



BASS EXPERIMENT TEAM, TELESCIENCE SUPPORT CENTER - GLENN RESEARCH CENTER

1
00:00:01,467 --> 00:00:03,769
>> One of the experiments
is going to be flying

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00:00:03,769 --> 00:00:06,405
to the Space Station on board
the Cygnus is the second

3
00:00:06,405 --> 00:00:08,908
iteration of the BASS
Experiment, that's the Burning

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00:00:08,908 --> 00:00:14,180
And Suppression of Solids
experiment, II, and it is led

5
00:00:14,180 --> 00:00:17,650
by Dr. Sandra Olson, who's
a Spacecraft Fire Safety

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00:00:17,650 --> 00:00:20,619
Researcher with NASA's
Glenn Research Center.

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00:00:20,619 --> 00:00:22,354
And she's here on the line
to tell us a little bit

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00:00:22,354 --> 00:00:23,489
about that experiment today.

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00:00:23,489 --> 00:00:25,257
Thanks so much for
joining us, Dr. Olson.

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00:00:25,257 --> 00:00:26,826
>> Yes, thank you, Brandi.

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00:00:26,826 --> 00:00:29,795

>> So we're about
to get a new set

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00:00:29,795 --> 00:00:31,897
of BASS experiments
on the Space Station.

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00:00:31,897 --> 00:00:33,732
Can you tell us a little bit
about the history of that

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00:00:33,732 --> 00:00:35,334
and what we're looking
for there?

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00:00:35,334 --> 00:00:36,635
>> Sure, yeah.

16
00:00:36,635 --> 00:00:41,073
The BASS experiment ran last
year, and we had a number

17
00:00:41,073 --> 00:00:43,742
of samples on board, and
it was very successful.

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00:00:43,742 --> 00:00:45,578
The crew really enjoyed
running the experiments,

19
00:00:45,578 --> 00:00:47,680
because it was very
hands-on with the crew.

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00:00:47,680 --> 00:00:49,281
And so we were given
the opportunity

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00:00:49,281 --> 00:00:51,117
to fly some additional samples,

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00:00:51,117 --> 00:00:54,386
and we are using shared
hardware that's been used

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00:00:54,386 --> 00:00:56,689
for a number of investigations.

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00:00:56,689 --> 00:00:59,058
And so we're really
maximizing the science return

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00:00:59,058 --> 00:01:01,527
on the investment
of that hardware.

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00:01:01,527 --> 00:01:04,697
>> OK, well, can you give us
a little bit of information

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00:01:04,697 --> 00:01:06,365
on what you've learned
from the previous one,

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00:01:06,365 --> 00:01:09,068
and why it's a good idea
to do another iteration,

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00:01:09,068 --> 00:01:10,369
and how you'll change it?

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00:01:10,369 --> 00:01:11,971
>> Sure. One of the things

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00:01:11,971 --> 00:01:14,340
that the hardware
does is it creates --

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00:01:14,340 --> 00:01:15,441

it's a little flow duct --

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00:01:15,441 --> 00:01:18,144
and it creates controlled
flow velocity,

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00:01:18,144 --> 00:01:22,214
so we can study the effect of
airflow on combustion in zero G.

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00:01:22,214 --> 00:01:24,750
As you know, fire in
space is very different

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00:01:24,750 --> 00:01:26,318
from what it is on earth.

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00:01:26,318 --> 00:01:29,822
Hot air rises on earth
because of buoyancy,

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00:01:29,822 --> 00:01:31,290
but it doesn't do that in space.

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00:01:31,290 --> 00:01:35,494
And so the mixing of the
pyrolysis gases that come off

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00:01:35,494 --> 00:01:38,030
of heated materials
and mixing with the air

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00:01:38,030 --> 00:01:41,100
in the space station
is very different

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00:01:41,100 --> 00:01:42,101
that you would see on earth.

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00:01:42,101 --> 00:01:44,136
And so you would expect

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00:01:44,136 --> 00:01:46,005
to get very different
combustion products,

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00:01:46,005 --> 00:01:47,840
things may be more
toxic in space.

