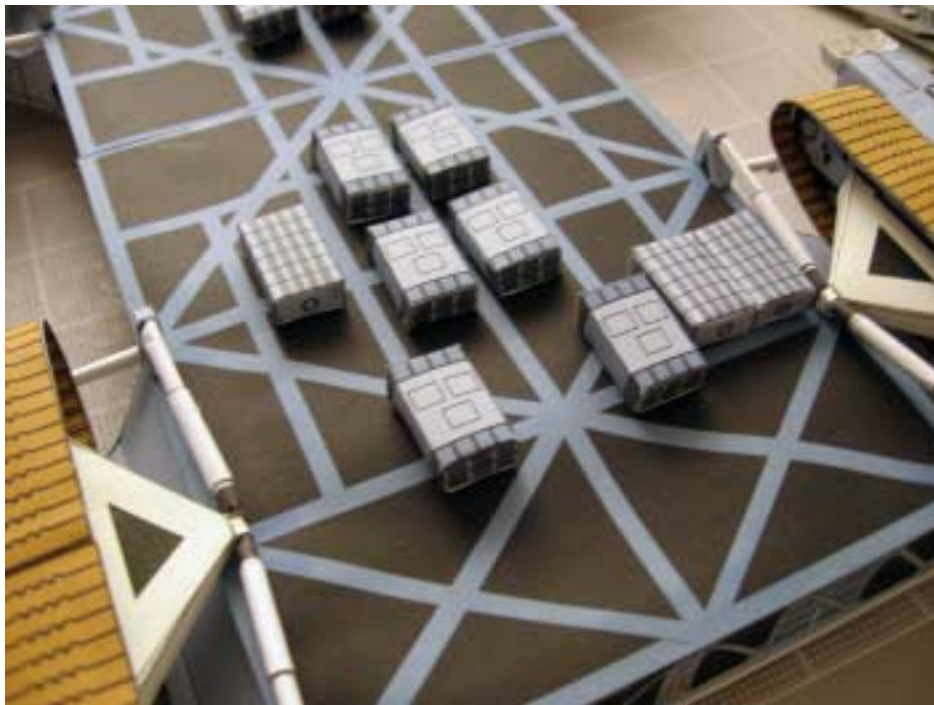




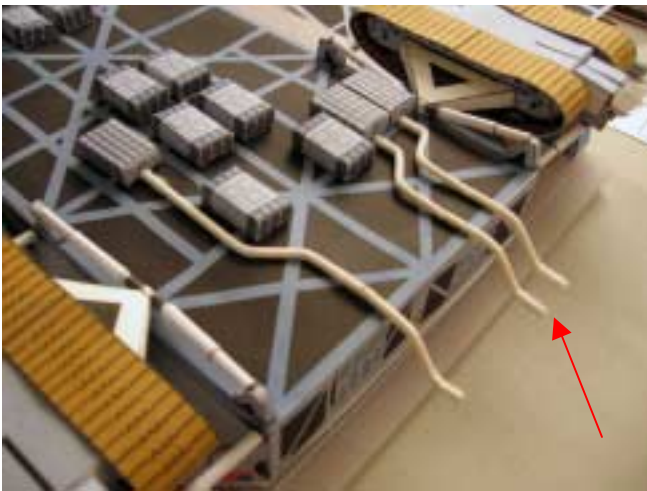
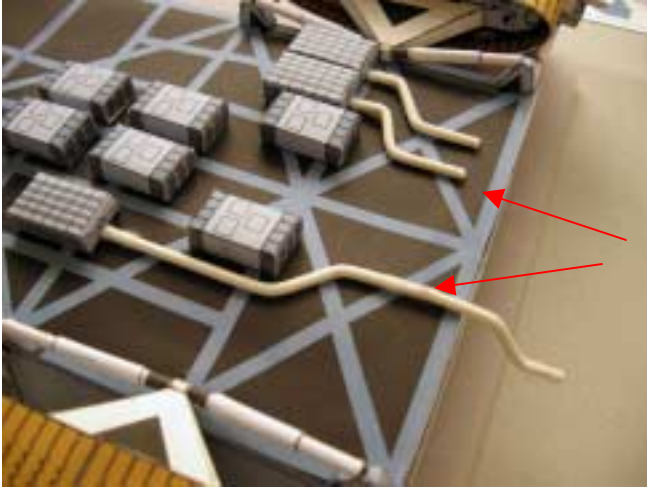
Use black marker to paint the inside of the exhaust tip.



