1
00:00:07,670 --> 00:00:04,630
hubble is all about

2
00:00:09,509 --> 00:00:07,680
imagery it's all about taking clear

3
00:00:10,870 --> 00:00:09,519
sharp beautiful pictures of the sky and

4
00:00:17,269 --> 00:00:10,880
doing fantastic

5
00:00:19,269 --> 00:00:17,279
science with with those images

6
00:00:20,710 --> 00:00:19,279
the story of the hubble space telescope

7
00:00:23,029 --> 00:00:20,720
launch is best uh

8
00:00:24,950 --> 00:00:23,039
the way i like to describe it is uh

9
00:00:26,710 --> 00:00:24,960
climbing to the top of mount everest

10
00:00:28,230 --> 00:00:26,720
and then suddenly within a couple of

11
00:00:34,229 --> 00:00:28,240
months of sinking to the bottom of the

12
00:00:38,549 --> 00:00:36,229
we were having trouble focusing the

13
00:00:40,069 --> 00:00:38,559

telescope and uh

14
00:00:41,430 --> 00:00:40,079
we noticed that wide field camera

15
00:00:43,430 --> 00:00:41,440
pictures that were coming down were

16
00:00:45,670 --> 00:00:43,440
fuzzy fuzzy blobs instead of nice

17
00:00:47,350 --> 00:00:45,680
sharp points and over the course of

18
00:00:49,190 --> 00:00:47,360
early june we started to get worried

19
00:00:49,590 --> 00:00:49,200
maybe maybe there's something wrong with

20
00:00:51,910 --> 00:00:49,600
the

21
00:00:53,029 --> 00:00:51,920
mirror itself you can't believe how down

22
00:00:54,790 --> 00:00:53,039
every astronomer

23
00:00:56,630 --> 00:00:54,800
on the hubble team was that day because

24
00:00:58,790 --> 00:00:56,640
we're about to announce to the world

25
00:00:59,670 --> 00:00:58,800
we messed up we don't have the telescope

26
00:01:01,510 --> 00:00:59,680
we thought

27
00:01:02,950 --> 00:01:01,520
the conclusion we've come to from that

28
00:01:04,869 --> 00:01:02,960
is that there's a significant

29
00:01:06,469 --> 00:01:04,879
spherical aberration appears to be

30
00:01:08,070 --> 00:01:06,479
present in the optics and the simplest

31
00:01:08,630 --> 00:01:08,080
way of understanding it is that when you

32
00:01:10,789 --> 00:01:08,640
have a

33
00:01:12,230 --> 00:01:10,799
mirror that's focusing the light all

34
00:01:13,670 --> 00:01:12,240
comes together the single point

35
00:01:14,789 --> 00:01:13,680
is the objective of the exercise you

36
00:01:16,310 --> 00:01:14,799
want the light to come together and

37
00:01:17,910 --> 00:01:16,320
focus at a single point

38
00:01:19,749 --> 00:01:17,920

when you have spherical aberration it

39
00:01:21,109 --> 00:01:19,759
says that there's some disfigurement of

40
00:01:22,710 --> 00:01:21,119
that mirror that causes the light

41
00:01:24,149 --> 00:01:22,720
instead of focusing at a single point to

42
00:01:27,350 --> 00:01:24,159
be spread across a region

43
00:01:29,749 --> 00:01:27,360
in space and suddenly in the press was

44
00:01:31,990 --> 00:01:29,759
born the term hubble trouble

45
00:01:33,830 --> 00:01:32,000
i remember giving a talk to some young

46
00:01:36,310 --> 00:01:33,840
kids they were kindergarten kids

47
00:01:37,910 --> 00:01:36,320
really young kids about the wonders you

48
00:01:41,030 --> 00:01:37,920
know hubble and

49
00:01:43,109 --> 00:01:41,040
i said the word hubble telescope

50
00:01:44,950 --> 00:01:43,119
it was like i was jay leno everybody

51
00:01:46,710 --> 00:01:44,960
laughed

52