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00:01:47,840 --> 00:01:50,376
In addition, you know,
obviously you don't want

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00:01:50,376 --> 00:01:51,577
to have a fire in space.

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00:01:51,577 --> 00:01:53,913
It could damage the spacecraft,

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00:01:53,913 --> 00:01:55,481
it could contaminate
the atmosphere,

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00:01:55,481 --> 00:01:57,016
and it could threatened
the crew and the mission.

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00:01:57,016 --> 00:01:59,852
So what we do when we
do these experiments,

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00:01:59,852 --> 00:02:01,654
is we do it in a very
controlled environment

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00:02:01,654 --> 00:02:04,023
with multiple levels of safety.

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00:02:04,023 --> 00:02:06,358

So there's no issue associated

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00:02:06,358 --> 00:02:09,762

with the safety of
these experiments.

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00:02:11,130 --> 00:02:14,600

>> And what are you
able to learn

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00:02:14,600 --> 00:02:17,603

from doing these experiments
on board the Space Station

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00:02:17,603 --> 00:02:22,041

as opposed to studying the
phenomenon here on the ground?

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00:02:22,041 --> 00:02:25,611

>> Yeah, we basically
are looking and trying

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00:02:25,611 --> 00:02:28,414

to study the flammability
of materials, the ignition

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00:02:28,414 --> 00:02:31,917

of materials, how fires
spread over materials.

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00:02:31,917 --> 00:02:35,988

And we're hoping to really
learn a lot about how we want

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00:02:35,988 --> 00:02:38,891

to screen materials in the
future for exploration missions,

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00:02:38,891 --> 00:02:41,660

because obviously, as you
go further from the earth,

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00:02:41,660 --> 00:02:44,597

if you have a fire, that's
a really bad scenario.

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00:02:44,597 --> 00:02:48,467

So we want to make sure we
fly the most safe materials.

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00:02:48,467 --> 00:02:50,469

We make our spacecrafts
out of safe materials,

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00:02:50,469 --> 00:02:52,538

and we fly all the stuff
that isn't going to burn

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00:02:52,538 --> 00:02:54,974

in the atmospheres that we're
using in the spacecraft.

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00:02:54,974 --> 00:02:59,578

What we have found to date is
it is very sensitive to the flow

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00:02:59,578 --> 00:03:03,682

and unfortunately, the
flow ranges of interest,

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00:03:03,682 --> 00:03:05,985

where the flammability
is optimized,

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00:03:05,985 --> 00:03:08,153

are really those
ventilation flows

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00:03:08,153 --> 00:03:09,755
that you get in a spacecraft.

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00:03:09,755 --> 00:03:13,292
And so one of the things that
ISS was designed for initially,

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00:03:13,292 --> 00:03:16,729
based on the research that
we've done historically,

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00:03:16,729 --> 00:03:19,632
is that if there's a fire
alarm, they shut off the airflow

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00:03:19,632 --> 00:03:25,971
in the Space Station to stop
fanning the fire, basically.

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00:03:25,971 --> 00:03:29,408
So that happens automatically
when a smoke alarm goes off.

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00:03:29,408 --> 00:03:31,577
And so that's one of the
major impacts we've had

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00:03:31,577 --> 00:03:34,146
on the safety of
the Space Station.

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00:03:34,146 --> 00:03:37,349
>> OK, so you're already
learning good information

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00:03:37,349 --> 00:03:40,286
for future exploration and life
on the Space Station as well?

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00:03:40,286 --> 00:03:41,887

>> Right. Right, yeah.

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00:03:41,887 --> 00:03:43,756

Yeah, the experiments
that we're flying,

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00:03:43,756 --> 00:03:45,357

we're flying new samples up.

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00:03:45,357 --> 00:03:47,426

They're going to
launch this month.

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00:03:47,426 --> 00:03:50,062

And we have five different
investigation teams

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00:03:50,062 --> 00:03:52,264

that are involved in the
last two experiments.

