

A close-up photograph of an astronaut in a white space suit, smiling and waving. The astronaut's helmet is clear, and an American flag patch is visible on the right shoulder. In the background, the complex structure of the Hubble Space Telescope is visible against the blackness of space.

**SERVICING MISSION 3B**  
**HUBBLE SPACE TELESCOPE**

1  
00:00:02,230 --> 00:00:00,389

[Music]

2  
00:00:04,390 --> 00:00:02,240

after nasa split hubble's third

3  
00:00:06,550 --> 00:00:04,400

servicing mission into two parts to

4  
00:00:08,470 --> 00:00:06,560

allow astronauts to get to hubble as

5  
00:00:10,629 --> 00:00:08,480

soon as possible to replace family

6  
00:00:14,549 --> 00:00:10,639

gyroscopes which are needed to point the

7  
00:00:18,710 --> 00:00:16,710

servicing mission 3a successfully got

8  
00:00:21,109 --> 00:00:18,720

hubble back up and running until

9  
00:00:23,509 --> 00:00:21,119

servicing mission 3b could launch and

10  
00:00:25,269 --> 00:00:23,519

complete all of the planned upgrades to

11  
00:00:27,509 --> 00:00:25,279

hubble

12  
00:00:30,070 --> 00:00:27,519

but even in times of ease the unexpected

13  
00:00:33,430 --> 00:00:30,080

can make an appearance again

14

00:00:35,350 --> 00:00:33,440

houston uh columbia for eva go ahead

15

00:00:37,910 --> 00:00:35,360

columbia we're listening

16

00:00:39,830 --> 00:00:37,920

okay uh as we put on many workstations

17

00:00:41,670 --> 00:00:39,840

i'm monitoring john's suit and there's a

18

00:00:43,350 --> 00:00:41,680

large bit of water down here at the

19

00:00:44,709 --> 00:00:43,360

bottom of the battery i'm fixing to open

20

00:00:47,110 --> 00:00:44,719

up now

21

00:00:48,150 --> 00:00:47,120

something unexpected like a spacesuit

22

00:00:49,830 --> 00:00:48,160

failure

23

00:00:51,670 --> 00:00:49,840

yeah scooter we're gonna have to get uh

24

00:00:53,990 --> 00:00:51,680

john out of the suit

25

00:00:56,709 --> 00:00:54,000

and of course these things always happen

26  
00:00:58,170 --> 00:00:56,719  
at the worst time too hubble is without

27  
00:01:01,500 --> 00:00:58,180  
a heartbeat

28  
00:01:14,390 --> 00:01:02,960  
[Applause]

