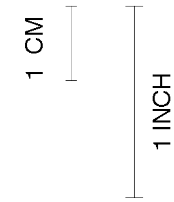
Galileo Scale Model

PRINTING
CALIBRATION



PARTS SHEET 1: The High-Gain Antenna

PRINT ON TRANSPARENCY MATERIAL

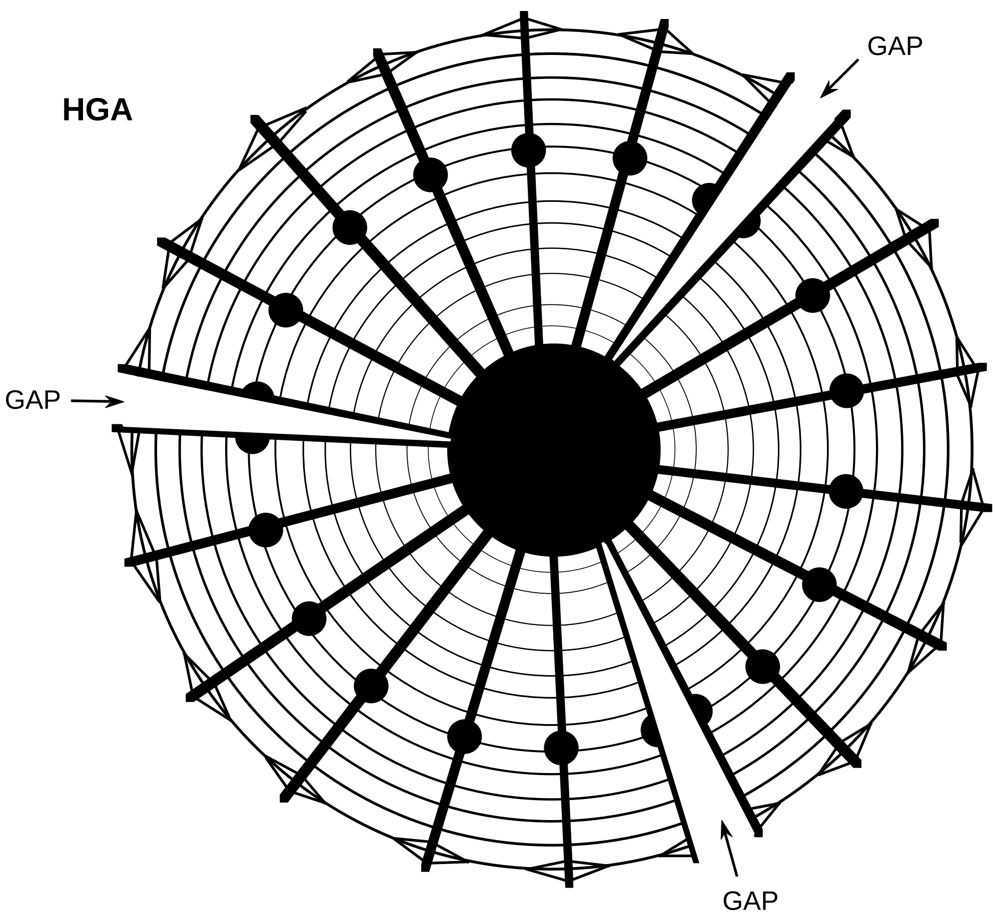
FOR ILLUSTRATED ASSEMBLY INSTRUCTIONS, GO TO http://www.jpl.nasa.gov/galileo/model

About the Galileo spacecraft

Launched in 1989 aboard the Space Shuttle Atlantis, the Galileo spacecraft arrived at our solar system's largest planet, Jupiter, on December 7, 1995, and began its "orbital tour." The spacecraft is loaded with a variety of instruments to learn about the composition and structure of Jupiter, its magnetic environment, and its amazingly varied moons. To support measurements with these instruments, to communicate with Earth, and to guide Galileo in its orbits around Jupiter, the spacecraft has power, communications, navigation, and computer systems on board, which you will learn about as you construct this model.