With the re-design of the crawler starting with STS-114 for the Return to Flight mission, the fans were moved from their original position to a more centered position on Sides 1 and 3. This new crawler has the new and upgraded exhaust and ventilation system in the undercarriage.

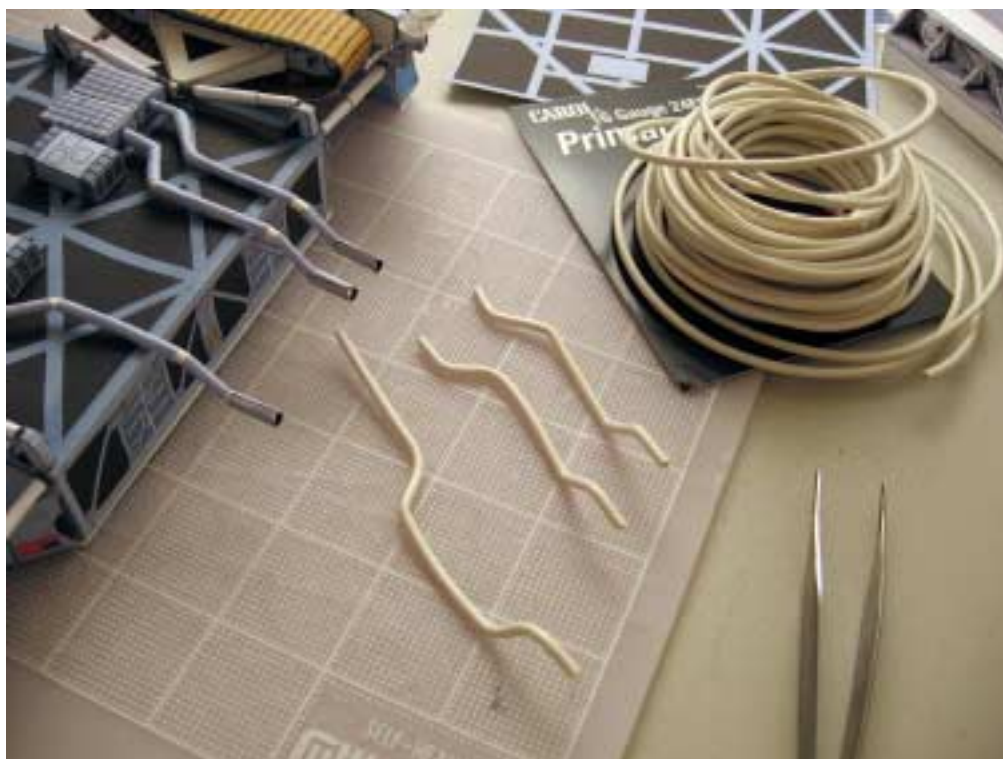


Glue the correspondent boxes to the undercarriage where indicated. This photo is from the prototype model and does not show where the pipes go. See next photo.



These photos show the assembly of the exhaust pipes on one end of the crawler. Notice that I have used cotton swabs for the pipes because of the width compared to the scale used.

Top photo shows that the each pipe is formed out of 2 swab parts, as second photo shows. The modeler can use whatever approach to building these pipes as long as they have a width of 2 mm.



Another approach is using electrical wire that can be found in a hardware or depot store. Use **16 gauge** for the pipes. This width is the same as the cotton swab 2mm.

