PROSPECTUS SUPPLEMENT NO. 27
(to Prospectus dated August 12, 2021)

Filed Pursuant to Rule (424)(b)(3)
Registration No. 333-257930

ASTRA SPACE, INC.

Primary Offering Of
15,333,303 Shares of Class A Common Stock

Secondary Offering of
189,026,575 Shares of Class A Common Stock

This prospectus supplement amends and supplements the prospectus dated August 12, 2021 (as supplemented or amended from time to time, the "Prospectus"), which forms a part of our Registration Statement on Form S-1 (No. 333-257930). This prospectus supplement is being filed to update and supplement the information in the Prospectus with the information contained in our Current Report on Form 8-K, filed with the Securities and Exchange Commission on February 9, 2022 (the "Current Report"). Accordingly, we have attached the Current Report to this prospectus supplement.

The Prospectus and this prospectus supplement also relate to the offer and sale, from time to time, by the selling securityholders named in this prospectus (the "Selling Securityholders"), or any of their permitted transferees, of (i) up to an aggregate of 20,000,000 shares of our Class A common stock that were issued to certain investors (collectively, the "PIPE Investors") in a private placement in connection with the closing of the Business Combination (as defined herein); (ii) 7,500,000 shares of Class A common stock issued to the Sponsor prior to Holicity's initial public offering and registered for sale by the Selling Securityholders; (iii) up to an aggregate of 92,277,793 shares of Class A common stock that were issued to certain affiliates of Astra (collectively, the "Astra Affiliates") pursuant to the Business Combination Agreement (as defined herein); (iv) up to an aggregate 56,239,188 shares of Class A common stock issuable upon conversion (on a one-for-one basis) of shares of our Class B common stock, par value $0.0001 per share ("Class B Common Stock") held by certain Selling Securityholders and (v) up to an aggregate of 7,676,261 shares of our Class A common stock issued in connection with our acquisition of Apollo Fusion, Inc. ("Apollo Fusion"), which closed on July 1, 2021 comprised of (x) 2,558,744 shares of our Class A common stock (the "Initial Apollo Shares") issued to certain of the Selling Securityholders on July 1, 2021, in connection with our merger with Apollo Fusion, Inc. ("Apollo Fusion") and (y) 5,117,517 additional shares of our Class A common stock (the "Additional Apollo Shares") which may be issued to certain of the Selling Securityholders assuming (a) the achievement of all remaining performance milestones set forth in the Apollo Fusion Merger Agreement (as defined herein), (b) we elect to pay all future milestone consideration in shares of our Class A common stock as required by the terms the Apollo Fusion Merger Agreement, and (c) the per share price used to calculate the number of shares of our Class A common stock to be issued is $11.7243, which is the same per share price used to calculate the number of Initial Shares issued to the Selling Securityholders. The Additional Shares have not been earned and are not currently outstanding. The actual number of Additional Shares issued to the selling stockholders could be materially greater or less than 5,117,517 shares of Class A common stock depending whether and to what extent the future performance milestones are met and/or the actual average closing price of our Class A common stock at the time such milestones are achieved. The Prospectus and this prospectus supplement also cover any additional securities that may become issuable by reason of share splits, share dividends or other similar transactions.

Our Class A common stock is listed on Nasdaq under the symbol "ASTR". On February 8, 2022, the closing price of our Class A common stock was $4.92 per share.

This prospectus supplement updates and supplements the information in the Prospectus and is not complete without, and may not be delivered or utilized except in combination with, the Prospectus, including any amendments or supplements thereto. This prospectus supplement should be read in conjunction with the Prospectus and if there is any inconsistency between the information in the Prospectus and this prospectus supplement, you should rely on the information in this prospectus supplement.

Investing in our securities involves risks that are described in the *"Risk Factors"* section beginning on page 15 of the Prospectus.

Neither the SEC nor any state securities commission has approved or disapproved of the securities to be issued under the Prospectus or determined if the Prospectus or this prospectus supplement is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this prospectus supplement is February 9, 2022.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM 8-K

CURRENT REPORT
Pursuant to Section 13 or 15(d)
of the Securities Exchange Act of 1934

Date of Report (Date of earliest event reported): February 5, 2022

Astra Space, Inc.
(Exact name of Registrant as Specified in Its Charter)

Delaware	**001-39426**	**85-1270303**
(State or Other Jurisdiction of Incorporation)	**(Commission File Number)**	**(IRS Employer Identification No.)**
1900 Skyhawk Street **Alameda, California**		**94501**
(Address of Principal Executive Offices)		**(Zip Code)**

Registrant's Telephone Number, Including Area Code: (866) 278-7217

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions:

☐ Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)

☐ Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)

☐ Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))

☐ Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Class A common stock, par value $0.0001 per share	**ASTR**	**NASDAQ Global Select Market**

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§ 230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§ 240.12b-2 of this chapter).

Emerging growth company ☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Item 8.01 Other Events.

On February 5, 2022, Astra Space, Inc. ("Astra") conducted a launch attempt for National Aeronautics Space Administration ("NASA"). Astra terminated this launch attempt before countdown due to a range asset that went out of service. Astra also attempted a launch for NASA on February 7, 2022, which Astra terminated at T-0 due to a minor telemetry issue. Astra rescheduled the launch for February 10, 2022, during a launch window beginning at 3:00 p.m. eastern time. Astra will livestream this launch beginning at 2:00 p.m., eastern time, on February 10, 2022. You may access the link to the livestream from Astra's website at www.astra.com. Astra will announce changes in the launch window and launch date, if any, on its Twitter account, @astra.

The launch attempts on February 5, 2022, and February 7, 2022, were livestreamed through NASA Spaceflight. The video of these livestreams is available on Astra's Twitter account (@astra), its LinkedIn account (linkedin/company/astraspace) and its website at www.astraspace.com. Astra has also furnished the transcript of the video from these launch attempts as Exhibit 99.1 and Exhibit 99.2. These exhibits shall not be deemed filed for purposes of the Securities Exchange Act of 1934, as amended (the "Exchange Act") or incorporated by reference in any filing under the Securities Act of 1933, as amended, or Exchange Act, except as shall be expressly set forth by specific reference in such a filing.

Item 9.01 Financial Statements and Exhibits.

(d) Exhibits

Exhibit No.	Description
99.1	Transcript of livestream video for launch attempt on February 5, 2022
99.2	Transcript of livestream video for launch attempt on February 7, 2022
104	Cover Page Interactive Data File (embedded within the Inline XBRL document)

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

Date: February 9, 2022

Astra Space, Inc.

By: /s/ Kelyn Brannon
Name: Kelyn Brannon
Title: Chief Financial Officer

Exhibit 99.1

SCRUB - Astra Launch Attempt Scrubbed for NASA's ElaNa 41 Mission

Saturday, 5th February 2022

1. Presentation

Thomas Burghardt: Hello everyone and welcome to this live view of Launch Vehicle 0008 on the pad in Cape Canaveral, Florida. Space Launch Complex 46 at the Cape Canaveral Space Force Station. Right now we are at T minus 22 minutes and counting towards Astra's launch attempt for the NASA ElaNa 41 mission with the goal of deploying four CubeSat payloads into orbit. We're coming to you live today from both Cape Canaveral and Alameda, California, where Astra's headquarters is. My name is Thomas Burghardt, news director for NASASpaceflight, and I'm joined by Carolina Grossman, the Director of Product Management at Astra. Carolina, thank you so much for joining me.

Carolina Grossman: Thank you Thomas, glad to be here.

Thomas Burghardt: Absolutely. Really quick, we want to get into a status update on today's countdown. Like you saw, we're at just under 22 minutes and counting. So Carolina, can you give us a status update?

Carolina Grossman: Sure. Thank you for your patience if you've been waiting for us to begin this stream. The team is actively troubleshooting an issue with an asset on the range. However, we are proceeding and hoping that the issue will be resolved in time for our T-zero time in just about 20 minutes. The team has loaded propellant on to the vehicle and completed all of the checks that need to happen, so everything appears nominal. We're also keeping an eye on the weather. A cold front has moved through the area last night and into this morning, so we are keeping an eye on those surface-level winds, but pending the range asset, we believe everything else is looking good for our upcoming T-zero time.

Thomas Burghardt: We will continue to monitor the status of that range issue and the weather as well and keep you updated as we hear more. But right now the clocks are proceeding as we're coming up on 20 minutes and counting. Once again, Astra and NASASpaceflight are partnering to produce this livestream, so thank you to Astra for helping cover some expenses involved in making that happen.

And while we wait for more word as the countdown proceeds, we're also just going to do a brief overview of today's mission, which is the NASA ElaNa 41 mission. There are four CubeSats on board, three from different university teams and one from the NASA Johnson Space Center. Carolina, do you want to talk a little bit about the orbit that we are targeting today?

Carolina Grossman: Yes. We are heading to an orbit of 500 kilometers and 41 degrees, where we will deploy the four payloads from four different universities: the University of Alabama, Tuscaloosa; the University of California, Berkeley; New Mexico State University; and then NASA's Johnson Space Center has provided that fourth CubeSat on our mission there. Very exciting technology demonstrations and scientific investigations aboard today's mission.

Thomas Burghardt: Thanks Carolina. And of course that map also points out the new launch site for Astra, the first time launching from the Space Coast here in Florida, Cape Canaveral Space Force Station's Launch Complex 46. And Carolina, this is another milestone for Astra as well, yeah?

Carolina Grossman: Yes, this will be our first time launching out of Cape Canaveral, which is very exciting. We are very thankful to our partners at NASA and Space Force and in particular the Space Launch Delta 45 and Space Florida, who have been absolutely wonderful to work with. One of the advantages of Astra's launch system is that much of the system is very easy to transport. So everything you see actually fits in shipping containers and so we can really launch with just a pad and a fence and some intranet. So we have been very grateful for the work from our partners in getting our pad set up very quickly over the last few months to make today's mission possible.

Thomas Burghardt: Excellent. This is also, of course, the first mission with payloads on board an Astra rocket that will be deployed into orbit as actual satellites. The ElaNa 41 mission is part of the Educational Launch of Nanosatellites program for NASA. This mission is also being referred to as the Venture Class Launch Services Demonstration 2 mission, which is the class of launch services NASA uses for these dedicated small satellites, and so that's another milestone for Astra as well. And of course the first launch of 2022 after the first successful flight, late last year, on the LV0007 flight out of Kodiak, Alaska.

Carolina Grossman: Yes, that's all correct Thomas. We are very excited about today. These Venture Class Launch missions help NASA support the development and demonstration of new commercial launch vehicles like Astra's rocket, and these small satellites have a higher risk tolerance. So we can demonstrate the system and mitigate risks and provide access for future small spacecraft and missions. These CubeSats have a large role in exploration, technology demonstration, and investigations at NASA, because they provide a low cost platform for these missions.

Thomas Burghardt: As we come up on about T minus 17 minutes here, Carolina, can you talk us through what's going on in the countdown now and the big milestone that we're about to hit in about a minute – or two minutes?

