1/72 scale Space Shuttle Orbiter
Flexible Thermal Protection System Replication Process
By Steven Jochums, Lake County Space Port

As I have said numerous times on the website, working on David Maier's Edu-Craft Diversions' phenomenal paper models, with their "photo-realistic" approach, has shifted my perspective on space modeling. As David used photos of the launch complex hardware in order to get the "look" of the equipment as realistic as possible, I have also found instances where using NASA photos, and even some photos I have personally taken, that certain improvements in overall realism could be achieved.

Over the last few years, I've looked at all of the available Shuttle tile decal sets available to see if there were any that "rivaled" the black tile decals I had purchased from Mr. Ed Bisconti from suburban Chicago, Illinois on eBay. Although the WarBirds sets for the 1/100 scale Tamiya Orbiter and their 1/144 scale set had a number of areas replicated as well or better than the Bisconti decals, the black tiles were nowhere near the quality of "look" that the Bisconti decals provided.

Having tried to contact Ed over several months, and knowing I had heard about "serious health issues," I found there was not going to be any new postings for his decals. The last purchase I made from Ed was a set of 1/144 scale decals I got for a potential new Revell 1/144 scale build, which never happened. But, I still had a full set of unmolested shuttle tile decals.

Going to my computer, I scanned the decals at a very high resolution, in order to get a set of reference files. Then, I set to work to find out if simply doubling the size would give me a usable set of 1/72 scale decals. With very few adjustments, the 201% printing of the decals worked well. I have subsequently made three sets for my own work (as described on the website), and now am offering these great decals to other modelers via eBay – both 1/72 and the original 1/144 scale. The black tile problem was solved.

But, unless I was going to build Columbia or Challenger, the re-scaled versions of the white tile decals I found from War Birds would still not properly replicate the new "thermal blanket" type of TPS materials used on Discovery, Atlantis and Endeavour. With tons of NASA photos and shots I took of both Discovery and Endeavour at their new display homes, I decided to try and do "photo-realistic" decals of the actual Orbiter surfaces to apply to the models.

Try as I might, I could not get a full set of photos of all the surface areas covered by the blankets that had good geometric linearity, good overall lighting, etc. to make a uniform looking surface with, plus, with all the curves of the Orbiter, many areas distorted by the curvature could not be corrected. The decals were not going to happen soon.

After looking at some of the solutions used by other modelers, one was intriguing – the use of surgical gauze, with very thin strips of plastic used as the seams between the blankets. While the surface detail was intense, it looked almost as "too much," especially the use of the plastic strips. The edges of the blankets didn't appear that visually obvious to me. So while the idea of using a physical material to make the blankets was interesting, the application needed improvement.

Then, while looking at a photo of the side of Discovery taken at NASM from a very severe angle, and seeing the texture of the blanket surface, it struck me. Tape. The same tape used to hold the surgical gauze in place to make bandages might be a solution.

We had a partial roll of Johnson & Johnson's Cloth Bandage Tape in our medicine cabinet, and the first time I looked at its surface, I knew we had a potentially useful material. Besides, if it didn't work, I could peel it right back off.

I used some of those NASA photos I was looking at for decal use and used them as the "pattern" to show me how the blankets were placed on the Orbiter. After doing a portion of the port side of the fuselage, I was convinced this was the

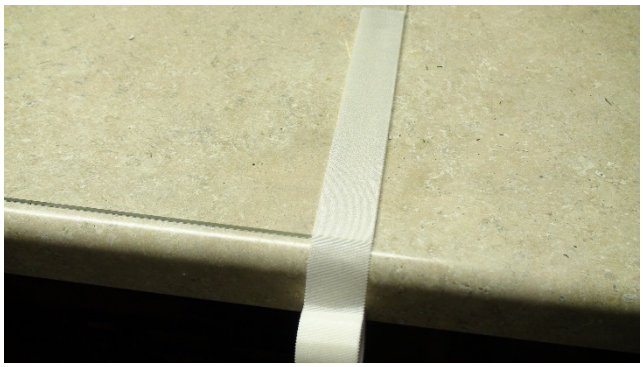
way to go. Since many of the blankets were “square” in shape, I could alternate the “grain” of the tape to visually highlight the texture. By looking at the layout of the blanket material on the vehicle, I could “adapt” the application method to make the work more realistic looking with the fewest pieces possible. A lot of this was done to get good geometric alignment across the surfaces of the Orbiter.

After doing three of these installations – both Endeavour and Atlantis from scratch, and re-doing my Discovery’s exterior – I have decided to create a set of instructions and “maps” so that others can give it a try, with maybe a bit more support than I had.

So, let’s get started making scaled Flexible Thermal Protection System (FTPS) blankets…

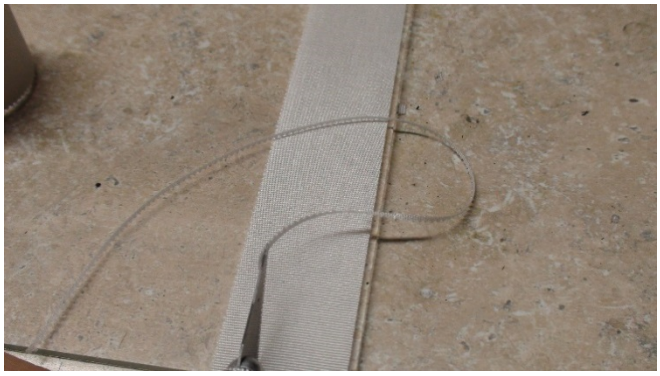
Here’s the material in question…
Johnson & Johnson’s Cloth Bandage Tape, 1 inch wide. I cut the top off the blister pack to fit better in my storage location. One key to finding the “genuine” article is to look for “made in Brazil” on the center spool. Whatever magic cloth the stuff is made from, that’s where it’s made.

For my work area, I found a sheet of window glass to provide clean, smooth surface from which I could lay out the tape, make the necessary cuts and then get the tape to yield from the surface most easily. A more formal “cutting board” type surface may also work well, but I didn’t have that option.



The tape has “serrated” edges, so these little “bumps” will need to be removed in order to get smooth, clean edges on each blanket section. The easiest way to do this was to lay a section of tape along the edge of the glass work surface, so that the edge of the tape runs dead parallel to the glass.

At this point, the section can be trimmed off by running the X-Acto knife along the lower edge of the glass sheet. Then place a metal straight edge along the tape surface, with the serrated edge of the tape exposed with an additional 1mm of tape.



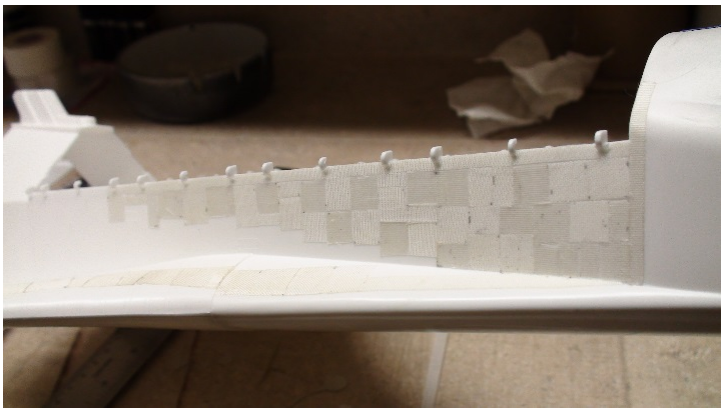
Run your knife along the straight edge, and remove the serrated edge from the tape section.
Now, it's time to make actual "blanket sections."