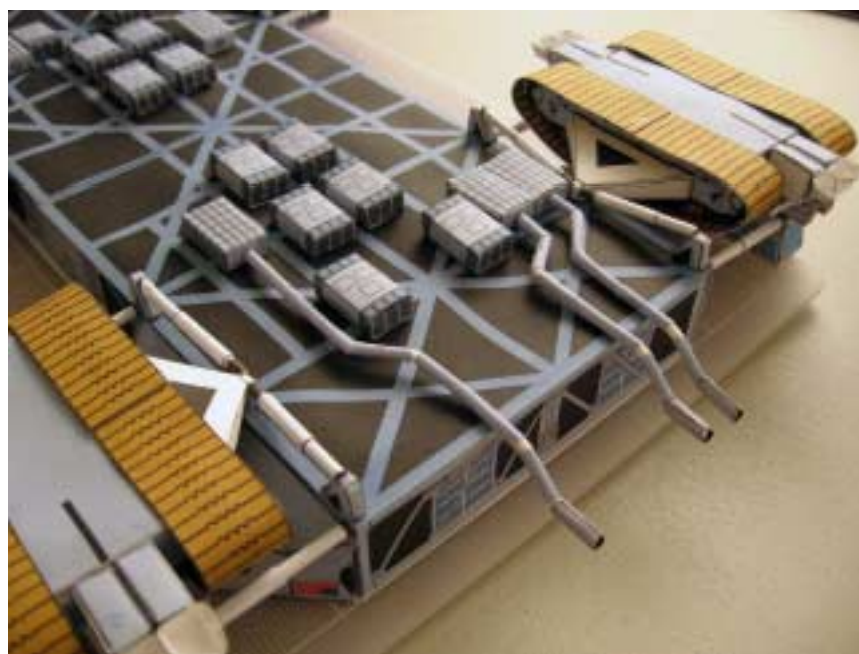
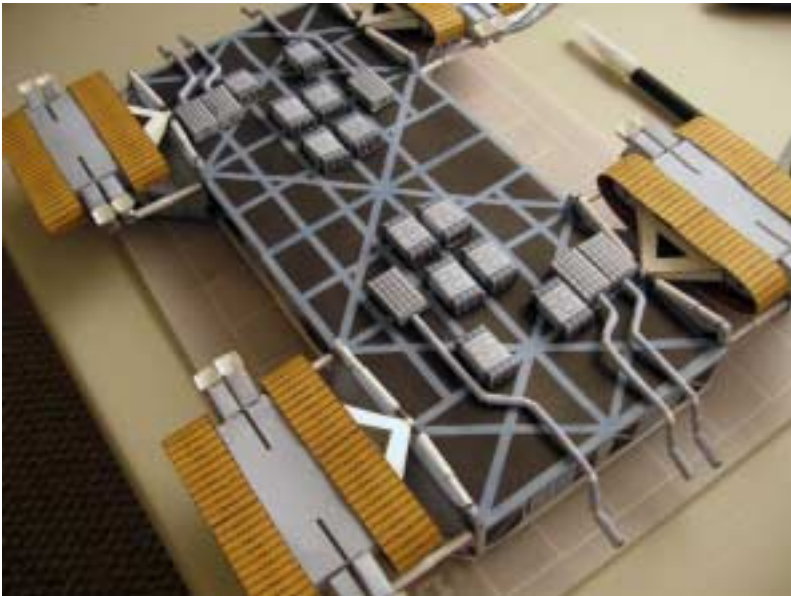
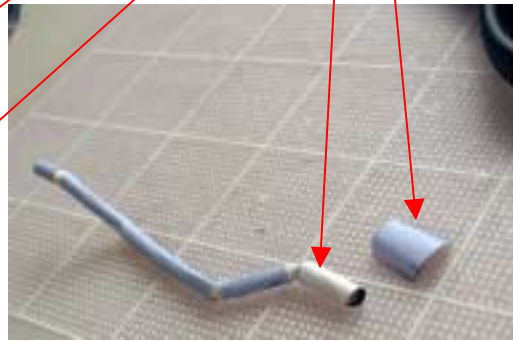
