

activity two

Build a Scale Rocket or a Desk Model of the World's Famous SR-71 Blackbird

OBJECTIVE

This gives the senior member a chance to build a rocket that is a scale replica of the actual SR-71 Blackbird, or to make it into an attractive desk set model for display in an office or other appropriate place.



NATIONAL SCIENCE STANDARDS

Content Standard E: Science and Technology

- Understandings about science and technology

Content Standard G: History and Nature of Science

- Historical perspectives

Unifying Concepts and Processes

- Evidence, models, and explanation

BACKGROUND

Most of the SR-71 aircraft have been used by NASA for research in high-speed and high altitude programs. As research platforms, the aerospace craft can easily cruise at Mach 3 for more than an hour! For experiments in heat dynamics, the Blackbird can produce heat soak temperatures of over 600 degrees (F). Other areas of research include aerodynamic propulsion, structures, thermal protection materials, high temperature instrumentation and sonic boom characterization.

The SR-71 initially started life as the YF-12A. Two YF-12As and a model designated YF-12C were flown at the Dryden Test Center between December 1969 and November 1979 in a joint NASA/USAF program to learn more about the capabilities and limitations of high-speed, high altitude flight. The YF-12As were prototypes of a planned interceptor aircraft based on a design

that later evolved into the SR-71 reconnaissance aircraft.

The Lockheed Skunk Works, (now Lockheed Martin), built the original SR-71. Each aircraft is 107.4 feet long and has a wingspan of 55.6 feet. It is 18.5 feet high (from the ground to the top of the fins when parked). Gross takeoff weight is about 140,000 pounds including a possible fuel weight of 80,280 pounds. The airframe is built almost entirely of titanium alloy and the main reason for this exotic metal is to withstand heat generated by sustained Mach 3 flight. Aerodynamic control surfaces consist of all-moving tail surfaces, ailerons on the outer wings and elevators on the trailing edges.

The last flight was made on Saturday, October 9th, 1999, at Edwards Air Force Base during an air show. Afterward, all NASA SR-71s were put in flyable storage until 2002 when they were sent to various museums.

PROCEDURE

We are going to build an Estes model rocket that is a level 3 in construction skill level. The author will walk you through the process of making a desk set model; however, if the builder doesn't want to go to this much trouble to make it almost perfect, it can be sealed with a hobby wood/paper sealer and painted flat black. The first step is to go through the instructions

and make sure that you have all of the parts that are supposed to be included in the kit. After that, you're ready to build one awesome aerospace craft.

If the builder wants to launch this model as a rocket, it is recommended that this be done first. Follow the instructions in the Estes kit and then, after several successful flights, it can be built as a desk model.



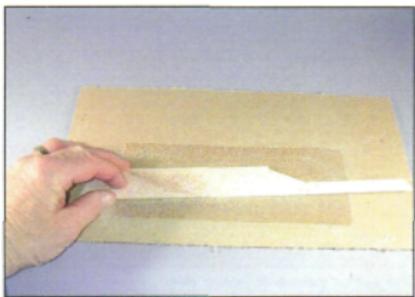
This is an awesome model and it will impress everyone who sees it either on a desk or in flight!



It's always a good idea to check the parts against the list in the kit. If something is missing, take it back to the shop where it was purchased. If they don't have a replacement, write Estes directly at: Customer Service, Estes Cox Industries, 1295 H Street, Penrose, Colorado 81240.



The author first buffed all of the balsa wood parts using a synthetic steel wool pad.



A piece of #240 grit sandpaper was bonded to a piece of flat cardboard, using a spray glue. This was used to sand the wood parts to a smooth finish.



For edges and hard-to-get-at places, sanding boards work. Beauty and hobby shops carry these in various grits.



This is an option. The author used an automotive sanding block and automotive grade sandpaper for finishing out the surface of the model.



The author used automotive clear lacquer for a balsa sealer. After the lacquer dries, the parts were block sanded with #240 sandpaper. Three clear coats were applied.



The author elected to use "super glue" for bonding the parts. To "kick" the glue; i.e., to make it set up quicker, an accelerator was used. The accelerator comes in a small spray container; however, it can be applied to small areas using a cotton swab on a stick. The author used this method of applying the accelerator to the body tube and the super glue (a.k.a. as "CA" glue) to the balsa parts.

When the balsa part is pressed into the accelerator, it sets immediately. It is recommended that the builder try this method on some scraps before using it on the model. This method sure beats using casein (white) or carpenter's (yellow) glue. No waiting around for drying! Also, when CA glues set...their bond is very strong. This type of glue is used extensively throughout the radio control modeling "world!"



After blocking the parts, the synthetic wool pad was used to clean sanding dust from the surface of the parts.



After the balsa parts are "super" bonded to the body tube, a sandpaper block was used to make the lines as perfect as possible.