29  
00:01:18,310 --> 00:01:16,630  
servicing missions are what make hubble

30  
00:01:20,310 --> 00:01:18,320  
hubble

31  
00:01:21,910 --> 00:01:20,320  
for over two decades servicing mission

32  
00:01:25,190 --> 00:01:21,920  
astronauts have been able to take

33  
00:01:27,190 --> 00:01:25,200  
advantage of hubble's malleable design

34  
00:01:29,429 --> 00:01:27,200  
being able to upgrade and refurbish

35  
00:01:31,670 --> 00:01:29,439  
parts periodically is how hubble has

36  
00:01:34,469 --> 00:01:31,680  
been able to stay on the bleeding edge

37  
00:01:36,710 --> 00:01:34,479  
of astronomical science

38  
00:01:39,030 --> 00:01:36,720

and servicing mission 3b was no

39

00:01:41,109 --> 00:01:39,040

exception to that fact we're providing a

40

00:01:43,030 --> 00:01:41,119

major upgrade in terms of science

41

00:01:44,710 --> 00:01:43,040

capability we're adding a new science

42

00:01:47,270 --> 00:01:44,720

instrument and we're bringing back to

43

00:01:49,429 --> 00:01:47,280

life the infrared camera and we're

44

00:01:51,270 --> 00:01:49,439

making important upgrades in terms of

45

00:01:52,789 --> 00:01:51,280

maintenance we're adding new solar

46

00:01:54,789 --> 00:01:52,799

arrays and we're changing out the power

47

00:01:57,990 --> 00:01:54,799

control unit

48

00:02:00,550 --> 00:01:58,000

forty percent of the highest impact

49

00:02:02,630 --> 00:02:00,560

subjects that hubble has has uh highest

50

00:02:04,630 --> 00:02:02,640

impact results that hubble has achieved

51

00:02:06,789 --> 00:02:04,640

were totally unexpected

52

00:02:09,109 --> 00:02:06,799

before hubble was launched

53

00:02:10,389 --> 00:02:09,119

and i expect that five or seven years

54

00:02:12,229 --> 00:02:10,399

from now hubble will be working on

55

00:02:13,430 --> 00:02:12,239

subjects that we can't anticipate today

56

00:02:14,869 --> 00:02:13,440

we don't even know how to ask the

57

00:02:16,869 --> 00:02:14,879

questions today

58

00:02:19,270 --> 00:02:16,879

and with the anticipation of those

59

00:02:21,510 --> 00:02:19,280

unknown discoveries building servicing

60

00:02:24,550 --> 00:02:21,520

mission 3b was scheduled to launch in

61

00:02:27,990 --> 00:02:24,560

the spring of 2002 ready to make its

62

00:02:28,869 --> 00:02:28,000

mark on the stars

63

00:02:29,830 --> 00:02:28,879

four

64

00:02:30,869 --> 00:02:29,840

three

65

00:02:31,750 --> 00:02:30,879

two

66

00:02:34,630 --> 00:02:31,760

one

67

00:02:36,550 --> 00:02:34,640

and liftoff of space shuttle columbia to

68

00:02:40,790 --> 00:02:36,560

broaden our view of the universe through

69

00:02:44,070 --> 00:02:42,229

houston now controlling the flight of

70

00:02:48,060 --> 00:02:44,080

columbia the pioneer shuttle headed for

71

00:02:48,070 --> 00:02:55,270

[Music]