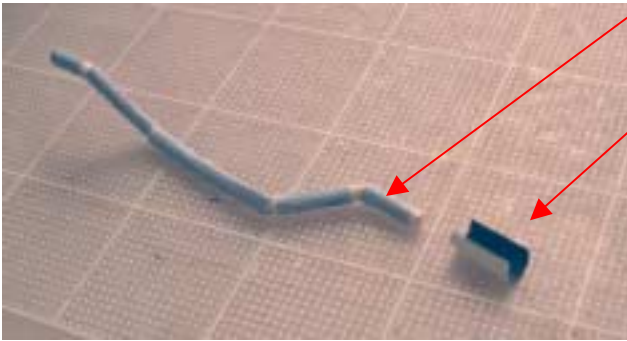
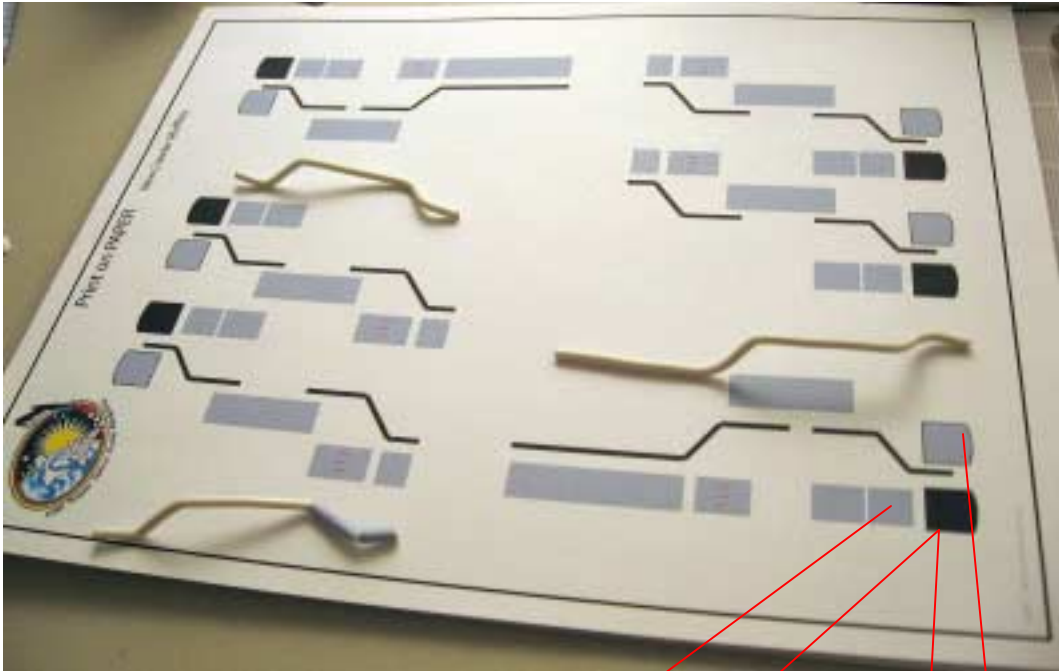


