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Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen only mode until the question and answer session of today's conference. At that time, you may press star one, unmute your phone and record your name to ask a question.

I would like to inform all parties that today's conference is being recorded. If you have any objections, you may disconnect. At this time, I would now like to turn the conference over to your host, Mr. (Joseph Atkinson). Thank you. You may begin.

(Joe Atkinson): Hi, good morning. I'm (Joe Atkinson) and I'd like to welcome you to this media briefing for dynamics and chemistry of the Summer Stratosphere or DCOTSS. This is a really exciting master airborne science campaign looking at intense summertime thunderstorms. It's now in its second year flying missions out of Salina, Kansas.

We have two speakers today - NASA Chief Sciences and Senior Climate Advisor, Kate Calvin and DCOTSS Principal Investigator and Professor of Atmospheric Science at Texas A&M University, Doctor Kenneth Bowman. We'll have brief presentations from both of our guest speakers this morning. And then we will open the briefing up to questions. I'd like to thank Kate and Ken for taking some time to be here today. And on that note, I'll go ahead and pass the time over to Kate.

Kate Calvin: Thank you (Joe). So one of the NASA's most important missions is our home planet. We have more than 24 satellites and instruments in orbit including several on the International Space Station that help us observe the Earth. And we can see things like vegetation, carbon dioxide, clouds and precipitation, changes in the massive ice sheets and much more.

We've been observing the earth for decades so we can see both the state of the planet today and also how it changed over time. What we see when we look at observations made on and above the earth's surface is that the climate is changing. 2021 was tied for the sixth-warmest year on record. And collectively the last eight years have been the warmest since modern record keeping began.

We know from science that these increases that we're observing in temperature recently are driven by increases in greenhouse gases and in particular from human activity. We continue here at NASA and around the world to study the Earth and improve our understanding of the earth.

So we have several launches planned for later this year including launches and instruments that will help us understand mineral dust and its role on climate and air quality, a mission to understand tropical cyclones as well as a satellite launching this fall that will help us better understand surface and freshwater.

We're also designing a new set of earth focused missions called the Earth System Observatory. This is a set of satellite missions designed to work together to provide a 3-D holistic picture of the earth to continue our decades long observations of the earth and improve our understanding.

We provide these earth observations as well as other information to scientists to help improve our understanding of the Earth as well as the stakeholders to help improve and inform decisions. For example, we work with response agencies, decision makers and local governments before, during and after disasters occur to provide near real time information.

In addition to the satellites and instruments in orbit we complement those measurements with surface and aircraft measurement campaigns. Our aircraft campaigns allow us for more detailed observations over targeted locations. In DCOTSS the campaign we're here to talk about today is one of those missions, and I'm going to turn it over to Ken to describe that further.

Ken Bowman: Okay, thanks Kate. Good morning everyone. This is Ken Bowman. I'm a professor of atmospheric science at Texas A&M University and the principal investigator for DCOTSS. So as (Joe) said DCOTSS is short for Dynamics and Chemistry of the Summer Stratosphere. And we're particularly looking at thunderstorms and its effects on the stratosphere.

The project team for DCOTSS includes members from eight universities, four NASA labs, the National Oceanic and Atmospheric Administration and the National Center for Atmospheric Research. So the goal of DCOTSS is to investigate the impact of intense thunderstorms on the stratosphere.

Now most storms, even most strong storms, happen and live out their lives in the lowest part of the atmosphere which is called the troposphere. The strongest storms however are so intense that their updrafts can extend upward into the stratosphere. We refer to these as overshooting storms. You may have seen these dome like overshoots extending above the flat anvil cloud from an airline window or even from the ground.

The stratosphere is very different from the troposphere. It is extremely dry and also contains large amounts of ozone which protects the earth's surface from harmful solar ultraviolet radiation. Now overshooting storms can rapidly carry large amounts of water and pollutants from the lower atmosphere into the stratosphere potentially affecting both the climate and the amount of ozone in the stratosphere.

The existence of overshooting storms like this have been known for many years but the details of how they work and how they affect the stratosphere has not previously been investigated in detail. So DCOTSS is using the NASA high altitude ER-2 aircraft, which is carrying a dozen different scientific instruments to directly measure the material that's coming out of the storm's top into the stratosphere. The ER-2 lets us get high end of the strategy to collect the measurements we need.

So to accomplish the measurements we monitor the locations of overshooting storms using weather radars and satellites, We forecast where the outflow from those storms will go. And we make flight plans for the ER-2 to intercept that outflow.