At night, with a pair of binoculars and a steady hand, you can see Jupiter and some of its 4 largest moons, just as Galileo Galilei did in Italy in 1610. While you can't see the Galileo spacecraft from Earth, you can see the images it is sending back from Jupiter on the internet at http://www.jpl.nasa.gov/galileo.

HGA



Galileo’s High-Gain Antenna (HGA) was designed to unfold like an umbrella. It needed to be folded up to fit within the Space Shuttle’s cargo bay for launch. Between the umbrella-like ribs on the spacecraft’s HGA is a fine metallic mesh which was to serve as the main reflector. This fine mesh would be invisible at the model’s scale of approximately 1/45. When the HGA was commanded to deploy to its unfolded “open-umbrella” configuration, it failed to completely do so. After many attempts to correct the problem, the Galileo mission was flown successfully using the primary low-gain antenna, a condition which required many changes to on-board software and within the Earth-based Deep Space Network. The HGA on your model represents the deployed configuration which was never achieved.

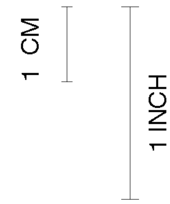
Galileo Scale Model

PARTS SHEET 2: HGA Reflector & Sun Shades

PRINT ON HEAVY WHITE PAPER

CUT PARTS AWAY FROM AREAS MARKED WITH THIS SHADING (APPEARS BLUE ON A COLOR MONITOR, AND GREY ON A B&W PRINTER)

PRINTING CALIBRATION



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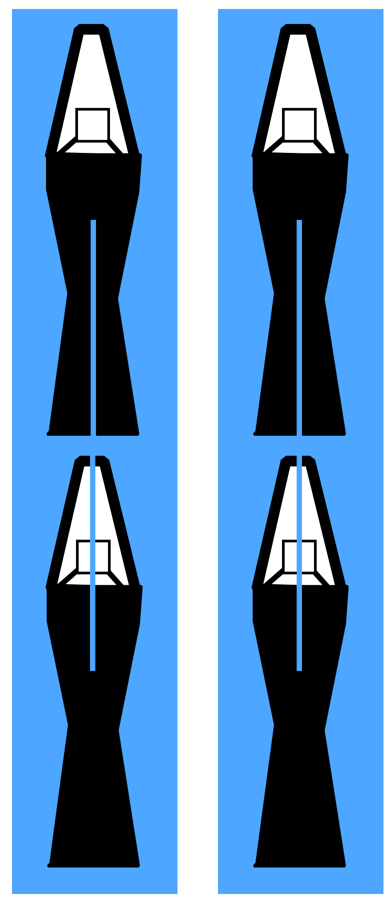
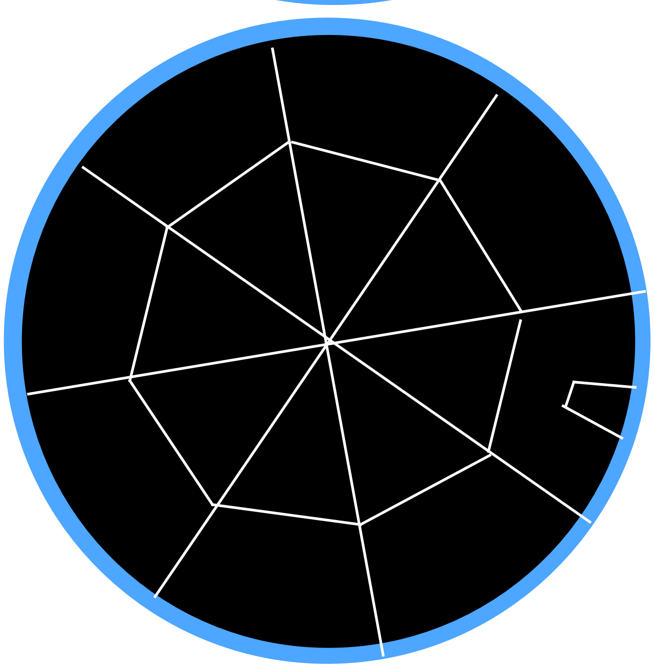
Galileo’s path through the inner solar system, needed for gravity assist early in its flight to gain enough energy to reach Jupiter, required the installation of sunshades to protect the HGA, the spacecraft bus, and many other parts of the spacecraft, from the Sun’s heat. A second low-gain antenna was mounted on an RTG boom for telecommunications. Low-Gain Antenna No. 1 (LGA-1), shown atop the HGA SUNSHADE, supports communications with Earth since the HGA is unusable.