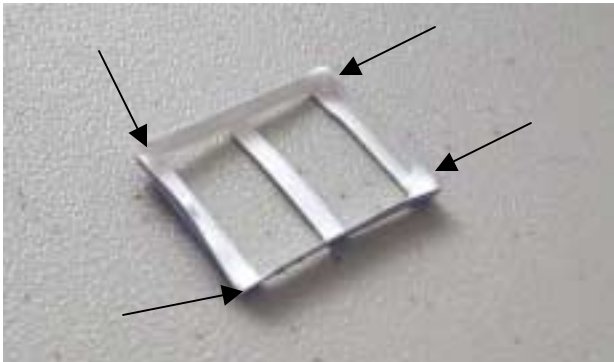
Photo shows that the pipes are covered with colored paper. (Use sheet that has the pipe covers and follow the pattern indicated) See next photo.



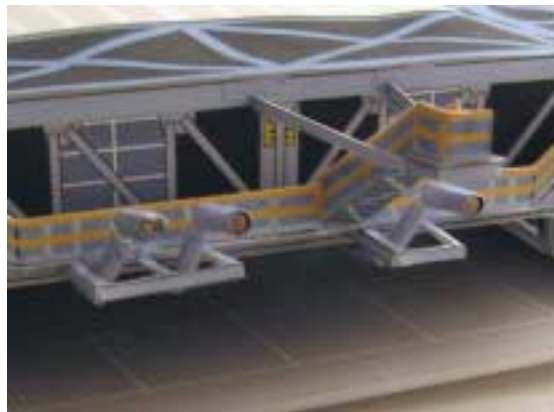
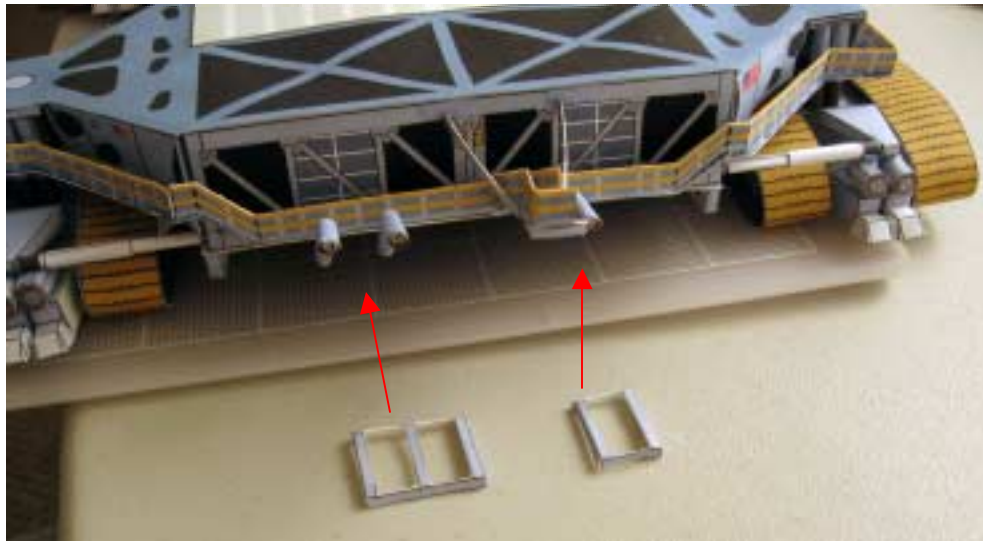
Arrows indicate the parts needed to build the tip of the new muffler.

This photo shows the complete new re-designed ventilation and exhaust system.

Building the exhaust pipes support (only for new current crawler)



Apply glue in each corner to reinforce the whole part.



