



1  
00:00:00,000 --> 00:00:01,435  
[background music]

2  
00:00:01,435 --> 00:00:04,171  
Welcome to mission control for  
the iconic Hubble Space

3  
00:00:04,171 --> 00:00:08,575  
Telescope. This is a virtual 360  
degree tour of the facility, so

4  
00:00:08,575 --> 00:00:11,745  
look around. You are currently  
in the lobby outside of the

5  
00:00:11,745 --> 00:00:15,382  
Space Telescope Operations  
Control Center at NASA's Goddard

6  
00:00:15,382 --> 00:00:18,518  
Space Flight Center where the  
day to day operations for Hubble

7  
00:00:18,518 --> 00:00:23,190  
are conducted. The tour starts  
next to a 1/5th scale model of

8  
00:00:23,190 --> 00:00:26,426  
Hubble. The real telescope is  
about the size of a large

9  
00:00:26,426 --> 00:00:31,498  
school bus, and would weigh  
27,000 pounds on earth. Hubble

10  
00:00:31,498 --> 00:00:35,202  
works like many backyard  
telescopes. It has two main

11

00:00:35,202 --> 00:00:37,671  
mirrors to gather light from the  
Universe and bring it into

12

00:00:37,671 --> 00:00:42,609  
focus: a primary mirror almost 8  
feet across, and a secondary

13

00:00:42,609 --> 00:00:47,147  
mirror that is one foot across.  
Light that enters the telescope

14

00:00:47,147 --> 00:00:49,783  
hits the main mirror and gets  
reflected toward the smaller

15

00:00:49,783 --> 00:00:53,787  
secondary mirror. The secondary  
mirror then reflects the light

16

00:00:53,787 --> 00:00:57,024  
back through a small hole in the  
primary, where it enters

17

00:00:57,024 --> 00:00:59,826  
Hubble's science instruments  
housed in the back part of the

18

00:00:59,826 --> 00:01:04,097  
spacecraft. Hubble has three  
types of instruments that

19

00:01:04,097 --> 00:01:09,102  
analyze light from the universe:  
Cameras such as its main camera

20

00:01:09,102 --> 00:01:13,574  
– the Wide Field Camera 3;  
spectrographs such as Hubble's

21

00:01:13,574 --> 00:01:17,444  
newest one, the Cosmic Origins  
Spectrograph; And

22

00:01:17,444 --> 00:01:22,049  
interferometers which are called  
Fine Guidance Sensors. In the

23

00:01:22,049 --> 00:01:25,085  
middle of the spacecraft there  
are four 100-pound reaction

24

00:01:25,085 --> 00:01:29,423  
wheels used to reorient the  
observatory. Based upon Newton's

25

00:01:29,423 --> 00:01:32,626  
Third Law of Motion — for every  
action there is an equal and

26

00:01:32,626 --> 00:01:36,630  
opposite reaction — turning a  
reaction wheel in one direction

27

00:01:36,630 --> 00:01:40,100  
causes Hubble to turn the  
opposite way. Because Hubble is

28

00:01:40,100 --> 00:01:43,637  
so massive, it only turns at the  
speed of a minute hand on a

29

00:01:43,637 --> 00:01:48,308  
clock. On the wall you see two  
images of an incredible star

30

00:01:48,308 --> 00:01:51,278  
nursery in the Eagle Nebula  
nicknamed the Pillars of

31

00:01:51,278 --> 00:01:56,049  
Creation. These images, among  
Hubble's most famous, reveal how

32

00:01:56,049 --> 00:01:58,585  
different the pillars appear in  
visible light and in

33

00:01:58,585 --> 00:02:01,989  
near-infrared light. The  
visible-light image shows small

34

00:02:01,989 --> 00:02:04,691  
tips that contain newborn stars  
and budding stars. The

35

00:02:04,691 --> 00:02:07,294  
near-infrared light can see  
through much of the gas and

36

00:02:07,294 --> 00:02:10,731  
dust, revealing thousands of  
stars behind the nebula and

37

00:02:10,731 --> 00:02:15,135  
inside the pillars. Further  
over, you see another image on

38

00:02:15,135 --> 00:02:19,139  
the wall of astronauts in space  
servicing Hubble. These

39

00:02:19,139 --> 00:02:22,309  
servicing missions included  
numerous spacewalks to help fix

40

00:02:22,309 --> 00:02:26,013  
and upgrade the telescope. The  
astronauts left Hubble in

41

00:02:26,013 --> 00:02:29,983  
outstanding condition in 2009  
during the final servicing

42

00:02:29,983 --> 00:02:32,319  
mission and it is still at the  
peak of its scientific

43

00:02:32,319 --> 00:02:37,657  
capability today. Over by the  
windows is a tool box that was

44

00:02:37,657 --> 00:02:41,795  
used to transport tools into  
space. \hKnown as the Auxiliary

45

00:02:41,795 --> 00:02:45,732  
Transport Module, it provided  
storage for the tools and safe

46

00:02:45,732 --> 00:02:47,734  
passage to and from orbit,  
protecting the tools from the

47

00:02:47,734 --> 00:02:49,903  
extreme cold of space. Two  
similar enclosures flew aboard