BUS SUNSHADE TOP

REFLECTOR STRUCTURE

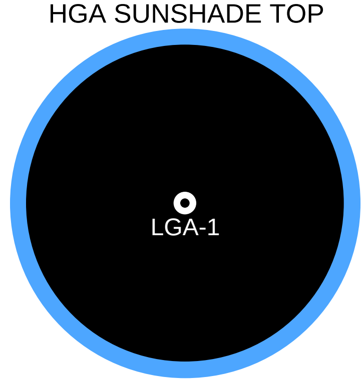
FRONT BACK



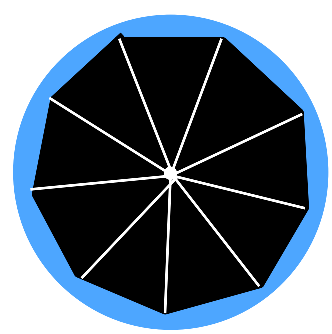


BUS SUNSHADE BOTTOM

HGA SUNSHADE TOP



HGA SUNSHADE BOTTOM



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PARTS SHEET 3: The Spun Bus

PRINT ON HEAVY WHITE PAPER

CUT PARTS AWAY FROM AREAS MARKED WITH THIS SHADING (APPEARS BLUE ON A COLOR MONITOR, AND GREY ON A B&W PRINTER)

PRINTING CALIBRATION

1 CM

1 INCH

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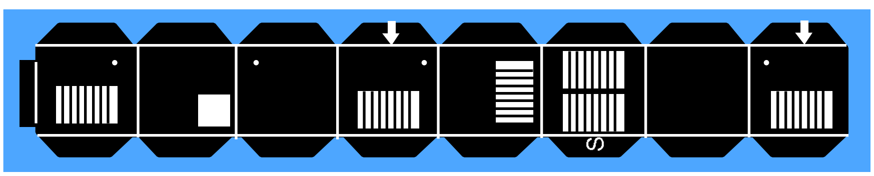
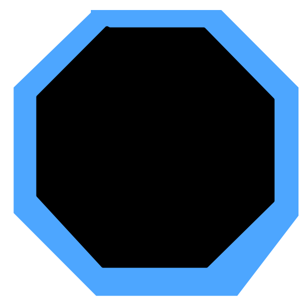
Galileo continuously spins for stability, for the fields and particles science instruments to continuously sweep their environment, and for propellant management. But the optical instruments, such as the camera, have to remain still to be able to point to their targets. The solution is a dual-spin spacecraft: while one part spins, the other part (called the de-spun section) is driven by an electric motor in the opposite direction so it stands still. The parts on this sheet, and the next two sheets, are part of the spinning section of the spacecraft. The bus structure holds the controlling hardware for the spun section. For most operations, the spun section rotates three times every minute.