As I found there were regularities to the sizes of these sections, I decided to make "guides" in order to make fabrication faster and more repeatable. Using pieces of 0.040" thick styrene plastic, I made short strips in 3/8" width and in ½" width and just over 1" long, I could then use these not only to make the tape for long-axis cutting, but also run the knife edge along them to cut out the individual sections across the tape strips.

Here, you can see I'm using the 3/8" guide to mark the tape 3/8" in from the new edge. You will find you can then mark a second location using the 3/8" guide for a second row, and still have enough edge stock for the "strip" tape material used in specific locations. Since the tape is actually a bit bigger than 1" wide, you can also get two rows of ½" wide blanket sections, but with no "left-overs."

Again, in this example, we have made the 3/8" cut down the long axis. By placing the guide along the bottom edge of the tape and cutting across, gently but firmly, we can create the 3/8" square blanket sections that make up a great deal of the 1/72 scale FTPS surface. By starting with ½" long cuts, you can do either ½" by ½" sections, or 3/8" by ½" sections, depending on the guide used for the cross-cut.

You can start placing these section where ever you wish, depending on what stage of the build you might be involved in. On the Endeavour build, I started with the side walls of the main fuselage, working from a NASA photo of the side of Discovery, as she rolled from the OPF to the VAB, where the lighting showed a great deal of relief on the blankets, and I could more easily identify each location.



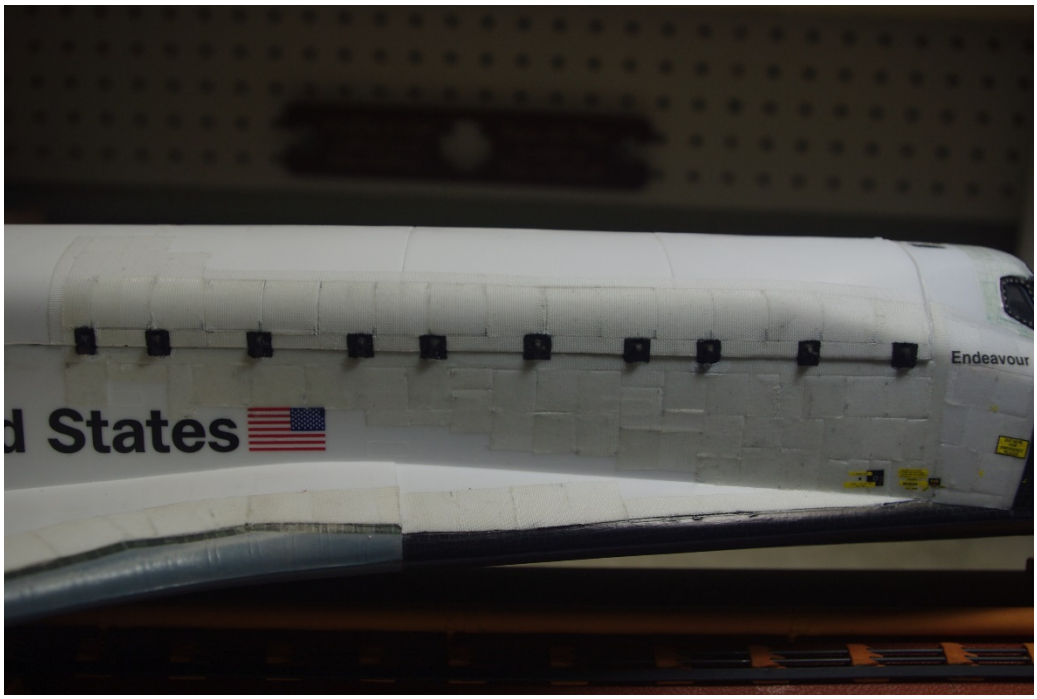
While we're on the subject of blanket section sizes, I'd like to use this point to introduce you to the "grammar" of the blanket sections I have found to work best for these 1/72 scale builds. In my original "plan," I tried to give each one of the "type" numbers, but found that to be a bit ponderous. So, I decided to assign types only to those "major sections" which occur consistently, and then show where "cut" versions of those sections are used.

Type 1 – (T1) – 3/" by 3/8" square
Type 2 – (T2) – ½" by ½" square
Type 3 – (T3) – 3/8" by ½"

If you see a "T1c" on a map it means it's a cut-down T1, usually cut in half, to provide a smaller section, or cut into the proper shape, to fit a specific location. The same will hold for T2c and T3c cut sections.

Strip 1 – (S1) – 5/32" wide tape strip
Strip 2 – (S2) – 3/32" wide tape strip
Strip 3 – (S3) – 7/32" wide tape strip

The strips are used as "boarders" along the forward fuselage/Midbody interface, along the lower edge of the Payload Bay Doors, the upper edge of the Midbody Payload Bay Door opening, the interface between the blankets and the white tiles of the cockpit area, and the forward blanket/tile interface on the OMS Pods. The maps will show the other locations these strips are employed.



For the long strips used on the Payload Bay Doors and Door body edge, there are openings on the lower edges of the doors for the hinges of the Midbody to fit through. The best way to work these areas is to lay the tape strip over the holes, along the door's lower edge, then using an X-Acto knife, make small cuts along the sides of the openings, and then across the top, removing each little cut-out square of tape as you go.
The same method is used along the upper edge of the Midbody door opening, except that the hinges are pushing through the tape.

