



1
00:00:00,500 --> 00:00:05,305
[Music]

2
00:00:05,305 --> 00:00:08,842
>> My name is Richard
Chapleau, I taught 25

3
00:00:08,842 --> 00:00:09,910
years for the high schools out
here.

4
00:00:09,910 --> 00:00:12,112
I did my doctorate
at UCLA, go Bruins.

5
00:00:12,112 --> 00:00:14,514
I want to talk about pressure
because since this is

6
00:00:14,514 --> 00:00:17,651
aeronautics and airplanes go up
in the air and so do spacecraft,

7
00:00:17,651 --> 00:00:19,887
we're really concerned
about pressure effects.

8
00:00:20,520 --> 00:00:24,424
[Music]

9
00:00:24,925 --> 00:00:28,262
PVnRt is the ideal gas
law, pressure times volume

10
00:00:28,262 --> 00:00:30,764
of a gas is equal to
the amount of gas,

11
00:00:30,764 --> 00:00:34,568

that's the lower case n plus
an R, and R is just a constant,

12

00:00:34,835 --> 00:00:35,802
times the temperature.

13

00:00:35,802 --> 00:00:38,839
But do you see the P and the
V are on one side and the

14

00:00:38,839 --> 00:00:40,274
n and the t are on the other?

15

00:00:40,274 --> 00:00:41,542
Elevators and seesaws-

16

00:00:41,542 --> 00:00:44,378
if you'd all put your hands like
this right now please-

17

00:00:44,378 --> 00:00:45,712
say same side seesaw.

18

00:00:45,712 --> 00:00:47,080
[Teachers]: Same side seesaw.

19

00:00:50,517 --> 00:00:48,382
Other side elevator.

20

00:00:50,517 --> 00:00:55,522
[Music]

21

00:00:56,890 --> 00:00:59,359
Looking at the ideal gas
law, are pressure and volume

22

00:00:59,359 --> 00:01:00,994
on a seesaw or an elevator?

23

00:01:00,994 --> 00:01:01,995

[Teachers]: Seesaw.

24

00:01:01,995 --> 00:01:03,864

So I'm going to lower the pressure.

25

00:01:03,864 --> 00:01:05,799

What should happen to the size of that balloon?

26

00:01:05,799 --> 00:01:08,335

It should increase, shouldn't it?

27

00:01:08,335 --> 00:01:12,005

[Vacuum pump]

28

00:01:12,005 --> 00:01:13,574

Well, is it?

29

00:01:13,574 --> 00:01:16,476

Now, what's going to happen as I, once again,

30

00:01:16,476 --> 00:01:18,979

increase the pressure, what should happen to the volume?

31

00:01:18,979 --> 00:01:23,116

It should decrease again, shouldn't it?

32

00:01:23,116 --> 00:01:24,284

Never take the cap off fast.

33

00:01:24,284 --> 00:01:25,552

It's a-boiling.

34

00:01:25,552 --> 00:01:26,720

Is it hotter in there?

35

00:01:26,720 --> 00:01:29,356

No, the definition of
boiling is when the pressure

36

00:01:29,356 --> 00:01:33,527

above a liquid is equal to
the pressure of the liquid.

37

00:01:33,527 --> 00:01:39,166

[Background noise]

38

00:01:39,166 --> 00:01:41,935

It goes on and off, see it?

On-off-

39

00:01:41,935 --> 00:01:43,236

'cause we're letting
the pressure on there.

40

00:01:43,236 --> 00:01:45,505

So try that again.

41

00:01:45,505 --> 00:01:48,642

[Music]

42

00:01:48,642 --> 00:01:51,244

>>So basically it's
a same side seesaw

43

00:01:51,244 --> 00:01:54,748

so when the pressure
increases, the volume decreases

44

00:01:54,748 --> 00:01:58,051

and they shrivel up and
when the pressure decreases,

45

00:01:58,051 --> 00:02:01,989
the volume increases
and they expand,

46

00:02:01,989 --> 00:02:02,923
and that's what you're seeing

47

00:02:02,923 --> 00:02:07,794
in the same side seesaw
of the ideal gas law.

48

00:02:07,794 --> 00:02:09,663
[Richard Chapleau]: Oh neat,
huh?

49

00:02:09,663 --> 00:02:11,732
We don't want this
to happen to us

50

00:02:11,732 --> 00:02:14,901
and that's why we have a subject
matter expert with us

51

00:02:14,901 --> 00:02:18,505
that will show how NASA has
overcome these problems.

52

00:02:18,505 --> 00:02:23,477
[Music]

53

00:02:23,477 --> 00:02:28,382
>>This suit right here is
the one that we use out at NASA.

54

00:02:28,382 --> 00:02:31,051
He talked about Boyle's
Law and you saw the effects

55

00:02:31,051 --> 00:02:34,121
of water boiling.
At 63,000 feet of altitude-

56
00:02:34,121 --> 00:02:40,227
that's where water boils at
body temperature, 98 degrees.

57
00:02:40,227 --> 00:02:43,563
The whole premise of this suit
is to keep three and a half PSI

58
00:02:43,563 --> 00:02:46,533
on your body at all times.

59
00:02:46,533 --> 00:02:50,971
So you're flying along-
some little 10 cent O-ring

60
00:02:50,971 --> 00:02:54,775
on your airplane breaks,
your engine quits,

61
00:02:54,775 --> 00:02:56,810
your canopy flies off,

62
00:02:56,810 --> 00:02:59,046
the outside environment comes
rushing into your cockpit.

63
00:02:59,046 --> 00:03:09,790
[Suit inflating]