Carolina Grossman: Sure. So we are just about to enter our terminal count, which is the final 15-minute point where we complete the final preparations for launch. Before that we'll see a test of our water system, so that will kind of be our signal, and we'll wait for the go-ahead from the range issue that has hopefully been resolved.

Thomas Burghardt: And on that point, we can actually hear the teams going through the countdown at this point coming up on that terminal point milestone, so let's go ahead and listen in to the countdown.

Carolina Grossman: Hi everyone, if you're looking, we've held the countdown at T minus 15 minutes and we'll give you an update as soon as we have one.

Countdown Team 1: Astra flight on countdown. Based on updates from the Rock[?], Astra is just going to finish running its steps from step 122 to 140 and then stop at terminal count entry. Step 122 Tango, can you please reactivate machine AV 1 power… [fade out]

123 Tango toggle on power ESEs.

Countdown Team 2: Toggling power ESEs.

Countdown Team 1: At this time, please confirm status of ESE… Tango toggle drive spin both…

Carolina Grossman: And we do have an update for you all. Unfortunately, due to a range asset that has gone out of service today, we are going to stand down from today's launch attempt of the ElaNa 41 mission. Our launch window does extend to tomorrow as well, at the same time, 1 to 4 PM Eastern Time, and you can follow us on Twitter @Astra for updates on the latest. Thank you for joining us today and we're going to give it another try tomorrow.

Thomas Burghardt: Absolutely. Again, thank you to Astra for partnering with us on this livestream to help make this happen. We'll be back with more coverage hopefully tomorrow, pending the resolution of that range issue, like we said. So we hope you all come back and tune in again tomorrow and until then, we'll see you then.

[END OF TRANSCRIPT]

[END OF TRANSCRIPT]

Exhibit 99.2

Astra Space Launch 2022

Monday, 7th February 2022

Thomas Burghardt: Hello everyone and welcome to today's live broadcast. You're looking at a live view of Launch Vehicle 0008 on the pad in Cape Canaveral Florida. Astra is just under 60 minutes away from conducting a launch for NASA with a goal of deploying four CubeSats into low earth orbit as part of the ELaNa 41 mission. We are coming to you live today, both from Cape Canaveral, Florida and Astra's headquarters in Alameda, California. My name is Thomas Burghardt news director for NASA Space Flight here in Florida and I'm joined by Carolina Grossman, the director of product management at Astra in California. Carolina, how are you doing?

Carolina Grossman: Great. How are you Thomas?

Thomas Burghardt: I'm doing well. Any launch day is a good day and excited for today's launch attempt. Astra and NASA Space Flight are partnering once again to bring you this livestream. So thanks to Astra for helping make that happen. also as usual, we will be taking your questions over the course of today's broadcast. So if you have a question tag us with @NASASpaceFlight in chat, and we're going to get through as many of those as we can, over the course of today's coverage. To start it off, let's give an overview of today's mission, which is the first Astra mission to attempt to deploy payloads into low earth orbit for CubeSats for three universities and a NASA center and we actually have a video with the CubeSat teams, about this mission so let's take a look at that.

"We are the UA space team from the University of Alabama building the Bama One CubeSat. I'm Kyle Rankin, a PhD student in New Mexico State University. We're working on the INCA, which is the Ionospheric Neutron Content Analyzer. It's the 3U CubeSat. Our project is a 2U CubeSat that aims to test a quantum gyroscope. My name is Sam Pedrotty. I'm from the NASA Johnson Space Center and I am here with the R5S1 spacecraft. The main mission of Bama One is to test the capability of a one meter squared drag cell on a 3U CubeSat and we're going to measure neutron influx in low earth orbit. Gyroscope made in diamond, which uses like lasers and magnetic to somehow measure rotation. R5S1 is exciting because it's doing a few different things. One of them is seeing exactly how cheaply we can build a CubeSat and the secondary payload we're happy to host, from The Los Alamos National Laboratory and it's effectively a license plate in space. This is the first CubeSat New Mexico state's ever done. We've got about five people currently working on it, but over the course of the project, we've had probably around a hundred students touch the satellite. This is really like our first CubeSat mission. Putting it together was a great learning experience as well. So we can kind of take everything we learned about building CubeSats in general and then apply it to hopefully future missions as well. Learning everything is fun. I've learned a ton doing this because we've had to do start to finish from an idea all the way to a completely integrated spacecraft with a very small team and then of course it's just been phenomenal to work with launch services programs, CSLI, and of course you all at Astra."

Thomas Burghardt: So those are the payloads that are intended to be deployed from today's mission and on that front, we're just under 55 minutes and counting. So Carolina, can you give us a status update of where we are in the countdown?

Carolina Grossman: Sure. As you can see that frosty white in the middle third of the rocket indicates that propellant is being loaded onto the vehicle. The team is also conducting the final checks of our flight safety system now and so far everything is looking nominal. We're keeping an eye on those clouds, but at this point we are looking good for launch.

Thomas Burghardt: Excellent. In addition to today being the first Astra launch with payloads on board, it's also the first launch from a new launch site; the rocket is at space launch complex 46 at the Cape Canaveral Space Force Station in Florida. Carolina, can you tell us a little bit about the new launch site?

Carolina Grossman: Yes, we're really excited to be launching of Cape Canaveral and be able to provide our customers access to more orbital destinations with our first launch out of Cape Canaveral today. We are very glad to be working with our partners at NASA and Space Force, specifically the Space Launch, Delta 45 and Space Florida who have been absolutely wonderful to work with, and integral in making today's, launch a reality. I think one of the biggest advantages of Astra's launch system is that really everything that you see in front of you here fits inside shipping containers and can very easily be sent to a new launch site and set it up very quickly, but we do rely on a lot of support from our partners in order to make everything possible. So we're very excited for, another first in Astra's history today.

Thomas Burghardt: Excellent. Also today is the LV0008 vehicle, which is the latest rocket 3.3, a vehicle that Astra is ready to launch, and but that means there were still some minor changes to the rocket since the last, launch. Carolina can you talk a little bit about what has been changed since LV0007 which made the successful orbital test flight last year?

Carolina Grossman: Sure Thomas. Yes so if you watched with us live or on YouTube after the fact, our LV0007 launch in November was our first successful, orbital launch and we had a test payload aboard that vehicle that was not deployed. So given that this was such a successful mission, we have made very few changes to this vehicle. there were some software upgrades to ensure that we can successfully deploy our payloads on this mission because this will be our first time actually deploying payloads, and then we've made some changes to the launch system to ensure that we can successfully launch from Cape Canaveral, making modifications to our communications, our flight safety system and our launch or our ground support system, to comply with regulations and ensure compatibility with the new, facility so, it's again, our first launch out of Cape Canaveral and we were able to make these preparations for launch in just a matter of months, which we are very, very thankful for all of the hard work done by the Astra team as well as NASA, FAA, Space Force and all of our partners.

Thomas Burghardt: Excellent. Of course, all those are pretty minor changes, right? Visually the [inaudible] here looks pretty similar to the one that was launched last year.

Carolina Grossman: Yeah, that's right. It's mostly been software changes, and other things that don't really appear visibly. It's a very similar rocket, to what we have today.

Thomas Burghardt: Yeah. For those who are new to the Astra rocket watching community, if you would, we can just do a brief overview of the rocket again. Rocket Three is a two stage rocket, fueled by liquid oxygen and kerosene and, right now the most of what you see here, Carolina is the first stage, right. That big, long, bare metal too, is that first stage and then the upper stage and payloads are hidden away in that top part of the rocket.

Carolina Grossman: Right. That's correct. So, the part with the NASA logo, that's the top piece of our fairing and our payloads that will be deployed on today's launch are beneath that fairing and then we've got our upper stage, system it is where you see, the American flag and the Astra logo on the vehicle. Our upper stage is behind that, covering and finally the first stage is that shiny metal that is slowly being covered by the frost as propellant loads onto to the vehicle.

Thomas Burghardt: Gotcha. So we'll definitely keep an eye on that as propellant load, uh continues and again, we're at T minus 50 minutes away. Launch is currently targeted for the opening of the window at 1:00 PM Eastern time. Uh the window does extend all the way to 4:00 PM Eastern time should that be needed. As far as other factors, obviously technical items all seem go as the countdown continues and Carolina, what are the weather watch items that we're looking for, even though the weather is currently green I believe?

Carolina Grossman: Yes. The weather is green, we're just keeping an eye on those clouds, but otherwise everything from a weather perspective is in the green at the moment.

Thomas Burghardt: All right. Starting to get some questions in chat. So we'll go ahead and head that way again, if you have any questions about today's mission tag us with @NASASpaceFlight and we're going to try to answer as many of them as we can, and the first question is what is the height or altitude and orbital inclinations that these satellites are planned to be inserted into?

Carolina Grossman: yes, so our target orbit today is an altitude of 500 kilometers and an inclination of 41 degrees. You can see that trajectory, image appearing on the screen now. So we'll be flying out over the Atlantic Ocean this time and heading to 500 kilometers, 41 degrees.

Thomas Burghardt: Absolutely and the four CubeSats will be deployed into that orbital low earth orbit which is a pretty standard mission profile for something like a CubeSat. In fact, most of them don't even need that, that specific of an orbit, it's kind of a general, requirement for just a low earth orbit, get into orbit and deal with the rest later. These CubeSats are one of those like low cost ways of getting access to orbit, especially for universities, which of course three of the CubeSats on board are from university teams and, there's a common payload for small set launch, such as Rocket Three. Got another question here, Nicholas is asking, is the upper stage ether engine capable of relight. So that upper stage engine, which powers Rocket Three's payloads the rest of the way to Orbit.

Carolina Grossman: Um yeah, I can talk a little bit about the capabilities of the engines that we have, on this rocket. So, um starting with the upper stage since that was the question, the upper stage ether engine, we have a single engine on that upper stage. It is a pressure fed engine. It's propelled by locks and kerosene, same as the first stage, and produces a thrust of 740 pounds. On the first stage, we have five Delphin engines which produce a thrust of 6,500 pounds each for

a total of 32,500 pounds on the first stage and again, same propellant on both stages, which is liquid oxygen and kerosene, and both the Delphin and ether engines are developed entirely in-house by our team in Alameda, California. I think one of the most unique things about our facility is that our engine test facility is literally right across the road from our production facility, our factory floor. So you can run a test, get some data, make changes, and bring the engine right back over for more testing. It's one of the unique advantages that we have in terms of our ability to learn and test our engines as quickly as possible.

Thomas Burghardt: And on that front, if you have not seen it yet, you should definitely check out the factory tour with NASA Space Flight. Actually, myself, went around with Bryson Gentile, the vice president of operations at Astra and got a really cool look at where all these engines and rockets are both built and tested over in the test cells in Alameda also very cool. next question in chat comes from a spaceman who says, is this space launch complex? The new small set launch pad that I heard was being built, is this a new pad?