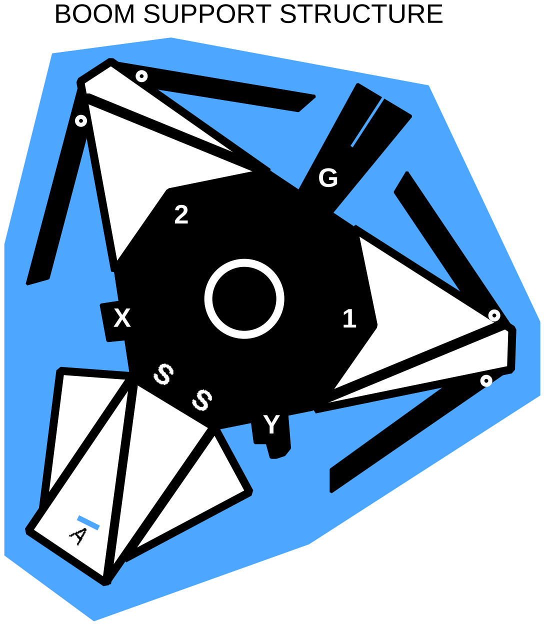
SPUN BUS





BUS SUPPORT

BOOM SUPPORT STRUCTURE



STAR SCANNER

HGA SUPPORT

Galileo Scale Model

PARTS SHEET 4: Booms

PRINT ON HEAVY WHITE PAPER

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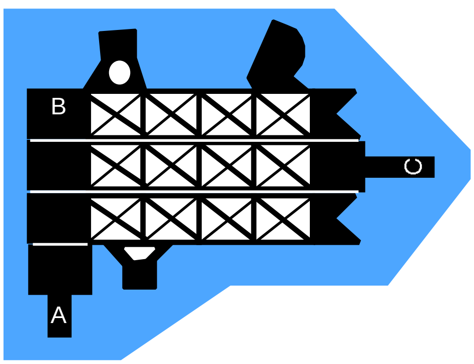
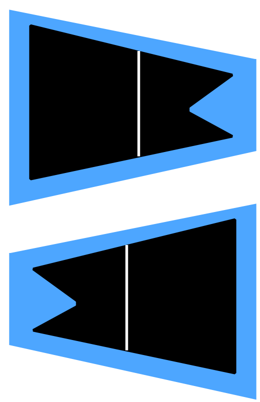
Galileo’s spun bus supports a science boom, which holds some fields and particles detecting science instruments, and a target and mirror for optical instrument calibration. Two magnetometers are supported by a long fiberglass boom, called the mag boom, which extends from the science boom to keep the instruments away from magnetic interference generated on the spacecraft. At the end of the mag boom is an electrical field antenna pair which serves the Plasma Wave instrument. Galileo’s electrical power supplies, the Radioisotope Thermo-electric Generators (RTGs) are mounted on two booms, balancing out the science and mag booms on the other side.

