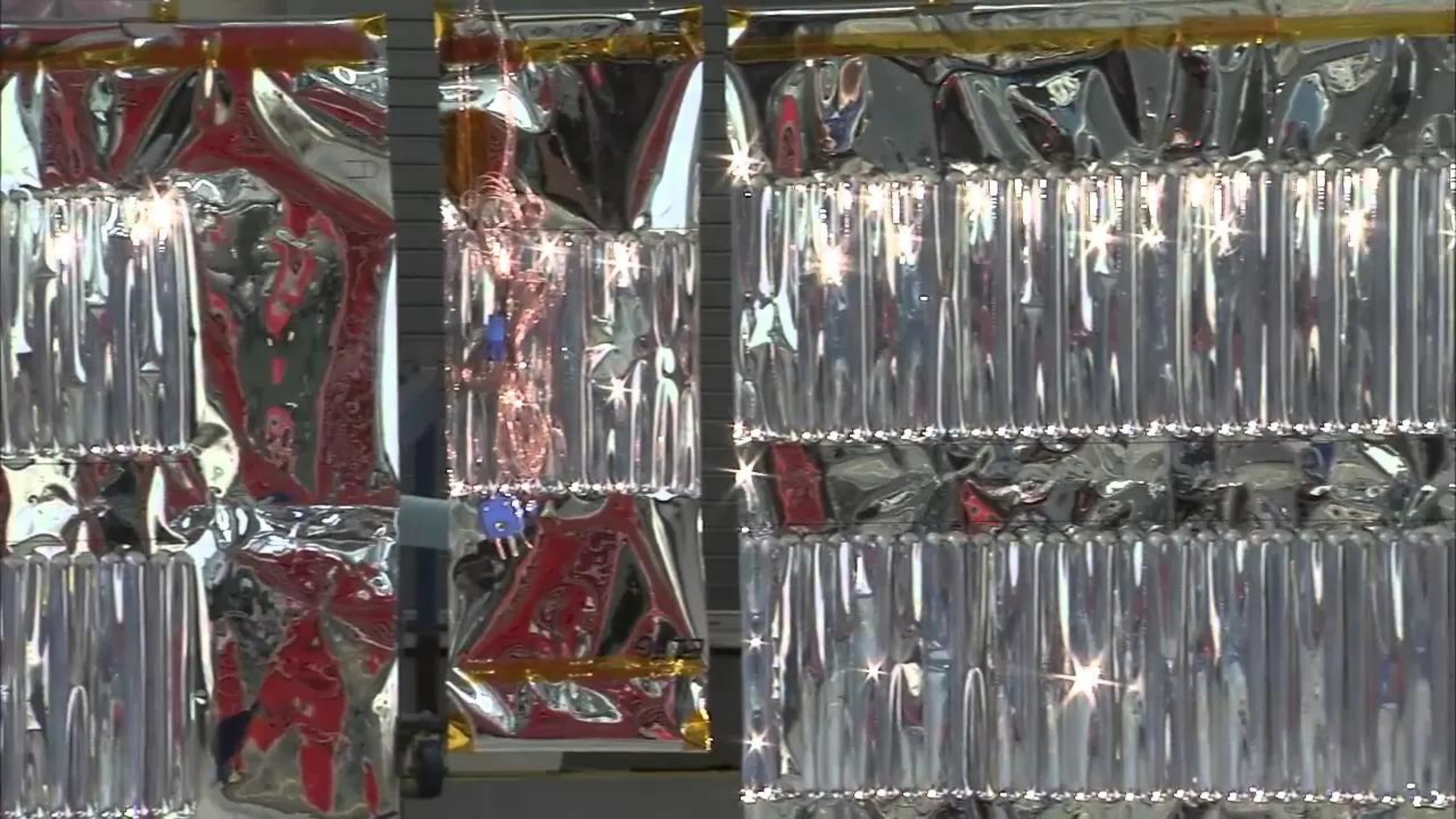

1
00:00:12,105 --> 00:00:14,453
Many parts of NASA’s James Webb Space

2
00:00:14,488 --> 00:00:16,949
Telescope have spent time inside

3
00:00:16,984 --> 00:00:19,421
facilities that simulate the extreme

4
00:00:19,456 --> 00:00:22,116
environment of deep space millions of

5
00:00:22,151 --> 00:00:23,621
miles away from Earth where the

6
00:00:23,656 --> 00:00:25,621
telescope will operate. The primary

7
00:00:25,656 --> 00:00:27,621
mirror backplane support structure,

8
00:00:27,656 --> 00:00:30,669
or PMBSS, which is essentially the

9
00:00:30,704 --> 00:00:32,973
spine of the telescope, just

10
00:00:33,008 --> 00:00:34,741
completed testing inside the X-ray

11
00:00:34,776 --> 00:00:36,453
and Cryogenic Test Facility at

12
00:00:36,488 --> 00:00:38,308
NASA's Marshall Space Flight Center

13
00:00:38,343 --> 00:00:40,309

in Huntsville, Alabama.

14
00:00:40,344 --> 00:00:42,284
To prepare the Webb structures to

15
00:00:42,319 --> 00:00:43,877
meet the extreme temperatures of

16
00:00:43,912 --> 00:00:46,165
space, engineers at the X-ray and

17
00:00:46,200 --> 00:00:47,844
Cryogenic Facility carefully examined

18
00:00:47,879 --> 00:00:49,869
telescope components inside a vacuum

19
00:00:49,904 --> 00:00:52,181
chamber that simulates the hyper-cold

20
00:00:52,216 --> 00:00:54,213
of space, chilling the hardware from

21
00:00:54,248 --> 00:00:57,117
room temperature down to a frigid

22
00:00:57,152 --> 00:01:00,548
minus 414 degrees Fahrenheit.

23