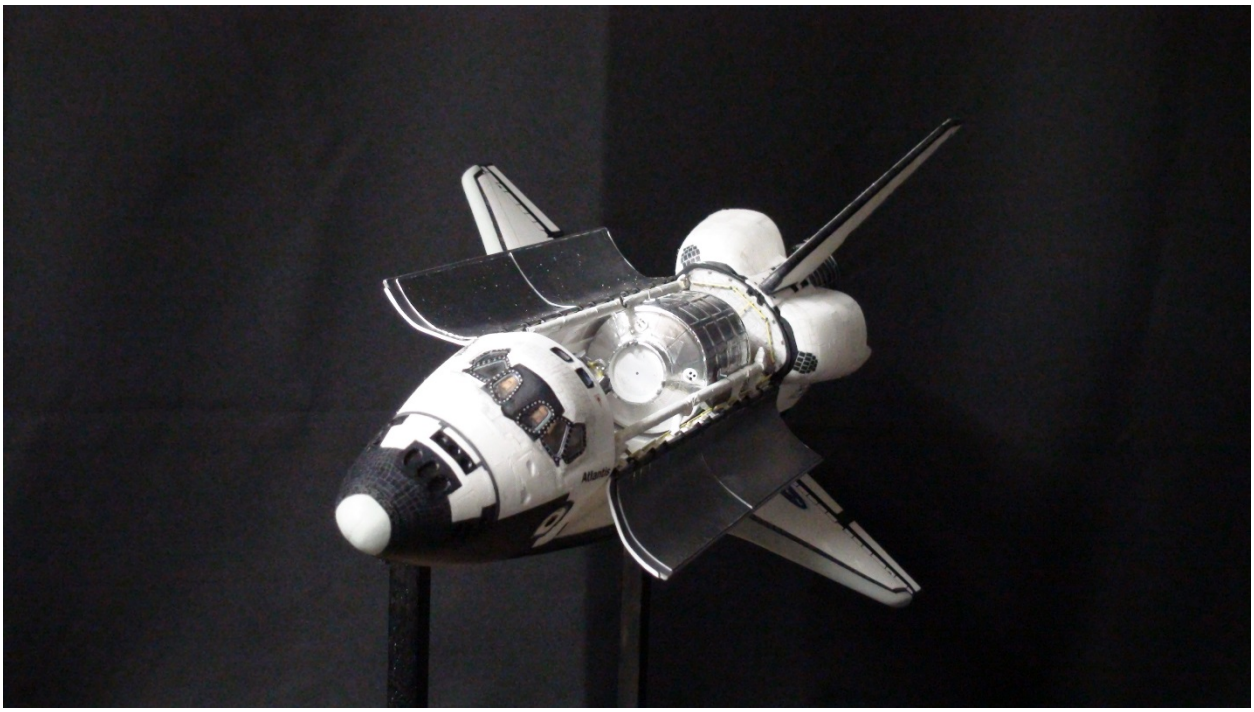
Make sure the strip edge and the upper edge have good alignment, then using your fingernail, push the tape in tight along both sides of a hinge, then use the knife to make the same side cuts and top cuts that you did on the door openings. The hinge will come right through a tight fitting tape strip. This will also help later when you paint the black tile areas around each hinge.

Once all of the tile decals and your FTPS work is done, you can apply a light coat of Testor's DullCoat dull-finish lacquer, in order to seal the finish and protect your decals. Also, tiny threads that migrate away from the tape can now be knocked-down with a sharp razor knife.
I have included some of the NASA photos I used for reference, as well as the first "marked-up" portion of the Discovery photo, showing how my though-process worked.

Feel free to modify and adjust this process to your own desires. After all, it's your model. My goal of sharing this process was to provide insight into how I found a way to do it, so that you can decide if it's the way you wish to go.

If anyone can figure out how to make these surfaces into a decal set, let me know how you did it!

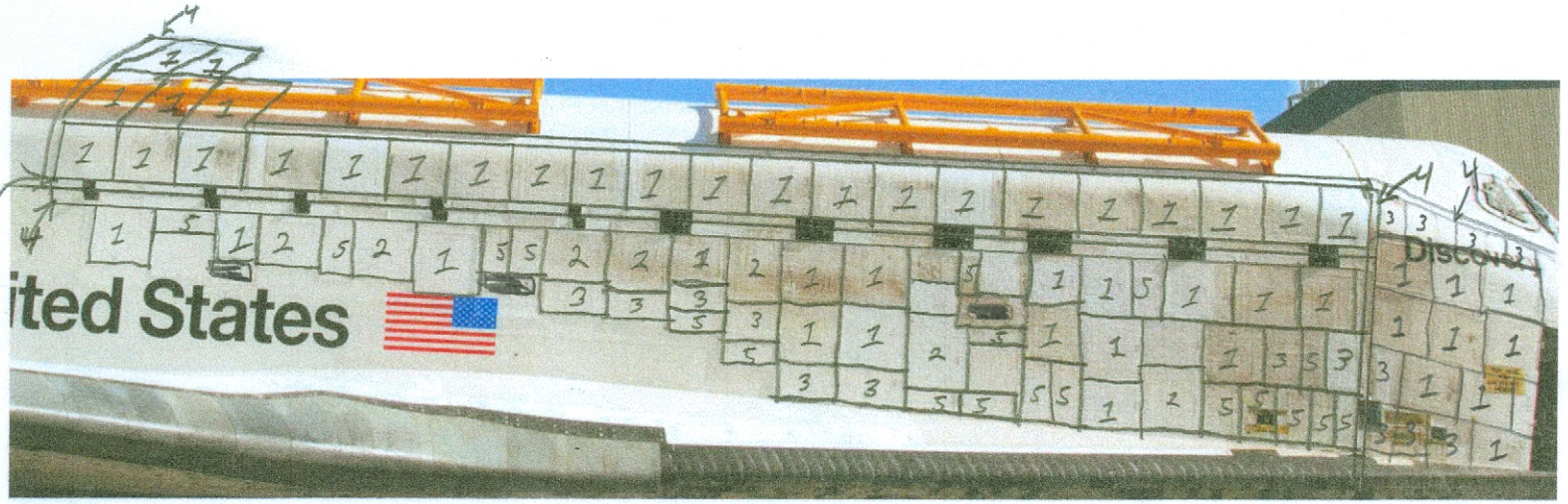
Until then, Happy Spacemodeling!! Ad Astra per Formae!!



White TPS tile and FTPS blanket interface, cockpit area, Orbiter Endeavour
Courtesy NASA

Port side, forward fuselage, Orbiter Discovery @ the NASM Udvar-Hazy Center
Courtesy - Steven Jochums

Orbiter Endeavour, California Science Center, Los Angeles, California



T1 3/8" x 3/8" → Type 1 - 3/8" x 3/8"

Type 2 - 1/2" x 3/8"

Type 3 - 3/16" x 3/8"

Type 4 - ~~5/32~~ wide long-strip

Type 5 - cut sections (typ. 1/2 of a 3/8" by 3/8")

T2 - 1/2" x 1/2"

T3 - 3/8" x 1/2"

T1c (cut T1)

