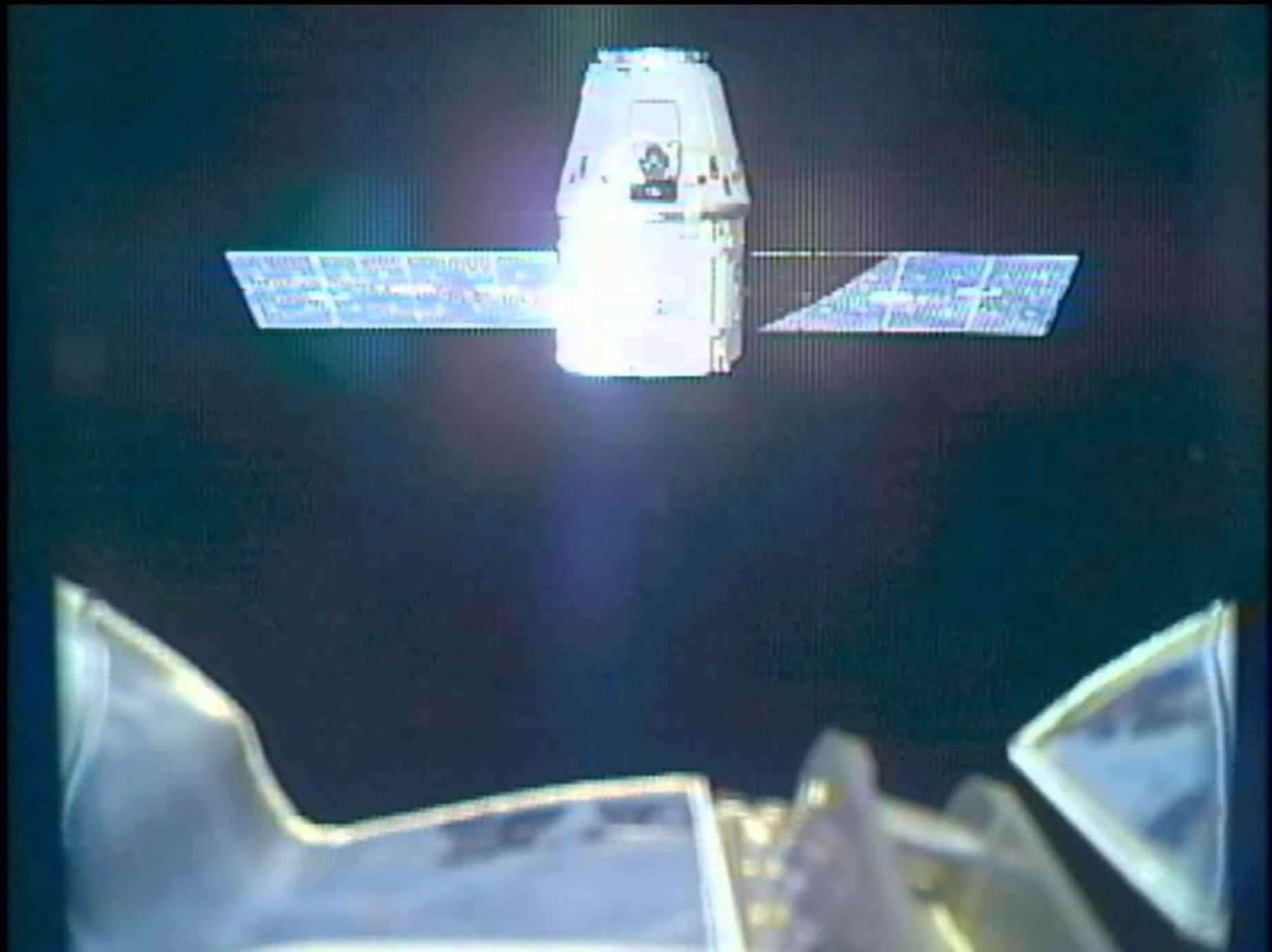

1
00:00:05,269 --> 00:00:03,350
in science fiction a laser is commonly

2
00:00:06,630 --> 00:00:05,279
used as a cutting tool

3
00:00:08,390 --> 00:00:06,640
while the same is true for the real

4
00:00:10,150 --> 00:00:08,400
world scientists at nasa's jet

5
00:00:11,990 --> 00:00:10,160
propulsion laboratory in pasadena

6
00:00:14,709 --> 00:00:12,000
california are finding ways to use

7
00:00:15,910 --> 00:00:14,719
lasers for communications as well

8
00:00:18,870 --> 00:00:15,920
one day they might even be able to

9
00:00:20,630 --> 00:00:18,880
provide live-streamed video from mars

10
00:00:23,029 --> 00:00:20,640
jessica egan with the station's payload

11
00:00:24,230 --> 00:00:23,039
operations integration center at nasa's

12
00:00:26,070 --> 00:00:24,240
marshall space flight center in

13
00:00:28,230 --> 00:00:26,080

huntsville alabama caught up with the

14
00:00:30,950 --> 00:00:28,240
mission manager for the optical payload

15
00:00:32,310 --> 00:00:30,960
for laser com science or opel's

16
00:00:34,389 --> 00:00:32,320
experiment

17
00:00:36,310 --> 00:00:34,399
we're trying to do is transmit data over

18
00:00:38,150 --> 00:00:36,320
laser beam which is very focused as

19
00:00:38,869 --> 00:00:38,160
opposed to a radio frequency beam which

20
00:00:41,110 --> 00:00:38,879
is

21
00:00:43,110 --> 00:00:41,120
diverges quite a bit over time and

22
00:00:45,029 --> 00:00:43,120
because we have a focused laser beam we

23
00:00:46,950 --> 00:00:45,039
need a lot of data to the ground so with

24
00:00:48,630 --> 00:00:46,960
higher data rates

25
00:00:50,709 --> 00:00:48,640
we can get data moving faster and we get

26
00:00:52,630 --> 00:00:50,719
things like high definition video across

27
00:00:53,910 --> 00:00:52,640
that data stream it's very important for

28
00:00:56,150 --> 00:00:53,920
going out and exploring and getting our

29
00:00:58,389 --> 00:00:56,160
science data back to the ground

30
00:00:59,670 --> 00:00:58,399
why is the iss an ideal place for you to

31
00:01:01,189 --> 00:00:59,680
do your research

32
00:01:02,950 --> 00:01:01,199
the iss gives us a platform that's

33
00:01:05,030 --> 00:01:02,960
already existing it's an existing

34
00:01:06,310 --> 00:01:05,040
infrastructure

35
00:01:07,990 --> 00:01:06,320
you can think of

36
00:01:10,789 --> 00:01:08,000
infrastructures used today like using

37
00:01:12,390 --> 00:01:10,799
windows on a pc that's a platform the

38
00:01:13,750 --> 00:01:12,400

isis is a platform

39
00:01:15,109 --> 00:01:13,760
and that gives us a window really to

40
00:01:17,350 --> 00:01:15,119
look down at the earth and to

41
00:01:19,190 --> 00:01:17,360
demonstrate and really use this optical

42
