Your Thor-Agena B scale model rocket kit consists of the following parts as illustrated in the drawing above:

(A) 1 Body Tube--Part #BT-528
(B) 1 Body Tube--Part #BT-60K
(C) 1 Engine Mount Tube--Part #BT-20J
(D) 1 Launching Lug--Part #LL-2B
(E) 1 Adapter--Part #TA-5200C
(F) 1 Nose Cone--Part #NC-52G
(G) 1 Tube Coupler--Part #JT-60C
(H) 1 Screw Eye--Part #SE-1
(I) 1 Engine Block--Part #EB-20A
(J) 2 Adapter Rings--Part #RA-2060
(K) 2 Adapter Rings--Part #RA-2050
(L) 2 Balsa Sheets--Part #BFS-20B
(M) 1 Balsa Block--Part #BFS-80T
(N) 1 Plastic Fin Stock--Part #CFS-40
(O) 1 Plastic Fin Stock--Part #CFS-20B
(P) 1 Shock Cord--Part #SC-1
(Q) 1 Bracing Wire--Part #RW-2
(R) 108" Shroud Line Cord--Part #SLT-1C
(S) 1 Parachute--Part #PK-18A
(T) 7 Tape Strips--Part #TD-2G
(U) 1 Decal Sheet--Part #KD-28
(V) 1 Pattern Sheet--Part #SP-28

In addition to the materials included in the kit you will need the following tools and supplies:
1) Modeling knife or single edge razor blade
2) Scissors
3) Extra strong white glue
4) Clear butylate dope
5) Ball point pen or pencil
6) Fine and extra-fine sandpaper
7) Sanding sealer and paint or dope

Read the entire assembly instructions carefully before beginning work on your rocket. Then start construction, following each step in order, checking off each step as it is completed.

Assembly Instructions

1) Glue one adapter ring to each end of the stage coupler as shown in fig. 1. The rings should be centered perfectly on the coupler. Apply enough glue to make a permanent, strong joint, but do not leave any excess glue on the outside of the unit. Set the assembly aside to dry thoroughly.

2) Glue the engine block in one end of the 2-3/4" long engine holder tube. To do this, apply glue to the last 1/4" of the inside of the tube, then slide the engine block into the tube until the end of the block is even with the end of the tube (see fig. 2A). Punch out one of the small (20-50) adapter rings and position it on the end of the engine holder tube opposite the engine block. Apply a glue fillet to the joint between the ring and the tube. Set this assembly on its end while it dries.

3) Cut out the shroud along its edge lines. This must be done carefully if it is to fit correctly. Form the shroud into a cone with the markings on the outside. Apply glue to the flap and press it into position. Hold it in place until the glue sets, then set it aside to finish drying.
(4) Glue the small end of the TA-520 adapter into one end of the BT-52 "Agena stage" body tube. To do this, apply glue to the first 1/4" of the inside of the tube and then push the balsa adapter into position. Glue the nose cone into the other end of the tube in the same way.

Fig. 4

(5) Insert the screw eye into the large end of the adapter. Remove the screw eye, press the nozzle of the glue bottle to the hole and squirt glue into the hole. Replace the screw eye and wipe away any excess glue.

Fig. 5

(6) Slide the shroud onto the engine holder tube so it fits snugly around the ring. Apply a fillet of glue to the ring-shroud joint and to the shroud-tube joint. Slide the ring-coupler unit onto the engine holder and position it so one ring is in contact with the small end of the shroud. Run glue fillets around both tube-ring joints.

Fig. 6

(7) Cut out the shock cord mount. Prefold it on the dotted lines, then flatten it out. Smear glue over section 1. Lay the end of the longer shock cord in place and fold section 1 over. Apply glue to the back of section 2 and fold again. Clamp the unit together with your fingers while the glue sets. Apply glue to the inside of the body tube over an area approximately the same as the shock cord mount, starting at least 3/4" from the front of the tube and extending rearward. Press the mount onto the glue and hold it until the glue sets.

