1
00:00:17,670 --> 00:00:15,990
the science instruments can't function

2
00:00:19,429 --> 00:00:17,680
all by themselves they get plugged into

3
00:00:21,189 --> 00:00:19,439
the hubble space telescope and there's

4
00:00:23,029 --> 00:00:21,199
an entire infrastructure in there that

5
00:00:24,070 --> 00:00:23,039
enables them to do the great science

6
00:00:26,470 --> 00:00:24,080
that they do

7
00:00:27,830 --> 00:00:26,480
and has to work properly in order for

8
00:00:30,070 --> 00:00:27,840
any of these instruments to get their

9
00:00:31,750 --> 00:00:30,080
science down to the ground we have the

10
00:00:33,350 --> 00:00:31,760
opportunity on these servicing missions

11
00:00:35,830 --> 00:00:33,360
not just to upgrade the instruments but

12
00:00:38,470 --> 00:00:35,840
also to upgrade that infrastructure

13
00:00:40,549 --> 00:00:38,480

hubble has six giant arrows in total

14
00:00:42,790 --> 00:00:40,559
and over time they wear out

15
00:00:44,549 --> 00:00:42,800
we're down to three working gyros but

16
00:00:45,750 --> 00:00:44,559
we're only using two we're keeping one

17
00:00:47,990 --> 00:00:45,760
in spare

18
00:00:50,069 --> 00:00:48,000
and in the next servicing mission we're

19
00:00:52,470 --> 00:00:50,079
going to replace all the gyros that we

20
00:00:53,510 --> 00:00:52,480
have full gyro capability for years to

21
00:00:56,150 --> 00:00:53,520
come

22
00:00:59,430 --> 00:00:56,160
well we have six gyros and what we do is

23
00:01:01,270 --> 00:00:59,440
we package two of them into a box with a

24
00:01:03,910 --> 00:01:01,280
handle

25
00:01:05,509 --> 00:01:03,920
it's not an easy test to replace these

26
00:01:08,230 --> 00:01:05,519
these rate sensor units these three

27
00:01:10,950 --> 00:01:08,240
boxes the star trackers have these long

28
00:01:14,070 --> 00:01:10,960
tubes on them called sun shades so when

29
00:01:15,910 --> 00:01:14,080
the astronauts have to replace the gyros

30
00:01:19,030 --> 00:01:15,920
they have to sort of wedge themselves

31
00:01:26,310 --> 00:01:19,040
into this very small area without

32
00:01:30,789 --> 00:01:28,630
gyros help us in two ways when we move

33
00:01:33,670 --> 00:01:30,799
from target to target the gyros help the

34
00:01:36,069 --> 00:01:33,680
computer know how quickly we're turning

35
00:01:39,030 --> 00:01:36,079
once we get locked in on a target those

36
00:01:41,109 --> 00:01:39,040
gyros help us steady the vehicle so that

37
00:01:45,830 --> 00:01:41,119
we can collect all that scientific data

38
00:01:49,030 --> 00:01:47,429

we're going to put in a new fine

39
00:01:51,670 --> 00:01:49,040
guidance sensor

40
00:01:53,510 --> 00:01:51,680
to take the place of one that has shown

41
00:01:55,429 --> 00:01:53,520
evidence of

42
00:01:56,950 --> 00:01:55,439
failing and not not being long for this

43
00:01:59,270 --> 00:01:56,960
world

44
00:02:02,310 --> 00:01:59,280
well defined guidance sensors actually

45
00:02:04,870 --> 00:02:02,320
are the components that find the

46
00:02:07,990 --> 00:02:04,880
particular observation and they pick two

47
00:02:10,869 --> 00:02:08,000
guide stars very close to what is being

48
00:02:13,670 --> 00:02:10,879
observed and fine guidance sensors then

49
00:02:15,589 --> 00:02:13,680
zero in on those guide stars they lock

50
00:02:17,670 --> 00:02:15,599
in on them and now you know you're

51
00:02:20,470 --> 00:02:17,680
pointing in the right place in the sky

52
00:02:23,190 --> 00:02:20,480
and then it transfers over to the rate

53
00:02:28,470 --> 00:02:23,200
sensor units the gyroscopes to hold

54
00:02:31,270 --> 00:02:29,430
when you're working with the hubble

55
00:02:34,150 --> 00:02:31,280
space telescope program anything can

56
00:02:35,910 --> 00:02:34,160
happen and in fact just a few weeks

57
00:02:37,350 --> 00:02:35,920
before we were scheduled to launch back

58
00:02:39,910 --> 00:02:37,360
in october

59
00:02:40,949 --> 00:02:39,920
the data handling system the sic and dh

60
00:02:43,830 --> 00:02:40,959
went down

61
00:02:46,229 --> 00:02:43,840
the sic date it is critical to the

62
00:02:48,150 --> 00:02:46,239
hubble space telescope because without

63
00:02:50,949 --> 00:02:48,160

it you have no telescope you have no

64
00:02:52,949 --> 00:02:50,959
science information nasa administration

65
00:02:55,030 --> 00:02:52,959
decided that it would be worth it to

66
00:02:56,869 --> 00:02:55,040