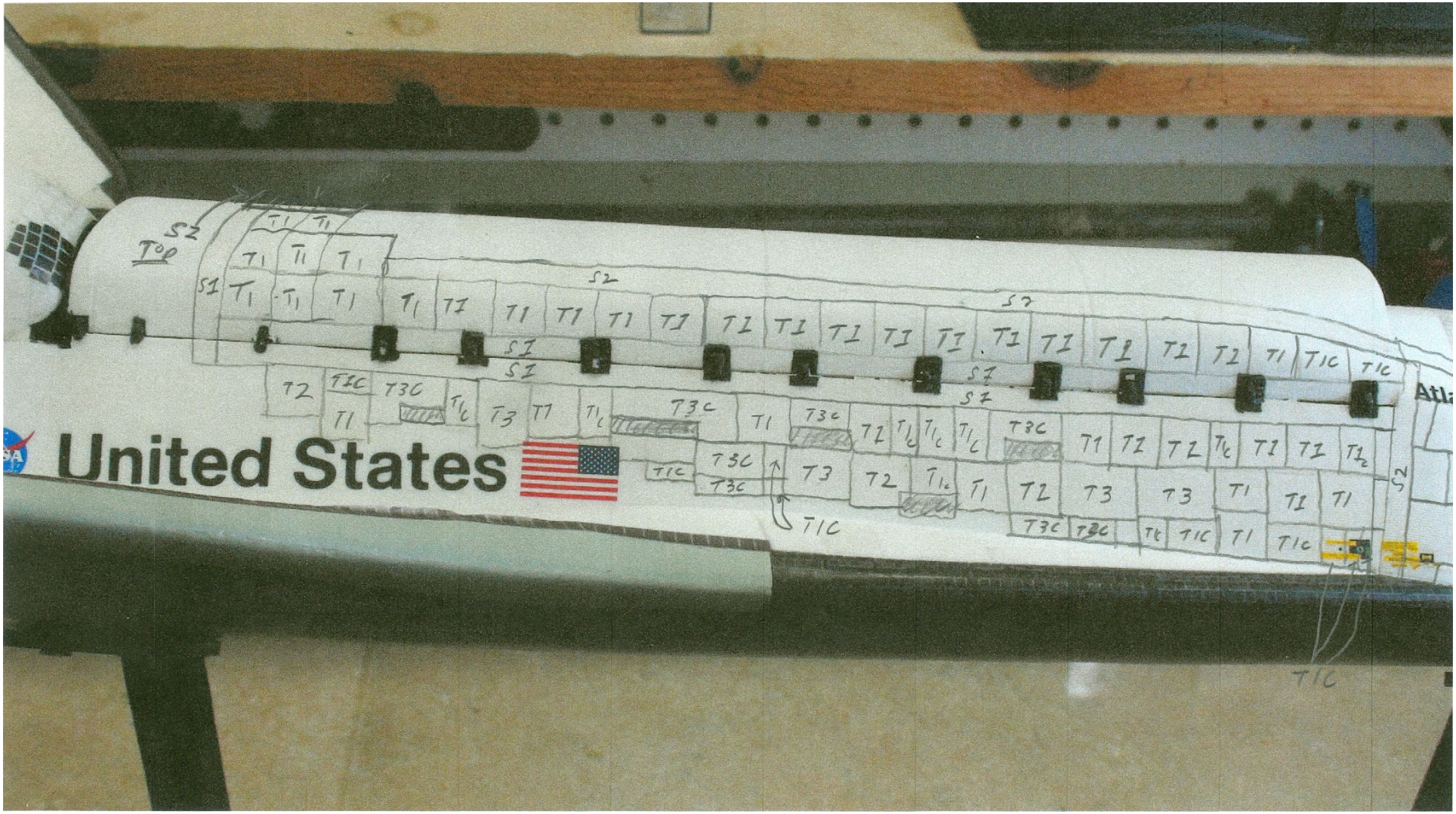
T2c (cut T2)