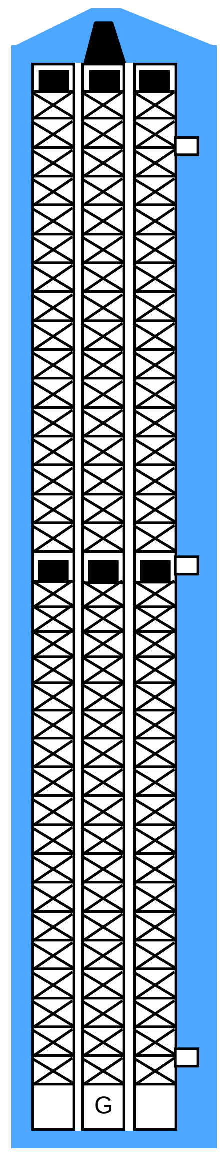
SCIENCE BOOM

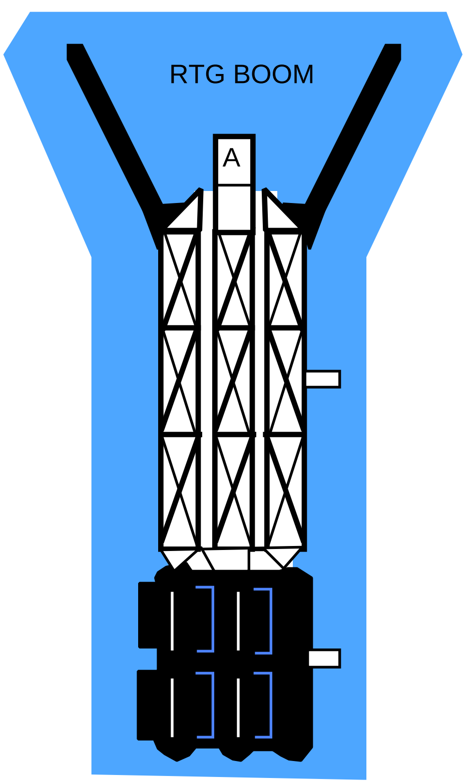


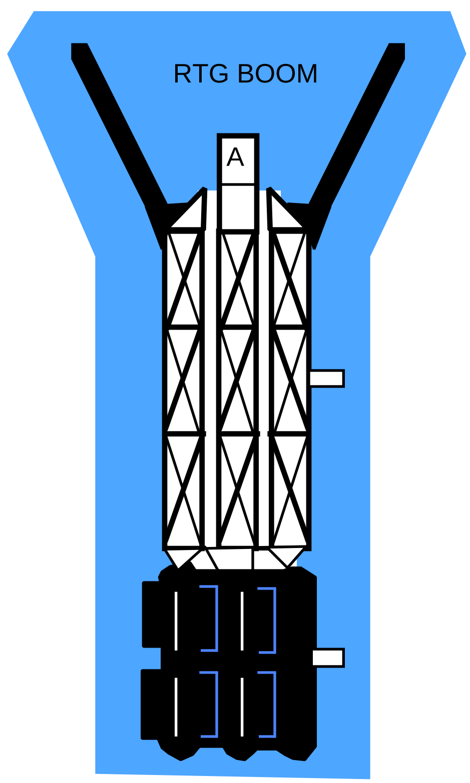
RTG NIMS SHIELDS



MAG BOOM







Galileo Scale Model

PARTS SHEET 5: The RPM

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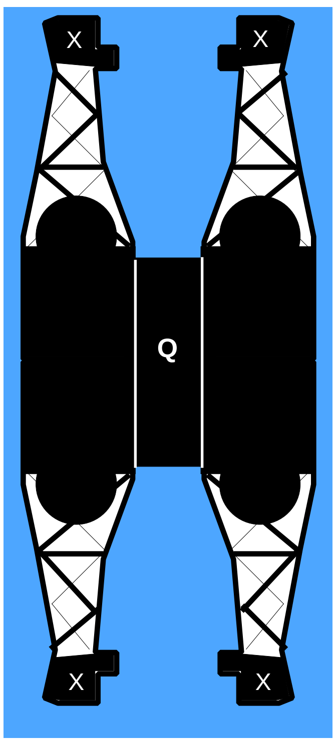
1 INCH

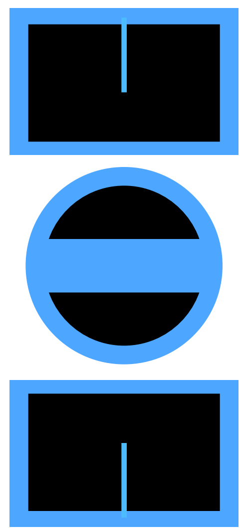
FOR ILLUSTRATED ASSEMBLY INSTRUCTIONS, GO TO http://www.jpl.nasa.gov/galileo/model

Galileo needed a way to slow down upon arrival at Jupiter in December, 1995, in order to enter Jovian orbit. A gravity-assist flyby of Jupiter's moon Io helped slow Galileo, but not enough. The Retro Propulsion Module (RPM) was equipped with the rocket engine and the propellants to do the job. The RPM also has small thrusters which are used for routine attitude control, and for small trajectory and spin rate corrections. Galileo's RPM was supplied by the Federal Republic of Germany.