Fig. 7

(8) Cut the BFS-20B balsa sheets into at least four 1/8" wide strips. Lay the strips on a flat surface and sand them to a half round section as shown. When the sanding is finished, cut the strips to make two pieces 5-1/2" long, two pieces 3" long and one piece 2-1/2" long. Sand the ends of the pieces to the shapes shown in fig. 8.

Fig. 8

(9) Cut out the tube marking guide from the pattern sheet. Wrap it around the BT-60 body tube near the front and mark the tube at the "A" arrows. Glue the two 5-1/2" long half round strips to the tube directly over the marks. The front ends of the strips should be even with the front of the tube. The strips run straight and exactly in line with the centerline of the tube.

Fig. 9

(10) Insert the adapter into the front of the BT-60 body tube. Glue the 3" long half round strips to the adapter section so they match the strips on the body. The rear ends of the strips on the adapter should be touching the front ends of the strips on the body. Remove the adapter from the body while the glue dries.

Fig. 10

(11) Mark the BT-52 "Agena stage" body tube 0.2" from its front and exactly halfway between the two strips on the adapter. Glue the 2-1/2" long flat strip to the tube so the front of the strip is centered on the mark and the strip runs straight on the tube.

Fig. 11

(12) Cut off a piece of launching lug 0.74" (or approximately 3/4") long to make the turbine exhaust. Trim the ends to the shape shown in fig. 12. Apply glue to the top end of the exhaust piece and seat it against the engine holder ring, halfway between the shroud and the outer edge of the ring. Hold the exhaust in position, parallel to the engine shroud as shown in fig. 12B until the glue sets.
Spray two or three light coats of white over the entire model, sanding lightly between coats.

**THEN**

Apply decals as shown.
(13) Cut two 3/8" long pieces from the 1/4" square balsa block. Trim these blocks to a thickness of 7/32" by 1/4" wide (and 3/8" long). Measure back 3/16" from one end of a block and mark across the block. Cut a 1/16" deep notch in the wood from this center mark to the end of the block as shown. After sanding the notched area, find its exact center and make a small hole with the point of a pencil. Carve the other end of the block so it is rounded and tapers down to about 1/8" thick as in the illustration. Repeat this procedure with the other piece.

(14) After sanding the surfaces of the vernier shrouds to a smooth finish, glue them to the engine holder ring. The two shrouds should be on opposite sides of the nozzle, each spaced 90° from the turbine exhaust and even with the edge of the ring. The drawing below illustrates the positioning of the shrouds.

(15) The vernier nozzles are formed by wrapping a sheet of paper around the point of a pencil. To do this, cut out a one inch square of paper (the same type of paper that these instructions are printed on will work well) and wrap it on the pencil point so a corner of the paper is at the point. Unwrap the paper part of the way, apply glue to it, and rewrap. Pull this cone off the pencil and make a second one. After the glue has dried cut off about 1/8" of the tip of each cone and glue these tip pieces into the holes in the vernier shrouds.

(16) [Diagram of 1" square of paper with glue applied to one corner]

(17) The remaining piece of 1/32" diameter wire should be 1.35" (or approximately 1-3/64") long. If it is too long, cut it to this length. Bend the wire to form a modified "V" as shown. The ends of the wire should be 3/4" apart, with the center section 1/8" long. Glue the wire in place as illustrated so its ends touch the shroud and its middle is against the turbine exhaust.

(18) Apply sanding sealer to all balsa surfaces on the rocket. When the sealer is dry, sand lightly with extra fine sandpaper. Apply more sealer, sand some more, repeating this step until all the pores and grain in the balsa are filled. After all balsa is smooth and even, give the outside of the entire rocket (except the engine holder unit) several light, even coats of white paint or dope, letting the rocket dry between coats, to get a smooth white finish.

