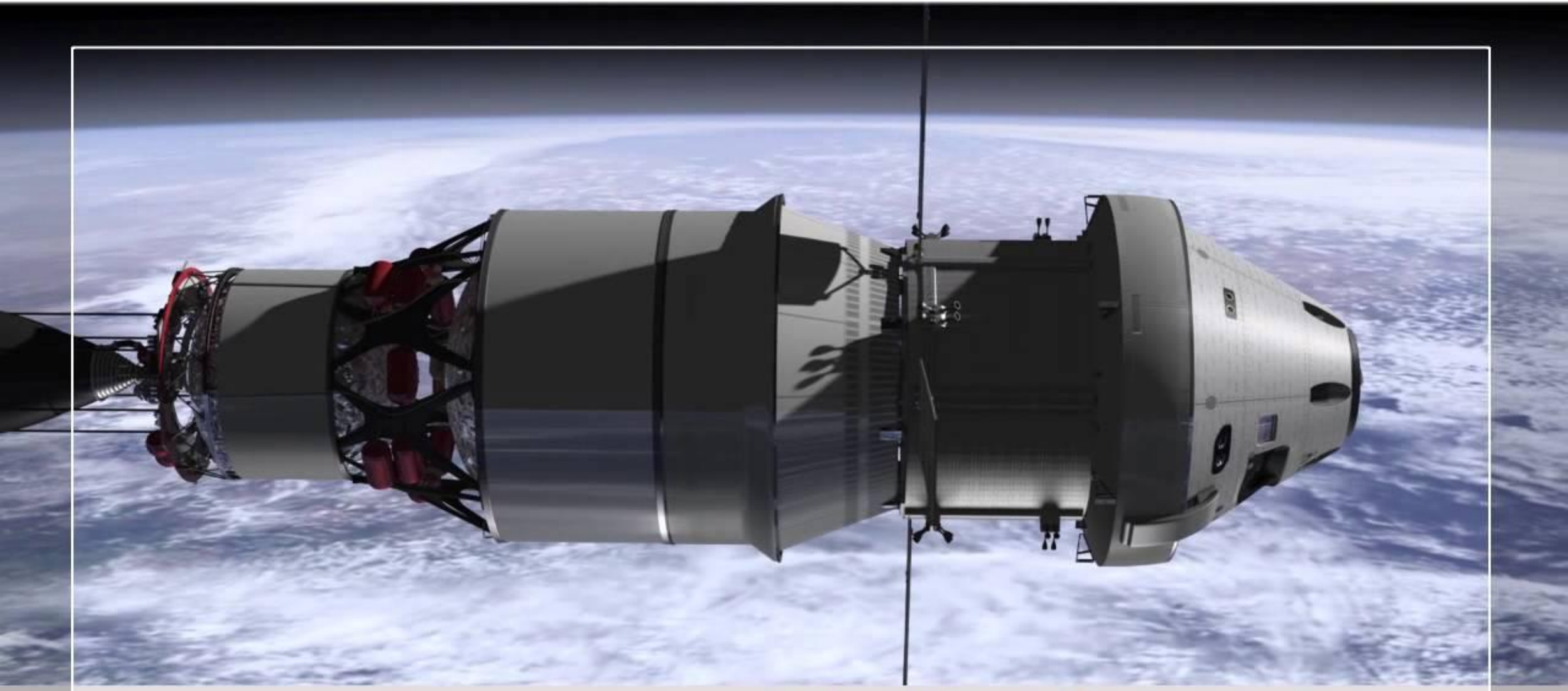

Natural Space Environment

1
00:00:00,000 --> 00:00:07,742
Music full then under VO.