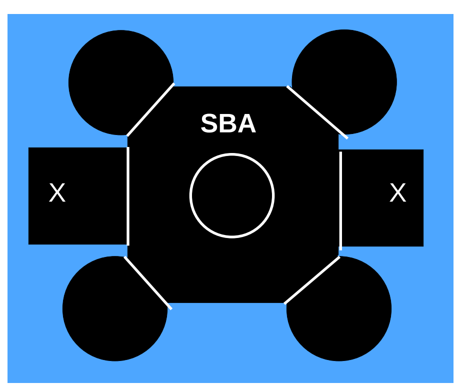
THRUSTER BOOMS



THRUSTER SHIELDS



RETRO PROPULSION MODULE (RPM)



Galileo Scale Model

PARTS SHEET 6: Despun Section

PRINT ON HEAVY WHITE PAPER

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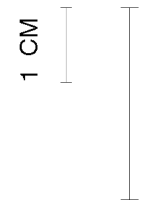

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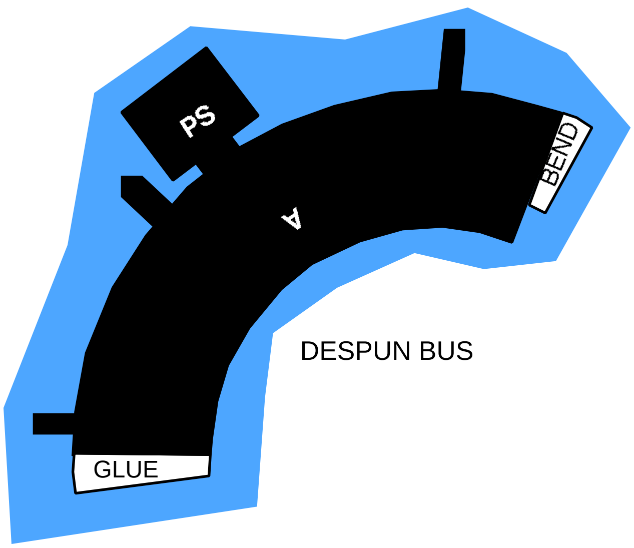
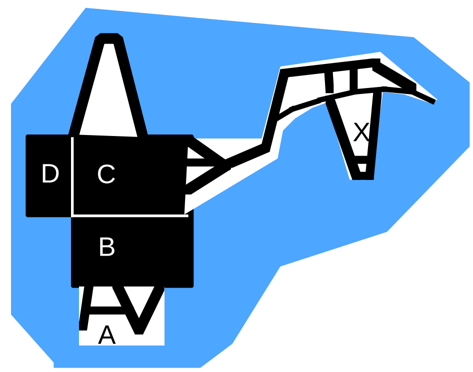
Since Galileo's upper portion spins, there has to be a section which remains stationary to point the optical instruments mounted on the scan platform, such as cameras and spectrometers, toward their targets. The despun section is driven by an electric motor to rotate in the direction opposite the spin. In addition to making it possible to point optical instruments, it permitted the Radio Relay Hardware (RRH) antenna to track the Atmospheric Probe, and capture its data, as it descended into Jupiter's atmosphere on December 7, 1995. The probe is represented in this model by its heat shield, which was visible externally on the spacecraft (the probe is now part of Jupiter's atmosphere!).

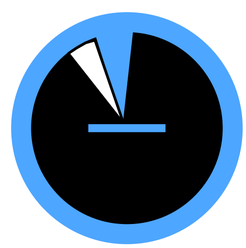


DESPUN BUS

RADIO RELAY HARDWARE (RRH)

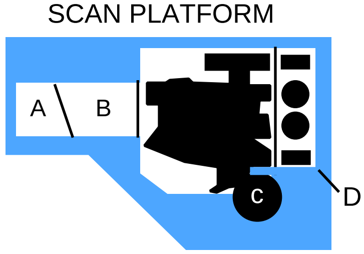


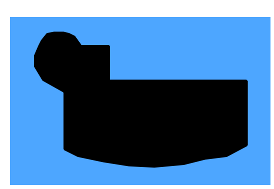
PROBE HEAT SHIELD



RRH ANTENNA

SCAN PLATFORM





SP SUNSHADE