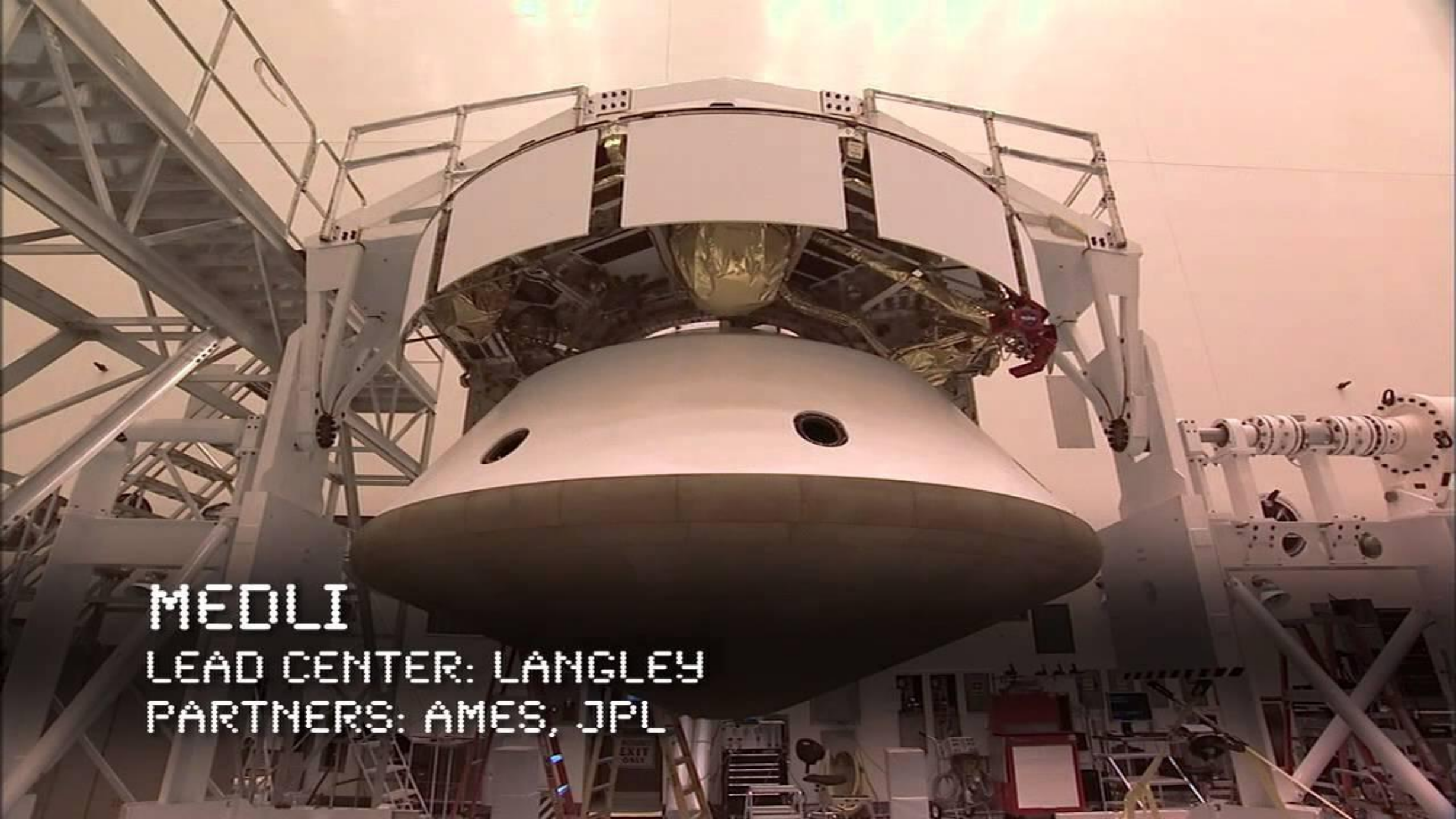

MEDLI

LEAD CENTER: LANGLEY

PARTNERS: AMES, JPL

1
00:00:00,000 --> 00:00:12,265
Sound effect.

2
00:00:12,332 --> 00:00:19,113
Music.

3
00:00:19,371 --> 00:00:19,801
Music under narration.