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00:03:52,264 --> 00:03:55,901

And they're looking at different
materials, different geometries

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00:03:55,901 --> 00:04:00,039

of materials, whether
they char or not char.

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00:04:00,039 --> 00:04:02,541

And like I said, they're
looking at flammability limits,

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00:04:02,541 --> 00:04:08,514

when does extinction occur,
how easy are they to ignite?

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00:04:08,514 --> 00:04:12,418

And the main two variables we
have, I mentioned flow before,

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00:04:12,418 --> 00:04:16,322

but we also added just recently
with the BASS ops in the spring

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00:04:16,322 --> 00:04:20,125

that we did, we added a new
variable of oxygen variation.

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00:04:20,125 --> 00:04:23,462

We found we could vitiate,
or reduce the oxygen

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00:04:23,462 --> 00:04:26,799

in the MSG working volume
where we do the experiments,

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00:04:26,799 --> 00:04:28,200

using Space Station nitrogen.

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00:04:28,200 --> 00:04:32,571

So we can vary the oxygen level,
and that gives us a whole new

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00:04:32,571 --> 00:04:37,509

and very important variable
to study fires in space.

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00:04:37,509 --> 00:04:38,877

>> Why would you
want to do that?

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00:04:38,877 --> 00:04:42,815

Is that a way to
extinguish it or?

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00:04:42,815 --> 00:04:45,851

>> The oxygen, no,
because if there's a fire,

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00:04:45,851 --> 00:04:47,586

it's going to be
consuming the oxygen.

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00:04:47,586 --> 00:04:51,924

And so the oxygen will naturally
deplete when there's a fire.

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00:04:51,924 --> 00:04:53,625

So studying it in
a controlled way

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00:04:53,625 --> 00:04:57,229

where you have known oxygen
levels, and you can vary it,

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00:04:57,229 --> 00:05:00,799

and then you know how
sensitive it is to the oxygen.

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00:05:00,799 --> 00:05:02,601

You can also get to
extinction that way.

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00:05:02,601 --> 00:05:05,771

You can, you know, test and
continue to reduce the oxygen

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00:05:05,771 --> 00:05:07,773

until you find that
extinction limit.

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00:05:07,773 --> 00:05:09,808

And that's something
we weren't able to do

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00:05:09,808 --> 00:05:13,379

until this past spring when we
realized we could vitiate the

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00:05:13,379 --> 00:05:15,647

atmosphere in the
MSG and demonstrated

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00:05:15,647 --> 00:05:17,883

that it worked as we expected.

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00:05:17,883 --> 00:05:19,084

>> Interesting.

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00:05:19,084 --> 00:05:20,552

So tell us a little bit

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00:05:20,552 --> 00:05:23,322

about how the crew is
involved in these experiments.

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00:05:23,322 --> 00:05:24,690

What part do they play?

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00:05:24,690 --> 00:05:28,560

>> Oh, they're very integrally
involved in the experiments.

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00:05:28,560 --> 00:05:32,798

They're our hands and eyes
when we run the experiments.

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00:05:32,798 --> 00:05:36,034

We monitor it from the
ground, but they're the ones

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00:05:36,034 --> 00:05:40,072

who are really, you know,
doing the manual ignitions,

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00:05:40,072 --> 00:05:44,977

taking the imaging,
changing out the samples,

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00:05:44,977 --> 00:05:47,746

calibrating the flow
system, all that stuff.

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00:05:47,746 --> 00:05:52,184

So it's something that
they are very involved in.

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00:05:52,184 --> 00:05:56,288

And they really enjoy
running the experiments.

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00:05:56,288 --> 00:05:57,423

>> That's great.

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00:05:57,423 --> 00:05:59,658

Well, tell us, is there
anything in particular

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00:05:59,658 --> 00:06:01,727

that you're really
looking forward to seeing

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00:06:01,727 --> 00:06:03,629

when we get these
experiments started again

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00:06:03,629 --> 00:06:04,630

on the Space Station,

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00:06:04,630 --> 00:06:06,331

or anything we should
watch out for?

