

**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): June 12, 2022

Astra Space, Inc.

(Exact name of Registrant as Specified in Its Charter)

Delaware
(State or Other Jurisdiction
of Incorporation)

001-39426
(Commission File Number)

85-1270303
(IRS Employer
Identification No.)

1900 Skyhawk Street
Alameda, California
(Address of Principal Executive Offices)

94501
(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 June 12, 2022, Astra Space, Inc. (the “Company” or “we”) conducted its first launch for NASA’s TROPICS-1 mission on our launch vehicle LV0010. This launch was livestreamed through NASA Spaceflight and we are furnishing our transcript of the video from this launch as Exhibit 99.1.

This exhibit 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

<u>Exhibit No.</u>	<u>Description</u>
99.1	Transcript of livestream video for launch of LV0010 on June 12, 2022
104	Cover Page Interactive Data File (embedded with 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: June 13, 2022

Astra Space, Inc.

By: /s/ Kelyn Brannon

Name: Kelyn Brannon

Title: Chief Financial Officer

June 12, 2022

Astra TROPICS-1 livestream transcript

[Opening NSF video]

Thomas Burghardt (00:01:55):

Good morning, everyone, and welcome to today's live launch coverage. You are looking live at Space Launch Complex 46 at the Cape Canaveral Space Force Station, where Astra is just under 30 minutes away from, conducting today's attempt for the first in three flights for NASA's TROPICS mission. We are coming to you live today from Astra's headquarters in Alameda, California. My name is Thomas Burghardt, news director for NASA Space Flight, and today I'm joined by Amanda Durk Frye, senior manager at First Stage and Engine Production here at Astra. Amanda, thank you so much for joining me this morning.

Amanda Durk Frye (00:02:23):

Great. Excited to be here.

Thomas Burghardt (00:02:24):

Astra and NASA Space Flight are once again partnering to bring you today's webcast, so thank you to Astra for helping make this all happen. Over the course of today's broadcast, as usual, we'll be taking as many of your questions as we can, so if you've got a question about today's flight, please tag us with @NASASpaceFlight in chat. We're gonna try to bring as many of those in as we can. Um, to start off, let's get of a status update on today's countdown.

Amanda, where are we in today's launch attempt?

Amanda Durk Frye (00:02:48):

Well, right now, the weather is looking good for the first beginning of our window. However, it will start to deteriorate quickly due to thunderstorms that are starting to roll in. However for now we are still proceeding with today's countdown. As Thomas mentioned, today is the first day of our launch window for an LV0010. Uh, we are back down in Cape Canaveral, where the vehicle is stationed at Space Launch Complex 46. We have two days in our launch window, with tomorrow as our backup should we be unable to launch this morning.

Amanda Durk Frye (00:03:16):

Uh, there are many factors that do influence when a launch can or can not happen, many of which are entirely out of our control. These can include weather or third-party activities, or even aircraft or boats that are getting too close to our launch site. And our team will not launch if these conditions are not optimal. So we are excited to potentially launch this morning, and should we be delayed for any reason, we will of course provide updates on Twitter at @Astra.

Amanda Durk Frye (00:03:39):

We would like to also extend a huge shout-out and thank you to our partners who helped make the launch of LV0010 happen. These include our partners at Space Launch Delta 45, NASA, MIT Lincoln Laboratory and the FAA, all of whom have been wonderful to work with, and we truly appreciate their ongoing support. And of course to all of our Astra team members and their families.

Amanda Durk Frye (00:03:59):

Thank you to our entire team for their dedication to the mission, and for helping us get back to the pad once again.

Thomas Burghardt (00:04:06):

As we mentioned earlier, today is the first flight of three in support of NASA's TROPICS mission, and we've got a video to highlight the partnership between Astra and NASA on today's flight.

TROPICS video

Martin Attiq (00:04:17):

A Pew research poll showed that of nine different categories that NASA should focus on, number one on the list is to observe the Earth's climate. The TROPICS mission is a mission that Americans really care about, because it is directly observing our climate.

Dr. William J. Blackwell (00:04:31):

TROPICS has a very specific need for their orbital configuration. We need to go to a 30 degree incline to orbit, and no one else really wants to go there. The [inaudible 00:04:39] are all going to the sun-synchronous orbits or mid-inclinations, so it's very well targeted to, uh, a smaller vehicle with a very targeted, uh, insertion where they can get us exactly where we wanna go. And Astra is perfect for that.

