Scratch Building Space Probes

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Reasons for real space scratch building

- Building something different
- Lack of available kit *
- Challenge
- The thrill of the hunt
- Madness!

- Besides, how many Me-109s can you build? 😊

* RealSpace Models (Tallahassee, FL) offers kits of Pioneer 10/11, Voyager 1/2, Viking 1/2, and Magellan in 1/24 scale as well as Sputnik 1 and Explorer 1 in 1/12 scale
Real space modelers are a very small group

In this contest only 0.56% of the total were space probes.

Space probes are ALWAYS a small part!
You want unique, you got unique.
Space probes – not for the faint of heart

• Complicated
• Spindly
• Fragile
• Unusual
• Unique
• Headaches!

COBE

MESSENGER

Mariner II
The thrill of the data hunt!

- Long ago we had only magazines, newspapers, & libraries but now we have...
- Internet and email!
  - Dimensions
  - Photos
  - Drawings
  - Technical papers
  - Yahoo Group: http://groups.yahoo.com/group/space-modelers *

* 2350+ members
Basic building techniques according to me!

- Found or bought objects
- Vacuum forming
- Heat forming
- Wood
- Built up
- Finishing – foil and paint
- Display
Found or bought objects

- My Luna 9 model started as a 25 mm diameter fishing bobber
- Plastruct (EMA) hemispheres
- Doll eye “Wiggle eye”
- Plastic bottles, aquarium filter tubing or PVC pipe
- Buttons, pens, toys, etc.
Vacuum forming

- Styrene sheet heated with heat gun or oven
- Pulled over form
- Forms can be wood, clay, etc.
- Home made vacuum box works fine with vacuum cleaner
- Part scribed out

New Horizons high gain antenna

Wood box with perforated metal top & plastic pipe
Heat forming

- Wrap part around form
- Dunk in boiling water

- Heat styrene (flame or heat gun)
  CAUTION!
- Pull over form
- Trim to shape

Stardust HGA rib

New Horizons launch adapter
Modify or cut up

• Vac formed master part
• Sliced into fours
• Styrene strips added

Luna 9 “petals”
Wood – bracing and skinning

- Saw or carve shape
- Make basic shape and “skin” with sheet plastic

NEAR bus

Deep Impact solar array Whipple shields
Use paper patterns

• Use printed or home made patterns
• Paper models are a good start
• Glue pattern to styrene sheet using glue stick
• Score and snap
Cutting board

- Plastic kitchen cutting board
- Aluminum angle attached * as a fixed straight edge
- Use steel triangle or square to keep cuts straight

* Countersink screws from underneath
Build up major parts from styrene

- Cut pieces oversize
- Gage blocks hold parts while cement dries
- Reinforce inside corners
- Trim/sand off excess

Deep Impact bus
New Horizons bus
Custom fixtures

- If making several parts...
- Make dedicated jig
- Of wood or plastic
- Magnets on a steel cookie sheet
- Tape parts onto a board

Lunar Orbiter solar panel fixture
High Gain Antenna Tool

- Simple tool for drilling tripod legs for antenna
- Equilateral triangle sized for leg spacing
- Supported on antenna rim
- Pin drill holes at tip of triangle for antenna feed support

Tool for NEAR antenna shown
Multi – media assembly

- Styrene, wood, and metal can be used
- Use epoxy or CA to join

Deep Impact telescope pallet

19/32” (15.1 mm) brass tube
Turning wood parts

- Use a mini-lathe
- Use a Dremel tool
- Use a drill press
- Drill on low speed
- Small files very useful
- Digital caliper (good/bad)
- Seal, sand, paint

Stardust sample return capsule

Stardust star trackers
Finishing

• Foil – aluminum foil, Mylar, candy foil, confectioners foil*, antiquing foil, or survival blanket
  (* look for baking or candy supplies)

• Many colors available

• Paint – generally metallic or flats
  (enamel or acrylic, your choice)
Finishing

- Decals – artwork for solar cells or insignia
- PC Paint, Photoshop, CAD
- Print on decal film or inkjet photo paper
- Apply with spray photo adhesive
- Display base – simple wood plaque
- Water Putty, spackle or plaster over foam
Near Earth Asteroid Rendezvous (NEAR) 1/36
Luna 9  1/24
New Horizons  1/48
Pioneer 6  1/36

Pioneer 6 Solar Probe
Launched: Dec. 16, 1965
Still operating: Dec. 8, 2000
1:36 Scale
Deep Impact  1/24
Lunar Orbiter 1/24
Stardust 1/24
Thank you for your attention! Now what to build next?

No cookies were harmed in the making of these models.