1
00:00:00,660 --> 00:00:31,110
\h (Music)

2
00:00:31,110 --> 00:00:33,220
\h Damon Talley/NASA's Digital Learning
Network Coordinator: Welcome to NASA's
L-1 Webcast, previewing the final space

3
00:00:33,220 --> 00:00:36,700
\h shuttle mission to the Hubble Space Telescope.

4
00:00:36,700 --> 00:00:41,830
\h I'm Damon Talley of NASA's Digital Learning Network here at Kennedy Space Center in Florida.

5
00:00:41,830 --> 00:00:46,830
\h The Hubble Space Telescope has opened our eyes to the universe in stunning and magnificent ways.

6
00:00:46,830 --> 00:00:50,310
\h Hubble has a unique advantage over the
observatories built on the highest peaks on

7
00:00:50,310 --> 00:00:53,300
\h Earth: it doesn't have to look through the atmosphere.

8
00:00:53,300 --> 00:00:59,040
\h That means it sees galaxies, planets and the birth of stars just as they happened with no distortion.

9
00:00:59,040 --> 00:01:03,870
\h Atlantis and its crew of seven plan to take that view of space and make it even better.

10
00:01:03,870 --> 00:01:08,550
\h Coming up, we'll show you how the STS-125 astronauts are going to upgrade the
telescope.

11
00:01:08,550 --> 00:01:11,860
\h Later, we'll examine imagery in art and culture.

12
00:01:11,860 --> 00:01:17,430

\h Plus, Dr. Mario Livio of the Space Telescope Science Institute will answer some questions

13
00:01:17,430 --> 00:01:20,840
\h about Hubble and its impact on science around the world.

14
00:01:20,840 --> 00:01:27,250
\h But first, we begin with correspondent Rebecca Sprague with a closer look at this amazing telescope. H

15
00:01:27,250 --> 00:01:28,070
\h Rebecca Sprague/NASA Public Affairs
Correspondent: Hi, Damon.

16
00:01:28,070 --> 00:01:32,230
\h As you mentioned, there is certainly more than meets the eye when it comes to Hubble.

17
00:01:32,230 --> 00:01:36,120
\h We're here at the Hubble exhibit at the
Kennedy Space Center Visitor Complex.

18
00:01:36,120 --> 00:01:40,440
\h We thought it would be the best place to talk about NASA's Hubble Space Telescope.

19
00:01:40,440 --> 00:01:45,480
\h The display is a stunning showcase of the
telescope's discoveries and
accomplishments.

20
00:01:45,480 --> 00:01:50,240
\h Now, almost 20 years after Hubble first began to unlock the secrets of the universe,

21
00:01:50,240 --> 00:01:58,830
\h seven astronauts are ready again to fly high above Earth and add years to the life of the most successfu

22
00:01:58,830 --> 00:02:05,810
\h After launching from NASA's Kennedy Space Center, space shuttle Discovery released Hubble into orbi

23
00:02:05,810 --> 00:02:11,440
\h From its perch high above Earth, Hubble can collect light that has not been distorted by the atmosphere

24
00:02:11,440 --> 00:02:18,190
\h That means clearer images of events that happened billions of years ago, such as the formation of earli

25
00:02:18,190 --> 00:02:22,980
\h And unlike other observatories in space, Hubble was built to be repaired by astronauts.

26
00:02:22,980 --> 00:02:28,820
\h In fact, much of the work astronauts perform on Hubble would not have been possible if designers had n

27
00:02:28,820 --> 00:02:34,650
\h telescope with modules that could be replaced relatively easy be astronauts working in weightlessness,

28
00:02:34,650 --> 00:02:39,250
\h and wearing bulky gloves and spacesuits.
The concept was put to the test when

29
00:02:39,250 --> 00:02:43,680
\h astronauts first flew to the Hubble Space Telescope in 1993.

30
00:02:43,680 --> 00:02:46,880
\h Essentially adding a set of glasses to the telescope, they cleared up the

31
00:02:46,880 --> 00:02:53,740
\h observatories blurred vision with a high-tech instrument that compensated for a flawed main mirror. Sinc

32
00:02:53,740 --> 00:02:58,490
\h three other crews brought more instruments and upgraded equipment to the telescope.

33
00:02:58,490 --> 00:03:03,740
\h Each mission extended its life or added to its extraordinary vision.

34
00:03:03,740 --> 00:03:11,940
\h Now it's STS-125's turn to upgrade the observatory. As you may recall, Atlantis was ready to fly this mis

35
00:03:11,940 --> 00:03:16,650
\h It was poised on the launch pad when a critical module already in the Hubble gave out.

36

00:03:16,650 --> 00:03:23,470
\h The unit does several important tasks, including storing the data Hubble records and then transmitting it

37
00:03:23,470 --> 00:03:30,700
\h When Hubble was switched to a backup control unit in space, engineers on Earth readied a spare unit t

38
00:03:30,700 --> 00:03:37,680
\h After extensive testing, the unit was shipped to Kennedy recently where technicians packed it for loadin

39
00:03:37,680 --> 00:03:43,610
\h The astronauts, meanwhile, adapted their plans and added the control unit to their already crowded to-d

40
00:03:43,610 --> 00:03:49,010
\h For a closer look at how the astronauts will make the upgrades, we'll send it back over to you, Damon.