Carolina Grossman: No, actually. So, we are launching out of space launch complex 46, which is SLC or SLC46 and it is actually the home of multiple launches since the 1980s, including, Trident II and Athena I and II systems. So, this is actually a very well established Launchpad, we might say. However, there hasn't been a launch from this launch complex since 2019 and actually, if you are lucky enough to be around the Cape Canaveral area today, you can get a great view of the launch complex and this is from a Jetty Park, I believe.

Thomas Burghardt: Yes. A big shout to Steven Mar, who is out in the field for us today, bringing us a camera view, we've got some of the Cape Canaveral crew out in force today, now that they're kind of in our backyard, Astra coming to Florida this time. Okay, that is the great public view and if you want to head out for this launch, Jetty Park or any of those beaches to the south of port, I highly recommend it. But yeah, so this is actually a more established launch site, although it is pretty simple. You can still see the rocket is pretty much just propped up on the slab of concrete out there. Carolina, if you would just want to talk a little bit about the requirements that Astra has to use a launch site?

Carolina Grossman: Sure. So, the launch site, we worked very closely with our partners, the FAA, in this case, NASA and the space force in order to be able to set up this launch site. And really, we work very closely to make sure that our system is compatible, that we can communicate with the vehicle and the other parts of the system that we can comply with the safety regulations that are in place for different ranges, for different reasons. We generally launch out of, or most commonly have launched out of Kodiak, Alaska in the Pacific Space Port, complex in Kodiak. So this is a new experience for us. We have different weather conditions, better this time of year than they are in Kodiak. So I know our red team on the ground has been enjoying that, but in general, really, we can bring all of our equipment to the launch site and then we work with our partners on the range to make sure that we can safely operate and, communicate with all of the shared interfaces that we have with the range.

Thomas Burghardt: All right. Very cool, and then that means actually we'll be able to go to other launch pads either here at Cape Canaveral or at other launch sites as well, right?

Carolina Grossman: Yes, that's right. Our approach is that, we can deploy to a new launch site, in theory very quickly and, we've been able to thankfully prove that here with our first launch out of Cape Canaveral and you can keep track of Astra's future plans by following us on Twitter @Astra. We're going to focus on this mission and all of the first here today, but we have a lot of exciting plans for the future.

Thomas Burghardt: Very cool. Looking forward to those as well. Keeping going with the questions again, if you have a question tag us @NASASpaceFlight, I'm going to keep them coming here. We are at team minus 43 minutes and counting and everything proceeding well so far. We'll continue to provide updates as we hit some different milestones later on here on the countdown, but Elias, I believe is your name, says, when is the next launch window, if this one gets canceled for any reason?

Carolina Grossman: Yeah. So we are hoping for a successful launch today, but, all future launch opportunities will be announced, on our Twitter. That's the best place to get information as close to real time as possible. So you can follow Twitter @Astra for updates on the next launch opportunity if we are unable to launch today for any reason.

Thomas Burghardt: Excellent, and again, stay tuned on that, but again, everything on track right now for the opening of the window. Again, if you are just joining us, today's launch window opens at 1:00 PM Eastern, and that is where the clock is currently ticking to, just about 42 minutes to go and the window extends until 4:00 PM Eastern. So we've got time if any issue were to come up, but nothing so far. Actually seeing a question shared about, is this Astra's first orbital launch? And I can take that one because the answer is no and I believe we even have video to recap Astra's 2021, which included the first mission to reach, orbit, let's take a look

"Hard problems attract amazing people and the chance to get to work with a bunch of really great people on really hard problems is something very special. Four years ago, Adam London and I quietly founded Astra with a bold mission to improve life on earth from space. Our goal is to expand access to space so dramatically that we deliver things to orbit every day, but it always starts with one. Our next objective is to execute. And there you have it, Astra's LV0007 has successfully reached orbit. There is a new orbital rocket. This is an incredibly hard thing to do. Continuing to do it is incredibly hard, so we're just getting started."

Thomas Burghardt: It was very cool for us to be part of broadcasting the LV0007 launch last year, and happy to be back again for LV8 with the first mission to deploy payloads hopefully, but keeping the questions coming. Next one here, Paul is asking, does the first stage get broken up into parts to ship to the launch site and if so, how is it sealed?

Carolina Grossman: That's a great question. Actually, the rocket fits tip to tail inside a 45 foot shipping container. The overall length of the vehicle is 43 feet. So we do not need to put together any of the stages or make the stages to each other at the launch site.

Thomas Burghardt: There you go. thank you for your question, Paul, and then also another question here from Sean that I'm going to have a follow up question to actually, but Sean asked what will Astra do to increase their ability to launch on a more regular and frequent basis?

Carolina Grossman: Right. That's a wonderful question. Our mission at Astra is to improve life on earth from space and one of the ways that we're really focused on doing that right now is providing frequent access, in the form of regular launches, as often as possible and I think really the way that our system is designed to be so portable, easy to transport, our approach of fast iteration and learning, are some of the main ways that we expect to, be able to increase our launch cadence and, while we're focusing on today's mission, because this is a very exciting mission, our first launch out of Cape Canaveral, our first payloads that will be deployed to space, if you want to keep track of Astra's future plans, please follow us on social media and check out our website for more updates.

Thomas Burghardt: Absolutely, but in the near term, there was also actually a milestone that Astra recently reached, which will play into of course, more regular and frequent launches and that is this Part 450 launch license that the FAA issued, the first one that they have issued and Astra being the first company to receive it. Can you tell us a little bit about what the heck a Part 450 launch license is?

Carolina Grossman: Sure. So Astra received the very first Part 450 license from the FAA on February 4th and that is what has allowed us to conduct our launch operations today. It is a licensing structure that helps simplify and consolidate a lot of previous licenses, like Part 415, Part 417, Part 431 and Part 435 and so this new Part 450 license was, first introduced back in October and now all, applications made after this date, will be under this new licensing regime. And really the main purpose is to support greater innovation, lay the foundation for the FAA to keep pace with, more frequent rocket launches. And it does allow for higher launch cadence and greater flexibility. So, it's much easier to add additional sites and new launch vehicles, under this license sensing regime. So we are very proud to be the first company to receive this license, and we plan to continue leveraging the full potential of its flexibility. If you are interested in learning more about Part 450, check out Astra.com/newsroom, where you'll find a detailed piece there by Tom Marrietta [ph] who's, our principal launch licensing manager and really led that effort. So, shout-out to you Tom and thanks for all of the work to make that happen.

Thomas Burghardt: Very cool. Of course, that was the license we were all waiting for. I know everyone on the space, Twitter verse was looking for that license to come out on, Friday before the most recent launch attempt and I'm glad that we finally got that in and we're ready to go into launch campaign and now we're here back on Monday for another attempt. Hopefully today we will have some better luck for the attempt, again, everything going well, so far, we're under 37 minutes to go. Carolina, how are things looking from the technical side of things?

Carolina Grossman: So far, everything continues to appear nominal. We are checking off the steps in our countdown procedure and, kind of the next major milestone that we anticipate is, some software configurations at around T minus 30 minutes, before we step into our final preparations and our terminal count.

Thomas Burghardt: Great to hear. We've got some more questions in the queue, so let's see what's coming up next. A question, does performing static fire test put an additional strain on the rocket before launches?

Carolina Grossman: That's a great question. So, if you are not familiar, one of the final preparations that we complete is a static fire test of the vehicle which means we essentially go through everything exactly as we will on launch day with the exception of letting go of the rocket. So, we light all five of those Delphin engines, and run them for several seconds to verify that everything is working as it should and then we shut down everything and that is one of our final steps in preparing for launch. So the rocket is designed specifically to be able to handle this test in addition to multiple launch attempts. So it does not cause any issues because the system is designed to be capable of that.

Thomas Burghardt: That's good and that's, even though this rocket is a one-time use rocket, it's an expendable rocket, but the engineers when designing the system, design it for multiple cycles of fueling pressurization and engine firing, right?

Carolina Grossman: Yes, that's correct. So we design our system, for multiple tests and all to be able to go through all of the necessary launch preparations with margin and including that static fire test.

Thomas Burghardt: I believe we actually have a video of that static fire test. Michael, can we show that? 10, water on, 8, 7, 6, 5, 4, 3 – shut down."

Thomas Burghardt: And again, that was completed, last week I believe and that actually ties back into our next question here, because Khalid asked how much time does it take to set up a Launchpad for Astra?

Carolina Grossman: That's a wonderful question. So, everything that you see that, is not part of that, like that fixed infrastructure of the pad, there are some lightning towers, there are some lighting fixtures that you can see, those all stay on the pad, but everything else we bring with us and we can really set up a pad in a matter of days, with a red team of about five folks who are on the ground setting up everything. So we really design our system to be as nimble as possible and like we've mentioned before everything fits inside shipping containers and can be set up by a very small team in a very short amount of time.

Thomas Burghardt: There you go. We have two questions next coming up that I'm actually going to combine into one question because I feel like they go together. One, person is asking, do we know much about today's payload? And then the other question is how does this improve life on earth? So, Carolina, can you talk about these missions and how they're improving life on earth?

Carolina Grossman: Sure. So there was a brief intro video that we showed at the top of the broadcast, but there are four teams that each have a CubeSat aboard today's mission. They come from the University of Alabama, Tuscaloosa, University of California at Berkeley, New Mexico State University and NASA's Johnson Space Center. So, I can talk about each of those four spacecrafts a little bit. Bama one is from the University of Alabama, Tuscaloosa and it's a technology demonstration mission that will demonstrate a drag cell module and rapidly deorbit the satellite and this helps reduce space debris and reduce the risk to operational satellites, space stations and crude vehicles, which is really interesting and exciting. INCA, which stands for Ionospheric Neutron Content Analyzer is from New Mexico State University. It's a scientific investigation mission that

will study the latitude and time dependencies of the neutron spectrum in low earth orbit for the first time and the purpose of this is to improve current space weather models and mitigate threats to space and airborne assets and the measurements come from a brand new directional neutron spectrometer, which is being developed in conjunction with NASA's Godard Space Flight center and the University of New Hampshire. CubeSat with a Q is from the University of California, Berkeley.

It's a technology demonstration mission that will test and characterize the effects of space conditions on quantum gyroscopes, using nitrogen vacancy centers in diamond and these nitrogen vacancy centers are defect points in diamond with quantum properties that allow scientists to form gyroscopes that measure angular velocity. so these technologies are well suited for space because they are very accurate, small and tolerant to radiation and our fourth payload is RFS1 from NASA's Johnson Space Center in Houston and it is intended to demonstrate a fast and cost effective way to build successful CubeSats in addition to demonstrating some technologies that are important to in-space inspection, which could help make crude space exploration safer and more efficient. R5S1 could prove a cheaper way to demonstrate crucial technologies like high performance computers, cameras, algorithms, and a new way for satellites to transmit pictures to the ground and so those are four very different, spacecrafts on board, but they all have very exciting missions that they are going to conduct and the second part of that question is really how do these prove life on earth and, getting better weather information, getting more technology from high performance computers, making those, spacecrafts more accurate and able to deorbit more easily, to protect other spacecrafts and be responsible stewards of space. Those are all really important missions that maybe you won't notice in your day to day life, but they definitely make an impact. So we're very proud to be selected as the launch provider for this mission and these four incredible payloads.

