



# SPACEX CRS-19



WHAT'S ON BOARD



1  
00:00:20,450 --> 00:00:25,970  
We're going to burn some small fuel  
samples, solid fuel samples in a wind

2  
00:00:25,970 --> 00:00:29,720  
tunnel aboard the International Space  
Station. So what happened here is shortly

3  
00:00:29,720 --> 00:00:34,760  
before the incident the building had  
gone through some renovation so

4  
00:00:34,760 --> 00:00:39,020  
cladding were added to the building  
facade for for energy and cosmetic

5  
00:00:39,020 --> 00:00:43,460  
consideration. So when fire entered this  
cavity space the thermal expansion of

6  
00:00:43,460 --> 00:00:47,690  
the compacting gases and the flow  
confinement forced the flame to accelerate

7  
00:00:47,690 --> 00:00:53,780  
and so it spread way faster than usually  
seen. We know that on Earth hot gas rises

8  
00:00:53,780 --> 00:00:59,989  
right, so fire is hot so you unavoidably  
associate it with a buoyancy flow. The

9  
00:00:59,989 --> 00:01:04,640  
problem about buoyancy flow is it's really  
hard to characterize and this complex

10  
00:01:04,640 --> 00:01:10,100  
flow may mask the underlying physics we  
want to observe. On the other hand in

11  
00:01:10,100 --> 00:01:14,960  
microgravity conditions we eliminate the  
the buoyancy flow and instead we can

12  
00:01:14,960 --> 00:01:20,270  
impose, like in a controlled manner,  
impose a flow externally. And it's a

13  
00:01:20,270 --> 00:01:24,229  
small wind tunnel so we actually force  
air flow past a sample because without

14  
00:01:24,229 --> 00:01:28,070  
gravity if you just left it burning it  
would probably go out by itself to be

15  
00:01:28,070 --> 00:01:31,729  
honest so you need some airflow. But the  
nice thing that, as Ya-Ting said, we

16  
00:01:31,729 --> 00:01:35,689  
can control the airflow from zero to any  
arbitrary value so we can actually probe

17  
00:01:35,689 --> 00:01:40,130  
that scientifically, get resolution in  
regions we can't study on Earth at all

18  
00:01:40,130 --> 00:01:44,659  
so it's very useful. So the main idea  
here is we would have the astronauts

19  
00:01:44,659 --> 00:01:48,649  
change the spacing. We moved the black  
walls in and out and we could change the

20  
00:01:48,649 --> 00:01:52,759  
amounts that the the distance from the  
fuel sample to the walls effectively

21  
00:01:52,759 --> 00:01:58,100  
making a narrow space or a wider space  
as you heard earlier that the importance

22  
00:01:58,100 --> 00:02:02,030  
of the fire that we saw on Earth was a  
confined space so we're looking at that

23  
00:02:02,030 --> 00:02:07,219  
effect on these flames. The focus of this  
project is a protein that we call

24  
00:02:07,219 --> 00:02:11,630  
myostatin which we discovered many years  
ago and we showed that myostatin normally

25  
00:02:11,630 --> 00:02:16,160  
acts to limit muscle growth and the  
dramatic illustration of this was that

26  
00:02:16,160 --> 00:02:21,230  
when we genetically engineered mice to  
lack myostatin entirely the muscles in

27  
00:02:21,230 --> 00:02:25,520  
those animals grew to be about twice the  
normal size. So all of this immediately

28  
00:02:25,520 --> 00:02:30,140  
suggested to us the possibility that  
drugs targeting myostatin that is

29  
00:02:30,140 --> 00:02:34,310  
blocking myostatin activity could be  
useful in a wide range of conditions

30  
00:02:34,310 --> 00:02:39,200  
in which muscle loss or muscle wasting  
is a problem. And one way to mimic that

31  
00:02:39,200 --> 00:02:43,459  
type of muscle loss is in microgravity  
as you've heard where you get the

32  
00:02:43,459 --> 00:02:49,880  
systemic loss of muscle because of the  
inability to bear weight. By testing this

33  
00:02:49,880 --> 00:02:57,410  
experimental drug we are hoping to be  
able to test a novel therapeutic method

34  
00:02:57,410 --> 00:03:05,360  
of combating really both muscle loss and  
bone loss, not only in astronauts in

35  
00:03:05,360 --> 00:03:11,239  
space but really for a lot of people  
here on Earth. Imagine if you will you're

36  
00:03:11,239 --> 00:03:15,920  
responsible for operating a satellite  
that's orbiting our beautiful planet and

37  
00:03:15,920 --> 00:03:20,420  
you need to track it and command it so  
that you can bring down data from it

38  
00:03:20,420 --> 00:03:24,019  
and then it comes right above you and  
then it leaves you and that takes about

39  
00:03:24,019 --> 00:03:28,730  
three to seven minutes. So you get a  
couple of opportunities a day and that's

40  
00:03:28,730 --> 00:03:31,069  
it. About a decade ago we started

41

00:03:31,069 --> 00:03:34,760  
investigating well what about using  
infrastructure that's already in space

42  
00:03:34,760 --> 00:03:40,430  
and guess what have our data downloaded  
24 hours a day seven days a week. This

43  
00:03:40,430 --> 00:03:45,079  
gave us an opportunity to formalize our  
first spaceflight collaboration with

44  
00:03:45,079 --> 00:03:51,500  
Mexico through Mexico's space agency.  
So mission objective number one demonstrate

45  
00:03:51,500 --> 00:03:55,840  
that we can use  
the infrastructure already in space, that we

46  
00:03:55,840 --> 00:03:59,380  
can connect with the global star  
constellation and have it download our

47  
00:03:59,380 --> 00:04:05,590  
data. Objective number two is give an  
opportunity a spaceflight project

48  
00:04:05,590 --> 00:04:10,420  
hands-on opportunity to the next  
generation. There is an electronic board

49  
00:04:10,420 --> 00:04:14,680  
that we actually designed and it's in  
charge for the communication with global

50  
00:04:14,680 --> 00:04:19,000  
star satellites and for me to be  
participating in such a huge project was

51

00:04:19,000 --> 00:04:25,480

like only in my dreams, so it's actually like a great opportunity because it's

52

00:04:25,480 --> 00:04:32,550

also a new career in Mexico. HISUI is named after the bird is an imaging

53

00:04:32,550 --> 00:04:38,500

spectrometer for Earth observation. It can observe more than 100 spectral

54

00:04:38,500 --> 00:04:45,190

bands. Using this technology we can identify minerals and other things from

55

00:04:45,190 --> 00:04:51,669

space. Minerals have its own specific absorption band in spectra. Using this

56

00:04:51,669 --> 00:04:57,370

signature we can distinguish and identify minerals. Distribution of

57

00:04:57,370 --> 00:05:02,410

minerals are strongly related to natural resources. The sensor developed