Martin Attiq (00:04:51):

And so being able to launch three different times for \$8 million is unprecedented. Because of our unique ability to get to three different orbital planes in a very short period of time at a low cost.

Chris Kemp (00:05:03):

Why I'm excited about TROPICS is, coming out of NASA, having the opportunity to fly satellites, uh, for the organization I used to work for is, is personally gratifying for me. It's also a really important mission, because we can detect tropical storms. We can help people evacuate and can save lives, and it's a mission that's really well-designed for Astra's capability, being able to put multiple rockets up into multiple planes rapidly.

Hemant Chaurasia (00:05:28):

And we have the honor of being the final and most important piece, at this moment in time, of their mission, which is get that hardware in space, exactly where it needs to go. We see that there are increasingly smaller satellites that are smarter, that are doing cool things in orbit, but they need to go to particular destinations at particular times.

Dr. William J. Blackwell (00:05:47):

The real end-game here is improving our ability to forecast tropical cyclones. What we're trying to do is make measurements in the microwave wavelength region, and those have the advantage of being able to penetrate the cloud tops and see the storm thermodynamics under the clouds. We're gonna get something we've never had before in the history of weather satellites, which is revisit rates of better than one hour.

Chris Hofmann (00:06:09):

For the team itself, just this will be a massive culmination of the last three years of work, of developing this launch system to be able to do these things that we set out to do from the very beginning.

Dr. Adam London (00:06:19):

From Astra's perspective it's really important because we believe in space at scale, and to do that you need to have much more frequent launches and access to space. And so this has been an opportunity for us to really understand how can we further compress the turnaround time between launches, both in terms of building the rockets and in conducting the launches.

Martin Attiq (00:06:45):

What this milestone means for us is delivering a really important mission for our customer, but also demonstrating a capability that others can leverage in the future.

Chris Hofmann (00:06:54):

And so the opportunity to be a part of something like TROPICS, where you get to make a difference, and make a really large impact in the lives of people, and help humanity as a whole, does mean a lot to me, and it really excites me as well. Going into this mission knowing that we can help do something to make the world a better, safer place for people.

Thomas Burghardt (00:07:20):

So Amanda, why don't you recap for us what the goals of today's launch are?

Amanda Durk Frye (00:07:24):

Right. So LV0010 marks Astra's second mission with NASA, and it is the first of three launches to deliver the NASA TROPICS satellites to low Earth orbit. Our objective for today is to successfully deliver our customers two identical CubeSats to an orbit of 550 kilometers at a 29.75 degree inclination relative to the Earth's equator. They are about 3U in size, which means each one is about the size of a loaf of bread. Uh, so pretty small CubeSats, and if all goes well we should be able to see one of our two payloads deploy through our on-board upper stage cameras.

Amanda Durk Frye (00:07:59):

Yet it is possible that we will not have confirmation for up to 90 minutes, or at least a couple of orbits, as the satellites pass over their ground networks. This is not unusual, since it is due entirely to where the loc- the satellites are located within their orbit at the time of deployment, relative to their corresponding ground communication links. So we will end the l- uh, live broadcast shortly after payload deployment, and ask that you follow on Twitter at @NASAEarth, or @NASA_LSP for confirmation of satellite communications. Astra will also share from our Twitter handle as soon as we have confirmed with our partners at NASA.

Thomas Burghardt (00:08:35):

Uh, before we go any further, we also want to recognize Dr. Gail Skofronick-Jackson. Um, she was the program scientist at NASA h- headquarters for the TROPICS mission, and sadly passed away in 2021. Her focus area was weather within the research and analysis program of the Earth sciences division under the science mission directory, and we have a video in honor of Dr. Skofronick-Jackson to show here.

Gail Skofronick-Jackson video

Dalia Kirschbaum (00:09:05):

There are many, many reasons why I will miss Gail. For her friendship, for her leadership, her science and her driven nature. And really, just for her thoughtfulness, as a person and as a scientist.

Ellen Gray (00:09:18):

I worked with Gail on the communications floor at the GP [inaudible 00:09:23] launch, and she was always so wonderful to work with. I feel like I really learned how to, you know, communicate what we needed ed- for telling great stories about the satellite, and I remember just how she lit up when she was talking about it.