Thomas Burghardt: Absolutely awesome to hear about those payloads and if you ever want to know how smart the people working on these space flight missions are just read about their payloads, because there's some really cool stuff in there. We've just passed the 30 minute mark and I actually want to cut it over to the countdown net because the teams are actually moving into the final software load. So let's listen into Chris Hoffman and the rest of the launch team.

Chris Hoffman: Tango and AV-1 managed pulling, toggle do only ground polling.

Speaker: Tango, do only ground polling.

Chris Hoffman: Okay. This takes us into step 119 loading, late load configs. Delphin, are you ready?

Speaker: Delphin is ready. Please provide.

Chris Hoffman: Okay Igniter is 180.

Speaker: Loading config, 18 Victor three, matter controller, load

Speaker: Engine alpha 174

Speaker: Loading config 174 Victor, load.

Speaker: Engine Bravo, 175 Victor One.

Speaker: Loading config, 175 of Victor One, Bravo, Load.

Speaker: Engine Charlie, 176, Victor 13.

Speaker: Loading config 176, Victor 13 on engine Charlie, load.

Speaker: Engine Delta 177, Victor 13.

Speaker: Loading config 177, Victor 13 on engine Delta, load.

Speaker: Engine echo, 178, Victor 15.

Speaker: Loading config 178, Victor 15, on engine echo, Load.

Chris Hoffman: Ether, please provide your late load config.

Speaker: Ether Config 18 Victor seven, please.

Speaker: Loading config 183 Victor seven on ether. Good load

Speaker: And GNC. Please provide an updated guidance config for us.

Speaker: Five Victor, 143.

Speaker: Loading config five Victor, 143 on guidance. Good load

Chris Hoffman: Copy. Good loads in all late load configs per step 120 tango in VB One, turn on/off PDBs, please give me a GNC setup.

Speaker: Toggling GNC setup.

Thomas Burghardt: The teams have finished their late load configs for all of the engines and as well as the guidance system. So that's another milestone checked off the list. Now coming up on T minus 26 minutes and counting and everything is still on track for an on time liftoff. Again, the launch window opens at 1:00 PM Eastern Time and everything on track right now. In the meantime, we've got some more questions. So why don't we head that way? Carolina, my next question, is this the first launch from Cape Canaveral, Florida? And that means reaching some different orbital inclinations because we touched on this during the last broadcast over in Kodiak, Alaska, how different launch sites lend themselves to different orbits. Can you talk a little bit about that?

Carolina Grossman: Sure. So, yes Thomas you're exactly right as you just mentioned. one of the things that helps determine which orbits you have access to in space, is the location where you launch from in particular, the latitude. So Kodiak, very far north, is great for reaching higher orbits like polar and sun synchronous orbits, but a lot of spacecrafts want to be closer to middle inclinations for a number of reasons; for tracking weather, for being communication satellites that want to be over more populated areas of the globe. So the Cape Canaveral location is great reaching some of those mid inclination locations. So, today's mission will be heading to an inclination of 41 degrees and an altitude of 500 kilometers. So, great, so, just to recap, the Cape Canaveral location will help us provide our customers with access to new desk destinations in space and, we are very grateful to our partners for helping make this launch possible

Thomas Burghardt: And a bit of orbital mechanics to go along with that. Sometimes if you have a mission that the inclination maybe isn't as important to the mission and other factors for the orbit are more important, you might want to launch closer to the equator because it is simply easier to reach orbit in the first place if you launch closer to the equator, such as Cape Canaveral, because you get a little bit of extra boost from Earth's spin. so that's another factor that plays into how the launch sites are chosen for different missions, but speaking of that, this is the first Astra mission launch here in Cape Canaveral like we just talked about, also the first Astra mission to deploy payloads into orbit. So those are very big historical milestones for Astra, but we also wanted to just pay a quick tribute to another historical space happening that happened in space history today, right Carolina?

Carolina Grossman: That's right. On February 7th 1984, so 38 years ago, NASA astronaut Bruce McCandless II became the first human being to walk in space untethered. McCandless stepped out of the space shuttle challenger and into nothingness as he moved away from the spacecraft. He floated freely without any earthly anchor and if you've ever seen those images of an astronaut floating in the blackness of space above earth, that is the spacewalk that we are talking about today and 38 years ago today that incredible image was, was taken.

Thomas Burghardt: Can you hear that everybody in chat? There's the shuttle reference of the day. It only took us a little under 40 minutes, but we got to the shuttle reference. It's an NSF stream. We have to, it's a rule. Moving on, we've got another question to talk a little bit about the mission controllers who are controlling the countdown. Like I mentioned, Chris Hoffman is our flight director, but there is a team at Astra in Alameda who is behind today's launch and Carolina, can you give us an introduction to the team today?

Carolina Grossman: Sure. So, we have our team here at mission control. They are sitting directly behind me when my camera is on, but they are right behind me. Starting with, Chris Hoffman with the Mohawk. He is our flight director. Hill Hudson is our flight activities officer or FAO with that googley eye console. Chris May is our command and data handling officer, and Claire Gauthier [ph] in the orange sweater is our, tango, who's our vehicle controller, who's actually the one that you hear, loading the software configurations onto the computer. Christopher Rossi, the wind destroyer is our GNC, um representative today and then finally we will have our flight safety FTS person Rose, who seems to be up from her desk at the moment.

Thomas Burghardt: I think you'll see those teams working throughout the rest of the countdown and the flight today. Again, 21 minutes and counting, all systems go right now. Those are the personnel in Alameda, California at Astra's headquarters. There are also some other members of the team here in Cape Canaveral, right Carolina?

Carolina Grossman: Yes, that's right. So, on the ground in Cape Canaveral we have a team, a very small team we have, known as the red team. Ryan Hirschfeld is our safety officer. Adam Frisch is our red lead. Robert Freeman, Eric Larson, Sam Herr stat, Benjamin Weiland, Rusty Haller, are our red team and then we have Eric Steiny Steinberg, and Tom Cannon who are our IT folks on the line which, we are thankful for all of your help in setting up our systems and hope you're enjoying the Florida weather, which is much nicer than it would be in Kodiak in February and in addition to helping us to be nimble, has also helped us limit travel to have such a small team on site, which has been a key consideration during the ongoing COVID 19 pandemic. All members of the team are taking regular COVID 19 tests to protect the health and safety of everyone involved in this mission.

Thomas Burghardt: Excellent. As we come up on 20 minutes and counting the teams are working through some additional steps in the countdown, Carolina, can you just give us an update what the teams are working on now?

Carolina Grossman: Sure. So, we are about to step into our go, no-go poll, to get into our terminal count and, uh essentially the team is just confirming that all of the systems are ready for launch, that our winds look acceptable and in just a few minutes here, we'll see our water deluge test and we will step into our terminal count from there.

Thomas Burghardt: That water deluge test is a very visible sign that the countdown is proceeding and getting towards that terminal count, you will not mistake it when it happens and we'll draw your attention to it again in a couple minutes here. Before we get into that, I'll take a couple last minute questions before we really get into the business end here. Nico asks what material is this rocket made of.

Carolina Grossman: That's a great question. So, one of the things that makes our system unique is we try and use very simple materials. Much of the first stage you see is made out of aluminum. We try and stay away from carbon fiber and any really fancy aerospace grade materials and that allows us to, manufacture quickly and cost effectively so that our customers can have the best access to orbit that they can have.

Thomas Burghardt: And that's a tradeoff, right? That's a tradeoff between the cost of manufacturing and producing those vehicles and the performance they give and in order to use cheaper materials, you have to design it so that obviously the vehicle will still perform as you need to?

Carolina Grossman: Right. It's something that we're constantly working towards and trying to push the envelope with what we can get out of our vehicles.

Thomas Burghardt: There you go. Uh so I'm saying some notes in chat that mission control in Alameda is approximately 50% Chris and we have a thing in NSF where a lot of people are named Chris as well. So, I mean, there's this trend going on between NASA and NSF, I wanted to notice that I see that in chat and I appreciate the comment.

Carolina Grossman: Yes, we do have quite a few Chris' but what you're not seeing when we see that mission control is that we also have the engineers, the responsible engineers for each of the systems that you may hear, on and off, coms, as we switch to the countdown. They're distributed throughout our factory at their normal desks, who are monitoring their systems and, uh there aren't too many Chris' in that group on the rest of our coms. So, a bit of a high Chris sample in that mission control shot.

Thomas Burghardt: There you go, got to have a larger sample size for a more representative, a better representation of the team for sure. T minus 17 and a half minutes and we are coming up on that water test. You'll see, actually Carolina, why don't you talk about, what are we going to expect with this water test coming up?

Carolina Grossman: Well, I believe I actually just heard that our water system is correctly configured and does not need to go through that test at the moment, but, uh if you joined us earlier and saw that static fire video, there is a large plume of water, that shoots out from the base of the vehicle and that's for, um fire suppression and making sure that nothing on the ground close to the vehicle is ignited when we light those five first stage engines. So, we will look out for that water deluge in the final moments of our terminal count.

Thomas Burghardt: The launch team is doing that thing where they make me look silly again, just to say, "Oh, we already tested it. It's good to go; we're not going to do the fancy thing that you just alluded to," but its fine, whatever it's okay. All right, so we're coming up on just a minute and a half, again at that 15 minute mark, we're going to expect a final clear to launch poll, actually at around 16 minutes, excuse me. We'll be into the terminal count at T minus 15 minutes. So, in a couple seconds here, let's go ahead and listen into the countdown, as flight director – I'm sorry, I take that back. Did I have the time wrong? I think I might have. We will stand by for the poll in a little bit, my apologies. Some other steps going before there, but either way we are coming up on terminal count of T minus 15 minutes. In the meantime, let's go back to some more questions then, if you have questions tag us with @NASASpaceFlight and our first question, oh, this is going to set up Michael nicely, are there any cameras on the rocket says, Henie [?].

Carolina Grossman: Yes, Henie, we have lots of onboard cameras and we hope to get some great, great views of them during our flight today. This is a gray view from one of our cameras, which will hopefully turn into a much nicer shot, but we do have –

Thomas Burghardt: Some venting going on there, there you go.

Carolina Grossman: Here we go. This is a great view, of the upper stage, this kind of top right part of the screen, that's the fairing. So we will see that fairing open up, and the payloads deploy, um during our flight.