4
00:00:20,251 --> 00:00:20,633
Getting tomorrow's

5
00:00:21,051 --> 00:00:21,290
technology ready

6
00:00:22,010 --> 00:00:22,170
for the future is the

7
00:00:22,602 --> 00:00:23,434
purpose of the Technology

8
00:00:23,469 --> 00:00:24,842
Demonstration Missions

9
00:00:24,877 --> 00:00:26,970
Program. Taking today's

10
00:00:27,178 --> 00:00:28,634
most promising exploration

11
00:00:28,796 --> 00:00:30,169
technology and raising it

12
00:00:30,187 --> 00:00:31,641
to the level of maturity

13
00:00:31,676 --> 00:00:33,065

that mission planners

14
00:00:33,067 --> 00:00:34,329
require, means that TDM puts

15
00:00:35,387 --> 00:00:35,721
the technology to the

16
00:00:36,459 --> 00:00:38,618
test. The projects include

17
00:00:39,036 --> 00:00:41,418
communication, materials,

18
00:00:41,453 --> 00:00:43,913
propulsion and robotics.

19
00:00:43,948 --> 00:00:46,074
Key to any exploration

20
00:00:46,109 --> 00:00:47,161
program is effective

21
00:00:47,196 --> 00:00:48,921
communication. Current

22
00:00:49,339 --> 00:00:50,649
technology is hitting a bandwidth

23
00:00:50,684 --> 00:00:52,569
and wavelength ceiling.

24
00:00:52,603 --> 00:00:54,345
Tomorrow's missions will

25
00:00:54,411 --> 00:00:57,257
need a new technology. NASA

26
00:00:57,292 --> 00:00:58,682
is leading the effort to

27
00:00:58,826 --> 00:01:00,042
make laser light reinforce

28
00:01:00,522 --> 00:01:02,218
the current radio or RF

29
00:01:02,346 --> 00:01:03,930
based communications. The

30
00:01:04,043 --> 00:01:05,929
Laser Communications Relay

31
00:01:05,964 --> 00:01:07,481
Demonstration or "Laser

32
00:01:07,707 --> 00:01:09,609
Comm" project will provide

33
00:01:09,644 --> 00:01:11,610
an orbital test-bed for a

34
00:01:12,076 --> 00:01:13,130
wide variety of scenarios

35
00:01:13,723 --> 00:01:14,745
to simulate future

36
00:01:14,955 --> 00:01:16,825
missions. In the near future

37
00:01:16,860 --> 00:01:18,362
laser communications could

38
00:01:18,397 --> 00:01:19,641

increase the amount of

39
00:01:19,708 --> 00:01:20,970
information to tens of

40
00:01:21,163 --> 00:01:23,769
gigabits per second. This

41
00:01:24,043 --> 00:01:25,241
would be an improvement of

42
00:01:25,339 --> 00:01:28,345
data rates of between 10-100

43
00:01:28,492 --> 00:01:30,553
times. The project will

44
00:01:30,619 --> 00:01:32,361
use laser light transmitted

45
00:01:32,396 --> 00:01:33,610
to a satellite payload and

46
00:01:34,171 --> 00:01:35,146
back to an earth station

47
00:01:35,994 --> 00:01:37,146
to simulate and test a

48
00:01:37,563 --> 00:01:38,970
large number of possible

49
00:01:39,051 --> 00:01:41,353
mission scenarios. Another

50
00:01:41,388 --> 00:01:43,417
foundational technology being

51
00:01:43,452 --> 00:01:45,802
improved by the TDM Program

52
00:01:45,837 --> 00:01:47,593
involves a basic component

53
00:01:47,628 --> 00:01:48,745
of all exploration missions…

54
00:01:50,028 --> 00:01:51,897
time. The Deep Space

55
00:01:51,899 --> 00:01:54,378
Atomic Clock project promises

56
00:01:54,413 --> 00:01:55,850
to reduce cost, improve

57
00:01:55,931 --> 00:01:57,962
space navigation, data

58
00:01:58,506 --> 00:02:00,121
quality and the next GPS

59
00:02:00,156 --> 00:02:02,361
system. To test this

60
00:02:02,492 --> 00:02:03,977
concept, the project will fly

61
00:02:04,140 --> 00:02:05,817
the deep space atomic clock

62
00:02:06,011 --> 00:02:08,394
along with a GPS receiver

63
00:02:08,491 --> 00:02:10,138

on a commercial communication

64
00:02:10,173 --> 00:02:12,090
satellite. Ground

65
00:02:12,125 --> 00:02:13,482
based systems require

66
00:02:13,517 --> 00:02:15,641
two-way communication, with an

67
00:02:15,739 --> 00:02:16,985
onboard atomic clock

68
00:02:16,987 --> 00:02:18,841
DSAC allows for 1 way

69
00:02:18,876 --> 00:02:21,225
navigation-using NASA's Deep

70
00:02:21,260 --> 00:02:23,452
Space Network more efficiently!