72

00:03:00,229 --> 00:02:56,949

with the hubble space telescope fully

73

00:03:01,589 --> 00:03:00,239

grappled it was time to get to work

74

00:03:03,589 --> 00:03:01,599

the servicing mission was going to

75

00:03:05,910 --> 00:03:03,599

encompass a wide range of upgrades and

76  
00:03:08,229 --> 00:03:05,920  
improvements so every minute of this 12

77  
00:03:10,229 --> 00:03:08,239  
day mission was meticulously planned in

78  
00:03:12,149 --> 00:03:10,239  
order to complete the five scheduled

79  
00:03:14,229 --> 00:03:12,159  
spacewalks

80  
00:03:16,630 --> 00:03:14,239  
first up replaced the old solar rays

81  
00:03:18,869 --> 00:03:16,640  
with the new and improved version 3 of

82  
00:03:20,550 --> 00:03:18,879  
the solar array system

83  
00:03:22,630 --> 00:03:20,560  
these new solar arrays were rigid and

84  
00:03:24,550 --> 00:03:22,640  
didn't roll up like previous designs

85  
00:03:26,630 --> 00:03:24,560  
being more robust it made hubble's power

86  
00:03:28,710 --> 00:03:26,640  
intake increase by about 20 to 30

87  
00:03:30,630 --> 00:03:28,720  
percent

88  
00:03:33,350 --> 00:03:30,640

solar ray 3 has passed its functional

89

00:03:35,670 --> 00:03:33,360

test and ready to support next on the

90

00:03:37,430 --> 00:03:35,680

list replacing the power control unit

91

00:03:39,270 --> 00:03:37,440

this is hubble's power switching station

92

00:03:41,589 --> 00:03:39,280

responsible for distributing all the

93

00:03:43,430 --> 00:03:41,599

electricity generated by the arrays

94

00:03:45,750 --> 00:03:43,440

batteries and sending it to the other

95

00:03:47,750 --> 00:03:45,760

parts of the telescope

96

00:03:49,910 --> 00:03:47,760

and in order for the power control unit

97

00:03:52,229 --> 00:03:49,920

to be replaced it required hubble to be

98

00:03:53,830 --> 00:03:52,239

completely powered down for the first

99

00:03:55,429 --> 00:03:53,840

time

100

00:03:57,429 --> 00:03:55,439

and one of the cardinal rules in the

101  
00:03:59,030 --> 00:03:57,439  
business of space is if it's working

102  
00:04:03,030 --> 00:03:59,040  
well

103  
00:04:07,110 --> 00:04:05,110  
during the systematic shutdown process

104  
00:04:09,190 --> 00:04:07,120  
astronauts john grunsfeld and rick

105  
00:04:12,630 --> 00:04:09,200  
lenahan were suiting up to tackle the

106  
00:04:18,469 --> 00:04:14,789  
however john's spacesuit began to take

107  
00:04:20,469 --> 00:04:18,479  
on water from the liquid coolant system

108  
00:04:22,710 --> 00:04:20,479  
not the most ideal situation to happen

109  
00:04:25,030 --> 00:04:22,720  
right before stepping out into the cold

110  
00:04:26,550 --> 00:04:25,040  
void of space

111  
00:04:28,390 --> 00:04:26,560  
with only a certain amount of time to

112  
00:04:30,550 --> 00:04:28,400  
react since parts of hubble were already

113  
00:04:32,469 --> 00:04:30,560

shut down grunfeld's crewmates quickly

114

00:04:35,030 --> 00:04:32,479

resized another spacesuit in order to

115

00:04:38,550 --> 00:04:35,040

get the spacewalker out in time before

116

00:04:40,230 --> 00:04:38,560

the whole spacewalk had to be canceled

117

00:04:41,749 --> 00:04:40,240

and the late but hopefully powerful

118

00:04:44,070 --> 00:04:41,759

start

119

00:04:46,070 --> 00:04:44,080

with things back on track the heart of

120

00:04:47,990 --> 00:04:46,080

hubble the power control unit was

121

00:04:50,990 --> 00:04:48,000

successfully changed out after a

122

00:04:56,150 --> 00:04:51,000

meticulous seven hours spacewalk

123

00:04:58,390 --> 00:04:56,160

[Music]

124

00:05:00,629 --> 00:04:58,400

next was to install the advanced camera

125

00:05:02,629 --> 00:05:00,639

for surveys this camera would allow

126

00:05:04,469 --> 00:05:02,639

hubble to capture wider vistas of the

127

00:05:05,909 --> 00:05:04,479

universe at a higher resolution than

128

00:05:07,670 --> 00:05:05,919

ever before

129

00:05:09,270 --> 00:05:07,680

allowing us to study weather patterns on

130

00:05:11,270 --> 00:05:09,280

other planets and understand how the

131

00:05:13,270 --> 00:05:11,280

universe evolved

132

00:05:15,189 --> 00:05:13,280

and finally the astronauts of servicing

133

00:05:16,950 --> 00:05:15,199

mission 3b were able to bring one of

134

00:05:19,510 --> 00:05:16,960

hubble's most critical instruments

135

00:05:21,510 --> 00:05:19,520

called mikmos back to life after it had

136

00:05:23,350 --> 00:05:21,520

been dormant for two years

137

00:05:25,830 --> 00:05:23,360

they achieved this by installing a cryo

138

00:05:28,469 --> 00:05:25,840

cooler for its infrared detectors once

139

00:05:32,070 --> 00:05:28,479

again unleashing hubble's power to peer

140

00:05:34,150 --> 00:05:32,080

into the invisible infrared universe

141

00:05:36,950 --> 00:05:34,160

servicing mission 3b proved that nasa

142

00:05:39,830 --> 00:05:36,960

can take on the unexpected head-on as a

143

00:05:42,469 --> 00:05:39,840

team accomplishing historical strides in

144

00:05:44,310 --> 00:05:42,479

our understanding of the universe around

145

00:05:46,629 --> 00:05:44,320

us

146

00:05:48,310 --> 00:05:46,639

and from the crew of stf-109

147

00:05:50,550 --> 00:05:48,320

we've been humble well on its new

148

00:05:55,450 --> 00:05:50,560

journey with its new tools to explore