



1
00:00:08,070 --> 00:00:05,749
hubble is all about imagery

2
00:00:09,750 --> 00:00:08,080
it's all about taking clear sharp

3
00:00:17,189 --> 00:00:09,760
beautiful pictures of the sky and doing

4
00:00:21,349 --> 00:00:19,269
the story of the hubble space telescope

5
00:00:23,029 --> 00:00:21,359
launch is best uh the way i like to

6
00:00:25,029 --> 00:00:23,039
describe it is uh

7
00:00:27,189 --> 00:00:25,039
climbing to the top of mount everest and

8
00:00:28,710 --> 00:00:27,199
then suddenly within a couple months of

9
00:00:34,150 --> 00:00:28,720
sinking to the bottom of the dead sea

10
00:00:38,470 --> 00:00:36,229
we were having trouble focusing the

11
00:00:40,069 --> 00:00:38,480
telescope and uh

12
00:00:41,430 --> 00:00:40,079
we noticed that wide field camera

13
00:00:43,750 --> 00:00:41,440

pictures that were coming down were

14

00:00:46,229 --> 00:00:43,760

fuzzy fuzzy blobs instead of nice sharp

15

00:00:47,990 --> 00:00:46,239

points and over the course of early june

16

00:00:49,830 --> 00:00:48,000

we started to get worried maybe maybe

17

00:00:52,150 --> 00:00:49,840

there's something wrong with the mirror

18

00:00:54,389 --> 00:00:52,160

itself you can't believe how down every

19

00:00:55,670 --> 00:00:54,399

astronomer on the hubble team was that

20

00:00:56,630 --> 00:00:55,680

day because we're about to announce to

21

00:00:58,709 --> 00:00:56,640

the world

22

00:01:00,790 --> 00:00:58,719

we messed up we don't have the telescope

23

00:01:02,950 --> 00:01:00,800

we thought the conclusion we've come to

24

00:01:04,869 --> 00:01:02,960

from that is that there's a significant

25

00:01:06,469 --> 00:01:04,879

spherical aberration appears to be

26

00:01:07,990 --> 00:01:06,479

present in the optics and the simplest

27

00:01:10,550 --> 00:01:08,000

way of understanding it is that when you

28

00:01:12,310 --> 00:01:10,560

have a mirror that's focusing the light

29

00:01:13,750 --> 00:01:12,320

all comes together at a single point is

30

00:01:15,190 --> 00:01:13,760

the objective of the exercise you want

31

00:01:17,190 --> 00:01:15,200

the light to come together and focus at

32

00:01:18,870 --> 00:01:17,200

a single point when you have spherical

33

00:01:20,710 --> 00:01:18,880

aberration it says that there's some

34

00:01:22,390 --> 00:01:20,720

disfigurement of that mirror that causes

35

00:01:24,310 --> 00:01:22,400

a light instead of focusing at a single

36

00:01:25,749 --> 00:01:24,320

point to be spread across a region in

37

00:01:27,749 --> 00:01:25,759

space

38

00:01:29,749 --> 00:01:27,759

and suddenly in the press was born the

39

00:01:31,910 --> 00:01:29,759

term hubble trouble

40

00:01:34,149 --> 00:01:31,920

i remember giving a talk to some young

41

00:01:35,350 --> 00:01:34,159

kids they were kindergarten kids really

42

00:01:37,830 --> 00:01:35,360

young kids

43

00:01:40,950 --> 00:01:37,840

about the wonders you know hubble and

44

00:01:43,109 --> 00:01:40,960

i said the word hubble telescope

45

00:01:44,870 --> 00:01:43,119

it was like i was jay leno everybody

46

00:01:46,710 --> 00:01:44,880

laughed

47

00:01:48,550 --> 00:01:46,720

it was a very sad very difficult time

48

00:01:57,830 --> 00:01:48,560

and some people left the program and

49

00:02:01,990 --> 00:02:00,310