71
00:02:23,564 --> 00:02:25,562
Eventually this will

72
00:02:25,597 --> 00:02:27,482
enable deep space autonomous

73
00:02:27,517 --> 00:02:29,770
navigation. Communications

74
00:02:29,771 --> 00:02:31,274
and science payloads

75
00:02:31,309 --> 00:02:33,145
need advanced warning of

76
00:02:33,180 --> 00:02:34,809
Solar Flares. One way to

77
00:02:34,844 --> 00:02:35,897
do that includes

78
00:02:35,932 --> 00:02:38,009
station-keeping capabilities like

79
00:02:38,044 --> 00:02:39,578
the current NOAA solar

80
00:02:39,613 --> 00:02:41,145
activity warning instrument.

81
00:02:41,322 --> 00:02:43,465
The TDM Solar Sail project

82
00:02:43,883 --> 00:02:45,130
takes a previously tested

83
00:02:45,435 --> 00:02:47,242
propulsion technology and

84
00:02:47,258 --> 00:02:48,522
infuses it into an even

85
00:02:48,557 --> 00:02:50,137
better warning system 2

86
00:02:50,172 --> 00:02:52,649
times closer to the sun. The

87
00:02:52,684 --> 00:02:54,505
Solar Sail project

88
00:02:54,747 --> 00:02:55,786

pushes the technology to a

89
00:02:56,235 --> 00:02:57,737
practical application while

90
00:02:57,835 --> 00:02:59,113
simultaneously maturing the

91
00:02:59,195 --> 00:03:00,634
system so that future

92
00:03:00,669 --> 00:03:02,218
mission planners can chose it

93
00:03:02,253 --> 00:03:04,634
for a whole range of missions.

94
00:03:04,669 --> 00:03:06,825
All of NASA's Technology

95
00:03:06,891 --> 00:03:08,233
Demonstration Missions are

96
00:03:08,267 --> 00:03:10,153
infusing mature technology

97
00:03:10,188 --> 00:03:11,961
from the realm of tested

98
00:03:11,996 --> 00:03:13,561
to ready and proven. The Green

99
00:03:13,627 --> 00:03:15,081
Propellant Infusion Mission

100
00:03:15,323 --> 00:03:16,457
will demonstrate a

101
00:03:16,492 --> 00:03:17,545
high performance green

102
00:03:17,580 --> 00:03:18,953
fuel with the goal of

103
00:03:19,019 --> 00:03:21,402
marketplace infusion.

104
00:03:52,176 --> 00:03:52,617
capacity and enhanced spacecraft

105
00:03:52,652 --> 00:03:55,898
manuneuverability. Maturing materials

106
00:03:56,347 --> 00:03:57,466
and technology continues

107
00:03:57,643 --> 00:03:58,920
to be an objective of

108
00:03:59,003 --> 00:04:01,129
the TDM Program. Sometimes

109
00:04:01,131 --> 00:04:02,489
that means putting instruments

110
00:04:02,491 --> 00:04:03,833
on the spacecraft of

111
00:04:03,883 --> 00:04:05,561
other NASA Missions to further

112
00:04:06,043 --> 00:04:07,769
our collective knowledge.

113
00:04:08,075 --> 00:04:09,113

One project that does that is

114
00:04:09,148 --> 00:04:11,530
MEDLI. MEDLI stands for Mars

115
00:04:11,565 --> 00:04:13,962
Science Laboratory Entry Descent

116
00:04:14,123 --> 00:04:16,265
and Landing Instrumentation.

117
00:04:16,507 --> 00:04:18,505
MEDLI was an instrumentation

118
00:04:19,435 --> 00:04:20,410
suite embedded in and behind the

119
00:04:21,116 --> 00:04:22,297
heat shield of the Mars Science

120
00:04:22,315 --> 00:04:24,889
Laboratory. It gathered data

121
00:04:24,924 --> 00:04:26,473
during the recent successful landing

122
00:04:26,508 --> 00:04:28,730
of the Mars Curiosity Rover

123
00:04:37,035 --> 00:04:37,545
shield, and aerodynamics during

124
00:04:38,235 --> 00:04:39,913
entry and descent. The MEDLI

125
00:04:40,011 --> 00:04:41,657
data will improve modeling and

126
00:04:41,692 --> 00:04:43,481
predictive capabilities for future

127
00:04:43,516 --> 00:04:45,593
missions, ensuring safer and

128
00:04:45,628 --> 00:04:47,354
less expensive missions to a

129
00:04:47,389 --> 00:04:49,978
larger variety of destinations.