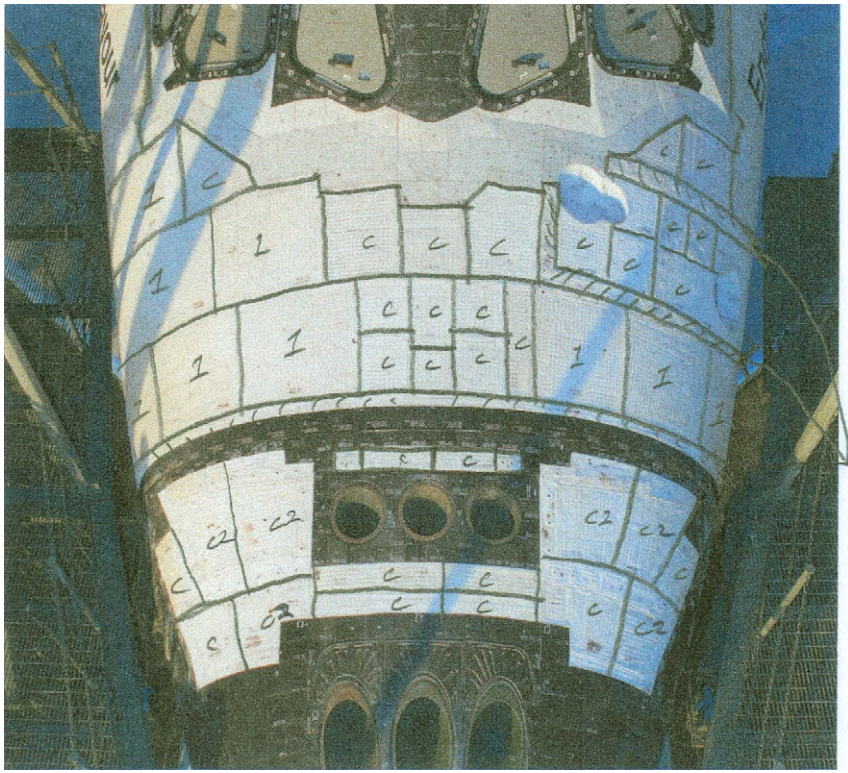
S1 5/32" wide

S2 3/32" wide

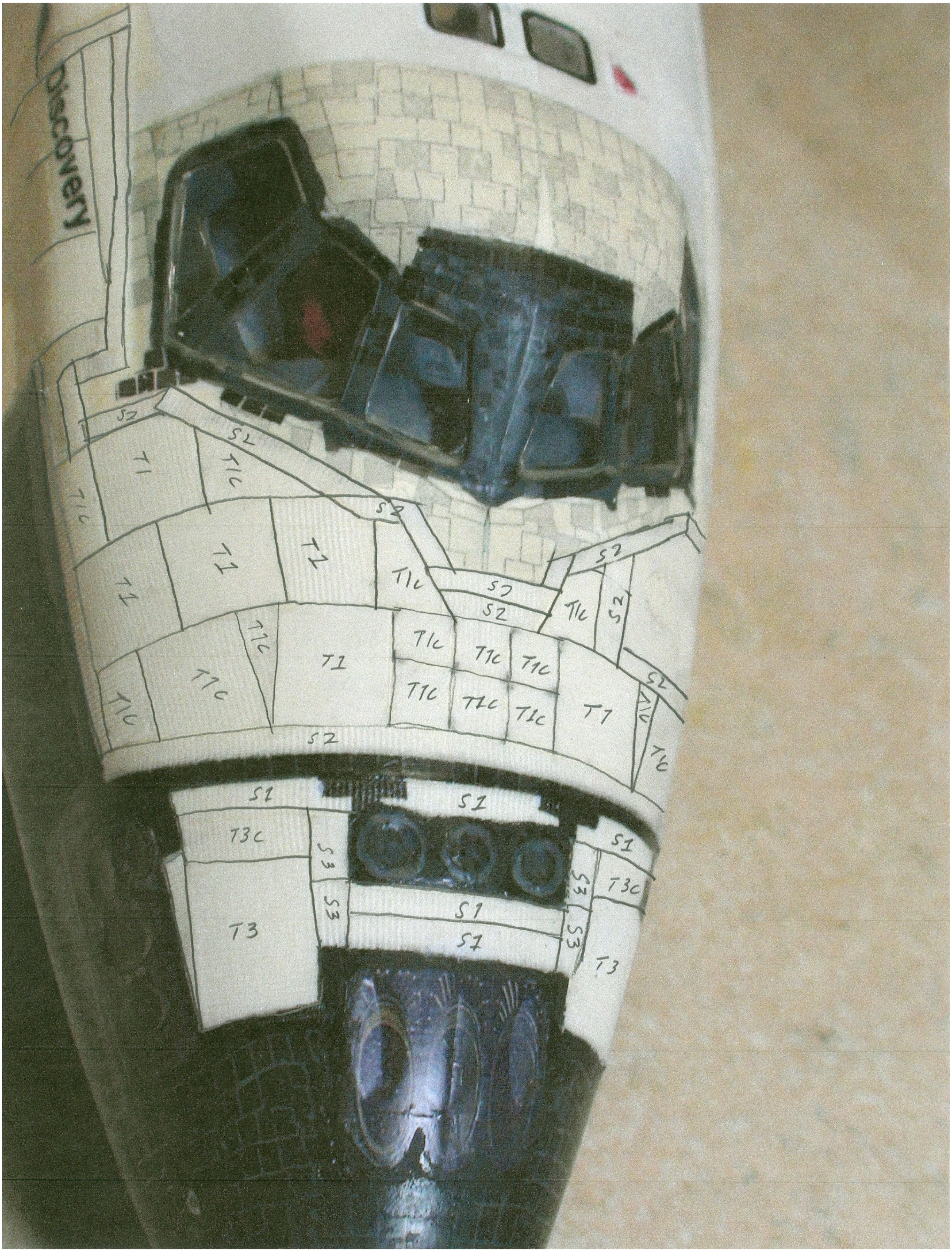
S3 7/32" wide

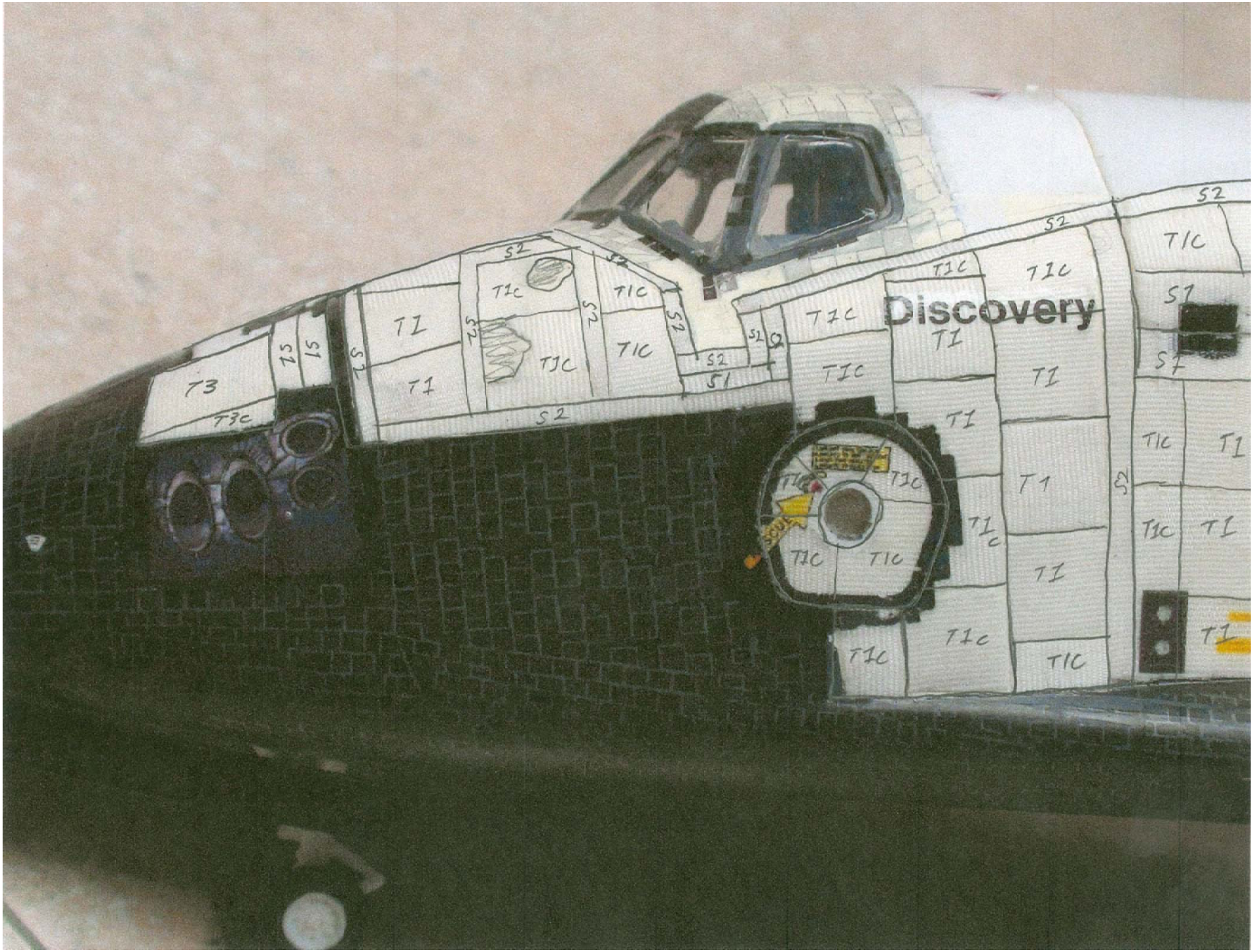
Original Tile Layout from Discovery photo @ KSC