(19) After the white paint has dried completely, finish the paint details as shown in fig. 19. The nose cone is painted black for 1" from its tip. The inside of the turbine exhaust near the bottom should also be painted black. The vernier fairings are painted white except for the notched areas, which are painted black. The turbine exhaust, support rod, and vernier nozzles are painted silver (or aluminum).

BEFORE Applying Sealer

AFTER Two or three coats of sealer

(20) Cut out the parachute on its edge lines as indicated on the plastic. Cut six 16" lengths of shroud line cord and attach one shroud line to each point of the parachute with a tape strip as shown in fig. 20. Tie the free ends of the lines together.

(21) After all parts on the engine mount unit have dried completely, check its fit in the BT-60 body tube. Sand the edges of the rings until they make a smooth slide fit inside the body tube. Smear glue around the inside of the rear of the body tube over an area extending from 1/4" to 1-1/2" from the end. Insert the engine mount, engine block end first, until the rear ring is even with the rear end of the body. Do not pause during this operation or the glue may set with the mount in the wrong position.
More detail may be added to your model by making two antennas from scrap BFS-20H (left over from the fairings). Use the dimensions shown in the drawing below.

Glue the antennas to the BT-60 body tube so the front edge of each is 1/4 inch from the front end of the tube and 5/16 inch to the right of each fairing.
(22) Tie the free end of the shock cord to the screw eye in the adapter. Tie the parachute shroud lines to the screw eye. Push the parachute into the body tube, packing the shroud lines and shock cord in over it. Push the base of the adapter into the forward end of the body.

(23) Read the instructions on the back of the decal sheet. Refer to fig. 23 and apply the decals in the positions shown in the illustration. Start with the rectangular panels on the main body tube and the filler stack ports, then apply the decal to the "Agena" stage body tube. Finally, apply the decal on the adapter and blot away all excess moisture. Let the rocket dry completely and then apply several coats of clear acrylic spray to protect it.

(24) After all paint has dried completely, wrap two layers of typing paper around the rear of the body tube. Cut the thin sheet of plastic fin material (CFS-20B) to a length of 5-1/2" and wrap it around the paper. Apply clear butyrate dope to the overlap joint and press the ends together to glue them. (Tape may be used to hold the joint while it dries.)

(25) Cut out the fin pattern. Position it on the thicker sheet of plastic (CFS-40) and trace around it with a ball point pen. Trace out all three fins in this manner. The fins may then be cut from the sheets either with a sharp pair of scissors or by scoring along the line with a sharp knife and bending on the line to break the plastic. (It is best to experiment on an unused corner of the plastic before cutting out the fins themselves.)

(26) Slide the ring off of the body, remove the paper and wrap the body tube marking guide around the rear of the body. Slide the ring back on over the marking guide. Apply a heavy layer of plastic butyrate dope to the root edge of each fin and press it against the ring over one of the lines on the spacing guide. Hold it in place until the dope sets, then attach the other fins in the same way. Using butyrate dope, glue the launching lug to a corner between a fin and the ring. After the fins and lug have dried, apply a fillet of dope to all joints.

FIN CARE

When the rocket is on display the fin unit may be removed. However, the fin unit should be stored on a tube of the same diameter as the rocket body to keep it from distorting. Such a tube may be formed by wrapping an old mailing tube with paper to bring it up to the desired size. If the ring portion of the unit becomes too tight to fit onto the body tube, it is possible to slit it as shown and secure it on the model by taping across the slit with cellophane tape.

GENERAL INFORMATION

The engine types recommended for use in the Thor-Agena B are the A-6-3, B-6-1, and C-6-5. For best results, the model should be launched on calm days. Make sure the rocket balances no more than 12-1/2" from the nose cone tip. Launch the Thor-Agena using a standard electrical launching system with a 1/8" diameter launch rod at least 36" long.