Thomas Burghardt: Well of course, people are looking into those onboard views as well and there's a great view of the payloads. You can actually see their payload deployers mostly, the CubeSats sit in a deployer on top of the upper stage and, hopefully once that fairing separates and the rocket is up into orbit, we should also hopefully get to see them flying away, which will be very cool but those are those four CubeSat payloads, ready for their ride to space just about 15 minutes from now. All right, and as we enter 15 minutes, Carolina, do you want to give us an update on what the teams are going to be looking through now, leading up to that terminal count poll that's coming up in a few minutes and then the final steps of the countdown.

Carolina Grossman: Sure. So in just a few moments, we'll listen into that go, no-go poll, right now, the team is working through, the final preparations and we are going to move into the last steps of our countdown, which include making sure that all of the systems continue you to be nominal and then we will hand over the vehicle to internal control, and, in the last moments before flight.

Thomas Burghardt: Absolutely and, for those who are just joining us, let's do a great brief recap of what we're about to watch as well. Again, this is the ELaNa 41 mission for NASA. It is the first mission that Astra is launching to deploy payloads into orbit and also the first launch that Astra is conducting from space launch complex 46 at the Cape Canaveral Space Force station in Florida. The mission is also called VCLS Demo II, which stands for Venture Class Launch Services, NASA's dedicated small set launch services program and the four payloads on board, three of them are from different university teams from the University of Alabama, University of California, Berkeley and New Mexico State University, as well as a fourth payload from the NASA Johnson Space Center. All of those payloads were selected through the CubeSat launch initiative from NASA and sponsored to be put onto this mission, and that is of course, why you see that beautiful NASA meatball logo on the payload fairing today, indicating that today's mission is for the American Space Program. As we come up on 13 minutes here, teams are going through the last couple of steps that precede the go, no-go poll. And we'll be listening into that in just about two minutes here. Meanwhile, visually you're seeing the rocket on the pad. You can see the one tank getting frosty and the lower tank below it, Carolina, I believe that is the kerosene or the yeah – the kerosene tank on the bottom, which is at mostly ambient temperature. You won't see any, frost on that, but the liquid oxygen tank above it is super cool, because obviously oxygen is not liquid at ambient temperature. So that's why we're seeing that frost on the vehicle, right?

Carolina Grossman: Yes, that's right. So, that sort of middle third of the vehicle is actually the same sort of silver color that you see in the bottom part of the vehicle, but it is covered in a coat of, frost from that very, very cold liquid oxygen and so our propellants on both stages are liquid oxygen and kerosene. We use RPX, which, is essentially a highly refined form of kerosene or mineral spirit and together, they move through our engines and generate the force to get us to orbit.

Thomas Burghardt: And then above that, of course there's the air stage with the Astra logo and the US flag which contains the sort of the bottom part of the upper stage and then payloads on top and that payload fairing. All right, let's go ahead and listen to the count as we are getting close to the continuing terminal count and let's listen to the teams as they continue to work.

Speaker: Astra is calling a hold at this time.

Carolina Grossman: Thanks for standing by. As you heard, we are in a hold right now. The team is looking into, wind limits and of course, the weather conditions can change pretty unpredictably. So, we're keeping an eye on that and we expect to have more updates for you shortly

Thomas Burghardt: And again, for those who are joining us from earlier in the broadcast today's launch window does extend till 4:00 PM Eastern time. So there's plenty of time to resolve this hold and, the clock stopped at just 11:46. So still pretty late in the count there, it should be a quick, cycle back and go again once these issues are confirmed to be resolved and ready to go, but we'll provide those updates as soon as we have them.

Carolina Grossman: That's right and we also just heard on comms that the vehicle continues to be nominal. So we are, um just waiting on these last final, issues we'll likely, reset the clock to probably around T minus 15 minutes when the hold is released.

Thomas Burghardt: Okay. And we are still waiting to hear back about the status of this whole, we'll provide that update as soon as we have it. Hopefully it will be resolved soon, but in the meantime, let's take some time to take a couple more questions here, and musical wolves in chat ask, is this the same launch pad equipment as Kodiak or new pad equipment for Cape Canaveral?

Carolina Grossman: that's a wonderful question. We use the same equipment at our sites with modifications as needed, um for different, little quirks that each range will have. So, this equipment, is designed to be compatible with Cape Canaveral, but otherwise it is identical to the launch of equipment that we would use in Kodiak.

Thomas Burghardt: So that means they're going to be shipping different sets of equipment to different ranges. Like you don't take the one launcher, reconfigure it and then send it to keep Cape Canaveral and then reconfigure it back if you're going back to Kodiak or something like that, they need to be separate sets, so that you can also be launching from different campaigns from different sites at the same time, right?

Carolina Grossman: Right. Of course, if we're launching from different sites at the same time, we can't be in two places at once.

Thomas Burghardt: It would be difficult.

Carolina Grossman: But yes, the system is designed so that, we can make those configuration changes and use it inter-operably at our different, um launch sites so theoretically there's nothing to prevent us from sending this, uh precise set to Kodiak.

Thomas Burghardt: Gotcha. Thank you. Another question here from Caleb says, why does it look like there's smoke coming out of the rocket? I don't believe that's smoke. I believe it's actually condensation, right?

Carolina Grossman: Yes. So, you can see that there's some sort of condensation looking, almost like steam coming off the vehicle, um and then you can see those vent lines that look to have a little bit more oomph to them than just the condensation that's evaporating off the vehicle and so those are our venting system just ensures that, our tanks are maintaining the appropriate pressure while, the vehicle is being operated.

Thomas Burghardt: And by proxy, those vents also help maintain these different temperatures, because if you're up on your chemistry, change in the pressure will change the temperature in the tank. So you can also use that to control your thermal conditions onboard the rocket. Uh it's kind of a neat physics thing that is used to make sure the rocket is at the right conditions from point.

Carolina Grossman: Yes, that is exactly right.

Thomas Burghardt: I've got another, sort of physics' question here from Sebastian who asked, how did the rockets using liquid fuel get fuel into the engine micro gravity without it just floating through the tank?

Carolina Grossman: That's a great question. So, that mostly affects our upper stage engine. Our upper stage ether engine is a pressure fed engine. So, actually the pressure inside of the tanks itself keeps the propellant flowing to the engine in space.

Thomas Burghardt: There you go. And then another question, engine question, Isaac is asking how much thrust do the engines generate? And that depends on which engine we're talking about, right, because there's two.

Carolina Grossman: Right? Well, technically they are six.

Thomas Burghardt: Well yeah, two different types of engines, my apologies.

Carolina Grossman: Right there's two different types of engines on the vehicle. So our first stage is powered by five Delphin engines which each produce 6,500 pounds of thrust for a total of 32,500 pounds of thrust on the first stage. They are electric pump fed engines and the upper stage is powered by one ether engine which is as we just mentioned a pressure fed engine that produces 740 pounds of thrust and both, stages are filled with locks and kerosene, so we have the same propellants on both stages.

Thomas Burghardt: There you go. And then also another question here, we actually didn't address this yet. We should talk about the range asset, which caused an issue on Saturday's attempt asking about that. Can we talk a little bit about how that was resolved and prepared for today?

Carolina Grossman: Right. So, there was an issue with the radar system on Saturday. It was an asset that is on the range and thankfully we were able to, resolve that issue, yesterday and prepare for today's launch attempt so that the issue that caused Saturday's scrub, will not be a problem today.

Thomas Burghardt: Glad to hear. And again, that's a partnership with the range here at Cape Canaveral, space launch Delta 45 is the space force wing, which is overseas, the Cape Canaveral space force station and that includes the range tracking assets and things that are used by all launch providers here at Cape Canaveral, so an important partner there. Another question here asking, how are these missions going to be affordable if the rockets are not reusable? They're expendable single-use vehicles?

Carolina Grossman: Yes, that's a wonderful question. So, reusability is only one piece of the equation when it comes to cost. The ways that, Astra focuses right now on, cost is using simple materials, we away from a lot of composites and the fancy aerospace types of materials. And we use a lot of automation in our systems. As we've mentioned before, it takes very few people to operate one of these vehicles to set up our launch site. The team that is developing the vehicle is a very deep bench, but to actually conduct our launch operations is a very small group of people and so those are some of the ways that we focus on, keeping costs down with our launch vehicle.

Thomas Burghardt: Got it. And of course there's also mass production, right, because the eventual plan is to be launching so frequently that your production cadence will bring down sort of your overhead cost and that's a manufacturing quirk that affects, these expendable vehicles as well?

Carolina Grossman: Yes, exactly. That's right. We hope to mass produce these vehicles and that is definitely one of the ways to bring down the cost, and we pride ourselves on making our system as simple as possible to build and scale because we hope to provide, almost unlimited access to space for our customers.

Thomas Burghardt: Gotcha. Also seeing some questions in chat, again, if you are just joining us, the teams are currently in a hold right now, looking at some wind data and making sure that those issues are resolved prior to proceeding with the count, we're expecting some sort of recycle here prior to resuming the countdown, and we'll give you updates as soon as we have them, but right now we're continuing to take some questions, as we wait for a resolution. Again, the launch window, excuse me, continuous until 4:00 PM Eastern time. So we have just under three hours to go before the end of the window, plenty of time, but questions, if you tag us with @NASASpaceFlight in the chat, we'll be able to see those questions through some software that Michael wrote. Thank you, Michael, producing the streams as usual, and we'll go ahead and answer as many of those as we can over the course of the broadcast. We've got Carolina Grossman from Astra, the expert in the field; I'm just here to relay questions realistically, but let me see what other questions we may have. We can maybe talk a little bit about the plan to flight profile for today. What are the kind of milestones, once the rocket is ready to lift off? We would expect to see as the rocket ascends and proceeds towards orbit.

Carolina Grossman: Yes, that's a great question. So, again, we are currently holding, but once we set that new T zero time, just a few seconds before lift off the first stage engines will ignite at T zero seconds. That will be lift off. A few seconds later the vehicle will begin its pitch over maneuver, and we expect to reach Max Q at around one minute and 10 seconds. So that's the, point of maximum aerodynamic pressure on the vehicle. It's a significant milestone for us. Around two minutes and 50 seconds, we have MECO or Main Engine Cut Off and then in very quick succession, we have the fairing separation at two minutes and 55 seconds, stage separation at three minutes and then the upper stage ether engine ignites at approximately three minutes and five seconds into flight. It runs for about five and a half minutes and at that point we will have SECO or Second Engine Cut Off and then finally we will have our payload deployment. This will be our first mission with deployed payloads, at eight minutes and 40 seconds and so we will be deploying the four CubeSats aboard today's mission, and at that point if we have achieved all of those milestones, we will be very excited to have completed the primary objectives of our flight and have achieved mission success.