2
00:00:07,777 --> 00:00:17,631
Marshall’s thermal and

3
00:00:17,666 --> 00:00:19,102
fluid dynamics systems

4
00:00:19,137 --> 00:00:20,879
capabilities are a powerful

5
00:00:20,914 --> 00:00:22,287
array of expertise,

6
00:00:22,322 --> 00:00:24,607
methods, tools and facilities

7
00:00:24,642 --> 00:00:26,254
used to ensure launch

8
00:00:26,289 --> 00:00:27,790
vehicles and space systems are

9
00:00:27,825 --> 00:00:30,254
designed and built reliably

10
00:00:30,289 --> 00:00:31,838
to withstand the demanding

11
00:00:31,873 --> 00:00:32,782
environments in which

12
00:00:32,817 --> 00:00:34,654
they operate. From simple

13
00:00:34,689 --> 00:00:36,398

to complex projects,

14
00:00:36,433 --> 00:00:37,791
Marshall brings a responsive

15
00:00:37,826 --> 00:00:39,423
and complete tool-set to

16
00:00:39,458 --> 00:00:40,830
every phase of space system

17
00:00:40,865 --> 00:00:42,655
development, from concept

18
00:00:42,690 --> 00:00:44,031
initiation through mission

19
00:00:44,066 --> 00:00:46,605
operations. Any organization

20
00:00:46,640 --> 00:00:47,918
developing launch

21
00:00:47,953 --> 00:00:49,486
vehicles, spacecraft, and

22
00:00:49,521 --> 00:00:51,534
the associated payloads needs

23
00:00:51,569 --> 00:00:53,214
the capabilities Marshall

24
00:00:53,249 --> 00:00:54,687
can provide to accomplish

25
00:00:54,722 --> 00:00:56,110
their fluid dynamics and

26
00:00:56,145 --> 00:00:57,390
thermal design, analysis

27
00:00:57,425 --> 00:01:00,223
and test activities. These

28
00:01:00,258 --> 00:01:01,599
capabilities ensure the

29
00:01:01,634 --> 00:01:03,071
development of reliable

30
00:01:03,106 --> 00:01:04,593
and affordable systems and

31
00:01:04,628 --> 00:01:05,838
components that deliver

32
00:01:05,873 --> 00:01:08,046
expected performance. Although

33
00:01:08,081 --> 00:01:09,358
separate disciplines,

34
00:01:09,393 --> 00:01:10,494
fluid dynamics and thermal

35
00:01:10,529 --> 00:01:12,527
analysis often interact;

36
00:01:12,562 --> 00:01:14,495
fluid dynamics is many times

37
00:01:14,530 --> 00:01:15,950
an important aspect of

38
00:01:15,985 --> 00:01:18,367

thermal analysis. The fluid

39
00:01:18,402 --> 00:01:19,678
behavior, loads and

40
00:01:19,713 --> 00:01:21,230
environments the system must

41
00:01:21,265 --> 00:01:22,750
account for are especially

42
00:01:22,785 --> 00:01:24,510
extreme and complex when

43
00:01:24,545 --> 00:01:26,142
high fluid velocities are

44
00:01:26,177 --> 00:01:27,998
involved. Fluid flowing

45
00:01:28,033 --> 00:01:29,631
through or around a hardware

46
00:01:29,666 --> 00:01:31,567
system and/or components

47
00:01:31,602 --> 00:01:32,879
creates system-wide

48
00:01:32,914 --> 00:01:34,399
structural loads and thermal

49
00:01:34,434 --> 00:01:35,694
environments that must be

50
00:01:35,729 --> 00:01:37,551
analyzed and designed for.

51
00:01:37,586 --> 00:01:39,199
Marshall Space Flight

52
00:01:39,234 --> 00:01:41,374
Center's engineering expertise

53
00:01:41,409 --> 00:01:45,134
is so broad and deep in

54
00:01:45,169 --> 00:01:46,558
particualr for propulsion,

55
00:01:46,593 --> 00:01:47,822
other governmental

56
00:01:47,857 --> 00:01:49,775
institutions have asked for our

57
00:01:49,810 --> 00:01:52,463
help; insight oversight

58
00:01:52,498 --> 00:01:53,791
and even inline or critical

59
00:01:53,826 --> 00:01:55,390
path work. Department of

60
00:01:55,425 --> 00:01:56,941
Defense, has asked us to

61
00:01:56,976 --> 00:01:58,365
review and participate in

62
00:01:58,400 --> 00:02:00,254
their propulsion development

63
00:02:00,289 --> 00:02:01,806

programs many times over.