41
00:03:49,010 --> 00:03:51,230
\h Damon Talley/NASA's Digital Learning
Network Coordinator: Thanks, Rebecca. It
will take five spacewalks,

42
00:03:51,230 --> 00:03:54,520
\h each about six and a half hours long, to install new instruments,

43
00:03:54,520 --> 00:03:58,710
\h guidance equipment and that control unit during the 11-day flight.

44
00:03:58,710 --> 00:04:02,680
\h This is how the spacewalkers will upgrade Hubble during the mission.

45
00:04:02,680 --> 00:04:07,970
\h It will take about two days for Atlantis to catch up to Hubble and capture it using the shuttle's robotic arm

46
00:04:07,970 --> 00:04:14,780
\h Then, working in teams of two, one spacewalker will stand on a platform at the end of the robotic arm.

47
00:04:14,780 --> 00:04:21,570
\h He will hold the large instruments while an astronaut inside the shuttle's cabin moves him around the tel

48

00:04:21,570 --> 00:04:27,330
\h There is little room for error, especially with instruments as delicate as those of the Hubble.

49
00:04:27,330 --> 00:04:34,460
\h That's why the astronauts have practiced the exact procedures precisely since being assigned to the mi

50
00:04:34,460 --> 00:04:38,890
\h With the new instruments, astronomers expect to see deeper into space than ever before.

51
00:04:38,890 --> 00:04:42,790
\h They expect to look closer at the
atmospheres of planets outside our solar

52
00:04:42,790 --> 00:04:45,650
\h system, and maybe find more planets like them.

53
00:04:45,650 --> 00:04:50,180
\h And all the maintenance will keep Hubble
going strong until at least 2014. Rebecca

54
00:04:50,180 --> 00:04:54,000
\h takes a closer look at what Hubble has given us already.

55
00:04:54,000 --> 00:04:57,560
\h Rebecca Sprague/NASA Public Affairs
Correspondent: This is the Hubble Ultra
Deep Field, perhaps the most famous

56
00:04:57,560 --> 00:05:00,240
\h photograph the observatory has taken.

57
00:05:00,240 --> 00:05:08,480
\h Astronomers pointed Hubble's powerful lens at an area of seemingly empty space and found thousands

58
00:05:08,480 --> 00:05:12,640
\h some as they were being formed more than 13 billion years ago.

59
00:05:12,640 --> 00:05:15,840
\h In cosmic terms, it's like a baby picture of

space.

60
00:05:15,840 --> 00:05:21,990
\h In early 2008, Hubble recorded the first signs of methane on a planet outside our solar system.

61
00:05:21,990 --> 00:05:27,440
\h Methane plays a vital role in the chemical reactions that lead to the development of life.

62
00:05:27,440 --> 00:05:31,570
\h All those discoveries require a powerful lens and cameras, but they also require a

63
00:05:31,570 --> 00:05:36,140
\h spacecraft that will not move even slightly while floating in the vacuum of space.

64
00:05:36,140 --> 00:05:38,330
\h Here's Damon to show you how it works.

65
00:05:38,330 --> 00:05:41,800
\h Damon Talley/NASA's Digital Learning Network Coordinator: Thanks, Rebecca. Everything from pointin

66
00:05:41,800 --> 00:05:48,120
\h of space to turning its lens away from the blinding light of the sun is controlled by a set of spinning whee

67
00:05:48,120 --> 00:05:53,160
\h With them, Hubble can turn itself in all
directions and, just as importantly, hold still.

68
00:05:53,160 --> 00:05:56,290
\h They work on the same principle as a bicycle wheel.

69
00:05:56,290 --> 00:06:04,010
\h At rest the bicycle wheel is easy to move from side to side and it will fall over if held up from one side. S

70
00:06:04,010 --> 00:06:07,990
\h generates rotational inertia and it becomes difficult to move it from side to side.

71
00:06:07,990 --> 00:06:22,310
\h You can really feel the difference. Amazingly, the wheel stays up when held from one side.

72
00:06:22,310 --> 00:06:26,610
\h This why you stay upright as long as your bicycle or motorcycle is moving forward.

73
00:06:26,610 --> 00:06:33,310
\h This is also why a spinning top stays up. To
demonstrate how Hubble uses the

74
00:06:33,310 --> 00:06:39,840
\h gyroscopic effect to turn itself in space, I'll stand on a reduced-friction surface.

75
00:06:39,840 --> 00:06:44,390
\h Now, a much safer way to try this at home is
by sitting down in a swivel chair.

76
00:06:44,390 --> 00:06:49,950
\h Hubble uses electric power to spin its gyros and to turn them from side to side.

77
00:06:49,950 --> 00:06:52,580
\h One must apply a force to turn the wheel on
its side.

78
00:06:52,580 --> 00:07:00,860
\h Newton's third law of motion action-reaction kicks in and spins you around.

79
00:07:00,860 --> 00:07:06,740
\h This is how Hubble can turn and lock on to
objects in many different directions using
gyroscopes.