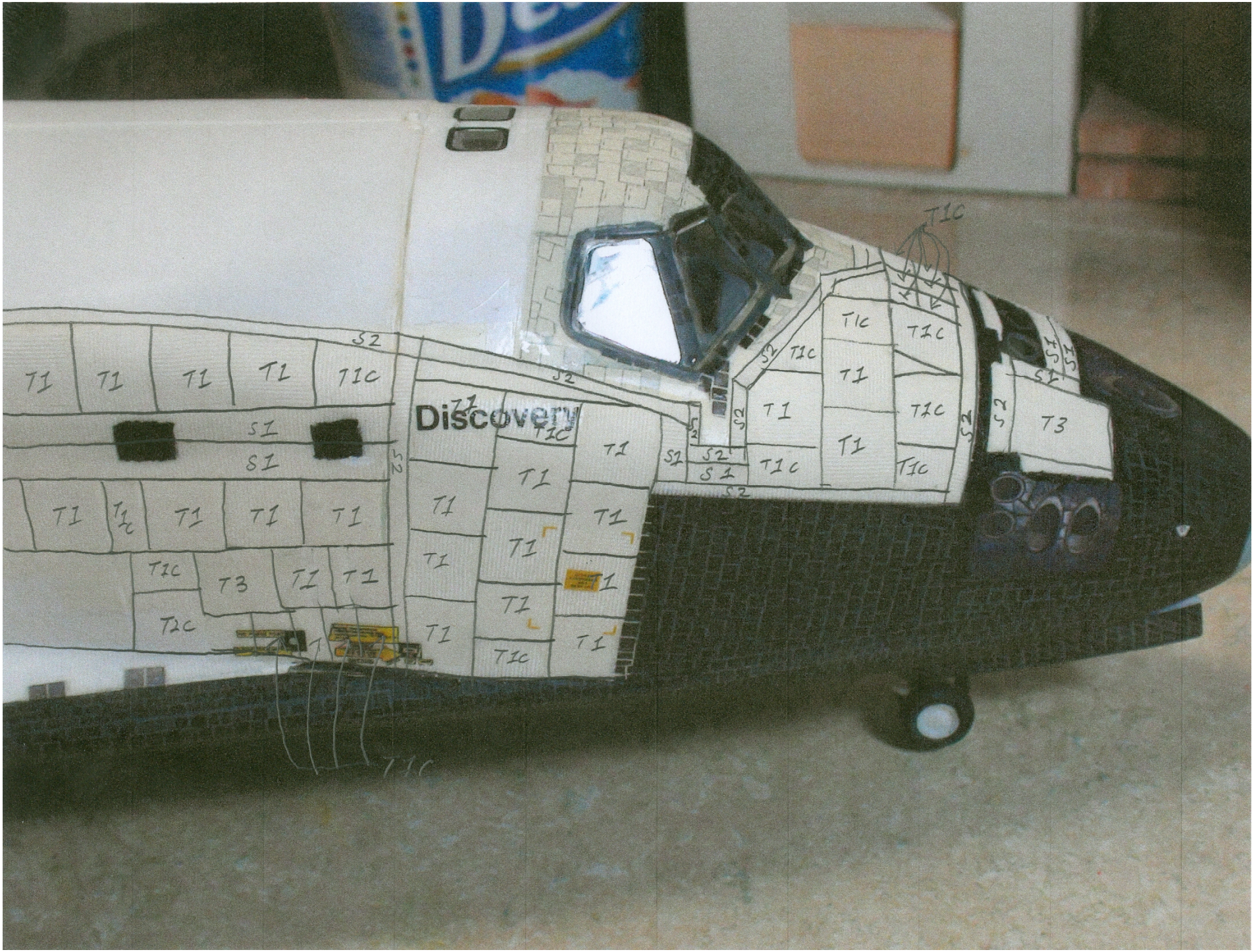

United States

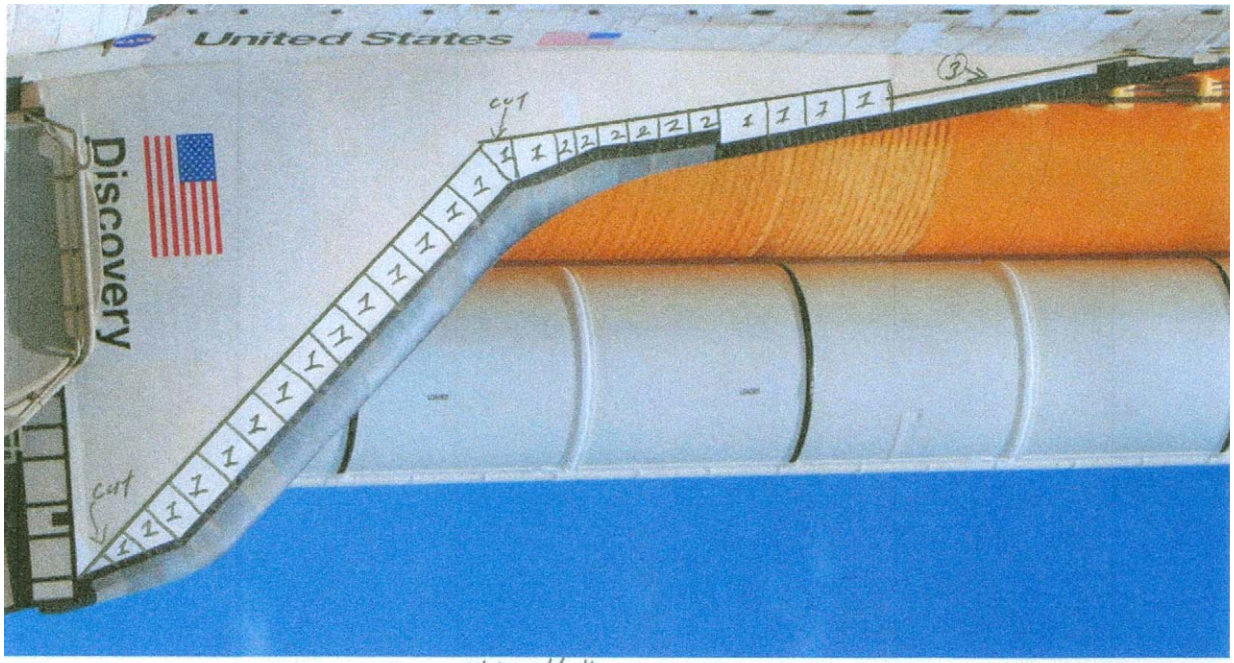


5/32" wide strip
1 - 3/8" x 3/8"
c - cut sections of 3/8" x 3/8"
c2 - cut sections of 1/2"