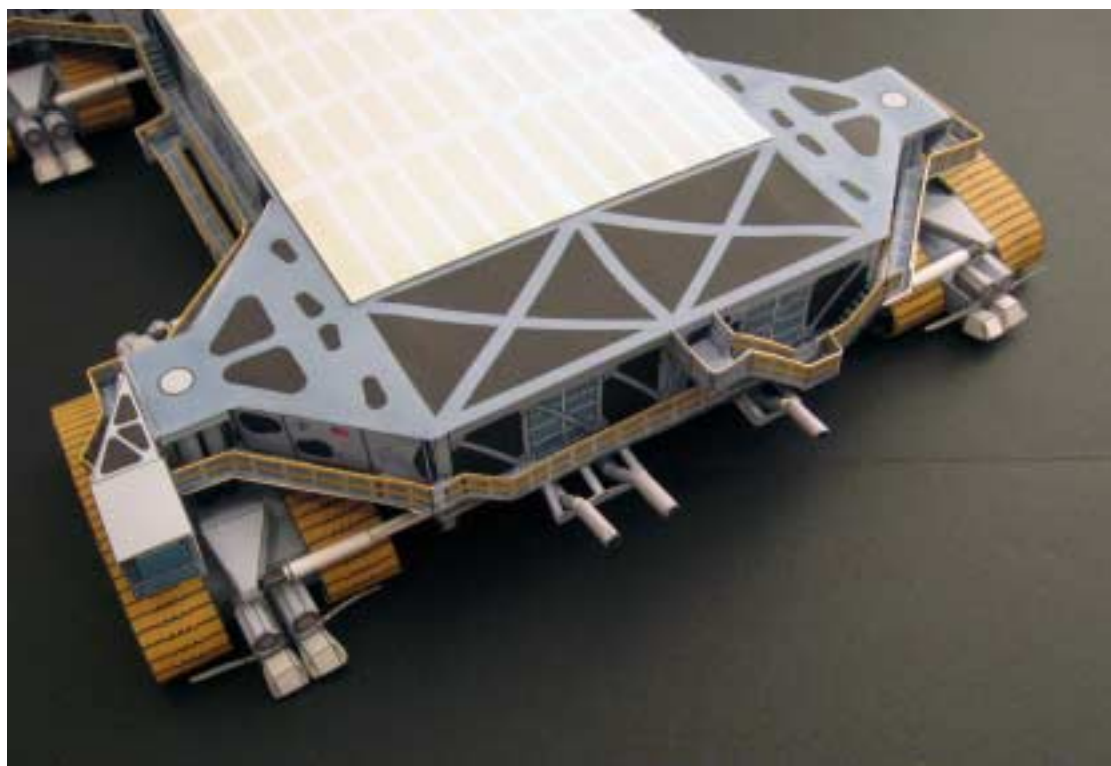
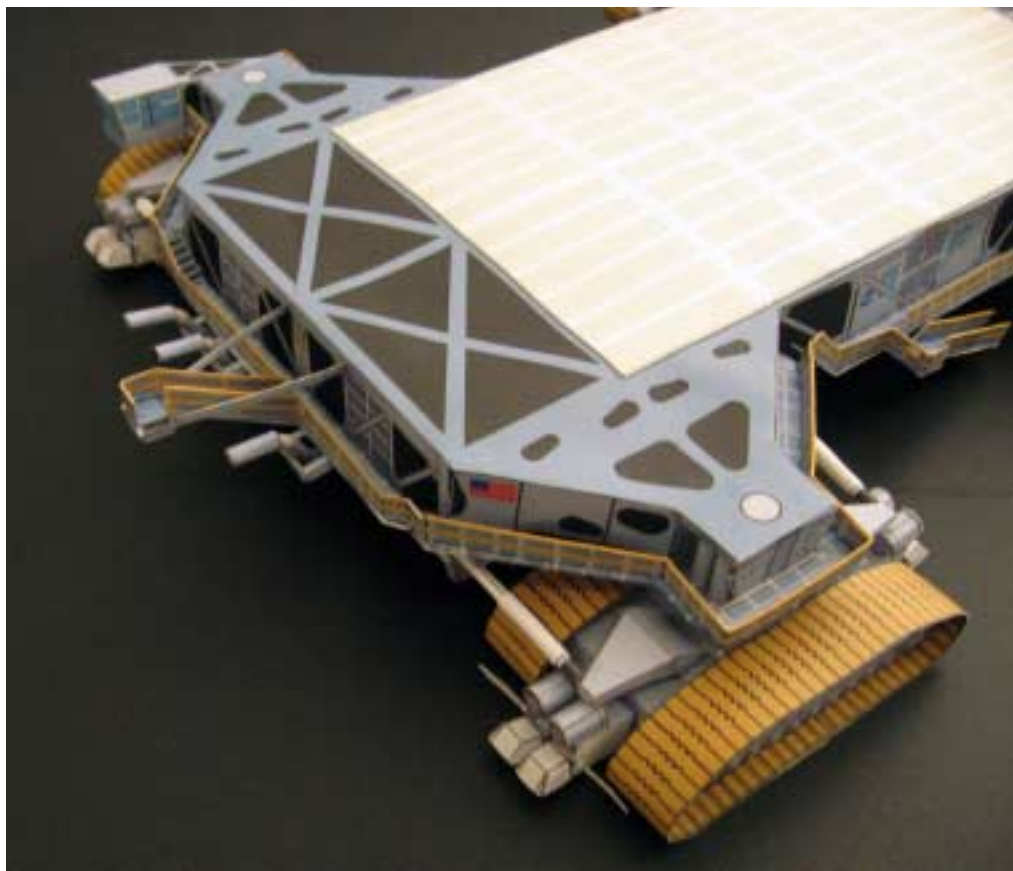
Crawler Cabs