00:01:00,583 --> 00:01:02,412
The telescope's backplane supports

24
00:01:02,447 --> 00:01:04,220
the beryllium mirrors, instruments

25
00:01:04,255 --> 00:01:05,980
and other elements. It holds the

26
00:01:06,015 --> 00:01:08,629
18-segment, 21-foot-diameter primary

27
00:01:08,664 --> 00:01:11,149
mirror nearly motionless while the

28
00:01:11,184 --> 00:01:15,028
telescope peers into deep space. ATK

29
00:01:15,063 --> 00:01:16,780
built the backplane structure at its

30
00:01:16,815 --> 00:01:18,580
facility in Magna, Utah, under a

31
00:01:18,615 --> 00:01:20,276
contract with prime contractor

32
00:01:20,311 --> 00:01:21,908
Northrop Grumman.

33
00:01:21,943 --> 00:01:23,548
The backplane is made of advanced

34
00:01:23,583 --> 00:01:25,388
graphite composite materials mated

35
00:01:25,423 --> 00:01:27,508
to titanium and invar fittings and

36
00:01:27,543 --> 00:01:29,596
interfaces. Invar is a nickel steel

37
00:01:29,631 --> 00:01:32,004
alloy notable for its uniquely low

38
00:01:32,039 --> 00:01:34,972

changes due to thermal expansion.

39
00:01:35,007 --> 00:01:37,229
The backplane is the final part of

40
00:01:37,264 --> 00:01:39,141
the Webb telescope to complete tests

41
00:01:39,176 --> 00:01:40,925
in the X-ray and Cryogenic Test

42
00:01:40,960 --> 00:01:42,901
Facility, one of the only places on

43
00:01:42,936 --> 00:01:44,741
Earth where such large components

44
00:01:44,776 --> 00:01:46,453
can be tested in a simulated

45
00:01:46,488 --> 00:01:48,187
space environment.

