carbon dioxide is a very very important gas and it's building up very rapidly in our atmosphere and we're tipping towards warmer and warmer conditions so build up a carbon dioxide in the atmosphere a buildup of greenhouse gases in the atmosphere is going to lead to a warmer world there's quite a lot of urgency to see what we can get from a satellite like Oh co2 take a breath as you exhale you're releasing carbon dioxide into the air around you on a small scale you've just demonstrated a process that's repeated every moment around the world
natural and man-made sources pour carbon dioxide into the atmosphere while plants and the oceans of sorting and sometimes release a portion of it back into the air this is the global carbon cycle the earth iselle is breathing nasa's orbiting carbon observatory-2 or oco-2 is designed to study this process from a whole new perspective Oh co2 is based on the original orbiting carbon Observatory mission launched in February 2009 however if that mission ended before it even began as a launch vehicle failure resulted in the loss of
the satellite shortly after liftoff but

by by the time the Sun rose the next morning we had already started to

formulate plans to restart the mission that turned out being a very long process the restart became a CO2 which is nearly identical to the lost OSIO satellite the body of the spacecraft called the bus as a hexagon shaped cylinder measuring about three by six and a half feet a pair of 10 foot long solar array wings generate power for oCO-2 systems the satellite carries one very important instrument designed to
peer down through the atmosphere and

44 00:02:05,049 --> 00:02:11,289
precisely measure the quantity of carbon
dioxide it finds their co2 is a

colorless odorless gas that's formed when one carbon molecule binds to two

48 00:02:16,090 --> 00:02:21,370
oxygen molecules it's a greenhouse gas

49 00:02:18,989 --> 00:02:23,409
meeting in absorbs and then traps radiation is reflected from the Earth's

50 00:02:26,229 --> 00:02:30,189
instrument features a trio of

53 00:02:27,909 --> 00:02:32,169
high-resolution spectrometers that will break this reflected light into its

54 00:02:30,189 --> 00:02:34,659
component colors so you can literally measure the brightness of the light in

55 00:02:36,639 --> 00:02:41,289
these colors that carbon dioxide absorbs
and count the number of molecules throughout the atmospheric column from the top to the bottom first plants and oceans absorb carbon dioxide and also emit it back into the atmosphere this give-and-take is a natural process and has taken place as long as there's been life on the planet but that balance began to shift with the dawn of the Industrial Age that's when human activities began to pump more and more carbon dioxide into the atmosphere an increase of about 40% but the amazing thing is that half of
that build-up has occurred since 1980
and one-quarter of that buildup has happened since 2001 so the rates of buildup of carbon dioxide in our atmosphere mainly from burning fossil fuels and other human activities is growing faster and faster as time goes on from its vantage point in orbit. Oh co2 we'll be able to track Earth's atmospheric carbon dioxide around the globe about twice a month through every season for at least two years although humans have been adding significant amounts of carbon dioxide to
the atmosphere over the past two centuries it also appears that the Earth's plants and oceans have been absorbing more than usual where this additional carbon dioxide is going is one of the big mystery scientists hope to solve with au co2 as the chlorophyll in plants absorbs sunlight and carbon dioxide to create carbohydrates through photosynthesis they reinvent small fractions of this energy as fluorescence the instrument on board Oh co2 will be able to detect this chlorophyll fluorescence allowing
scientists to see where plants are actively growing and whether there's a response in atmospheric CO2 and the two in combination coming up soon in the atmosphere and an indicator of how effective plants are in taking CO2 out of the atmosphere it's just an impossibly brilliant combination from a science point of view. Oh CO2 will circle earth every 99 minutes as it sweeps her south to north. Across the sunlit hemisphere it will pass overhead around 1:30 in the afternoon local time after about a 16 day period the Earth rotates under the
satellite such that we were back on exactly the same ground track we get an opportunity to map out couple of times a month but first Oh co2 has to get into the right place in Earth orbit the spacecraft will get its boost into orbit from a delta 2 rocket a reliable vehicle with a workhorse reputation NASA's launch services program ensures the spacecraft and rocket are ready to fly and manages the countdown and liftoff working in tandem with rocket provider United Launch Alliance the NASA launch services
program team has been preparing for the

oco-2 mission for almost two years now

this will be our first Delta to launch

in just over two and a half years and

we've been very focused on integrating

the oco-2 spacecraft onto the Delta to

the launch team is based at the Kennedy

Space Center in Florida but they

traveled frequently to Vandenberg Air

Force Base to make sure everything's on

track oh co2 has to launch from the

California site in order to accomplish

its mission the oco-2 mission requires a

polar orbit that's an orbit that would
cross the North and South Poles covers a tremendous amount of area of the surface of the earth and the only way to achieve a polar orbit from US soil is from Vandenberg Air Force Base in California months before launch the Delta 2 was transported from the manufacturing facility in Decatur Alabama to Vandenberg where the stages were stuffed together at space launch complex-2 when everything's checked out they start building the rocket on the pad kind of like a Lego system so you'll start with the first stage and in the second stage
which it'll be the part of the rocket

00:06:44.920 --> 00:06:48.819
you attach the solid motors on the

00:06:46.870 --> 00:06:50.019
outside which are the three white little

00:06:48.819 --> 00:06:53.290
motors that are attached to the base of

00:06:50.019 --> 00:06:55.060
the rocket and the and then just check

00:06:53.290 --> 00:06:57.430
it out and make sure as a whole that it

00:06:55.060 --> 00:07:00.100
works the spacecraft was assembled by

00:06:57.430 --> 00:07:02.800
orbital sciences corporation and tested

00:07:00.100 --> 00:07:04.750
at its facility in Gilbert Arizona then

00:07:02.800 --> 00:07:07.180
trucked to the launch site for final

00:07:04.750 --> 00:07:09.129
checkouts and functional tests

00:07:07.180 --> 00:07:11.530
after the satellite is installed atop

00:07:09.129 --> 00:07:13.089
the rocket it's enclosed in the fairing

00:07:11.529 --> 00:07:15.939
that will protect it during the first

00:07:13.089 --> 00:07:18.069
minutes of its climb to orbit once the
countdown begins the launch team will spend the night at their consoles monitoring the health of the Delta 2 rocket and the OCO-2 spacecraft OCO 2 is going to be launching just before 3 o'clock in the morning so we will be arriving on console approximately 10 o'clock at night on launch day it's really a joy to sit back and watch our NASA team work hand-in-hand with our contractor team from United Launch Alliance and also with our fellow government team from the United States Air Force at Vandenberg Air Force Base
and see this whole team pulling all of their components together that are required for the launch vehicle the spacecraft and the range so that we're all ready for a liftoff at t0 after years of careful planning the orbiting carbon observatory-2 mission finally is about to begin this is the most exciting period of any project life-cycle you're counting down the days ready together for launch and then hopefully if everything goes successfully you start seeing that data come back and all
the work which is many many years of
work come to fruition but if you look at
the big scheme of where we are in
understanding climate change the impact
of increasing greenhouse gases in the
atmosphere this is really important so
we're expecting it to give us a real
breakthrough and a real step forward
you