80
00:07:06,740 --> 00:07:11,650
\h STS-125 will provide Hubble with six brand new gyroscopes.

81
00:07:11,650 --> 00:07:16,120
\h Although Hubble is renowned for numerous
firsts, STS-125 will mark several lasts for the

82
00:07:16,120 --> 00:07:19,950
\h telescope and the space shuttle program. Right, Rebecca?

83
00:07:19,950 --> 00:07:22,710
\h Rebecca Sprague/NASA Public Affairs
Correspondent: That's right! STS-125 marks the last

84
00:07:22,710 --> 00:07:26,100
\h time human eyes are scheduled to see the Hubble directly.

85
00:07:26,100 --> 00:07:32,520
\h It will be the last time hands will touch it before it is released to orbit on its own for several more years.

86
00:07:32,520 --> 00:07:37,530
\h After a distinguished career, it will eventually be decommissioned and remain in orbit high

87
00:07:37,530 --> 00:07:40,790
\h above Earth and out of the way of other spacecraft.

88
00:07:40,790 --> 00:07:47,250
\h Here at Kennedy, this mission marks the last time two orbiters are expected to be on the launch pad at t

89
00:07:47,250 --> 00:07:54,930
\h The silhouette of space shuttle Endeavour moved toward Launch Pad 39B recently as the sun peered o

90
00:07:54,930 --> 00:08:00,210
\h With Atlantis already at Launch Pad 39A,
Endeavour completed the unusual scene of

91
00:08:00,210 --> 00:08:03,600
\h two space shuttles standing ready for launch.

92
00:08:03,600 --> 00:08:10,310
\h NASA took the extra precaution of preparing two shuttles for flight at the same time since Atlantis will no

93
00:08:10,310 --> 00:08:14,890
\h safety at the International Space Station if something goes wrong during the mission.

94
00:08:14,890 --> 00:08:19,480
\h In that unlikely event, Endeavour would be

launched on a rescue mission.

95
00:08:19,480 --> 00:08:24,210
\h It's a breathtaking scene, with a serious purpose. Damon.

96
00:08:24,210 --> 00:08:26,980
\h Damon Talley/NASA's Digital Learning Network Coordinator: Hubble's reach extends well beyond scien

97
00:08:26,980 --> 00:08:31,740
\h Dr. Mario Livio of the Space Telescope
Science Institute said that the cultural

98
00:08:31,740 --> 00:08:36,290
\h outreach may turn out to be the Hubble's most significant contribution.

99
00:08:36,290 --> 00:08:43,160
\h Dr. Mario Livio/Space Telescope Science Institute Senior Astrophysicist: On the cultural arena, Hubble i

100
00:08:43,160 --> 00:08:53,510
\h Hubble images have crossed the boundary between science and culture and penetrated into areas such

101
00:08:53,510 --> 00:08:58,690
\h Really has become, you know, the symbol of science exploration.

102
00:08:58,690 --> 00:09:00,500
\h Rebecca Sprague/NASA Public Affairs
Correspondent: There are scores of
instances of

103
00:09:00,500 --> 00:09:03,240
\h Hubble's crossover from science to culture.

104
00:09:03,240 --> 00:09:07,590
\h For example, a picture of one of the stardust stalks of the Eagle Nebula was printed as

105
00:09:07,590 --> 00:09:11,880
\h part of a series of stamps celebrating the telescope's achievements.

106

00:09:11,880 --> 00:09:19,690
\h The influential rock band Pearl Jam used a Hubble photo of a planetary nebula as the album cover for “

107
00:09:19,690 --> 00:09:26,670
\h The telescope has been mentioned on notably unscientific shows, including Family Guy. And art museu

108
00:09:26,670 --> 00:09:32,520
\h Hubble images with reverence normally associated with Picasso, Monet or Cezanne.

109
00:09:32,520 --> 00:09:41,280
\h The exhibits hold up the universe not as a set of data points to be analyzed, but as artwork to be apprec

110
00:09:41,280 --> 00:09:47,780
\h It's just another way Hubble brought space down to Earth. That's it from here, back to you Damon.

111
00:09:47,780 --> 00:09:49,020
\h Damon Talley/NASA's Digital Learning
Network Coordinator: Thanks Rebecca.

112
00:09:49,020 --> 00:09:51,060
\h The final mission to NASA's Hubble Space Telescope

113
00:09:51,060 --> 00:09:56,790
\h may be one of the most exciting that space shuttle astronauts have undertaken. You can follow the laun

114
00:09:56,790 --> 00:10:06,250
\h NASA TV or at www.nasa.gov/shuttle. A launch blog will be available, along with updated photo and vid

115
00:10:06,250 --> 00:10:09,900
\h You can stay up-to-date throughout the
mission at NASA's Web site.

116
00:10:09,900 --> 00:10:14,640
\h I'll host a live webcast on the Digital Learning Network during the last hour of the countdown.

117
00:10:14,640 --> 00:10:21,050
\h That's our show looking ahead to Atlantis'
STS-125 servicing mission to the Hubble
Space Telescope.