HUBBLE
TOOL TIME
SERVICING MISSION 1

1
00:00:00,160 --> 00:00:05,310
all right tool time take 126.

2
00:00:05,320 --> 00:00:17,510
[Music]

3
00:00:22,470 --> 00:00:20,550
hi i'm john grunsfeld nasa astronaut

4
00:00:25,990 --> 00:00:22,480
hello i'm russ wordiff

5
00:00:28,390 --> 00:00:26,000
i was the eva manager for hubble space

6
00:00:31,509 --> 00:00:28,400
telescope from goddard

7
00:00:33,750 --> 00:00:31,519
now eva is an acronym for extra

8
00:00:36,470 --> 00:00:33,760
vehicular activity which is just a

9
00:00:38,630 --> 00:00:36,480
really long way of saying spacewalk

10
00:00:41,350 --> 00:00:38,640
i'm wearing some spacewalk gloves i

11
00:00:43,190 --> 00:00:41,360
noticed that to talk about spacewalking

12
00:00:45,670 --> 00:00:43,200
on the hubble space telescope now the

13
00:00:48,310 --> 00:00:45,680

hubble space telescope we all know it's

14
00:00:50,389 --> 00:00:48,320
that amazing observatory in space that

15
00:00:51,350 --> 00:00:50,399
helps us unravel the mysteries of the

16
00:00:53,910 --> 00:00:51,360
universe

17
00:00:56,709 --> 00:00:53,920
but when hubble was first launched in

18
00:00:59,110 --> 00:00:56,719
1990 we discovered the mir was a

19
00:01:01,430 --> 00:00:59,120
slightly incorrect shape and so the

20
00:01:03,189 --> 00:01:01,440
images were fuzzy and that's

21
00:01:05,910 --> 00:01:03,199
slight incorrect

22
00:01:08,550 --> 00:01:05,920
problem with the mirror was

23
00:01:12,149 --> 00:01:08,560
around the outside edges it was 1 50th

24
00:01:13,270 --> 00:01:12,159
the diameter of a piece of human hair

25
00:01:15,030 --> 00:01:13,280
too flat

26
00:01:17,429 --> 00:01:15,040
but it was enough that we couldn't do

27
00:01:20,710 --> 00:01:17,439
the science we had base optics yes

28
00:01:25,109 --> 00:01:20,720
so in 1993 a crew of women and men went

29
00:01:27,749 --> 00:01:25,119
up to do five space walks to change out

30
00:01:29,749 --> 00:01:27,759
one of the scientific instruments

31
00:01:33,830 --> 00:01:29,759
with the corrective optic space

32
00:01:36,069 --> 00:01:33,840
telescope axial replacement or co-star

33
00:01:38,630 --> 00:01:36,079
which corrected that optics

34
00:01:41,270 --> 00:01:38,640
in order to take that instrument out

35
00:01:43,670 --> 00:01:41,280
they had to use a power tool now one

36
00:01:46,149 --> 00:01:43,680
thing i'd like to say about hubble space

37
00:01:47,350 --> 00:01:46,159
telescope is that

38
00:01:50,310 --> 00:01:47,360

it was

39
00:01:54,230 --> 00:01:50,320
designed engineered originally quite

40
00:01:55,749 --> 00:01:54,240
uniquely to be take a particle

41
00:01:56,550 --> 00:01:55,759
not a real word

42
00:01:58,310 --> 00:01:56,560
but

43
00:01:59,510 --> 00:01:58,320
that means and i think everybody

44
00:02:02,389 --> 00:01:59,520
understands

45
00:02:06,550 --> 00:02:02,399
that a scientific instrument or a solar

46
00:02:07,510 --> 00:02:06,560
array could be taken off and replaced

47
00:02:09,669 --> 00:02:07,520
in case

48
00:02:11,670 --> 00:02:09,679
something had gone wrong with it

49
00:02:12,869 --> 00:02:11,680
or it needed repair

50
00:02:14,949 --> 00:02:12,879
and

51
00:02:17,830 --> 00:02:14,959
guess what we get new technology all the

52
00:02:19,750 --> 00:02:17,840
time the designers put in standardized

53