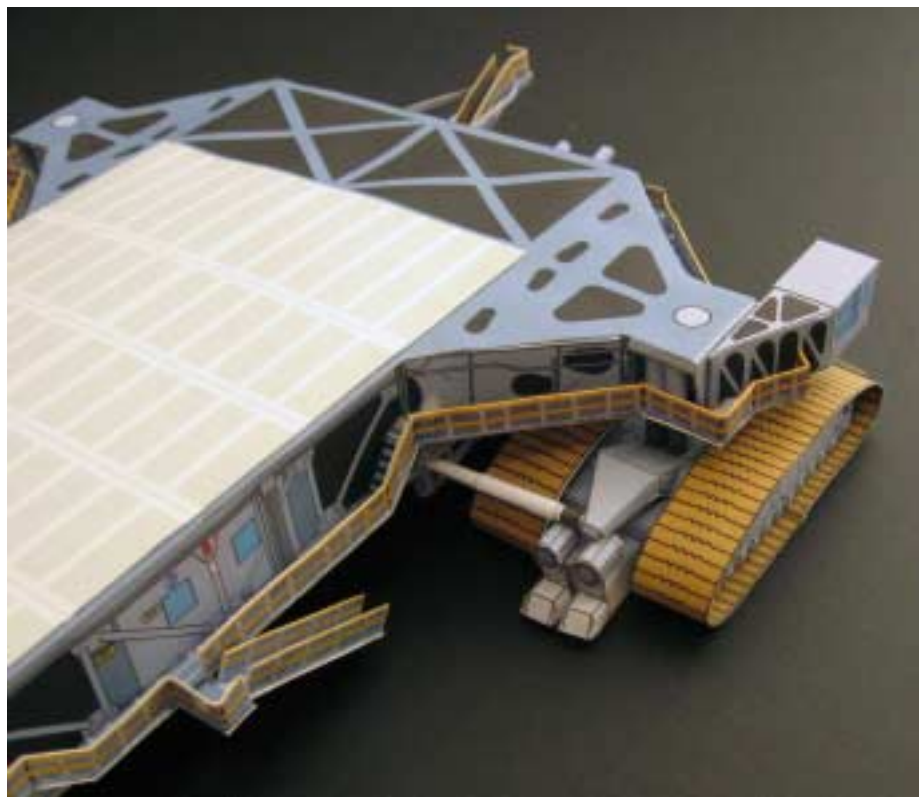
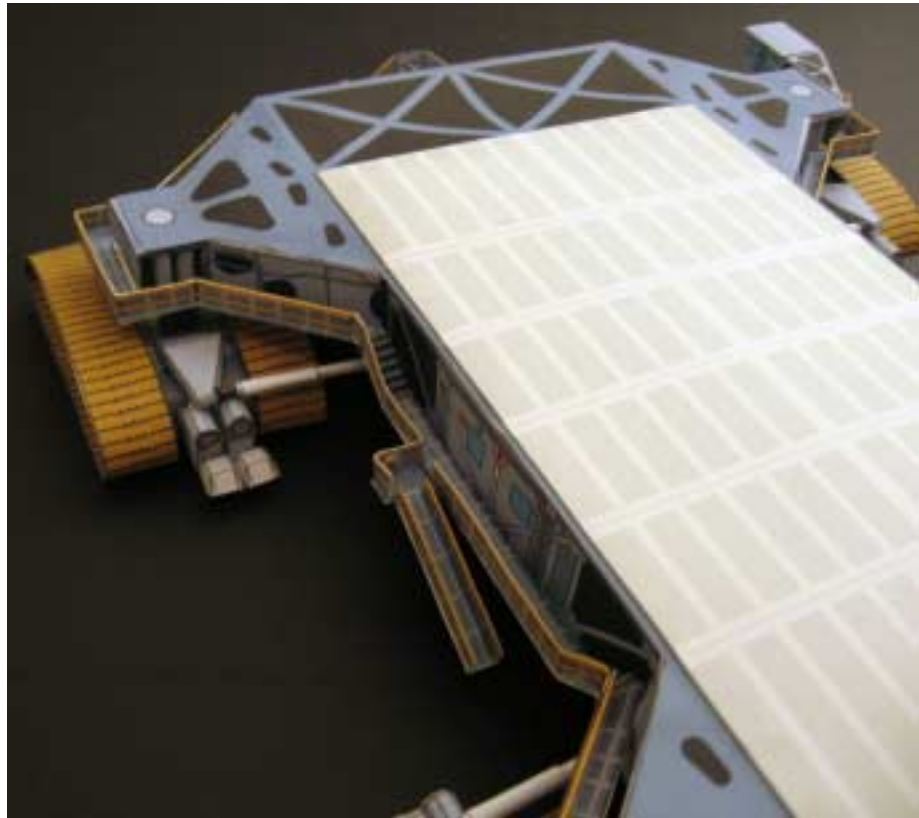


