
CAM 12
ORBITAL ATK CRS-9
WHAT'S ON BOARD
141 08:44:14.622

1
00:00:03,360 --> 00:00:10,810
antares on its way

2
00:00:10,820 --> 00:00:20,710
[Music]

3
00:00:24,710 --> 00:00:22,950
it's true that quantum mechanics is the

4
00:00:26,390 --> 00:00:24,720
is the science of the very very small

5
00:00:28,150 --> 00:00:26,400
but due to sort of a twist of fate it's

6
00:00:30,150 --> 00:00:28,160
also the science of the extraordinarily

7
00:00:32,229 --> 00:00:30,160
cold this idea this sort of relevance

8
00:00:34,389 --> 00:00:32,239
this connection between the very very

9
00:00:37,110 --> 00:00:34,399
cold and the science which underpins the

10
00:00:39,510 --> 00:00:37,120
very small which underpins the future of

11
00:00:41,030 --> 00:00:39,520
our economy is not a new idea in fact

12
00:00:42,950 --> 00:00:41,040
there are hundreds of groups around the

13
00:00:44,229 --> 00:00:42,960

world here on earth including mine which

14
00:00:46,229 --> 00:00:44,239
are studying this thing called bose

15
00:00:49,750 --> 00:00:46,239
einstein condensation

16
00:00:51,990 --> 00:00:49,760
with this idea in mind but up in space

17
00:00:53,670 --> 00:00:52,000
we hope to be able to get colder yet we

18
00:00:55,510 --> 00:00:53,680
hope to get to temperatures

19
00:00:58,069 --> 00:00:55,520
of about something less than one

20
00:01:00,389 --> 00:00:58,079
nanokelvin so we intend to get to within

21
00:01:02,549 --> 00:01:00,399
one billionth of a degree of absolute

22
00:01:05,350 --> 00:01:02,559
zero i always ask students what's the

23
00:01:07,990 --> 00:01:05,360
most widely used material on earth and

24
00:01:10,789 --> 00:01:08,000
the answer is water what's the second

25
00:01:13,030 --> 00:01:10,799
most widely used material on earth

26
00:01:14,870 --> 00:01:13,040
and that's concrete for every person

27
00:01:17,030 --> 00:01:14,880
sitting in this room there is one ton of

28
00:01:18,950 --> 00:01:17,040
concrete being produced and consumed

29
00:01:20,469 --> 00:01:18,960
every year we really need to understand

30
00:01:22,149 --> 00:01:20,479
much better what is happening with this

31
00:01:25,030 --> 00:01:22,159
material how can use with more

32
00:01:27,350 --> 00:01:25,040
sustainable on earth and how we can make

33
00:01:29,590 --> 00:01:27,360
a usage of raw materials present in the

34
00:01:32,630 --> 00:01:29,600
space and make a binder concrete like

35
00:01:34,950 --> 00:01:32,640
cement like binder in the space so if we

36
00:01:36,390 --> 00:01:34,960
can make the process pure because we

37
00:01:38,310 --> 00:01:36,400
know from protein research that the

38
00:01:40,789 --> 00:01:38,320

crystals will go larger and more more

39
00:01:42,630 --> 00:01:40,799
ideal in its shape if we can

40
00:01:44,469 --> 00:01:42,640
narrow down the

41
00:01:46,469 --> 00:01:44,479
amorphous phases and the crystal phases

42
00:01:48,710 --> 00:01:46,479
forming pardon cement paste maybe we can

43
00:01:50,389 --> 00:01:48,720
improve the process on earth

44
00:01:52,310 --> 00:01:50,399
so here we are doing essentially a

45
00:01:54,149 --> 00:01:52,320
fundamental paradigm shift in the way

46
00:01:56,389 --> 00:01:54,159
people have processed chemicals so we're

47
00:01:58,870 --> 00:01:56,399
shifting from a gravity-based paradigm

48
00:02:00,870 --> 00:01:58,880
to a force surface forces driven this is

49
00:02:02,389 --> 00:02:00,880
the device that we are sending to space

50
00:02:05,109 --> 00:02:02,399
we hope to learn

51
00:02:06,789 --> 00:02:05,119
more about how this this device works in

52
00:02:08,630 --> 00:02:06,799
order to make it better and so this

53
00:02:10,469 --> 00:02:08,640
would benefit earth applications

54
00:02:13,110 --> 00:02:10,479
hopefully pharmaceutical production in

55
00:02:15,750 --> 00:02:13,120
terms of exploration of deep space you

56
00:02:17,670 --> 00:02:15,760
need to have the capability of making

57
00:02:20,550 --> 00:02:17,680
molecules so you need chemical

58
00:02:23,190 --> 00:02:20,560
processing capabilities and this if it

59
00:02:26,229 --> 00:02:23,200
works in the way we hope would enable

60
00:02:28,869 --> 00:02:26,239
certain steps in order to pave the way

61
00:02:30,229 --> 00:02:28,879
towards chemical synthesis in space and

62
00:02:31,350 --> 00:02:30,239
of course there's a very exciting

63
00:02:33,589 --> 00:02:31,360

horizon

64
00:02:35,110 --> 00:02:33,599
all three of us up here have projects

65
00:02:37,190 --> 00:02:35,120
that are based on the use of small

66
00:02:38,869 --> 00:02:37,200
satellites called cubesats all three of

67
00:02:42,070 --> 00:02:38,879
these projects are earth observing

68
00:02:44,630 --> 00:02:42,080
missions from the iss we later in the

69
00:02:46,229 --> 00:02:44,640
summer get pushed out into orbit into

70
00:02:47,670 --> 00:02:46,239
free-flying orbit we've built a new

71
00:02:48,949 --> 00:02:47,680
processor that's a very capable

72
00:02:50,390 --> 00:02:48,959
processor

73
00:02:51,990 --> 00:02:50,400
it's it's to be the first time a

74
00:02:55,350 --> 00:02:52,000
processor like this has been used in

75
00:02:58,309 --> 00:02:55,360
space we still don't know exactly when

76
00:03:01,030 --> 00:02:58,319
the cloud forms and when it rains and we

77
00:03:03,270 --> 00:03:01,040
need to observe these storms as a

78
00:03:05,030 --> 00:03:03,280
function of time at one space

79
00:03:07,110 --> 00:03:05,040
so this whole project is about

80
00:03:09,270 --> 00:03:07,120
developing all the technology

81
00:03:10,949 --> 00:03:09,280
that what we used to do from huge

82
00:03:12,790 --> 00:03:10,959
systems into

83
00:03:16,630 --> 00:03:12,800
shoebox eyes right now it's a technology

84
00:03:18,630 --> 00:03:16,640
demonstration that is successful uh

85
00:03:21,509 --> 00:03:18,640
soon we'll see constellations of these

86
00:03:23,670 --> 00:03:21,519
small raiders together with radiometers

87
00:03:25,750 --> 00:03:23,680
which will significantly improve

88
00:03:29,480 --> 00:03:25,760

weather and climate forecasting and our