64
00:02:01,841 --> 00:02:03,422
In addition the commercial

65
00:02:03,457 --> 00:02:05,743
crew entities, they have also come

66
00:02:05,778 --> 00:02:07,631
through various space act agreements and

67
00:02:07,666 --> 00:02:09,486
other means to Marshall Space Flight

68
00:02:09,521 --> 00:02:11,711
Center for engineering expertise. On the

69
00:02:11,746 --> 00:02:13,278
thermal side, every launch vehicle

70
00:02:13,313 --> 00:02:16,189
and spacecraft hardware system operates

71
00:02:16,224 --> 00:02:18,638
in extremely complex and interrelated

72
00:02:18,673 --> 00:02:20,782
thermal environments. To understand this

73
00:02:20,817 --> 00:02:22,894
complex environment, these effects

74
00:02:22,929 --> 00:02:25,711
must be appreciated and accounted for in

75
00:02:25,746 --> 00:02:28,046
the system’s design. Those effects

76
00:02:28,081 --> 00:02:29,439
include… The natural

77
00:02:29,474 --> 00:02:32,062
space environment Solar

78
00:02:32,097 --> 00:02:34,302
and planetary radiation and the extreme

79
00:02:34,337 --> 00:02:37,693
cold of deep space. In addition to

80
00:02:37,728 --> 00:02:39,694
these challenges, Marshall engineers

81
00:02:39,729 --> 00:02:41,454
have to plan and design

82
00:02:41,489 --> 00:02:43,134
for extremely cold

83
00:02:43,169 --> 00:02:44,831
- cryogenic propellant temperatures

84
00:02:44,866 --> 00:02:47,935
down to negative 423 degrees Fahrenheit

85
00:02:47,970 --> 00:02:51,117
and rocket engine and plumes up to

86
00:02:51,152 --> 00:02:54,158
6000 degrees! Leaving and entering the

87
00:02:54,193 --> 00:02:56,542
atmosphere at high speeds creates its

88
00:02:56,577 --> 00:02:58,830

own set of issues with the vehicles

89
00:02:58,865 --> 00:03:02,638
design. I think people underestimate,

90
00:03:02,673 --> 00:03:05,165
I guess the actual thermal environment,

91
00:03:05,200 --> 00:03:07,854
or the extremes that you're kind of

92
00:03:07,889 --> 00:03:10,750
going through. And when people come to

93
00:03:10,785 --> 00:03:12,253
us and they say, we don't know why

94
00:03:12,288 --> 00:03:14,594
this failed, we spent weeks trying to do

95
00:03:14,629 --> 00:03:16,494
this weld.And you can come in and say,

96
00:03:16,529 --> 00:03:18,462
Oh if you just add this one tool you

97
00:03:18,497 --> 00:03:20,718
won't get that crack anymore. When they

98
00:03:20,753 --> 00:03:23,150
come and they say its so basic but I

99
00:03:23,185 --> 00:03:25,342
didn't think of that, I thinks that is

100
00:03:25,377 --> 00:03:28,205
kind of the joy that we get out of our

101
00:03:28,240 --> 00:03:31,950
job every day. It takes more than good

102
00:03:31,985 --> 00:03:34,190
calculations to find the best solutions

103
00:03:34,225 --> 00:03:36,430
for demanding space applications.

104
00:03:36,465 --> 00:03:39,071
From decades of experience on launch

105
00:03:39,106 --> 00:03:41,278
vehicles, space systems and complex

106
00:03:41,313 --> 00:03:43,502
scientific observatories,

107
00:03:43,537 --> 00:03:45,102
Marshall’s core

108
00:03:45,137 --> 00:03:46,894
thermal and fluid analysis engineers

109
00:03:46,929 --> 00:03:48,702
have developed an extensive suite of

110
00:03:48,737 --> 00:03:51,342
customized design tools to draw upon,

111
00:03:51,377 --> 00:03:53,854
and the expertise to quickly apply the

112
00:03:53,889 --> 00:03:56,479
right tools to find the best solutions.

113
00:03:56,514 --> 00:03:59,518

We distribute many of these to industry