postpone the servicing mission so that

67
00:02:59,110 --> 00:02:56,879
we could get the flight spare

68
00:03:01,750 --> 00:02:59,120
and test and verify it and replace it on

69
00:03:04,550 --> 00:03:01,760
the servicing mission the sic dh

70
00:03:06,710 --> 00:03:04,560
function is to take the data from the

71
00:03:08,470 --> 00:03:06,720
science instruments and

72
00:03:11,750 --> 00:03:08,480
it formats it

73
00:03:13,430 --> 00:03:11,760
it puts it in a command sequence that is

74
00:03:16,710 --> 00:03:13,440
then transmitted to the ground and then

75
00:03:18,470 --> 00:03:16,720
deciphered back on the ground

76
00:03:21,589 --> 00:03:18,480
without it you have no science

77
00:03:22,630 --> 00:03:21,599
information and by putting a

78
00:03:24,550 --> 00:03:22,640
new

79
00:03:26,470 --> 00:03:24,560
sic day check up there you gain the

80
00:03:30,869 --> 00:03:26,480
redundancy back and you're not one

81
00:03:34,949 --> 00:03:33,670
the soft capture mechanism is a device

82
00:03:37,030 --> 00:03:34,959
that we're putting on the bottom of the

83
00:03:38,869 --> 00:03:37,040
telescope

84
00:03:41,190 --> 00:03:38,879
we're going to convert hubble from a

85
00:03:43,190 --> 00:03:41,200
shuttle interface which grabs with some

86
00:03:44,070 --> 00:03:43,200
last three latches on the bottom of

87
00:03:46,229 --> 00:03:44,080
hubble

88
00:03:48,470 --> 00:03:46,239

to an exploration interface because

89
00:03:50,149 --> 00:03:48,480
we're using a similar interface that our

90
00:03:52,789 --> 00:03:50,159
exploration program is using for the

91
00:03:54,710 --> 00:03:52,799
orion capsule

92
00:03:56,149 --> 00:03:54,720
so in five minutes we'll convert from a

93
00:03:57,910 --> 00:03:56,159
shuttle-based

94
00:03:59,990 --> 00:03:57,920
architecture to an exploration-based

95
00:04:01,990 --> 00:04:00,000
architecture for hubble that will enable

96
00:04:04,229 --> 00:04:02,000
sometime in the future for us to dock

97
00:04:05,990 --> 00:04:04,239
another spacecraft not the space shuttle

98
00:04:07,750 --> 00:04:06,000
to the hubble

99
00:04:09,990 --> 00:04:07,760
for the purpose of making sure that at

100
00:04:15,990 --> 00:04:10,000
some point at its end of life

101
00:04:20,310 --> 00:04:18,310
the batteries we're operating on are the

102
00:04:23,990 --> 00:04:20,320
original batteries that were launched

103
00:04:27,030 --> 00:04:24,000
with the observatory in 1990

104
00:04:30,310 --> 00:04:27,040
the design life span was five years

105
00:04:31,189 --> 00:04:30,320
so these batteries are operating well

106
00:04:33,350 --> 00:04:31,199
past

107
00:04:35,030 --> 00:04:33,360
what they were designed for

108
00:04:37,670 --> 00:04:35,040
it's time to change them out we are

109
00:04:41,189 --> 00:04:37,680
losing capacity

110
00:04:43,990 --> 00:04:41,199
we're installing six new batteries

111
00:04:58,150 --> 00:04:44,000
arranged in two modules of three packs

112
00:05:03,909 --> 00:05:01,189
we're going to install a new outer

113
00:05:06,629 --> 00:05:03,919

blanket layer called a noble which is a

114
00:05:08,310 --> 00:05:06,639
solid it's not a blanket anymore it's a

115
00:05:11,110 --> 00:05:08,320
solid sheet

116
00:05:13,990 --> 00:05:11,120
we designed a new outer blanket layer

117
00:05:17,029 --> 00:05:14,000
that can either lay on top of the

118
00:05:19,029 --> 00:05:17,039
degraded blankets just cover them up or

119
00:05:20,870 --> 00:05:19,039
we will take off the blanket in order to

120
00:05:24,629 --> 00:05:20,880
install a new radiator against the bay

121
00:05:26,469 --> 00:05:24,639
door and this is a very

122
00:05:27,990 --> 00:05:26,479
weather resistant new outer blanket

123
00:05:29,510 --> 00:05:28,000
layer that we have designed so it should

124
00:05:31,990 --> 00:05:29,520
not degrade

125
00:05:34,950 --> 00:05:32,000
appreciably for the next

126
00:05:36,870 --> 00:05:34,960
15-20 years

127
00:05:38,710 --> 00:05:36,880
so at the end of this servicing mission

128
00:05:41,270 --> 00:05:38,720
where we've installed new cameras and

129
00:05:42,710 --> 00:05:41,280
upgraded all of this infrastructure

130
00:05:44,710 --> 00:05:42,720
the whole point of this is that the

131
00:05:46,550 --> 00:05:44,720
hubble space telescope will be better

132
00:05:48,629 --> 00:05:46,560
than it's ever been in its history and

133
00:05:51,110 --> 00:05:48,639
will continue to produce this this