COUNTDOWN CHECKLIST

-13- Pack flameproof recovery wadding into the body tube from the top. The wadding should fill the tube for a distance of about 2-1/2 to 3 inches and seal tightly along the sides of the tube (8 to 10 squares of RP-1A are recommended). Hold the parachute between two fingers at its center and pass the other hand down to fold it in two or three sections as shown in the illustration. Push the folded parachute down into the tube on top of the wadding and pack the shroud lines and shock cord in on top of the parachute. Slide the nose cone into place.
- Install an electrical igniter in the engine as directed in the instructions which came with the engine.

- Wrap the engine with masking tape until it makes a tight fit in the engine holder tube. This fit must be tight so the engine will not blow out when the ejection charge is activated. Insert the engine into the tube until its forward end rests against the engine block.

- Remove the safety interlock or key from the launch control panel. (If a simple spring switch is used, install the protector around the switch to separate the contacts). Carry the key or interlock on the person of the launch control officer.

- Place the rocket on the launcher. Check to be sure the panel is disarmed. Clean the micro-clips and attach them to the igniter.

- Clear the launch area, alert the recovery crew and trackers.

- Check for low flying aircraft and unauthorized persons in the recovery area.

- Arm the launch panel.

- LAUNCH!

Facts about Thor-Agena B

The Thor-Agena B was originally designed for use as the prime booster in the Air Force’s Discoverer program. It was used for the first time in Oct., 1960 to launch Discoverer #16 from the Western Test Range at Vandenberg AFB, Calif. This launching failed when the booster and Agena stage did not separate. Both fell into the ocean. However 16 out of the next 23 Discoverer launchings were successful. The Thor-Agena B combination also launched Nimbus (the weather satellite), Echo II, Alouette (Canada's first satellite) and Oscar (the amateur radio satellite, sent into orbit with Discoverer 36).

Towering 81 feet, the Thor-Agena B can loft a 1,600 lb. payload into a 300 mile circular orbit. The rocket's height varies some, depending on the payload and nose cone configuration.

Built by Douglas (now McDonnell Douglas), the first stage Thor is 8 ft. in diameter and 55 ft., 11 in. long. When fully fueled it weights 107,000 lb. The Rocketdyne MB-3 motor develops 172,000 lb. of thrust. In addition to the main motor, the Thor has two vernier motors which produce 1000 lb. each. They are used for attitude control. The Thor burns 100,500 lb. of liquid oxygen and RP-1 (or kerosene) in 146 sec. Manufactured by Lockheed, the Agena B upper stage is powered by a Bell Aerospace 8096 rocket motor. It is capable of burning 12,300 lb. of propellant in 240 sec. With a thrust of 16,000 lb., the Agena B weighs 15,800 lb. fully loaded.

The Agena’s motor can be restarted in space, making it very useful both when orbit changes are needed, and when a very exact orbit is desirable. The Agena measures 25 feet from the rear of its nozzle to its satellite adapter, and is 5 ft. in diameter.

It is predicted that the basic Thor-Agena system will continue to be used at least until early 1970.
Connects T60 tube with
ID = 1.595  OD = 1.637

To T52 tube with:
ID = 1.014  OD = 1.0

Overall length: 5.25
Exposed length: 3.75
Shoulder length: .75

Material: Balsa

Part is drilled for, and supplied with, a 3/8 inch hardwood dowel drilled to accept a screw eye.

Balsa Machining Service
Material: Balsa

Fits T52 tube with
ID = .988  OD = 1.014
Overall length: 1.95
Exposed length: 1.45
Shoulder length: .5

Part is drilled for, and supplied with, a 1/4 inch hardwood dowel drilled to accept a screw eye.

all dimensions are in inches unless otherwise specified.
THOR AGENA-B

SCALE MODEL OF THE LAUNCH VEHICLE FOR THE DISCOVERER PROGRAM
FLYING SCALE MODEL

$3.75

THOR-AGENA-B
KIT NO. K-28

SPECIFICATIONS
Body Dia. - - - 1.837"
Length - - - 17.25"
Weight - - - 2.16 oz.

RECOMMENDED ENGINES
A8-3, B6-4, C6-5
(Use A8-3 for first flight.)

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