00:02:22,309 --> 00:02:19,760
bolts and interfaces this means

54
00:02:24,390 --> 00:02:22,319
connectors the bolts and even doors on

55
00:02:26,790 --> 00:02:24,400
the telescope that opened and closed and

56
00:02:28,630 --> 00:02:26,800
they had those doors had bolts on them

57
00:02:30,150 --> 00:02:28,640
and this tool was one of the tools used

58
00:02:32,150 --> 00:02:30,160
to help undo the bolts of the

59
00:02:33,990 --> 00:02:32,160
instruments of the doors it's called the

60
00:02:36,710 --> 00:02:34,000
power ratchet tool

61
00:02:39,750 --> 00:02:36,720
this this was the initial

62
00:02:41,750 --> 00:02:39,760
power tool that we used as john said on

63
00:02:44,229 --> 00:02:41,760

our first search servicing mission back

64
00:02:47,110 --> 00:02:44,239
in 1993.

65
00:02:49,270 --> 00:02:47,120
it's doesn't weigh much in space

66
00:02:51,830 --> 00:02:49,280
floats floats in space

67
00:02:54,710 --> 00:02:51,840
but it is kind of bulky

68
00:02:57,270 --> 00:02:54,720
so in tool development in the future we

69
00:03:00,070 --> 00:02:57,280
came up with other power tools but at

70
00:03:02,309 --> 00:03:00,080
the time this was the tool of choice

71
00:03:04,790 --> 00:03:02,319
that we use for the tasks that we had on

72
00:03:06,790 --> 00:03:04,800
that very first servicing mission and so

73
00:03:09,910 --> 00:03:06,800
this was used with an extension on it

74
00:03:12,390 --> 00:03:09,920
and a socket to turn bolts so when you

75
00:03:14,149 --> 00:03:12,400
pull the trigger

76
00:03:17,030 --> 00:03:14,159
electricity would flow from the battery

77
00:03:19,030 --> 00:03:17,040
through this long cable to the motor

78
00:03:21,270 --> 00:03:19,040
and turn the bolt and you could turn it

79
00:03:23,509 --> 00:03:21,280
clockwise or counter clockwise it could

80
00:03:26,229 --> 00:03:23,519
also be used manually in case a bolt was

81
00:03:27,910 --> 00:03:26,239
stuck just like a big torque wrench on

82
00:03:30,309 --> 00:03:27,920
the ground which means

83
00:03:32,789 --> 00:03:30,319
you know using your muscles to crank the

84
00:03:34,710 --> 00:03:32,799
bolt in case it was stuck right we have

85
00:03:35,589 --> 00:03:34,720
to consider a lot of things

86
00:03:38,229 --> 00:03:35,599
and

87
00:03:41,350 --> 00:03:38,239
it has to be operational it has to be

88
00:03:42,229 --> 00:03:41,360

used with those big old gloves

89
00:03:47,830 --> 00:03:42,239
and

90
00:03:50,789 --> 00:03:47,840
use in space with no sharp edges

91
00:03:51,990 --> 00:03:50,799
to puncture those gloves or your suit

92
00:03:54,149 --> 00:03:52,000
and each time we went up to the

93
00:03:55,509 --> 00:03:54,159
telescope as russ said we would bring

94
00:03:58,070 --> 00:03:55,519
new scientific instruments new

95
00:04:00,789 --> 00:03:58,080
electronics and the net effect

96
00:04:02,789 --> 00:04:00,799
is that we reinvented the telescope and

97
00:04:05,110 --> 00:04:02,799
made a new observatory each time we went

98
00:04:06,789 --> 00:04:05,120
to space allowed hubble to help us

99
00:04:10,410 --> 00:04:06,799
unravel the mysteries of the universe

100
00:04:20,069 --> 00:04:10,420
thanks russ okay thanks john

101
00:04:23,749 --> 00:04:22,390
there's a tear in the glove christy

102
00:04:25,909 --> 00:04:23,759
all right there's probably a few there