Dr. Gail Skofronick Jackson (00:09:37):

So you can see these small-scale systems at a resolution of about 10 kilometers by about 10 kilometers. It's about six [inaudible 00:09:44]-
Walt Petersen (00:09:44):

You know, she was... She was just excellent to work with. Just on all levels, an outstanding friend, a great person to talk to when you had problems. Um, always willing to listen, and I'm certainly going to miss her dearly, a- as I'm sure everybody else will.

Dalia Kirschbaum (00:09:58):

She was a tremendous scientist in the field of snow remote sensing. She led GPM to its success, working with a multi-disciplinary and diverse team, and she worked to encourage and expand our team, and being mindful of, of diversity and inclusion within the GPM and the broader program.

George Huffman (00:10:19):

She leaves some very big shoes to fill, and she has provided a stellar example of how we should be carrying out science, and getting the work of NASA done.

Thomas Burghardt (00:10:49):

So thank you to the NASA and Astra folks for their partnership on today's webcast, and of course recognizing Dr. Skofronick Jackson there. Um, we're gonna go ahead and get into some questions here. We're about T-minus 19 minutes and counting. Everything appears on track so far for the opening of today's window. Um, of course, the focus of any launch is the payloads that are on board, so our first question here from Carson is, "Are these pa- satellites CubeSats on board today's flight?" Amanda?

Amanda Durk Frye (00:11:12):

Uh, yes. Uh, the satellites on board are, are CubeSats. Uh, they are two identical 3U CubeSats that contain a dual-spitting radiometer and a compact microwave spectrometer. Uh, the purpose of these are to penetrate through the cloud layer of developing or active storm fronts and provide near-hourly imagery of a storm's progression, including data on precipitation, temperature and humidity. Uh, so these CubeSats will help scientists and meteorologists to understand how storms form, grow and intensify throughout their life cycle, uh, helping them to better detect and understand tropical storms better.

Amanda Durk Frye (00:11:46):

NASA has an incredible mission overview about these small satellites that you can find, uh, a link to at astra.com/mission/tropics-1.

Thomas Burghardt (00:11:58):

Awesome. And of course today's flight is the first of three missions for the TROPICS program. There are two satellites on board today. Six satellites are planned in total across the three flights, all launching from here at Cape Canaveral. Um, today's first flight, uh, on schedule so far... Again, if you're just joining us, the launch window opens at 9:00am Pacific Time, or noon Eastern over at local time in Cape Canaveral, which is just under 18 minutes away from now.

Thomas Burghardt (00:12:22):

Keep the questions coming in, chat, if you've got 'em. We'll try to answer as many of those as we can. Um, one of the questions we're seeing in chat here is, uh, where is Carolina today? Of course, we've seen Amanda on the, the coverage before. We've definitely interviewed here before, but first time hosting, so congratulations, Amanda.

Amanda Durk Frye (00:12:36):

Thank you.

Thomas Burghardt (00:12:37):

Um, I do believe, uh, we do know where Carolina is today, though.

Amanda Durk Frye (00:12:40):

Yes! Yes, so, uh, she is not here for a very great reason today. Uh, so Carolina

Amanda Durk Frye (00:12:49):

So Carolina and family are at home resting and recovering. Very well deserved. So huge congratulations to her from our entire Astra family. Uh, but yeah, so she is at home right now, enjoying and, uh, cheering on TROPICS from, from at home.

Thomas Burghardt (00:13:05):

Awesome. So congratulations to Carolina and her family, of course. Um, some other questions coming in here. I've got one saying, uh, "How much does a rocket weigh?" Amanda?

Amanda Durk Frye (00:13:15):

How much does it weigh? Uh, so the vehicle weighs approximately 2400 pounds at, when it is dry. So that is just the dry weight of the vehicle. Uh, which doing a quick Google search before this.

Thomas Burghardt (00:13:27):

(laughs)

Amanda Durk Frye (00:13:27):

Let's find out that that is roughly the weight of an unfueled Toyota Yaris. Uh, (laughs) and then we, we do add about 2400 pounds' worth of propellant, uh, to the vehicle. So in total, you're really looking at around 2600 t- or- s- 26,000 pounds, I'm sorry. 24,000 pounds of propellant. Um, so doing some back of the envelope com- uh, calculations, that's about the equivalent of a Toyota Yaris carrying around four female elephants.