00:01:21,190 --> 00:01:19,200
link as a test bed

43
00:01:23,510 --> 00:01:21,200
as if we're in the laboratory

44
00:01:25,670 --> 00:01:23,520
it rotates over the earth just like a

45
00:01:27,749 --> 00:01:25,680
orbiter would rotate over mars and we

46
00:01:29,109 --> 00:01:27,759
can test things out like what if a mars

47
00:01:30,630 --> 00:01:29,119
rover were to communicate with an

48
00:01:32,390 --> 00:01:30,640
orbiter in space

49
00:01:33,990 --> 00:01:32,400
we can test that out by

50
00:01:36,069 --> 00:01:34,000
communicating between the iss and earth

51
00:01:38,710 --> 00:01:36,079
orbit and a ground station on the earth

52
00:01:40,550 --> 00:01:38,720
and test out those technologies

53
00:01:42,230 --> 00:01:40,560
so you can imagine now curiosity uh the

54
00:01:43,590 --> 00:01:42,240
rover has been on mars for about a year

55
00:01:46,469 --> 00:01:43,600
now driving around

56
00:01:48,149 --> 00:01:46,479
and currently it takes minutes to almost

57
00:01:50,630 --> 00:01:48,159
hours to get just single images down

58
00:01:52,069 --> 00:01:50,640
from mars and that's just because of the

59
00:01:53,670 --> 00:01:52,079
bandwidth and having to relay all that

60
00:01:54,550 --> 00:01:53,680
data through various orbiters along the

61
00:01:56,310 --> 00:01:54,560
way

62
00:01:58,149 --> 00:01:56,320
if we have optical com

63
00:01:59,429 --> 00:01:58,159

you might be able to get streaming video

64
00:02:01,670 --> 00:01:59,439
from the surface of mars and i think

65
00:02:03,030 --> 00:02:01,680
that's a game changer in terms of

66
00:02:04,630 --> 00:02:03,040
public outreach and getting the public

67
00:02:05,990 --> 00:02:04,640
involved with mars and also science and

68
00:02:08,309 --> 00:02:06,000
getting detailed science and being able

69
00:02:09,910 --> 00:02:08,319
to react to things in real time and do

70
00:02:11,110 --> 00:02:09,920
the science a lot faster

71
00:02:12,790 --> 00:02:11,120
we're an external payload so what

72
00:02:14,470 --> 00:02:12,800
they're going to do is mount us in the

73
00:02:16,070 --> 00:02:14,480
trunk of the dragon which is on the

74
00:02:17,589 --> 00:02:16,080
underbelly we're almost upside down kind

75
00:02:19,110 --> 00:02:17,599
of like in a bat cave

76
00:02:20,869 --> 00:02:19,120
we'll launch the spacex rocket and we

77
00:02:22,790 --> 00:02:20,879
get up to the space station

78
00:02:24,229 --> 00:02:22,800
the dragon will uh

79
00:02:25,670 --> 00:02:24,239
phase the space station get within a few

80
00:02:27,110 --> 00:02:25,680
hundred meters and then

81
00:02:29,030 --> 00:02:27,120
the robotic arm comes out and grabs the

82
00:02:31,030 --> 00:02:29,040
dragon opens up the trunk just like

83
00:02:33,190 --> 00:02:31,040