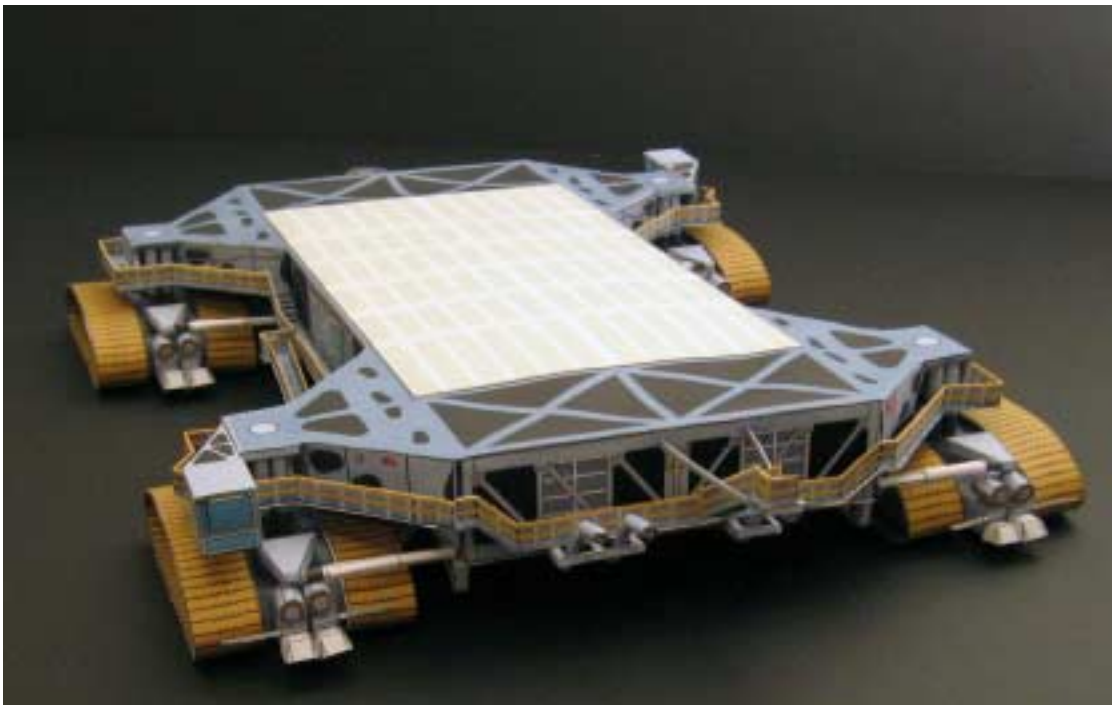
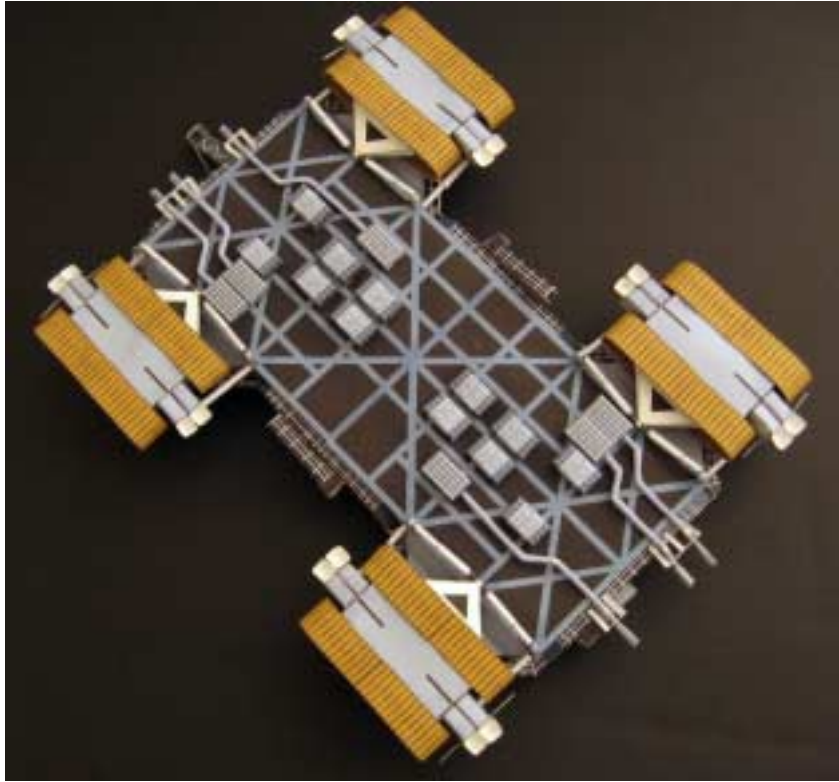
Photo shows the evolution of the cab, from the Apollo era (left) to the Shuttle program (middle and right).

Reference photos









<http://www.axmpaperspacescalemodels.com>