1
00:00:17,349 --> 00:00:15,430
we're at the high bay at northrop

2
00:00:20,550 --> 00:00:17,359
grumman where we are about to get a

3
00:00:22,390 --> 00:00:20,560
bird's eye view of the sun shield

4
00:00:24,470 --> 00:00:22,400
to tell us more about the sunshield

5
00:00:26,390 --> 00:00:24,480
which is actually made up of five layers

6
00:00:28,230 --> 00:00:26,400
of a material called captain we have

7
00:00:29,589 --> 00:00:28,240
andy tau he's the chief engineer for the

8
00:00:31,349 --> 00:00:29,599
sunshield

9
00:00:34,229 --> 00:00:31,359
andy tell us first of all what is the

10
00:00:36,470 --> 00:00:34,239
sunshield for well the sunshield's main

11
00:00:39,110 --> 00:00:36,480
purpose is to keep the energy from the

12
00:00:41,830 --> 00:00:39,120
sun from getting to the telescope j west

13
00:00:43,990 --> 00:00:41,840

looks for very faint basically thermal

14
00:00:47,190 --> 00:00:44,000
objects out in space it's important to

15
00:00:49,430 --> 00:00:47,200
keep things really cold so if we were to

16
00:00:51,270 --> 00:00:49,440
allow the telescope to heat up the

17
00:00:53,189 --> 00:00:51,280
warmth of the telescope itself would

18
00:00:54,709 --> 00:00:53,199
just swamp out the sensors and it

19
00:00:55,910 --> 00:00:54,719
wouldn't be able to see anything except

20
00:00:57,750 --> 00:00:55,920
its own heat

21
00:00:59,910 --> 00:00:57,760
the second thing is just to keep out the

22
00:01:02,389 --> 00:00:59,920
visible light also the visible light can

23
00:01:03,750 --> 00:01:02,399
get inside the optical train and cause

24
00:01:05,590 --> 00:01:03,760
all kinds of interference so we want to

25
00:01:07,590 --> 00:01:05,600
keep that out too

26
00:01:09,270 --> 00:01:07,600
now andy i mentioned before it has five

27
00:01:12,390 --> 00:01:09,280
layers of a material called campton

28
00:01:15,190 --> 00:01:12,400
before i ask you why five capped on

29
00:01:17,830 --> 00:01:15,200
cap time half done is essentially a

30
00:01:19,270 --> 00:01:17,840
space age plastic film material it's

31
00:01:21,510 --> 00:01:19,280
something that's been developed for a

32
00:01:23,749 --> 00:01:21,520
number of years and we actually use it

33
00:01:26,469 --> 00:01:23,759
in our thermal insulation material okay

34
00:01:27,510 --> 00:01:26,479
and five layers why is that five layers

35
00:01:29,270 --> 00:01:27,520
well

36
00:01:30,710 --> 00:01:29,280
six would be too many and four would be

37
00:01:33,510 --> 00:01:30,720
too few you've got this down yeah well

38
00:01:35,830 --> 00:01:33,520

it's actually uh has to do with

39
00:01:38,310 --> 00:01:35,840
the amount of energy that we need to

40
00:01:40,310 --> 00:01:38,320
reject from the sun the sun is putting

41
00:01:42,069 --> 00:01:40,320
in a certain amount of energy and we

42
00:01:43,830 --> 00:01:42,079
need to reject that and make sure it

43
00:01:45,749 --> 00:01:43,840
doesn't get to the telescope the

44
00:01:47,350 --> 00:01:45,759
sunshield is built so that there's an

45
00:01:49,429 --> 00:01:47,360
angle between each one of the layers so

46
00:01:51,510 --> 00:01:49,439
heat that comes off of layer one gets

47
00:01:52,710 --> 00:01:51,520
bounced out and actually gets rejected

48
00:01:55,590 --> 00:01:52,720
out the sides

49
00:01:57,109 --> 00:01:55,600
so if the spacecraft was down here we

50
00:01:58,870 --> 00:01:57,119
actually have a couple of holes in the

51
00:02:01,270 --> 00:01:58,880
sunshield that allow heat to come up

52
00:02:03,429 --> 00:02:01,280
from the spacecraft and get pumped out

53
00:02:05,350 --> 00:02:03,439
through the sides so the sunshield is

54
00:02:07,510 --> 00:02:05,360
sort of like a giant heat pump passive

55
00:02:08,949 --> 00:02:07,520
heat pump this is the not the flight

56
00:02:11,270 --> 00:02:08,959
hardware right this is actually just the

57
00:02:13,589 --> 00:02:11,280
test article that's right this is uh one

58
00:02:15,510 --> 00:02:13,599
of our series of development articles

59
00:02:17,510 --> 00:02:15,520
and a very important one it's full size

60
00:02:19,830 --> 00:02:17,520
and it's pretty close to flight but

61
00:02:22,550 --> 00:02:19,840
there's some important differences

62
00:02:29,030 --> 00:02:22,560
all right ready to come down

63
00:02:33,670 --> 00:02:31,509

oh boy

64
00:02:36,309 --> 00:02:33,680
these layers that you see right now

65
00:02:38,470 --> 00:02:36,319
actually will be coated with a vapor

66
00:02:40,229 --> 00:02:38,480
deposited aluminum okay and that

67
00:02:43,509 --> 00:02:40,239
aluminum which you see here on the

68
00:02:45,150 --> 00:02:43,519
underside of the thermal covers

69
00:02:48,390 --> 00:02:45,160
is uh

70
00:02:49,830 --> 00:02:48,400
99.99 reflective so that helps a lot

71
00:02:52,229 --> 00:02:49,840
when we're trying to bounce all that

72
00:02:54,470 --> 00:02:52,239
thermal energy out of the sunshield okay

73
00:02:56,710 --> 00:02:54,480
now the the kind of pinkish purplish

74
00:02:58,470 --> 00:02:56,720
part is actually a silicon layer and

75
00:03:00,630 --> 00:02:58,480
that's the one that's exposed to the sun

76
00:03:02,309 --> 00:03:00,640
that's right but we use the aluminum the

77
00:03:04,550 --> 00:03:02,319
super highly reflected aluminum

78
00:03:08,790 --> 00:03:04,560
everywhere else that we can to reject

79
00:03:12,949 --> 00:03:10,949
this silicon layer actually protects the

80
00:03:15,509 --> 00:03:12,959
sun shield during launch and when the

81
00:03:17,350 --> 00:03:15,519
james webb space telescope observatory

82
00:03:18,869 --> 00:03:17,360
reaches its destination one million

83
00:03:21,589 --> 00:03:18,879
miles from earth

84
00:03:23,430 --> 00:03:21,599
this silicone cover gets deployed thanks