SERVICING MISSION 3A

SAVED THE DAY

1
00:00:07,829 --> 00:00:05,430
[Music]

2
00:00:09,830 --> 00:00:07,839
the hubble space telescope has had five

3
00:00:14,310 --> 00:00:09,840
servicing missions since its launch in

4
00:00:17,430 --> 00:00:14,320
1990 from servicing mission 1 in 1993 to

5
00:00:18,790 --> 00:00:17,440
servicing mission 4 in 2009.

6
00:00:21,029 --> 00:00:18,800
wait what

7
00:00:23,670 --> 00:00:21,039
five servicing missions but the last one

8
00:00:25,750 --> 00:00:23,680
is called servicing mission four

9
00:00:27,830 --> 00:00:25,760
while it might seem strange at first

10
00:00:30,390 --> 00:00:27,840
there's a reason for that and that's

11
00:00:32,069 --> 00:00:30,400
because servicing mission 3 has a very

12
00:00:33,910 --> 00:00:32,079
interesting history

13
00:00:36,310 --> 00:00:33,920

originally scheduled for launch in

14
00:00:37,830 --> 00:00:36,320
mid-2000 hubble's third servicing

15
00:00:39,910 --> 00:00:37,840
mission was going to upgrade and

16
00:00:41,750 --> 00:00:39,920
refurbish the telescope just as the

17
00:00:44,630 --> 00:00:41,760
first two servicing missions had done

18
00:00:48,709 --> 00:00:44,640
before but in quick succession hubble's

19
00:00:51,270 --> 00:00:48,719
all-important gyroscopes begin to fail

20
00:00:52,549 --> 00:00:51,280
so why are hubble's gyroscopes so

21
00:00:54,549 --> 00:00:52,559
important

22
00:00:56,869 --> 00:00:54,559
hubble deputy project manager jim

23
00:00:59,430 --> 00:00:56,879
gellatik can explain so while we're

24
00:01:01,510 --> 00:00:59,440
turning hubble we need to know exactly

25
00:01:03,750 --> 00:01:01,520
which direction we're turning it so we

26
00:01:04,950 --> 00:01:03,760
use a sensor known as a gyroscope or a

27
00:01:07,270 --> 00:01:04,960
gyro

28
00:01:10,390 --> 00:01:07,280
they use the conservation of angular

29
00:01:12,469 --> 00:01:10,400
momentum to tell us if hubble is turning

30
00:01:14,149 --> 00:01:12,479
in which specific direction

31
00:01:16,390 --> 00:01:14,159
and how fast it's turning in that

32
00:01:18,870 --> 00:01:16,400
direction so essentially without the

33
00:01:21,830 --> 00:01:18,880
gyroscopes we have no way to know where

34
00:01:23,670 --> 00:01:21,840
hubble is pointing which for a telescope

35
00:01:27,109 --> 00:01:23,680
is kind of important

36
00:01:29,270 --> 00:01:27,119
in 1999 hubble needed at least three of

37
00:01:31,590 --> 00:01:29,280
its six gyroscopes to be running in

38
00:01:33,830 --> 00:01:31,600

order to do science and with only three

39
00:01:35,990 --> 00:01:33,840
gyros still functioning a hubble

40
00:01:38,870 --> 00:01:36,000
emergency was declared and servicing

41
00:01:41,510 --> 00:01:38,880
mission three was quickly split into two

42
00:01:44,149 --> 00:01:41,520
separate launches

43
00:01:46,230 --> 00:01:44,159
sm-3a's main priority would be switching

44
00:01:49,429 --> 00:01:46,240
out all the gyroscopes with new and

45
00:01:51,429 --> 00:01:49,439
improved versions while sm-3b was

46
00:01:53,030 --> 00:01:51,439
scheduled for a few years later and

47
00:01:55,830 --> 00:01:53,040
would work on the updates that hubble

48
00:01:58,310 --> 00:01:55,840
still needed but weren't as urgent

49
00:02:01,030 --> 00:01:58,320
due to this timing change the astronauts

50
00:02:03,030 --> 00:02:01,040
for sm-3a had less time to train for

51
00:02:05,350 --> 00:02:03,040
their important mission but they went

52
00:02:08,109 --> 00:02:05,360
into overdrive and were ready in time

53
00:02:12,150 --> 00:02:08,119
for their launch date of october 14

54
00:02:14,390 --> 00:02:12,160
1999 however delays caused by final

55
00:02:16,150 --> 00:02:14,400
inspections and wiring repairs on the

56
00:02:18,150 --> 00:02:16,160
shuttle continued to push the launch

57
00:02:20,790 --> 00:02:18,160
date deeper and deeper into the end of

58
00:02:23,670 --> 00:02:20,800
the year and then as if things couldn't

59
00:02:26,150 --> 00:02:23,680
get any worse in mid-november a fourth

60
00:02:28,710 --> 00:02:26,160
gyroscope on hubble failed hubble was

61
00:02:30,470 --> 00:02:28,720
put into safe mode and all science came

62
00:02:32,470 --> 00:02:30,480
to a screeching halt

63