Now it turns out that the Central US is one of the global hot spots for overshooting storms. So we're operating from Salina, Kansas which puts most of the overshooting storms in North America within range of the aircraft, We're currently in the data collection stage having flown 11 science flights last year and for so far this year We've been very successful in intercepting storm outflow and the preliminary data looks very promising. We'll be in the field here for several more weeks and also make a few flights after the aircraft returns home to California. And so with that overview I'll stop here and turn it back over to (Joe).

- (Joe Atkinson): Okay. Thank you Kate and Ken for those overviews from both of you. I think we can go ahead now and open it up to questions.
- Coordinator: Thank you. We will now begin to question and answer session. If you would like to ask a question please press star one, un-mute your phone and record your name, Your name is required to introduce your question. If you need to withdraw your question, press star two. Again to ask a question please press star one. Thank you. (Unintelligible) your line is open.
- Matt Rahn: Hi this is Matt Rahn from News on 6 KOTV in Tulsa, Oklahoma. We are wondering how many pilots do you guys operate out of Salina, Kansas?
- Ken Bowman: Sure I think I can answer that. This is Ken Bowman. So typically when we're in the field there are two pilots, one who flies the plane and one who monitors the flight from the ground. And there's also a chase car. So the ER-2 is a complicated aircraft to fly and so particularly on landing, they use the chase car to help the pilot and know exactly where he is and how high he is above the runway as he lands.

And so as I said, we have two pilots. They typically alternate flights and we fly every two or three days on average.

Matt Rahn: Okay. And we also wondered, you said there might be a chance that you guys are going to take off tomorrow morning. Is that still a possibility or do you know the plans for that?

- Ken Bowman: Yes. So we're currently go for a flight tomorrow, We pushed the take-off time back a little bit so instead of 7:00 it looks like we're planning to take off at 9:00. So if you want to come up and see that you're welcome to join us here and you won't have to leave quite so early tomorrow.
- Matt Rahn: Okay, yes. We were actually planning on coming up tonight and staying the night overnight.
- Ken Bowman: Okay.
- Matt Rahn: Would there be a possibility of maybe just getting some ground footage at the airport this evening, or I don't know how accessible the airport and aircraft was this evening or late afternoon?
- Ken Bowman: It depends on the timing and exactly when they close the hanger. They have to close early because they have to get in very early to start prepping for take-off. So I'm not sure the best way to arrange contact. Are you in contact with (Joe)?
- Matt Rahn: Yes we're in contact with him.
- Ken Bowman: Okay.
- (Joe Atkinson): Yes, this is (Joe). I can talk to you more offline about that but we can get you guys set-up. It'll probably be easier to do in the morning, but I'll reach out to you after this call.
- Matt Rahn: Yes, I think, yes, with the morning too. I think with the (latest) launch date, that'll be fine too, I think to get some video. I'm here with my other coworkers (Dustin) and Richard Clark. Do you guys have any more questions?

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Man 1: I think that's it for me (unintelligible).

Man 2: You said you made four flights so far this year?

Ken Bowman: Yes.

Man 2: And we know the whole reason we became aware of this program was because we saw the flight over Oklahoma last Tuesday. Do you know where the other flights went?

Ken Bowman: Let's see if I can remember. They tend to blur together after a while. So, we flew up to Wisconsin and through some very recent storms that had happened there. And we also flew over Tennessee and North Carolina. That was a couple of days after the flight over Oklahoma. And we were actually looking at material that had come from those storms over Oklahoma and had been moving east. So we saw it when it was fresh and we saw a couple of days later.

And then we've also done one flight far to the north as far as the aircraft can go basically and as high as it can go to get a good picture of what the stratosphere background looks like, ozone and other chemicals that are present in the stratosphere outside the regions where these storms are having an effect.

Man 2: And how many people do you have in total stationed at Saline?

Ken Bowman: It's on the order of 50. I don't have an exact count but between the aircraft crew and the pilot and the management people and the science team, it's probably about 50 at any given time.

Man 2: And that's just one aircraft? Ken Bowman: Just one aircraft but there's 12 different science instruments on the aircraft. And each one of the science instruments has its science team which is often two or three people Man 2: Got you. And one of the universities you're working with is the University of Oklahoma. Is that correct? Ken Bowman: Yes that's right. Man 2: Okay. Any idea what the timeline will be once the flights are over until, you know, the results are published? Ken Bowman: So the data from last year's flight is now in the public archive. And it typically takes about six months after the deployment ends, after this deployment ends for the data files from this project to be released in the public archives. So the actual science analysis and publishing science papers, that's been ongoing, It's sort of a slow rate because we haven't had a lot of data yet, but that's going to be picking up. And we'll also be starting a lot of modeling activities after the flights are over to go back and do high resolution simulations of these storms and compare those with what we actually saw when we were out in the atmosphere. So what we expect to see is papers being published starting a few months after the deployment ends and then ongoing for at least several years from now,