you'd open up your trunk on your car

84
00:02:34,790 --> 00:02:33,200
pulls out opals and uh relays us in

85
00:02:37,350 --> 00:02:34,800
about three or four hours over to our

86
00:02:38,949 --> 00:02:37,360
elc location which is basically a pallet

87
00:02:40,710 --> 00:02:38,959
on the outside of the space station that

88
00:02:42,150 --> 00:02:40,720

points down towards the ground at that

89
00:02:43,750 --> 00:02:42,160
point we're ready to go we're ready to

90
00:02:46,150 --> 00:02:43,760
start optical communications our

91
00:02:48,470 --> 00:02:46,160
baseline mission is about 90 days and

92
00:02:50,550 --> 00:02:48,480
that's just to get one video down from

93
00:02:51,750 --> 00:02:50,560
the space station to the ground after

94
00:02:53,030 --> 00:02:51,760
that's complete we'll go into an

95
00:02:55,110 --> 00:02:53,040
extended mission where we'll start to

96
00:02:57,430 --> 00:02:55,120
try uh different passes different ground

97
00:02:59,670 --> 00:02:57,440
stations different geometries and really

98
00:03:01,830 --> 00:02:59,680
start getting to statistics on the data

99
00:03:03,110 --> 00:03:01,840
about how this optical link changes over

100
00:03:05,190 --> 00:03:03,120
time changes over different weather

101
00:03:06,229 --> 00:03:05,200
patterns and that'll really help us when

102
00:03:07,430 --> 00:03:06,239
we want to design these things in the

103
00:03:09,830 --> 00:03:07,440
future we'll have data on the ground

104
00:03:11,270 --> 00:03:09,840
we'll have statistics that are real and

105
00:03:13,509 --> 00:03:11,280
that's really important to this

106
00:03:14,869 --> 00:03:13,519
technology we have been tracking the

107
00:03:17,750 --> 00:03:14,879
space station with our telescope at

108
00:03:20,470 --> 00:03:17,760
table mountain what we do is we

109
00:03:23,190 --> 00:03:20,480
get a gps state from a gps same way you

110
00:03:24,550 --> 00:03:23,200
get it on your iphone and we use that to

111
00:03:27,190 --> 00:03:24,560
predict where the iss is going to be in

112
00:03:29,350 --> 00:03:27,200
the sky from our telescope and so we've

113
00:03:30,789 --> 00:03:29,360

tracked the iss on our telescope

114
00:03:32,470 --> 00:03:30,799
overhead

115
00:03:34,149 --> 00:03:32,480
early in the morning when uh it's it's

116
00:03:35,270 --> 00:03:34,159
dark on the ground but the iss is lit up

117
00:03:37,509 --> 00:03:35,280
by the sun so we can actually see the

118
00:03:38,789 --> 00:03:37,519
isis passing through our telescope which

119
00:03:40,470 --> 00:03:38,799
is pretty neat to see so the next time

120
00:03:42,070 --> 00:03:40,480
we'll do this when we do it for real

121
00:03:44,229 --> 00:03:42,080
we'll see a laser pointing back down at