00:02:35,190 --> 00:02:32,480

thankfully the hubble team had already

64
00:02:37,670 --> 00:02:35,200
decided to split sm-3 into two missions

65
00:02:39,430 --> 00:02:37,680
months earlier otherwise hubble would

66
00:02:42,550 --> 00:02:39,440
have been totally silent until the

67
00:02:44,470 --> 00:02:42,560
originally planned mid-2000 mission so

68
00:02:47,270 --> 00:02:44,480
after a few more delays due to more

69
00:02:50,229 --> 00:02:47,280
inspections rewiring engine replacements

70
00:02:51,910 --> 00:02:50,239
and bad weather the crew of sm-3a

71
00:02:54,949 --> 00:02:51,920
sitting in the cockpit of the space

72
00:02:56,550 --> 00:02:54,959
shuttle discovery was ready to launch

73
00:02:58,790 --> 00:02:56,560
the eight-day mission had three

74
00:03:01,110 --> 00:02:58,800
spacewalks planned the first was the

75
00:03:03,350 --> 00:03:01,120
all-important gyro switch-out there were

76
00:03:06,309 --> 00:03:03,360
a few minor problems that came up during

77
00:03:08,470 --> 00:03:06,319
the 8 hour 15 minute long space walk but

78
00:03:10,949 --> 00:03:08,480
by the end of the day hubble's gyro

79
00:03:12,550 --> 00:03:10,959
troubles were over

80
00:03:15,110 --> 00:03:12,560
the next two days had their own

81
00:03:17,509 --> 00:03:15,120
spacewalks updating hubble with a more

82
00:03:19,589 --> 00:03:17,519
advanced computer adding a new fine

83
00:03:21,589 --> 00:03:19,599
guidance sensor installing a new

84
00:03:23,990 --> 00:03:21,599
solid-state digital recorder and

85
00:03:25,910 --> 00:03:24,000
replacing hubble's old outer insulation

86
00:03:27,750 --> 00:03:25,920
with new panels in order to protect

87
00:03:30,630 --> 00:03:27,760
hubble's scientific equipment from

88
00:03:32,550 --> 00:03:30,640

getting too hot or too cold

89
00:03:34,309 --> 00:03:32,560
when all the work was finished hubble

90
00:03:36,229 --> 00:03:34,319
was released back into orbit on

91
00:03:38,550 --> 00:03:36,239
christmas day and as the crew of

92
00:03:40,390 --> 00:03:38,560
discovery landed at kennedy space center

93
00:03:43,110 --> 00:03:40,400
it became clear that this mission was a

94
00:03:45,670 --> 00:03:43,120
resounding success

95
00:03:48,789 --> 00:03:45,680
servicing mission 3b would also be a

96
00:03:51,990 --> 00:03:48,799
success later in march of 2002 followed

97
00:03:55,830 --> 00:03:52,000
by the fifth and final flight servicing

98
00:03:57,350 --> 00:03:55,840
mission 4 in may of 2009

99
00:04:00,070 --> 00:03:57,360
thanks to everyone involved with

100
00:04:02,229 --> 00:04:00,080
servicing mission 3a hubble was able to

101
00:04:04,390 --> 00:04:02,239
quickly get back on schedule with its

102
00:04:06,470 --> 00:04:04,400
groundbreaking science and continue

103
00:04:09,950 --> 00:04:06,480
forward with its mission of uncovering

104
00:04:14,869 --> 00:04:09,960
the mysteries of the universe

105
00:04:18,870 --> 00:04:16,870
i'm sure you know who i am

106
00:04:21,110 --> 00:04:18,880
you know today is the busiest day of the

107
00:04:23,270 --> 00:04:21,120
year for me i'm delivering presents to

108
00:04:25,110 --> 00:04:23,280
good girls and boys

109
00:04:27,030 --> 00:04:25,120
i heard the discovery was up in space

110
00:04:28,390 --> 00:04:27,040
working over the holidays so i decided

111
00:04:30,710 --> 00:04:28,400
to stop by

112
00:04:32,550 --> 00:04:30,720
and visit my astronaut fans and deliver

113
00:04:33,909 --> 00:04:32,560

presents because they've been good girls

114
00:04:36,230 --> 00:04:33,919
and boys

115
00:04:38,469 --> 00:04:36,240
it's a very busy time of the year

116
00:04:40,230 --> 00:04:38,479
and so i must be on my way

117
00:04:42,230 --> 00:04:40,240
but i would like to wish

118
00:04:45,430 --> 00:04:42,240
all the boys and girls around the world

119
00:04:47,830 --> 00:04:45,440
a merry christmas especially those ones

120
00:04:49,749 --> 00:04:47,840
down in houston and mission control at

121
00:04:51,510 --> 00:04:49,759
the kennedy space center which has done

122
00:04:54,230 --> 00:04:51,520
so much work during the holidays to make

123
00:04:56,790 --> 00:04:54,240
this fishing such a great success it's

124
00:04:59,820 --> 00:04:56,800
busy busy here so i gotta go merry