Thomas Burghardt: There we go, and a question about those payloads again, if you are just joining us, asking about what the target orbit and the payload size is onboard today's flight. So the target orbit is inclined 41 degrees and an altitude of 500 kilometers and you can actually see from an onboard camera there that, those CubeSat payloads are sitting in their deployers, they are 3U CubeSats sitting on top of the ether powered upper stage of rocket in that payload fairing right now and of course we are hoping that those payload fairings will separate out in space and those payloads will be able to be deployed after a successful launch soon. so staying tuned for that, again, we're in a hold right now, but stay tuned for further updates, but those are those payloads and I love those onboard views giving us a glimpse into the payloads, just anxiously waiting their ride to space Another question here, Matias is asking, how is the weather looking now? Looks too scrubby. No, I don't think so; weather is actually green right now, right Carolina?

Carolina Grossman: Yeah, I believe the weather is looking good at the moment and we are, hopefully awaiting some news about releasing this hold soon.

Thomas Burghardt: Absolutely. I know they were looking at those wind limits to make sure that they're going to remain green and stay where they need to be. So we're going to keep an update on that and make sure that they're all ready to go, to release this hold, and again, stay tuned for updates on that, but, keeping on with some questions here, William says, where in the countdown do you hand off to the flight computers?

Carolina Grossman: Yes. So the handover to the flight computers happens, um in the final moments before launch. You'll hear, once we're listening to the countdown that, our flight director, Chris Hoffman call out vehicle is on internal control. That's at 60 seconds before T zero. So you can listen and hear when that milestone in particular takes place.

Thomas Burghardt: Gotcha. Again, we're staying tuned for further updates, but right now, keeping going with some questions. So tag us @NASASpaceFlight, and we'll try to answer as many of those as we can. We did talk about the flight profile and actually I want to highlight this because rocket three is a little bit unique in that that payload ferrying has to separate before the upper stage actually separates, right?

Carolina Grossman: yes, that is correct. Our fairing separation happens right before stage separations, but these milestones, we just talked through the mission timeline, between Main Engine Cut Off and the upper stage ignition. We run through some significant milestones in just 15 seconds. So, we have our main engine cut off, fairing, separation, stage separation, and then the upper stage ignition, all within 15 seconds of each other in pretty quick succession.

Thomas Burghardt: And again, we are continuing to stand by for further word of the status of today's countdown and we'll stay tuned. Please stand by for further updates and we'll provide them again as soon as we have them, the team's working through them right now.

Pause [1:03:57 to 1:14:55]

Thomas Burghardt: All right, everybody, thank you for your patience. The teams are still in a hold right now, but I believe we have an update from the status of the countdown, so Carolina, what are the teams working on right now?

Carolina Grossman: Yes, Thomas, the team is still looking at some wind data and reviewing that, we try and get the latest up to the minute information and run through simulations to make sure that everything will be okay despite the change in conditions. So that is what the team is reviewing right now. We are optimistic that we'll be able to, continue, with our launch countdown, shortly. So, in the meantime, we are still holding so thanks for your patience and thanks for bearing with us.

Thomas Burghardt: Didn't want to like, come on and talk about something when we didn't have an update. So we went and got that update first. Thank you all for staying tuned. And again, more updates forthcoming as soon as we have them, but we do have some more questions in the queue. So, we can go back to that if you'd like, and, right on cue, we're talking about releasing this hold, hopefully before too long. Mr. S asked what is the decision making process like to resume a countdown once you've called a hold.

Carolina Grossman: Yeah, so we will take all of the information from the issues that we've been troubleshooting and, verify that we have not encountered any new issues, for example, if we hold too long, there may be certain, blackout times specifically that we'll need in order to avoid colliding with another object in space. And so we'll coordinate with the range to make sure that we can set our new T zero time and we'll proceed with picking up the countdown.

Thomas Burghardt: And on the same topic there, Noah asked, when does this window close, 1600 EST? That is correct. 4:00 PM Eastern Time which is if I do math in my head, 2100 UTC had to do that in my head real quick. Thank you, but that is the end of the window. So plenty of time, a little under three hours to go and as you can see, the terminal count starts at 15 minutes prior to launch so, there is plenty of time for the teams to resume the count once that wind data is verified to be nominal and that the teams will be ready to go so, no worries just yet. Another question here, Alex asked, after Main Engine Cut Off or MECO, what happens to the first stage of the rocket?

Carolina Grossman: Right. So, MECO stands for Main Engine Cut Off, and that's the point where the first stage engines will have done their job and they will be shutting off because, we have run out of fuel. So after that point, once we separate the stages, the first stage will fall back towards earth. We work very closely with all of the relevant authorities to make sure that there is a safe area in the ocean for, the first stage to fall back to earth, and it lands in the ocean.

Thomas Burghardt: All right. And then a similar question, moving on later in the flight profile, how long does it take for the rocket, to reach its final deployment asked Alex? So how long before those payloads are in a stable over along with that upper stage and then deployed from that stage?

Carolina Grossman: Right. So, we talked through the mission profile, a little while ago, but it takes just about nine minutes from T zero to the payload deployment. So it is a pretty, zippy flight, although the upper stage runs for about five minutes and sometimes can feel like long time to make sure of that, to be watching that, upper stage.

Thomas Burghardt: So continuing to wait for additional updates as the team continues to work, this hold here, but, on that same topic, talking about payload deployment, we should actually go into a little bit more detail about the payloads that are on board. We mentioned that there are four CubeSats on board, three from universities, and one from the NASA Johnson Space center in Houston, Texas, all four of them sponsored by NASA through the CubeSat Launch Initiative, also referred to the Educational Launch of Nano Satellites program, which is that ELaNa 41 designation and Carolina, can you tell us a little bit about what that program is all about?

Carolina Grossman: Sure. So, to start off with a fun fact, the program is actually named after the daughter of senior mission manager, Garrett Skrobot who used to lead the ELaNa missions. So it does stand for Educate Launch of Nano Satellites and well, the launch service is provided under a venture class launch services Demonstration II, contract. So if you see on the top left of your screen under that NASA meatball logo, you see the mission name is ELaNa 41, and the contract name as well, the VCS Demo II. so this contract provides dedicated launch capabilities

for smaller payloads and is awarded by the NASA launch services program based at Kennedy space center, and, one of the interesting things about this, contract is, the venture class missions help further the development and demonstration of new commercial launch vehicles just like Astra's. the, small satellites that we have on board can tolerate a higher level of risk than many larger missions, which help us demonstrate and, help mitigate the risks associated with, new launch vehicles and really pave the way for new launch vehicles, and future small spacecraft missions, to move forward. There's also a lot of interesting things about CubeSats. They're playing an increasingly larger role in exploration, technology demonstration, scientific research and educational investigations at NASA.

One of the payloads onboard is from Johnson Space Center in Houston. These miniature satellites in general provide a low cost platform for NASA missions such as planetary space exploration, earth observation, fundamental earth, and space science and technology demonstration like cutting edge laser communications, energy storage, in space propulsion and autonomous movement capabilities. Another great thing about CubeSats just like on our mission is that, educators have economical means to engage students in all phases of satellite development, operation and data collection. So three of our four payloads are from, universities, and the CSLI provides a launch of CubeSat projects designed, built, and operated by students, teachers, and faculty, as well as NASA centers and nonprofits. So overall, to summarize this, missions from the ELaNa program provide a deployment opportunity or ride share to space and, this program provides space flight education and some incredible research capabilities through very small CubeSats. Over the lifetime of the program, since its inception in 2010, the initiative has selected over 200 CubeSat missions, over a hundred, which have been launched and more than 30 missions scheduled in the next 12 months. The CubeSats represent 42 states, the District of Columbia, Puerto Rico, and 102 unique organizations. So, if you are a student and interested in sending a CubeSat to space, you can check out the NASA CSLI call for proposals which was most recently in August of 2021.

Thomas Burghardt: There we go. So those are those CubeSat payloads that are on board today's flight and on across many missions across the space flight industry, lots of CubeSats going up pretty much all the time and those make up a bulk of those small satellite payloads actually. Of course the primary objective for today's flight is deploying those CubeSats into low earth orbit. The targeted orbit once again is 41 degrees inclination so amid inclination launch, which is perfect for the Cape Canaveral launch slate, also a 500 kilometer altitude low earth orbit, circular, low earth orbit. We do have a question chat from Astra west who asked are there any secondary objectives for today's flight beyond payload deployment?

Carolina Grossman: yes. So, as we've mentioned, our primary mission objective today is to successfully deploy those four payloads aboard, but we at Astra, we are constantly launching and learning. So we have a number of secondary objectives, mostly for our engineering teams in order to, gather more data about their systems and how they operate in space.

Thomas Burghardt: Excellent. And of course, that's just part of gaining data from every single flight you fly, right? The more you fly your rocket, you're going to gain data from every flight, and that's always kind of a secondary objective to just keep building that flight heritage.

Carolina Grossman: Yes, exactly. If you want to learn more about our approach in general, you can check out our website, Astra.com. We have our newsroom there where we post updates, and you can even check out and read some of the things that we learned from our last missions, LV0006 in August and LV0007 in November, because even if the mission is successful, there are still a lot of things that we can learn.

Thomas Burghardt: And we've also got another question here that I picked out from chat myself because I'm a big fan of the space shuttle here, and we've got a space shuttle relevant question though. James asked a fun hypothetical question, but could Rocket Three fit inside the space shuttle payload bay, and would the shuttle be able to launch a fully fueled Rocket Three? Well, I've got the dimensions in front of me because I looked this up and yes, I can confirm that Rocket Three would fit in the payload bay. The Rocket Three is 43 feet long, 52 inches in diameter and you know what, I think I might go to say, you could fit multiple Rocket Threes in our space shuttle bay because the space shuttle had a 60 foot long payload bay and 15 foot diameter payload bay so yes, absolutely and someone's got to launch kind of a space program and do this now.

Carolina Grossman: Yes, that is a fantastic question. That is a really fun fact that I'm very glad to have in my back pocket for now, but yes, the rocket that you see in front of you at 43 feet long, it fits inside a standard 45 foot shipping container, which also would have fit in the, payload bay of the space shuttle.

Thomas Burghardt: And I think, and this is just me kind of spit-balling off the top of my head though. I'm pretty sure even fully fuel the rocket would also still be light enough to be in the shuttle payload bay because the shuttle was a pretty heavy lifter and I think it would make for a great two stage, kind of kick stage deal if you wanted to launch CubeSats to Pluto or something, I don't know. That would be a little ridiculous, but it'd be fun.

Carolina Grossman: Yes. I love that idea. Using the rocket as a kick stage from the space shuttle to send CubeSats far away, yes, I'm not sure exactly the mass capacity of the shuttle, but, I reckon that the rocket would be a comfortable passenger on board, maybe even two of them as you mentioned.

Thomas Burghardt: Yeah. We do have another question. We've got a great view of the ground system, the launcher that the rocket is sitting on and Tom asked is that launch Mount sat on the ground or does it have foundations, how does that kind of roll out and set up for launch?

Carolina Grossman: Right. So, you can see that the rocket is sitting on, I almost just said the shuttle, the rocket is sitting on, a black structure. There is a mounting interface, with the ground, there are specific, sort of hold downs there, and that is how we interface, with the ground, but there is, no kind of permanently installed foundation aside from the concrete base, that entire structure that you see the rocket sitting on is entirely portable.