john gave me this one ray of hope it was

50

00:02:04,630 --> 00:02:02,000

that one little ray of hope that i

51
00:02:05,910 --> 00:02:04,640
glommed onto we played with it we played

52
00:02:08,229 --> 00:02:05,920
with the model

53
00:02:10,309 --> 00:02:08,239
and we realized that if the error were

54
00:02:12,470 --> 00:02:10,319
in the primary mirror

55
00:02:15,190 --> 00:02:12,480
we could make our correction with a

56
00:02:18,229 --> 00:02:15,200
little mirror about the size of a nickel

57
00:02:19,670 --> 00:02:18,239
inside our camera so we purposely made

58
00:02:22,309 --> 00:02:19,680
the mirror in our instrument and

59
00:02:23,990 --> 00:02:22,319
therefore our whole camera out of focus

60
00:02:26,309 --> 00:02:24,000
with a minus sign

61
00:02:29,510 --> 00:02:26,319
it was as profoundly out of focus as the

62
00:02:31,990 --> 00:02:29,520
hubble telescope was exactly

63
00:02:33,910 --> 00:02:32,000

and that was not easy

64

00:02:35,830 --> 00:02:33,920

we were finishing up the final optical

65

00:02:38,309 --> 00:02:35,840

alignment and the nasa administrator dan

66

00:02:39,830 --> 00:02:38,319

golden visited jpl we went to the clean

67

00:02:41,430 --> 00:02:39,840

room and he said

68

00:02:43,190 --> 00:02:41,440

what's going on here

69

00:02:45,110 --> 00:02:43,200

larry simmons the project manager says

70

00:02:46,390 --> 00:02:45,120

well we're here to fix the hubble

71

00:02:48,869 --> 00:02:46,400

telescope

72

00:02:50,710 --> 00:02:48,879

and his response was no you're here to

73

00:02:52,869 --> 00:02:50,720

save the agency

74

00:02:57,110 --> 00:02:52,879

that was a clear message to us that it

75

00:02:59,589 --> 00:02:57,120

was important we shall not fail

76

00:03:01,830 --> 00:02:59,599

okay are you ready to let go shortly

77

00:03:04,470 --> 00:03:01,840

after the mission was over

78

00:03:06,710 --> 00:03:04,480

we brought with pictu online

79

00:03:08,710 --> 00:03:06,720

we'd done everything that we thought we

80

00:03:13,190 --> 00:03:08,720

had to do but there's no substitute for

81

00:03:16,949 --> 00:03:15,190

the first image came and it looked

82

00:03:22,070 --> 00:03:16,959

really good i mean it looked just the

83

00:03:26,390 --> 00:03:23,990

we did like nine press conferences in a

84

00:03:28,149 --> 00:03:26,400

row with primarily with pick pictures

85

00:03:31,350 --> 00:03:28,159

every single one made front page news

86

00:03:36,070 --> 00:03:33,430

it took this camera

87

00:03:37,990 --> 00:03:36,080

being put in the hubble in 1993 to

88

00:03:40,149 --> 00:03:38,000

really start the career of hubble to

89

00:03:42,470 --> 00:03:40,159

turn hubble from a national disgrace

90

00:03:43,430 --> 00:03:42,480

almost to the great american comeback

91

00:03:45,270 --> 00:03:43,440

story

92

00:03:47,589 --> 00:03:45,280

and here it is still our workhorse

93

00:03:49,509 --> 00:03:47,599

camera going on 15 years

94

00:03:50,789 --> 00:03:49,519

it's going to be a tough moment when

95

00:03:52,789 --> 00:03:50,799

it comes out of the hubble because i

96

00:03:55,190 --> 00:03:52,799

remember exactly the moment it was

97

00:03:57,030 --> 00:03:55,200

emplaced in the hubble but i really look

98

00:03:59,270 --> 00:03:57,040

forward to be able to walk up to it and