00:01:48,550 --> 00:01:46,720
it was a very sad very difficult time

53
00:01:57,910 --> 00:01:48,560
and some people left the program and

54
00:02:01,749 --> 00:02:00,310
john gave me this one ray of hope it was

55
00:02:04,389 --> 00:02:01,759
that one little ray of hope

56
00:02:05,910 --> 00:02:04,399
that i glommed onto we played with it we

57
00:02:08,309 --> 00:02:05,920
played with the model

58
00:02:10,309 --> 00:02:08,319
and we realized that if the error were

59
00:02:12,470 --> 00:02:10,319
in the primary mirror

60
00:02:15,190 --> 00:02:12,480
we could make our correction with a

61
00:02:18,309 --> 00:02:15,200
little mirror about the size of a nickel

62
00:02:19,190 --> 00:02:18,319
inside our camera so we purposely made

63
00:02:20,470 --> 00:02:19,200

the mirror in our

64
00:02:22,309 --> 00:02:20,480
instrument and therefore our whole

65
00:02:25,270 --> 00:02:22,319
camera out of focus

66
00:02:26,070 --> 00:02:25,280
with a minus sign it was as profoundly

67
00:02:29,510 --> 00:02:26,080
out of focus

68
00:02:32,949 --> 00:02:29,520
as the hubble telescope was exactly

69
00:02:34,710 --> 00:02:32,959
and that was not easy we were finishing

70
00:02:36,390 --> 00:02:34,720
up the final optical alignment and the

71
00:02:38,710 --> 00:02:36,400
nasa administrator dan golden

72
00:02:39,910 --> 00:02:38,720
visited jpl we went to the clean room

73
00:02:42,390 --> 00:02:39,920
and he said

74
00:02:44,550 --> 00:02:42,400
what's going on here larry simmons the

75
00:02:46,790 --> 00:02:44,560
project manager says well we're here to

76
00:02:48,309 --> 00:02:46,800
fix the hubble telescope and his

77
00:02:51,110 --> 00:02:48,319
response was no

78
00:02:51,430 --> 00:02:51,120
you're here to save the agency that was

79
00:03:04,550 --> 00:02:51,440
a

80
00:03:06,710 --> 00:03:04,560
pick 2 online

81
00:03:08,710 --> 00:03:06,720
we'd done everything that we thought we

82
00:03:13,270 --> 00:03:08,720
had to do but there's no substitute for

83
00:03:16,949 --> 00:03:15,270
the first image came and it looked

84
00:03:17,350 --> 00:03:16,959
really good i mean it looked just the

85
00:03:22,070 --> 00:03:17,360
way

86
00:03:25,589 --> 00:03:23,990
we did like nine press conferences in a

87
00:03:27,589 --> 00:03:25,599
row with primarily with pick

88
00:03:31,430 --> 00:03:27,599

pictures every single one made front

89
00:03:35,910 --> 00:03:34,229
it took this camera being put in the

90
00:03:38,070 --> 00:03:35,920
hubble in 1993

91
00:03:40,149 --> 00:03:38,080
to really start the career of hubble to

92
00:03:40,869 --> 00:03:40,159
turn hubble from a national disgrace

93
00:03:43,750 --> 00:03:40,879
almost

94
00:03:45,750 --> 00:03:43,760
to the great american comeback story and

95
00:03:47,589 --> 00:03:45,760
here it is still our workhorse camera

96
00:03:49,670 --> 00:03:47,599
going on 15 years

97
00:03:50,789 --> 00:03:49,680
it's going to be a tough moment when it

98
00:03:51,350 --> 00:03:50,799
comes out of the hubble because i

99
00:03:53,509 --> 00:03:51,360
remember

100
00:03:54,710 --> 00:03:53,519
exactly the moment it was in place in

101
00:03:56,470 --> 00:03:54,720
the hubble but i

102
00:03:57,990 --> 00:03:56,480
really look forward to be able to walk

103
00:03:59,190 --> 00:03:58,000
up to it and touch it someday in the