Thomas Burghardt: Gotcha. Thank you very much. Another question here, is there a no fly zone regarding today's launch? I believe that is standard practice here at both Cape Canaveral and other launch ranges, no fly zones, also Marine hazard zones, that are maintained and that's part of that partnership with space launch Delta 45, right Carolina?

Carolina Grossman: Right. So we do work, with the range to make sure that not only planes, but also boats stay away from, the keep out zone. So in the event that we would, encounter, an aircraft or a boat in that keep out area that would mean that we would hold until, that issue is removed. So, we actually have, I believe a coast guard helicopter who's out making sure that the airways and, maritime area is clear for our launch today.

Thomas Burghardt: Excellent. We actually caught a glimpse earlier, right before we went live a coast guard helicopter circling the range and if our friend Steven out there catches that again, we'll try and show that but, the security forces are out in force to ensure that today's launch goes off without a hitch. Another question here asking how long can this rocket stay in a hold?

Carolina Grossman: Right? So we closely monitor all of the systems. Our launch window does extend to 4:00 PM Eastern time. So we have, about two and a half hours left, I believe, in our countdown time. So we have in the past, used all that time and the vehicle has been fine. So we're keeping an eye on everything but, we can be, ready to launch at any point within our window.

Thomas Burghardt: Gotcha. I keep saying, got you. I'm doing that thing where I say the same word over and over again. I'll come up with a new response next time you answer a question, but thank you to Carolina for all the expertise here. Andrew with a question asking what is the typical lifespan of a CubeSat?

Carolina Grossman: Yeah, so, I'm not a CubeSat expert here, more focused on, the rocket and the rest of the launch system. However, CubeSats can be pretty resilient and live quite a long time. One of the depending factors is how much time it can spend on orbit before the orbit decays, of course, but CubeSats can have a lifespan of many years.

Thomas Burghardt: And yeah, the CubeSats are also designed to be sort of a low cost access to solution to space which means that they are tailored towards, short term missions in low earth orbit. Usually some CubeSats are designed to last a long time. CubeSats have been sent to Mars, for example, but most of them operate in low earth orbit and operate pretty short missions, but that also means there's potential for an extended mission because if you plan for let's say a month long mission, and then after a month, the CubeSat's still working, well, you can go get extra data, you can keep doing the mission. You could even do a different mission using the same instruments or whatever. So, there are some factors that play into that but the CubeSats all have, different varying mission requirements and things like that, but, that orbital decay is a big thing because most of them don't have propulsion on board, not all of them, most of them don't, which means you can't boost your orbit. You're kind of at the mercy of physics, if you will, but definitely an interesting point to talk about. Another question here from Taylor asking how many Rocket Threes will there be and is there another rocket in the works?

Carolina Grossman: Well, there's always another rocket in the works here at Astra. And, we have a lot of exciting plans. Today we are focused on this very exciting launch of LV0008, which represents a lot of firsts, for us at Astra. It will be our first mission where we will be deploying a payload. We are of course having our first launch from Cape Canaveral. If you've joined us in the past, the view's a little different from our regular launch site in Kodiak, Alaska and so we're focused on today's mission, but if you want to keep track on Astra's future plans, you can check out our website, Astra.com and follow us on social media as well.

Thomas Burghardt: Looking forward to many rockets in the future. Coming up, hopefully releasing a hold before too long. We're standing by for another update where currently or the launch teams are currently in a hold. I'm just sitting here blabbing my mouth about it, but the launch teams are currently in a hold, and we're going to stand by for a further update here. Again, the launch window extends until 4:00 PM Eastern time, plenty of time to resolve this. So let's go ahead and listen into the countdown net and wait for another update from Mission control.

Chris Hoffman: This is Astra flight on countdown. Astra is picking the count back up at T minus 15 minutes at this time, and reentering terminal count. CH confirm for me that the first H fuel tank is full and we do not require additional filling.

Speaker: Confirmed.

Chris Hoffman: First step 146, tango please inspect launch machine to prepare to set a new UTC T zero time.

Speaker: Ready.

Chris Hoffman: New UTC T zero time is hours; one, eight.

Speaker: One, eight.

Chris Hoffman: Minutes; five, zero.

Speaker: Minutes; five, zero.

Chris Hoffman: Seconds; zero, zero.

Speaker: Seconds; zero, zero.

Chris Hoffman: Please save and commit.

Speaker: Save and committing now.

Carolina Grossman: And as you have just seen and heard, we have resumed our countdown and we are just inside 14 minutes from our new T zero time, which is 10:50 AM Pacific time, 1:50 PM Eastern Time and, the team is proceeding into the final steps of preparing the vehicle for launch, our terminal count. In just a few moments we'll hear our go, no-go poll with our final, preparations and after that point, we will be in, just a few minutes away from our T zero.

Thomas Burghardt: Looking forward to liftoff as the clocks are now ticking once again and are heading towards that new T zero again, 1:50 PM Eastern Time, 1850 UTC. We can go ahead and listen into the countdown as they work through some more procedures, coming up on that go, no-go poll. Let's listen in.

Speaker: Activating OX1OV201 first fill.

Chris Hoffman: OX1OV401 fill.

Speaker: Deactivating OX1OV401 fill.

Chris Hoffman: OX1OV301 upper fill.

Speaker: Deactivating OX1OV301 upper fill.

Chris Hoffman: And machine fuel four operate toggle off first and full

Speaker: Toggling off first, toggling off full.

Chris Hoffman: Please deactivate fuel four operate.

Speaker: Deactivating fuel four operate.

Chris Hoffman: Fuel three, supply.

Speaker: Deactivating fuel three, supply.

Chris Hoffman: Fuel 1FV300 upper fill.

Speaker: Deactivating fuel 1FV300 upper fill.

Chris Hoffman: Fuel 1FV200 first fill.

Speaker: Deactivating fuel 1FV200 first fill.

Chris Hoffman: AV1 radios.

Speaker: Deactivating AV1 radios.

Chris Hoffman: And deactivate AV1 rocket support cart.

Speaker: Deactivating AV1 rocket support cart.

Chris Hoffman: Please confirm for me that the following machines are still enabled and running, zero stop, purging?

Speaker: Confirmed.

Chris Hoffman: AV1 managed polling.

Speaker: Confirmed.

Chris Hoffman: AV1 managed power systems?

Speaker: Confirmed.

Chris Hoffman: The entire helium stack?

Speaker: Confirmed.

Chris Hoffman: Please activate machine igniter one spark test.

Speaker: Activating igniter one spark test.

Chris Hoffman: VB1 first stage power.

Speaker: VB1 first stage power is activated.

Chris Hoffman: VB1 upper stage power.

Speaker: Activated.

Chris Hoffman: VB1 turn on/off PDBs.

Speaker: Activated.

Chris Hoffman: And water one, water system.

Speaker: Activated

Chris Hoffman: Tango, please activate launch machine.

Speaker: Activating launch.

Chris Hoffman: Please toggle locks topping at this time.

Speaker: Toggling locks topping.

Chris Hoffman: Per step 151, this is the Astra poll for tank pressurization and launch. After this point, any system issue must be called as a three word hold. That is a hold, hold, hold over the net. If there are no concerns for flight call go, otherwise call no-go, red lead.

Speaker: Red lead is, go.

Chris Hoffman: FTS?

Speaker: FTS is go.

Chris Hoffman: Delphin?

Speaker: Delphin is go.

Chris Hoffman: Ether.

Speaker: Ether is go.

Chris Hoffman: Odin.

Speaker: Odin is go.

Chris Hoffman: Inco?

Speaker: Inco is go.

Chris Hoffman: ACE?

Speaker: ACE is go.

Chris Hoffman: Launcher?

Speaker: Launcher is go.

Chris Hoffman: Orbit.

Speaker: Orbit is go.

Chris Hoffman: Booster?

Speaker: Booster is go.

Chris Hoffman: GNC?

Speaker: GNC is go.

Chris Hoffman: FAO?

Speaker: FAO is go.

Chris Hoffman: CDH?

Speaker: CDH is go.

Chris Hoffman: Tango?

Speaker: Tango is go.

Chris Hoffman: Safety?

Speaker: Safety is go.

Chris Hoffman: Flight is go as well at this time, tango and AV1 manage polling, please toggle do only ground polling.

Speaker: Toggling, do only ground polling.

Thomas Burghardt: So, as you just heard, sorry, don't want to talk over the flight director there, but the teams have pulled go for launch nine and a half minutes to go for target lift off time of 1:50 PM Eastern Time. Teams are going to be working through the rest of the terminal count here as, all systems are go including the range, weather and the rocket itself. Carolina, how are you feeling over in Alameda?

Carolina Grossman: The anticipation is certainly building over here in our final minutes before launch.

Thomas Burghardt: Why don't we give a brief update, or not update an overview of the mission timeline since we are now into the business end of the countdown. First things first, yeah go ahead Carolina.

Carolina Grossman: Yeah sure. You can see the mission timeline up on your screen and, at T minus three seconds, those five first stage Delphin engines will ignite before our liftoff at T zero and then we will very quickly begin our pitch over maneuver at T plus six seconds. If all goes well, we'll reach Max Q at about one minute and 10 seconds. That's the point of maximum aerodynamic pressure on the vehicle and a very significant milestone. And then in very quick succession, we have Main Engine Cut Off or MECO, fairing separation and stage separation and then just around three minutes and five seconds into flight, we have our upper stage ignition of our ether engine and then ether will burn for about five and a half minutes before Second Engine Cut Off or SECO and finally, we will deploy our four CubeSat payloads at eight minutes and 40 seconds after launch.

Thomas Burghardt: And that will be a deployment sequence of a couple seconds between each satellite before CubeSats, all deployed in quick succession and we are hoping that we get there in just about well, eight minutes of countdown and then eight minutes of flight to orbit. So about 16 minutes or so hoping to be on orbit and delivering those payloads. That would be an awesome site to see. Again, if you are just joining us, this is Astra's first launch, carrying payloads, actual

satellites into low earth orbit, also the first launch from space launch complex 46 here on the space coast at Cape Canaveral, Florida. Liftoff is targeted for 1:50 PM Eastern Time, seven and a half minutes to go and you're listening to live coverage from NASA Space Flight, Thomas Burghardt here at Cape Canaveral and Carolina Grossman at Astra's headquarters in Alameda, California. Let's go ahead and listen back into the countdown net as the teams go through their final points, I should also point out that boat in the background is not an issue. That is outside the exclusion zone. Just realized you might see that in the view. I promise the range is green, I'm told, the rocket is actually flying a different direction, so all good here, uh but yeah, as the teams get through these final steps, let's go ahead and listen back into the countdown.

Chris Hoffman: V1 manage polling toggle, do both ground and guidance polling.