46
00:01:48,222 --> 00:01:49,780
Webb's wings underwent testing in the

47
00:01:49,815 --> 00:01:51,965
facility. The wings, also made by ATK,

48
00:01:52,000 --> 00:01:54,605
are made up of 900 separate parts of

49
00:01:54,640 --> 00:01:57,269
lightweight graphite that fold up

50
00:01:57,304 --> 00:01:59,788
allowing the entire mirror assembly

51
00:01:59,823 --> 00:02:02,548
to fit inside a rocket for launch.

52
00:02:02,583 --> 00:02:04,772
This spring, Marshall engineers tested

53
00:02:04,807 --> 00:02:07,132
samples of Webb's sunshield in a smaller

54
00:02:07,167 --> 00:02:09,604
environmental test facility. The

55
00:02:09,639 --> 00:02:11,893
sunshield acts like a parasol shading

56
00:02:11,928 --> 00:02:14,332
and protecting Webb's sensitive mirrors

57
00:02:14,367 --> 00:02:16,717
and instruments. In space, the sunshield

58
00:02:16,752 --> 00:02:18,628
will experience both hot and cold

59
00:02:18,663 --> 00:02:21,044
temperatures. For the test, several

60
00:02:21,079 --> 00:02:23,005
sunshield samples experienced temperatures

61
00:02:23,040 --> 00:02:25,548
ranging from minus 423 degrees Fahrenheit

62
00:02:25,583 --> 00:02:30,092
to 170 degrees Fahrenheit. Marshall

63
00:02:30,127 --> 00:02:32,645

performed the tests for ManTech International

64
00:02:32,680 --> 00:02:35,003
Corporation. The company recently

65
00:02:35,038 --> 00:02:37,357
completed manufacturing of full-scale

66
00:02:37,392 --> 00:02:39,445
sunshield test articles that weigh a mere

67
00:02:39,480 --> 00:02:41,709
18 pounds each, yet are almost 45-feet-wide

68
00:02:41,744 --> 00:02:44,149
by 70-feet long. The entire sunshield

69
00:02:44,184 --> 00:02:48,725
consists of five tennis-court-size,

70
00:02:48,760 --> 00:02:50,892
kite-shaped layers that will be folded

71
00:02:50,927 --> 00:02:52,972
and deployed once the Webb telescope

72
00:02:53,007 --> 00:02:55,789
reaches its destination.

73
00:02:55,824 --> 00:02:57,852
The sunshield must endure a decade of

74
00:02:57,887 --> 00:03:00,301
space operations, so the sunshield material,

75
00:03:00,336 --> 00:03:02,612
Kapton, was exposed to space as part of the

76
00:03:02,647 --> 00:03:05,564
Materials International Space Station

77
00:03:05,599 --> 00:03:08,284
Experiment, or MISSE. The material spent

78
00:03:08,319 --> 00:03:10,237
more than four years in orbit, which helped

79
00:03:10,272 --> 00:03:12,076
engineers at NASA's Goddard Space

80
00:03:12,111 --> 00:03:14,053
Flight Center, the NASA Center managing the

81
00:03:14,088 --> 00:03:16,228
telescope, to determine if the material

82
00:03:16,263 --> 00:03:19,132
would perform well as a sunshield. Marshall

83
00:03:19,167 --> 00:03:21,443
engineers analyzed the samples when

84
00:03:21,478 --> 00:03:24,220
they were returned to Earth.

85
00:03:24,255 --> 00:03:27,036
The Webb Observatory will be 100 times more

86
00:03:27,071 --> 00:03:29,517
powerful than the Hubble Space Telescope,

87
00:03:29,552 --> 00:03:31,404
and it will be operating farther

88
00:03:31,439 --> 00:03:33,597

away from Earth. NASA will not be able to

89
00:03:33,632 --> 00:03:35,892
service the telescope, so its parts must

90
00:03:35,927 --> 00:03:38,692
be light, strong, and durable. Marshall