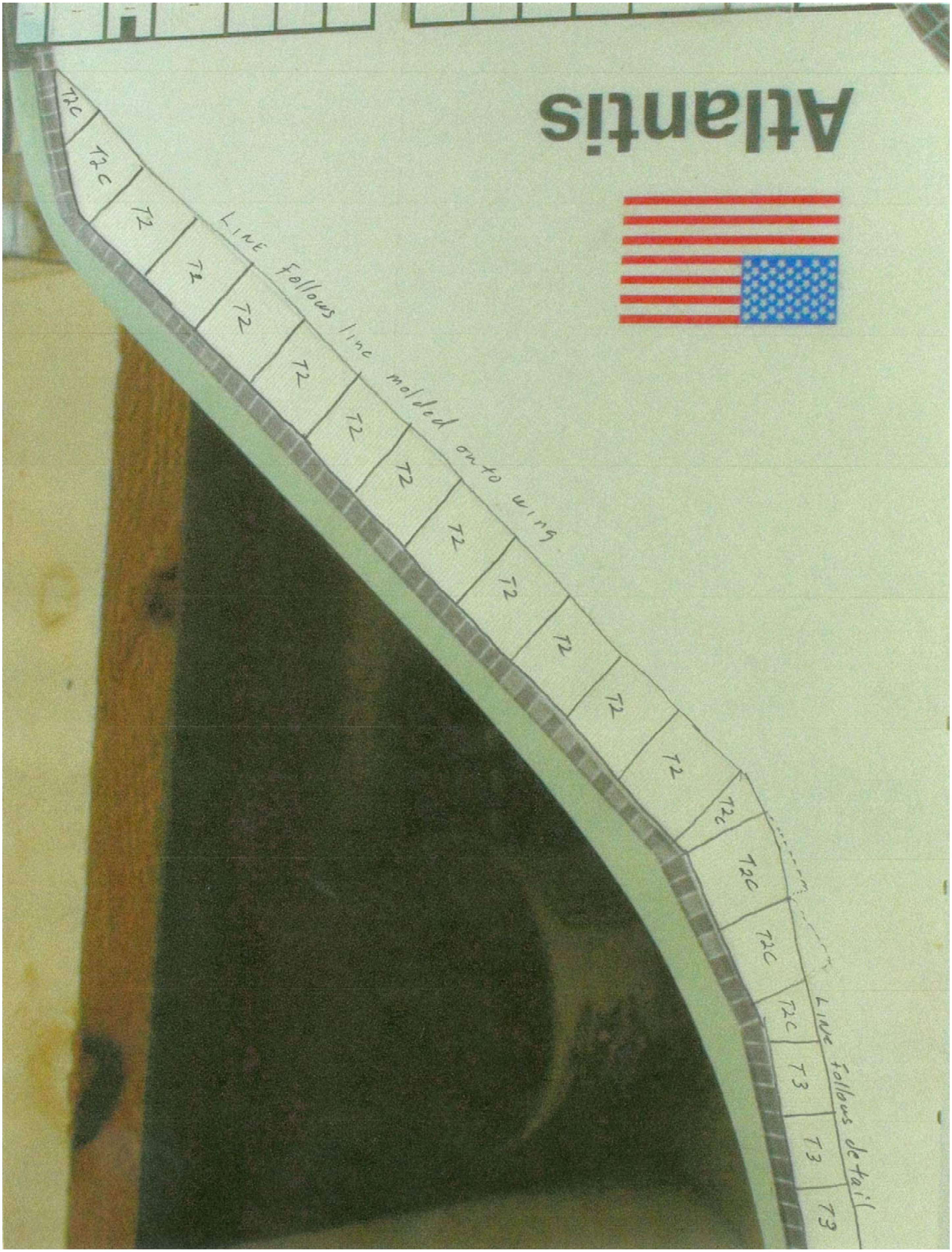

Discovery
S2
T1
T1C
T1C
T2
T1C
S2
T1C
T1
T1C
S1
T3C
S3
T3
S1
S1
S3
T3C
T3


Discovery

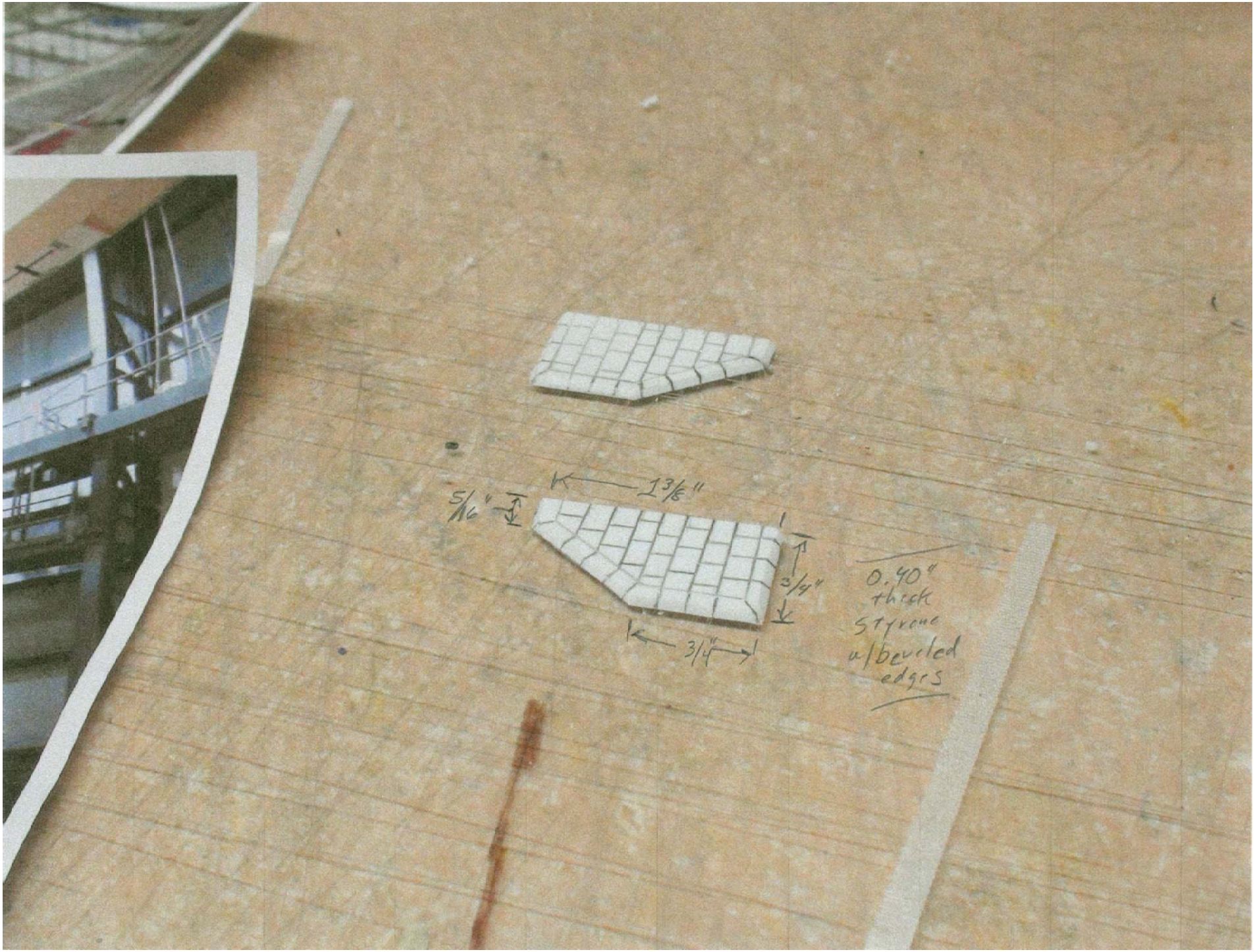

Discovery

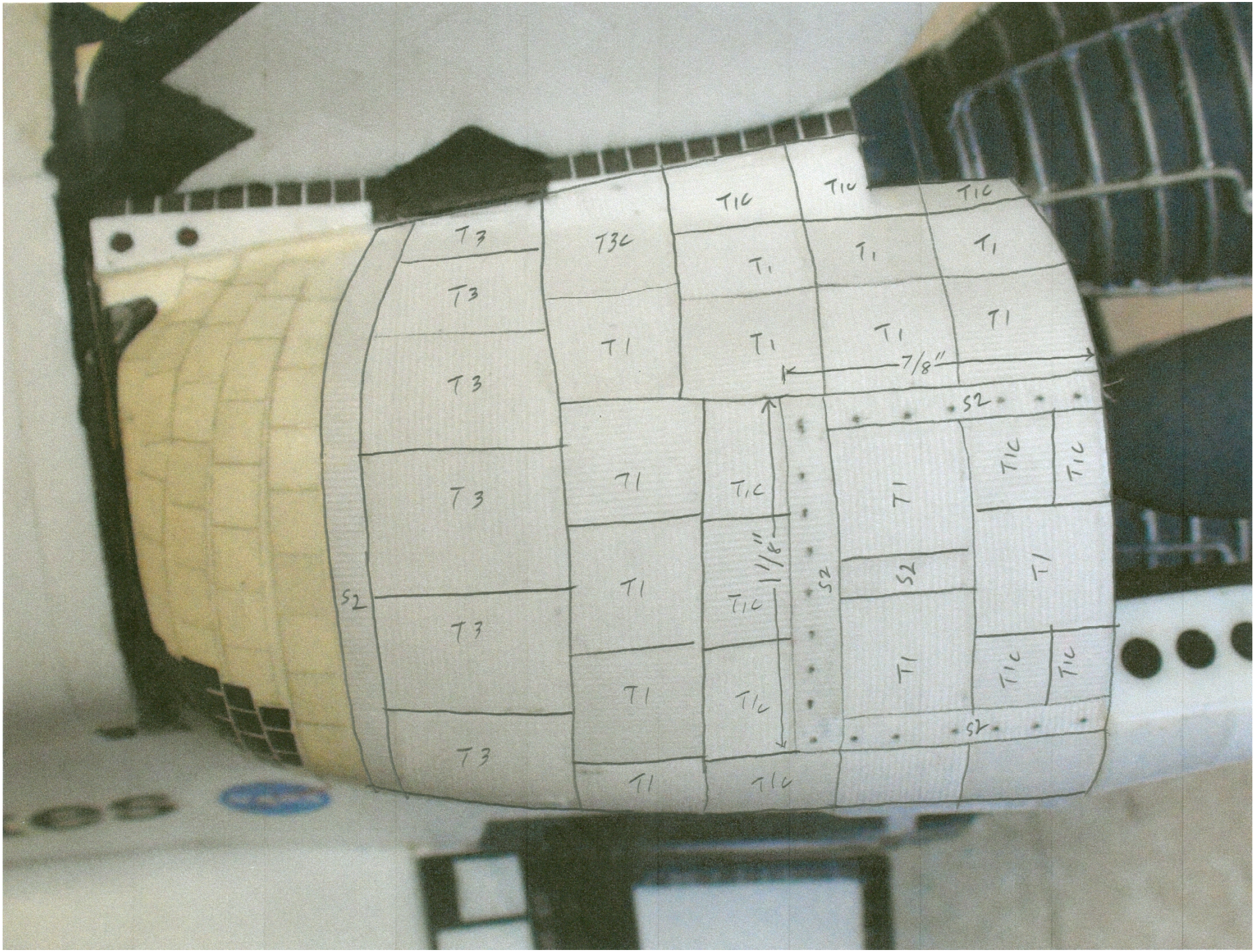


Type 1 - 1/2" x 1/2"
Type 2 - 3/8" x 1/2"
Type 3 - 7/16" wide long strip


Atlantis
LINE follows line molded onto wing
LINE follows detail
T2C
T2
T3


United St
S3
T2
T2
T2
T2
T3
T3
T3
T3
T3
T3
T2c