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00:06:06,331 --> 00:06:08,967

>> Well, we're certainly
flying new samples

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00:06:08,967 --> 00:06:10,402
that haven't been flown before.

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00:06:10,402 --> 00:06:15,007
So we're really looking for
some different configurations

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00:06:15,007 --> 00:06:16,642
of flames and finding,

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00:06:16,642 --> 00:06:19,211
especially with the thicker
materials that we're burning,

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00:06:19,211 --> 00:06:22,748
we're really hoping to -- these
are the largest thick materials

141
00:06:22,748 --> 00:06:24,716
that we've been able
to fly to date.

142
00:06:24,716 --> 00:06:26,218
And so we're really
looking forward

143
00:06:26,218 --> 00:06:30,022
to seeing how long it takes
to reach a steady state flame

144
00:06:30,022 --> 00:06:33,058
or how long it takes
for them to extinguish.

145
00:06:33,058 --> 00:06:36,528
We're really looking forward
to, you know, learning a lot

146
00:06:36,528 --> 00:06:38,630
of these things with

these new samples.

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00:06:38,630 --> 00:06:41,834

>> We're always excited to see video of that experiment.

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00:06:41,834 --> 00:06:44,002

It's so interesting to watch.

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00:06:44,002 --> 00:06:46,038

>> Yeah, they're very dynamic flames.

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00:06:46,038 --> 00:06:49,141

They react almost instantaneously to change

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00:06:49,141 --> 00:06:52,177

in the velocity, which the crew can dial in.

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00:06:52,177 --> 00:06:56,248

They have a little knob that they can turn the flow up

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00:06:56,248 --> 00:06:59,518

and down, basically turning a fan faster and slower.

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00:06:59,518 --> 00:07:02,321

And that changes the flow through the test section,

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00:07:02,321 --> 00:07:05,858

and the flame reacts almost instantaneously to it.

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00:07:05,858 --> 00:07:06,558

>> Well, yeah.

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00:07:06,558 --> 00:07:07,726

It's very cool to watch.

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00:07:07,726 --> 00:07:08,927

Thank you so much
for talking with us.

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00:07:08,927 --> 00:07:11,530

Before you go, I wanted to
ask, just was interested

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00:07:11,530 --> 00:07:14,800

in your title, Spacecraft
Fire Safety Researcher.

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00:07:14,800 --> 00:07:16,401

I'm guessing there
aren't a whole lot

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00:07:16,401 --> 00:07:17,903

of people who share that title.

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00:07:17,903 --> 00:07:18,871

Is that true?

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00:07:18,871 --> 00:07:20,939

>> That's pretty
much true, yeah.

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00:07:20,939 --> 00:07:22,307

There are a handful of us.

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00:07:22,307 --> 00:07:23,876

>> How did you get
into that field?

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00:07:23,876 --> 00:07:28,413

>> I just sort of happened
into it, when I hired in here.

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00:07:28,413 --> 00:07:32,885

They had an opening
in a very small group

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00:07:32,885 --> 00:07:36,154

that was just getting
started, and I was interested.

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00:07:36,154 --> 00:07:39,024

I had been working in
Combustion in Aeronautics,

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00:07:39,024 --> 00:07:43,095

but they said we're interested
in looking at fires in zero G,

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00:07:43,095 --> 00:07:45,464

and I thought that sounded
amazingly interesting,

173

00:07:45,464 --> 00:07:46,732

so I joined it.

174

00:07:46,732 --> 00:07:49,034

And I've been in that
group ever since, so.

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00:07:49,034 --> 00:07:50,102

>> Well, it does
sound interesting.

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00:07:50,102 --> 00:07:51,169

Thanks again for joining us.

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00:07:51,169 --> 00:07:52,137

We really appreciate it.

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00:07:52,137 --> 00:07:53,939

And again, this was
Dr. Sandra Olson

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00:07:53,939 --> 00:07:56,942
from the Glenn Research Center,

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00:07:56,942 --> 00:07:58,944
Spacecraft Fire Safety
Researcher working

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00:07:58,944 --> 00:08:00,045
on the BASS experiment.