130
00:04:50,474 --> 00:04:55,849
Along with the MEDLI data, NASA

131
00:04:56,027 --> 00:04:57,434
will see the fruits of research

132
00:04:57,469 --> 00:04:59,530
into entry in low density

133
00:04:59,565 --> 00:05:01,401
atmospheres like Mar's with the

134
00:05:01,436 --> 00:05:03,322
Low Density Supersonic Decelerator

135
00:05:03,803 --> 00:05:07,833
or LDSD project. On Mars for

136
00:05:08,107 --> 00:05:09,594
example, increasingly massive

137
00:05:09,739 --> 00:05:11,450
payloads and eventually human

138
00:05:11,579 --> 00:05:13,609

missions will require new ways to

139
00:05:13,707 --> 00:05:16,809
slow down to subsonic speeds, high

140
00:05:17,131 --> 00:05:18,810
in the thin Martian Atmosphere,

141
00:05:18,827 --> 00:05:20,186
allowing more landing site

142
00:05:20,682 --> 00:05:23,194
options. These heavier spacecraft

143
00:05:23,229 --> 00:05:25,193
will need large drag generating

144
00:05:25,243 --> 00:05:27,002
devices and the LDSD project

145
00:05:27,037 --> 00:05:30,250
will test 3 of them. Two of the

146
00:05:30,859 --> 00:05:32,409
test articles will be inflatable

147
00:05:32,507 --> 00:05:34,089
inner tube type devices that

148
00:05:34,155 --> 00:05:36,569
surround the entry capsule.

149
00:05:36,604 --> 00:05:38,570
These 6 and 9 meter devices will

150
00:05:39,210 --> 00:05:41,146
be flown at supersonic speeds

151
00:05:41,179 --> 00:05:43,738
high in the earth's atmosphere.

152
00:05:43,773 --> 00:05:44,713
The third device will be a

153
00:05:44,748 --> 00:05:46,457
large 30 meter parachute tested

154
00:05:46,492 --> 00:05:48,538
several times to collect data

155
00:05:48,907 --> 00:05:50,937
for future exploration missions.

156
00:05:51,051 --> 00:05:53,018
All the previous exploration

157
00:05:53,147 --> 00:05:54,394
enabling technologies will be

158
00:05:54,652 --> 00:05:56,442
dependent on propulsion to get

159
00:05:56,477 --> 00:05:58,410
to their destination. Long

160
00:05:58,411 --> 00:06:00,042
duration missions require special

161
00:06:00,077 --> 00:06:01,690
considerations for the cryogenic

162
00:06:01,725 --> 00:06:03,162
propellant likely to be used

163
00:06:03,803 --> 00:06:05,497

for human exploration missions.

164
00:06:05,707 --> 00:06:07,257
On short missions, the natural

165
00:06:07,500 --> 00:06:09,209
boiling off of cryogenic fluids

166
00:06:09,547 --> 00:06:11,241
is not as serious a concern,

167
00:06:11,659 --> 00:06:12,505
but on long missions it

168
00:06:12,827 --> 00:06:14,521
becomes critically important.

169
00:06:14,556 --> 00:06:16,665
Propellants are heavy and expensive

170
00:06:17,179 --> 00:06:18,346
to lift to orbit and therefore

171
00:06:18,779 --> 00:06:20,521
too precious to lose. Anything

172
00:06:20,556 --> 00:06:22,361
we can learn to minimize this

173
00:06:22,427 --> 00:06:25,225
pays back huge dividends! There

174
00:06:25,260 --> 00:06:27,577
are a variety of approaches to

175
00:06:27,612 --> 00:06:29,113
meet this challenge including

176
00:06:29,628 --> 00:06:30,986
passive systems like insulation

177
00:06:31,675 --> 00:06:33,946
and active ones like refrigeration.

178
00:06:34,171 --> 00:06:36,138
Another important part

179
00:06:36,173 --> 00:06:37,593
of this research is lossless

180
00:06:37,628 --> 00:06:39,513
transfer of cryogenic fluids and

181
00:06:39,739 --> 00:06:42,201
accurate measurement. Some of

182
00:06:42,236 --> 00:06:43,785
those future missions will include

183
00:06:43,820 --> 00:06:45,769
humans, others robots and some will

184
00:06:45,804 --> 00:06:50,250
be a symbiotic combination of both.

185
00:06:50,285 --> 00:06:52,522
The Telerobotic Project is working

186
00:06:52,557 --> 00:06:54,762
onboard the International Space Station