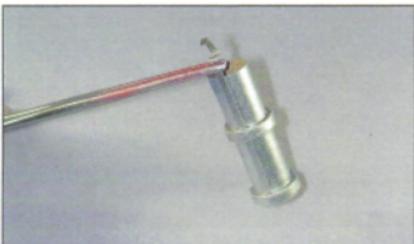
Now, here's a technique that really takes the builder from the toy stage to a real hobbyist level. Use a rattle can (aerosol) of automotive grade lacquer "Primer Surfacer" on the assembled parts. This step will be repeated numerous times if you are going to build a perfect desk model.



While the primer surfacer is drying, the builder can cut out other plastic pieces such as the nacelle parts.



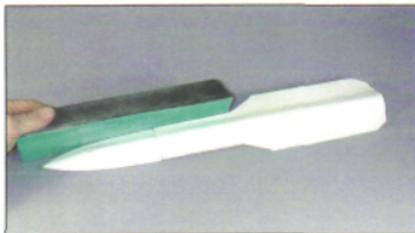
The intake and outlet parts of the SR 71 nacelles are positioned and bonded in place.



If the builder plans to take this model all the way to a full desk display, the center rocket engine piece will not be used.



The center body piece is heavy paper and it is recommended that carpenter's glue be used to assemble this component.



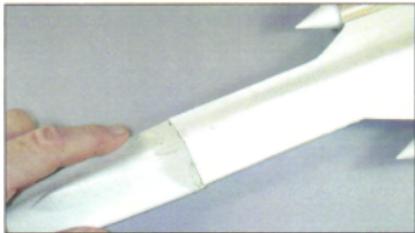
The nose piece is the "weakest link" in the building of this model. It does not fit very well, so steps must be taken to blend the lines.



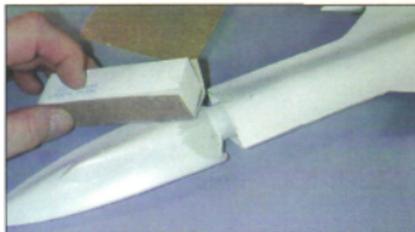
The author first wrapped the forward fuselage area with common masking tape. Then, using hobby putty (can also be found at automotive supply stores), a build-up was made on the nose piece where it is attached.



Let this putty dry at least overnight if not longer. When thoroughly cured, it will be ready to block sand.



The builder can now see how much better the nose piece fits the fuselage.



Using a small foam block wrapped with fine (220+) grit, gently shape the dried putty until the nose piece is a perfect fit. This whole process may have to be repeated several times to make it flawless.



Automotive primer surfacer is applied to the surface and using, again, fine sandpaper, carefully work the surface until it is flawless.



Between each coat of primer surfacer, the author buffed the surface with synthetic steel wool. (3M® makes a product called Scotchbrite® and it works very well for this procedure).



After repeated coats of primer surfacer and careful sanding, this is how the builder determines the final look of the SR-71.



The author selected a semi-gloss black for the final finish. Since the surface is protected with primer surfacer, automotive paint, in an aerosol, can be used. There are excellent hobby paints that work as well.



The first coat is always a mist. Let this dry for at least 20 minutes and then proceed with the color coats.



Ultrafine sandpaper (1500) can be used to remove tiny flaws and paint problems.



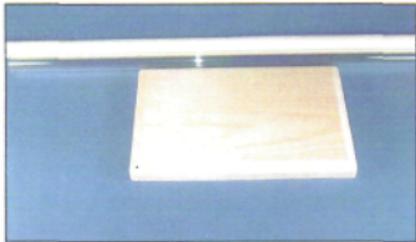
The sticker decals can now be applied to the final finish. A cotton swab was used to burnish these so bubbles are removed.



The builder must follow the directions in the kit to get perfect placement.



Testor's Dullcote was applied to make the decals blend with the paint finish. The Dullcote tends to hide the film around the decal.



A wooden base was purchased from a hobby and crafts store along with a two foot 7/8th dowel rod. These pieces will be used to make the stand for the SR-71.



A razor saw was used to cut the dowel rod to the exact angle needed to mount it on the base.



A guide hole was drilled in the dowel rod and this is where a screw was placed to hold it in position while the rod was epoxied to the base. Two holes were drilled in the base at an angle. One was large and the other was small. The smaller hole went up through the base. When a long screw was inserted into the larger hole, it went through the smaller hole and attached the dowel rod. The builder does not have to epoxy the dowel rod, but it does make a stronger support for the model.



The SR-71 will sit on the dowel rod as shown in the picture.



The base and dowel rod were first sealed with clear lacquer. Then several coats of primer surfacer were applied. The base was then lightly buffed with the synthetic steel wool pad and painted a bright red. This made a striking color contrast for the semi-gloss black surface of the SR-71.

If the builder will take time to keep working the surface until it is flawless, a beautiful desk model will be the result.

