Model Wrappers

The wrappers show the Hubble Space Telescope’s exterior features and the locations of its science instruments. On Page 7 you’ll find a list of the abbreviations that appear on the wrappers along with brief descriptions of the parts they represent.

These pages contain all of the wrappers needed to complete the Hand-Held Hubble model. The assembly instructions can be found on the Web at: www.hubblesite.org/go/model.

Aperture Door

Glue the Aft Bulkhead and Aperture Door pieces to cardboard or posterboard before cutting them out.

Aft Bulkhead

Measure the dashed line below to make sure your printer is making these pages at the correct scale.

If the line is not exactly 1” long, you may have to change your printer options. In the Print dialog box, do the following:

- If you’re using Acrobat 5, deselect “Shrink Oversized Pages to Paper Size” and “Expand Small Pages to Paper.”

- If you’re using Acrobat 4, deselect “Fit to Page.”
Aperture door attaches here

Drill holes through the X for the Communications Antennae and the Solar Panels.

Attach door here
When attaching Part A of the Aft Shroud wrapper, make sure that the NASA logo on the Forward Shell and the three circular shapes on the Aft Shroud Part A form a straight line.
Line up Part B of the Aft Shroud wrapper along the dotted lines on Part A and secure it with cellophane tape. Check that the wrapper’s features are lined up correctly in the area where the two pieces overlap.
What’s What

All of the labeled items on these model wrappers represent working parts of the real Hubble Space Telescope. Here is a brief introduction to them.

For a more detailed description of how the telescope works, visit HubbleSite at www.hubblesite.org.

**Abbreviations**

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<td>Near Infrared Camera and Multi-Object Spectrometer</td>
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**ACS**
The Advanced Camera for Surveys (ACS) is Hubble’s newest camera. It is used to observe weather on other planets in our solar system, conduct new surveys of the universe, and study the nature and distribution of galaxies.

**Aft Shroud**
The Aft Shroud is simply the rear section of the telescope. It contains all of Hubble’s science instruments.

**Aperture Door**
The Aperture Door “guards” the telescope’s internal mechanisms. It is usually open, which allows starlight to enter the telescope and be picked up by the science instruments. Sometimes the door is closed to protect the mirror and instruments from space debris.

**Bays**
Hubble’s 20 bays are “closets” that contain the telescope’s instruments and electronics.

**Communications Antennae**
Hubble’s communications antennae allow astronomers and technicians to communicate with the telescope — telling it what to do and when to do it. The antennae send and receive information between the telescope and the Flight Operations Team at the Space Telescope Science Institute.

**COSTAR**
The Corrective Optics Space Telescope Axial Replacement (COSTAR) apparatus functions like eyeglasses for Hubble. When the telescope was launched in 1990, the shape of the primary mirror was flawed, which resulted in “fuzzy” images. COSTAR’s small, carefully designed mirrors, which sit in front of the telescope’s science instruments, correct this problem.

**NICMOS Cryocooler**
The NICMOS cryocooler is a “refrigerator” that keeps the instrument very cold — below –321º F, or 77 degrees Kelvin. The sensitive infrared detectors in NICMOS must operate at very cold temperatures to avoid exposure to unwanted light in the form of heat.

**FGS**
Hubble’s four Fine Guidance Sensors (FGS) are targeting devices that lock onto “guide stars” and measure their positions relative to the object being viewed. Adjustments based on these precise readings keep Hubble pointed in the right direction.

**FHST**
Fixed Head Star Trackers (FHST) are small telescopes with wide fields of view that are used in conjunction with the Fine Guidance Sensors. The star trackers locate the bright stars that are used to orient the telescope for scientific observations.
Forward Shell
The Forward Shell makes up the front part of the telescope. It houses Hubble’s light baffle and mirrors.

Mirrors
Hubble has two mirrors: the primary mirror and the secondary mirror. The primary mirror reflects the light gathered by the telescope back to the secondary mirror, which focuses it and bounces it back toward the science instruments.

NICMOS
The Near Infrared Camera and Multi-Object Spectrometer (NICMOS) is Hubble’s heat sensor. Its sensitivity to infrared light makes it useful for observing objects hidden by interstellar gas and dust (such as stellar nurseries and planetary atmospheres) and for peering into deepest space.

Solar Panels
The Solar Panels are Hubble’s power stations. They gather sunlight and convert it to electricity, which runs the telescope’s scientific instruments, computers, and radio transmitters. The Solar Panel’s solar cell “blankets” generate 3000 watts of electricity — enough to power 30 household light bulbs.

STIS
The Space Telescope Imaging Spectrograph (STIS) is a versatile instrument that can act somewhat like a prism, separating light from the cosmos into its component colors. The colors of an object reveal many clues about its age and composition.

WFPC2
The Wide Field and Planetary Camera 2 (WFPC2) is the “workhorse” instrument behind nearly all of the most famous Hubble pictures. As Hubble’s main camera, it is used to observe just about everything.

Credits
This model was developed by the Office of Public Outreach at the Space Telescope Science Institute. We would like to thank our colleague Max Mutchler for creating the original Hubble model and for assisting us with this upgraded version.