(Joe Atkinson): (Ray).

| (Ray): | I had a quick question. You guys are taking off tomorrow at 9:00. Do you |
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| | know about how long they plan to be up? |
| Ken Bowman: | Yes. We're planning a pretty long flight. It's currently aimed at seven hours. So the landing time would be about 4:00 p.m. local. |
| (Ray): | Okay. |
| Ken Bowman: | And we'll be flying down over Oklahoma as it turns out tomorrow. That's the plan. |
| (Ray): | Oh cool. |
| Ken Bowman: | Yes, we're anticipating big storms in the Texas panhandle overnight. And as material comes out of those we'll be moving east with the winds over Oklahoma. So that's currently where the flight track is planned. |
| | And once the storms have actually happened, we'll do minor adjustments to get that as close as we can to where we think that material will be. |
| (Ray): | Very cool. |
| (Steve): | So a question and this may be a question for just later. For the take-off and landing, will we have, you know, visible access to be able to get good angles and video of those things happening? Because it's - being that'll be up so long whether we stay that late in the day to get back here or not, I guess it would depend on if we would have good access to, you know, get the video we need for that? |

- (Joe Atkinson): Hey yes, again we can talk about that following the call but we do there will be access where you can shoot take-off tomorrow so it should be good. But I'll reach out to you, so we can talk about this (Steve).
- (Steve): And speaking of tomorrow's flight, do you folks shoot your own video or record your own video or any of the sensors, you know, video cameras or still cameras?
- Ken Bowman: So we have two cameras mounted on the aircraft and one of them we can turn and point. And we use that during the flight to keep an eye on the storms that are within visible range of the aircraft. The downward looking camera is just fixed and it's not as useful for us because we typically don't fly right over the tops of these storms.

But we have time-lapse video from that, so we have a lot of imagery from that. And we have some - the pilot can also carry a camera in the cockpit, and we have some photos. I don't know if we have video. I'll have to check from inside the cockpit depending on whether they have time to fool with the camera while they're flying and doing everything else they need to do.

We do have we do have some B-roll already shot from, you know, that was taken during the flight. So, you know, it's something that, you know, can give viewers a sense of what it's like to be in the cockpit during the flight.

(Steve): Yes, we would love to use any of that video. And if it would be possible to get the video from the aircraft shot tomorrow while it's over Oklahoma, that would be fantastic.

Ken Bowman: We can definitely grab some still images for you.

| (Steve): | Yes, we'd love |
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| Ken Bowman: | Yes, we could do that. |
| (Steve): | That'd be great. Thank you. |
| Coordinator: | (Mark) your line is open - of Aviation Week. |
| (Mark): | Yes, thanks. When did this year's campaign start and when does it end? And for how many years have you been able to do this? |
| Ken Bowman: | Let's see. Let me get my calendar up so, I get this approximately right. So, you know, we started installing the instruments into the aircraft in early May. And we transited to Salina, let me get the date here right, on May 23. So, we've been here since the 23rd. We'll be transiting back to California, to Palmdale, the 30th. |
| | And then we plan to carry out several more science flights the following two weeks probably ending on July 11. That was part of your question. What was the other part? |
| (Mark): | Yes, I just wonder for how many years you've been able to conduct these campaigns? |
| Ken Bowman: | So we were delayed getting in the air by COVID. We had originally planned to start flying back in 2020 and finish in 2021 but we didn't start until last year. So, we flew one deployment last year and we'll do this one deployment this year. |

So the flight operations were last year and this year. The project is actually a five- year project. So, as soon as the flight segment is over the data analysis and data processing will be done, and we'll begin - we'll have another year or two to work intensively on the analysis and publishing of the science results.

(Mark): Thank you

Coordinator: We show no further questions in queue.

(Joe Atkinson): So, unless there are any other last second questions, I'll give us a minute here to see if there are any final questions but if not we'll go ahead and wrap up.Okay, so I'm going to go ahead and wrap it up.

This concludes our briefing for DCOTSS and I want to again thank Kate Calvin and Ken Bowman for giving us some of their time and being here today to talk about NASA and about this mission. And thanks for those of you who dialed in to listen and ask some great questions.

A recording of this call will be made available later. I don't have the exact details on where that recording is gonna be located yet, but you can reach out to me to get that. My email address is (joseph.s.atkinson@nasa.gov) and I'll be happy to get you connected with a recording of that call if you want it. And otherwise, thanks again to everybody who was here today. Have a good afternoon.

Coordinator: Thank you. That concludes today's conference. You may disconnect at this time. Host, please stand by. Thank you.