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00:00:04,730 --> 00:00:10,100

A meteorological airship containing a "Cloud Lab" flew over Kennedy Space Center in Florida

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00:00:10,100 --> 00:00:11,510

in September.

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00:00:11,510 --> 00:00:18,340

It was carrying components of NASA's Microorganisms in the Stratosphere, or MIST, experiment.

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00:00:18,340 --> 00:00:23,340

The microbes for MIST were developed at the Space Life Sciences Laboratory near the center.

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00:00:23,340 --> 00:00:25,949

"MIST has two primary goals.

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00:00:25,949 --> 00:00:29,439

One is to collect microorganisms in the stratosphere.

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00:00:29,439 --> 00:00:34,910

The second goal is to intentionally expose microorganisms to the stratosphere to understand

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00:00:34,910 --> 00:00:36,680

how they survive."

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00:00:36,680 --> 00:00:41,310

Smith looks forward to MIST samples flying on a series of experiments over the next couple

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00:00:41,310 --> 00:00:42,460

of years.

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00:00:42,460 --> 00:00:47,680

Researchers, along with engineers from Kennedy's Rocket University, will start with smaller

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00:00:47,680 --> 00:00:52,019

weather balloons and work their way up to stadium-sized balloons.

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00:00:52,019 --> 00:00:58,060

They can carry very heavy and sophisticated payloads to high altitudes, and stay aloft

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00:00:58,060 --> 00:01:00,039

for long periods of time.

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00:01:00,039 --> 00:01:04,500

“The relationship between MIST and Rocket University is a great collaboration.

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00:01:04,500 --> 00:01:07,710

Rocket University was founded here at Kennedy Space Center.

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00:01:07,710 --> 00:01:13,550

The idea is to get our engineers and scientists here on center more flight-system experience

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00:01:13,550 --> 00:01:18,260

and to get hands-on experience, and to move concepts quickly through the mission life

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00:01:18,260 --> 00:01:19,260

cycle.

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00:01:19,260 --> 00:01:25,230

With Rocket University, we can grab onto opportunities like their Near Space Program, which is using

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00:01:25,230 --> 00:01:29,890

meteorological weather balloons launched from Kennedy Space Center to achieve a variety

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00:01:29,890 --> 00:01:31,230

of goals.”

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00:01:31,230 --> 00:01:37,160

The second goal is the e-MIST experiment, which stands for Exposure of Microorganisms

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00:01:37,160 --> 00:01:38,690

in the Stratosphere.

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00:01:38,690 --> 00:01:44,350

The e-MIST experiment will measure the microorganisms' responses to extreme altitudes.

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00:01:44,350 --> 00:01:51,340

“What it is is simply to take a known quantity of microorganisms up to the stratosphere,

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00:01:51,340 --> 00:01:58,510

and then once the balloon or aircraft reaches the altitude of interest, we expose those

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00:01:58,510 --> 00:02:00,750

microorganisms to the environment.

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00:02:00,750 --> 00:02:05,390

And then once the payload returns safely back down to the ground, we can take the experiment

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00:02:05,390 --> 00:02:09,340

back into the lab and assess just how many microorganisms survived.

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00:02:09,340 --> 00:02:14,799

We can also look at the genetic level and understand what type of changes happened to

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00:02:14,799 --> 00:02:16,260

the cells at altitude.

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00:02:16,260 --> 00:02:23,739

"From a planetary exploration standpoint, microorganisms are present on spacecraft at

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00:02:23,739 --> 00:02:24,799

the time of launch.

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00:02:24,799 --> 00:02:30,760

They're very low numbers because the Planetary Protection Program within NASA spends a great

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00:02:30,760 --> 00:02:36,180

deal of effort to develop protocols to keep the microbial contamination on spacecraft

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00:02:36,180 --> 00:02:37,950

to very, very low levels.

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00:02:37,950 --> 00:02:39,420

But it's not zero.

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00:02:39,420 --> 00:02:44,819

So NASA's concerned about microorganisms simply because we do not want to contaminate

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00:02:44,819 --> 00:02:48,500

the planetary bodies that we're exploring."

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00:02:48,500 --> 00:02:53,879

Schuerger says microbes can survive in Earth's atmosphere if they're tolerant of ultraviolet

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00:02:53,879 --> 00:02:58,370

radiation, dry conditions and decreasing pressure.

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00:02:58,370 --> 00:03:01,590

They get into the atmosphere in several ways.

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00:03:01,590 --> 00:03:07,980

Winds are the primary mechanism for lofting debris or dust particles off the ground, plant

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00:03:07,980 --> 00:03:11,049

surfaces, roads and deserts.

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00:03:11,049 --> 00:03:16,760

Solar heating also causes air to rise, carrying fine particles of organic matter, dust or

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00:03:16,760 --> 00:03:17,950

microorganisms.

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00:03:17,950 --> 00:03:24,180

“My background is in microbiology, plant pathology and astrobiology.

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00:03:24,180 --> 00:03:29,810

But right now we’ve developed a Mars Simulation Chamber, which is in the background, that

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00:03:29,810 --> 00:03:35,349

we are studying how bacteria that might be found on spacecraft are going to survive,

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00:03:35,349 --> 00:03:41,060

potentially grow and then, if possible, proliferate on the surface of Mars.

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00:03:41,060 --> 00:03:45,739

So we’re looking at microbial survival and growth under Martian conditions.”

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00:03:45,739 --> 00:03:53,249

ANNCR: As we begin to explore the solar system outside of low-Earth orbit with humans, microorganisms

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00:03:53,249 --> 00:03:58,689

could be very beneficial to human activity, whether it’s in the human body itself or

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00:03:58,689 --> 00:04:04,730
whether in a plant-growing system that might
be used to regenerate oxygen, water or food

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00:04:04,730 --> 00:04:05,730
for humans.