Speaker: Toggling do both ground and guidance polling.

Chris Hoffman: Delphin confirm GSE igniter system is ready for launch.

Speaker: Igniters are in good state. Good for launch.

Chris Hoffman: FTS issue logic on AFTU verify CAS is green and nominal.

Speaker: Standby. AFTU is logic enabled and master enabled.

Chris Hoffman: Copy, tango, verify vehicle looks ready for launch aside from tank pressures.

Speaker: The vehicle is ready for launch.

Chris Hoffman: Rock this is flight on countdown. Astra is looking for final range green and launch authorization for this morning.

Speaker: Range green

Thomas Burghardt: And you just heard the Cape Canaveral Space Force station range has confirmed range is green for the launch.

Chris Hoffman: Tango in the launch machine, please toggle launch.

Speaker: Enabling launch.

Thomas Burghardt: Coming up on five minutes, the flight director, Chris Hoffman will give the final briefings ahead of the final business end of the countdown and the rocket is before too long, going to be taking over internal control of the countdown itself and getting towards liftoff

Chris Hoffman: Five minutes. And with flight on countdown with a reminder to all that any three word hold call from here on out is an immediate abort, regardless of source. Four minutes

Thomas Burghardt: Under four minutes to go to the launch of the ELaNa 41 mission on Astra Rocket Three, LV0008

Chris Hoffman: Rock flight on countdown. Rock; please verify the range's recording telemetry at this time.

Speaker: Verified.

Chris Hoffman: Thank you, sir. And a reminder to all Astra personnel, control room, if you require RF data, be prepared to switch over your [inaudible] sources at liftoff, MECO flight on countdown.

Speaker: MECO.

Chris Hoffman: MECO prepare to issue option when rocket IIP marker passes mean MECO point and is within dispersed trajectories, call out at time.

Speaker: MECO copies.

Chris Hoffman: Three minutes.

Thomas Burghardt: There's a great view of the Astra teams in Alameda watching today's launch, Two and a half minutes to go.

Chris Hoffman: FTS at this time, send to master enable and watchdog on AFTU.

Speaker: Watchdog enabled.

Chris Hoffman: Thank you. Two minutes.

Thomas Burghardt: Now passing two minutes to the launch. Again, this is the launch of the ELaNa 41 mission for NASA four CubeSats to your right on rocket 3.3 LV0008, Astra's first mission with satellites on board, ready to lift off from Cape Canaveral, Florida in just under two minutes from now, coming up on 90 seconds.

Chris Hoffman: 90 seconds.

Thomas Burghardt: I'm going to leave commentary in the hands of Carolina Grossman at Alameda's headquarters and good luck and God's speed to LV000.

Carolina Grossman: Enjoy the view, Thomas.

Chris Hoffman: ACE flight on countdown.

Speaker: ACE here.

Chris Hoffman: Please start PSD recordings and down range ground station recordings.

Speaker: In work.

Chris Hoffman: 60 seconds, vehicle's on internals. 45 seconds, first stage tanks coming up to pressure, 35, vehicle is at pre lift off tank pressures, 30 seconds, 20, 15, 10, nine, eight, seven, six, five, four, three – abort.

Carolina Grossman: As you just heard, they had an abort at T zero, teams will look into the data and we have time to try again. So, right now the team is getting the vehicle into a safe state as we look at the issue that triggered the abort. If we are able to reset the countdown, we would pick up again at our terminal count point of T minus 15 minutes, and we do have time in today's launch window which extends until 4:00 PM Eastern.

Speaker: Copy, in work.

Carolina Grossman: And as you saw there was an abort at our T zero lift off time, looks like we did have engine ignition and an abort was called. The teams are troubleshooting the issue, looks like the pad is safe and secure, no fires, no issues on the ground. so thanks for standing by while the team looks at what happened in the final moments of our terminal count, and we will keep you posted with updates as soon as we can. We are able to recycle today's launch attempt. We would resume T minus 15 minutes, the top of our terminal count and we do have until 4:00 PM Eastern today in our launch window.

Thomas Burghardt: And whether that recycle can occur will course depend on the issue itself and how it can be resolved so we'll stay tuned for those updates, but like Carolina said, launch window does extend for a couple more hours, so, we're going to stay tuned and see what our status is and we'll share that as soon as we have it. We actually did talk about this a little bit earlier in the broadcast, how the rocket is course, designed to handle multiple fueling and ignition cycles. We're talking about the engine static fire test, which is a planned milestone before every launch, to make sure that the systems are all healthy, goes through an entire countdown, and so, the rocket does have that recycle capability, but just depends on what the actual hold or the abort was triggered by, but those aborts are all triggered by onboard commands, right, Carolina, so an onboard computer sensing something is not quite right.

Carolina Grossman: That's right. So, at T minus 60 seconds, you heard that call out that the vehicle is on internal control and its all systems within the vehicle that are monitoring and making sure that everything is as it should and if it isn't, an abort is triggered. So that's exactly what happened. That is, the system is working exactly as it should and so we can, look at what caused the specific abort that was called and the teams are already beginning to look through the data and troubleshoot.

Thomas Burghardt: And you can see that countdown clock stuck at 13 seconds, we'll expect to see that, of course in recycle, if a recycle is feasible, standing by for word on that, but that clock is holding right now as the teams assess the abort. While we wait for more status, we can go ahead and get back into questions. If you have any question about today's mission, please tag @NASASpaceFlight in chat and, we're going to go ahead and try to answer those and keep providing some more information on the mission. We'll also keep those updates forthcoming though as we have them. The next question, someone is asking what happens if there's a range violation after liftoff, does that warrant an FTS activation?

Carolina Grossman: Right. So if there're is an issue after liftoff, we do have a Flight Safety System, or FTS, Flight Termination System, that is onboard the vehicle and so, the FTS system, would be activated if for example the vehicle is, drifting off course, and would ensure that we stay in the safe area. We make sure that the keep out zones are clear before we launch, to make sure that, everyone on the ground, in the area, is as far away from the rocket as they need to be.

Thomas Burghardt: Yeah, those range borders are actually monitored, not just those inside the hazard zones but any vehicles that may be approaching the hazard zone too. So it's not just ensuring the hazard zone is clear at liftoff, but then the question being about what if a range violation occurs afterwards, well, the relevant authority are also looking at any nearby vehicles that could reach the hazard zone shortly after liftoff and are making sure that they're all clear as well. So that's all coordinated and ensured that that will not take place, once the rocket's actually in the air. Another question here from Daniel asking, can Rocket III launch in the rain?

Carolina Grossman: yeah, that's a great question. So there are lots of weather conditions that we, keep in mind in order to ensure a safe and successful launch. A big one is lightning. There's a big lightning protection system, around the rocket, which is so large. You can't really even see it in the frame right now. We also keep an eye on winds, that was the reason for a hold earlier, but rain itself actually, isn't that big of a problem. it's all of the, typical bad weather effects that come along with rain, such as lightning and wind.

Thomas Burghardt: It would be appropriate for someone to ask what those towers are for right now, but I feel like we've preempted that question by talking about lightning protection a couple times. You could see in this frame, there are some cables running down on the left and right hand side of the rocket. Those are part of the lightning protection systems. They run up to the towers and then here's a great view from Jetty Park and you can see those two lighting towers more clearly there, along with the mobile service tower, which is of course not in use for Astra's rocket, but has been used for other launches from complex 46. Another question here from Sky Surfer, who asks during a launch do the cables, hoses, and electronics on that strong back get damaged from the heat?

Carolina Grossman: Right. That's a great question. So we do, everything that we can to protect the system from that engine plume, those very hot gases that are exiting the first stage as the vehicle, lifts off. We do since we, light the engines a few seconds before T zero, as well as conducting a static fire test, of a few seconds duration before we make any launch attempt at all, we do our best to protect all of the cabling, hosing, electronics, etcetera, and do maintenance as needed for the bits that get a bit crispy.

Thomas Burghardt: Gotcha. So see some questions shared about the venting that you can see on the screen, that is not them de-tanking the vehicle, right, Carolina, that's just nominal sort of a stable, replenish venting?

Carolina Grossman: Right, that's correct. So we pressurize the tanks a few minutes before our T zero time. So we vent, to make sure that we can, keep the vehicle safe and in a safe and stable state while it's on the ground while the team is, troubleshooting the issue that caused the abort, right around T zero.

Thomas Burghardt: And on that front, the ground equipment will be able to top off those fuel tanks continuously, right? That's still taking place, especially after a recycle.

Carolina Grossman: Right. We will make sure that we are able to, reach the appropriate levels and top off the tanks as needed.

Thomas Burghardt: Again, if you're just joining us, this is the launch of ELaNa 41, a CubeSat mission for NASA, four CubeSats on board. The launch was just aborted right about a moment before liftoff, and the teams are currently working to assess that abort and determine if a recycle will be able to occur. We'll provide that update as soon as we have it.

Pause [2:00:49 to 2:15:22]

Carolina Grossman: Thanks for standing by with us. If you're just joining us, we had an abort call just a few seconds before liftoff and the team has been working to troubleshoot the issue. We are at this point, keeping all of our options open, and we would recycle, you can see the clock's been reset preemptively to T minus 15 minutes and holding there. So we would recycle our countdown from the beginning of our terminal count at T minus 15 minutes. We'll continue to give you updates as we have them, but the team is keeping our options been and hoping to recycle today.

Pause [2:15:56 to 2:42:37]

Carolina Grossman: And thanks for standing by. If you are just joining us or waiting along with us, we had an abort, right around T zero of our launch attempt. The team has spent the last approximately 45 minutes looking through the issue. And, we are doing some final tests to see if will be able to attempt to recycle today's launch attempt. We have about an hour and 15 minutes remaining in the launch window, and we would pick up the count from T minus 15 minutes. So, plenty of time to try again, if we're able, and we are just standing by to see if the team is able to successfully complete the final test before picking up the count again.

Pause [2:43:16 to 3:12:32]

Chris Hoffman: This is Astra flight on countdown. Astra is scrubbing for the day.

Thomas Burghardt: And as you just heard, the flight director, Chris Hoffman did just call a scrub for the day. Carolina, do you have an update for us?

Carolina Grossman: Yes, unfortunately, the abort, that was around our T zero time is a minor telemetry issue that the team needs to work to resolve. So, unfortunately we need to stand down from today's launch attempt. Thank you so much for sticking with us and you can follow us on Twitter, @Astra to hear the latest updates on our next launch attempt.

Thomas Burghardt: Yeah. Stay tuned for future coverage and again, thank you to Astra for partnering with NASA Space Flight for today's coverage. We'll be back with you as soon as another launch attempt is ready, but thank you so much for watching today. Thanks to all of the support and the chat messages and the NSF and Astra teams behind today. We'll hopefully be back with you very soon for another launch attempt, so signing off for now, Carolina, thank you so much for joining me today from Alameda in California.

[Off Topic Discussion]

[END OF TRANSCRIPT]