T2
T2
T2


1 3/8"
5/16"
3/4"
3/4"
0.40" thick Styrene u/beveled edges


T3
T3
T3
T3
T3
T3
T3C
T1
T1
T1
T1
T1
T1C
T1C
T1C
T1
T1
T1
T1
T1
T1
T1
T1
T1C
T1C
T1C
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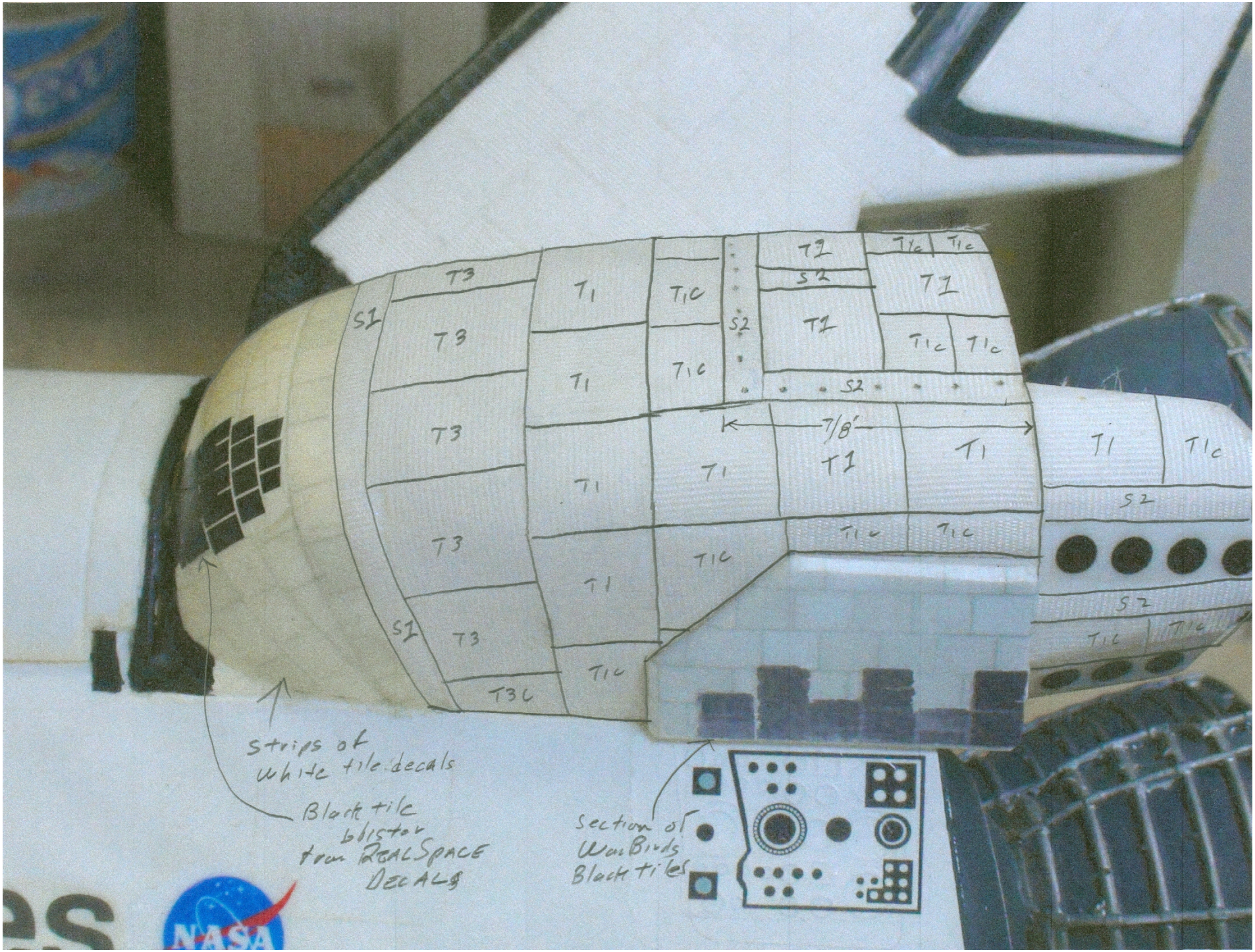
T1C
S2
S2
S2
S2
S2
7/8"
1 1/8"


T3
T1
T1C
S1
S2
T2
T1C
T3C
7/8"
Strips of white tile decals
Black tile blister from REALSPACE DECALS
Section of WarBirds Black tiles
NASA