Thomas Burghardt (00:13:55):

(laughs)

Amanda Durk Frye (00:13:56):

Uh, another fun, uh, fun fact, uh, that our engineering team likes to share about the vehicle is that the wall thickness to diameter ratio of the rocket is actually similar to that of a soda can.

Thomas Burghardt (00:14:06):

All right.

Amanda Durk Frye (00:14:07):

(laughs)

Thomas Burghardt (00:14:07):

There we go. Uh, thank you to Judah for, uh, submitting that question to us here. Uh, let's see. So again, 15 minutes to go here. Everything on track so far. We'll keep some questions coming. Uh, Mitch Bunks asked, "Is this an instantaneous launch window?" I believe not. Right, Amanda? We have a two-hour launch window, I believe, today?

Amanda Durk Frye (00:14:28):

Yeah. Today's launch window is two hours. As we mentioned at the beginning, there is a small window at the beginning where the we- weather does look favorable. However, there are thunderstorms that are rolling in, uh, so the weather will continue to quickly deteriorate as we move into our window this morning.

Thomas Burghardt (00:14:43):

Got it. We'll keep an eye on that, of course. If there are any updates regarding the weather, we will happily provide those. But count proceeding towards the opening so far. Um, let's see. Some other questions here. Uh, we talked about earlier, Brent asking, "What direction is this launch going?" So today's target orbit is a 29 degree inclination, just about, which is, uh, pretty much due east from Cape Canaveral. Um, we actually saw a, um, a graphic earlier showing the, the launch trajectory zones going east from Cape Canaveral.

Thomas Burghardt (00:15:13):

There it is. Um, that is the path the rocket is planned to take, east of Cape Canaveral towards that orbit. Um, that's actually why this mission is launching from Cape Canaveral. It's because it's targeting, it's that sort of mid-inclination orbit, um, which is different from Kodiak, where Astra also launches, um, where that's more favorable for polar launches or sun-synchronous launches.

Thomas Burghardt (00:15:40):

Uh, so as you can just see, the countdown is just held at T-minus 15 minutes, so we're gonna go ahead and look for some more information on that. Um, we'll provide an update as soon as we have it.

Speaker 2 (00:17:12):

Just hang on. Countdown change is, uh, is complete.

Speaker 3 (00:17:15):

And [inaudible 00:17:15] pulling. Please toggle to both ground and guidance pulling to put the vehicle back in its nominal state.

Speaker 2 (00:17:21):

[inaudible 00:17:21] One, managed pulling to both ground and guidance. Set to true.

Speaker 3 (00:18:07):

Per step 69, Delphin. Can you confirm that the Delphin system looks ready for launch?

Speaker 4 (00:18:17):

Delphin confirms. Good for launch.

Speaker 3 (00:18:22):

Step 70. Orbit, can you confirm that ether is ready for launch?

Speaker 5 (00:18:28):

Ether's ready for launch.

Speaker 3 (00:18:30):

Tango and machine, OX1 ISO control. Set high pressure target to 90psi.

Speaker 6 (00:18:35):

OX1 ISO control high pressure target 90. [inaudible 00:18:40].

Speaker 3 (00:18:47):

Step 72. Tango verify vehicle looks okay for launch, aside from tank levels and pressures.

Speaker 6 (00:18:54):

[inaudible 00:18:54]. Confirmed. Vehicle looks good.

Speaker 3 (00:19:06):

And step 73, GNC, confirm wind profiles are still acceptable for launch at this time.

Speaker 7 (00:19:11):

Confirmed.

Speaker 3 (00:19:17):

'Kay. This takes us to our water test, step 74. Tango, in water one, water system, toggle prime to true to begin flowing water up to the [inaudible 00:19:25] system.

Speaker 6 (00:19:27):

Water one, water system prime to true. Can I flip them?

Thomas Burghardt (00:19:50):

So while teams are working to resolve this hold at T-minus 15 minutes, and again, we'll provide updates as soon as we have them, we do have a couple more questions coming in, so let's start with this one from Don, which asks, "What is the thrust of this rocket?" Amanda?

Amanda Durk Frye (00:20:03):

Uh, so the first stage of the rocket has a total combined thrust of 32,500 pounds, uh, to lift us up from the launch pad, and then our upper stage has 740 pounds of thrust.

Thomas Burghardt (00:20:15):

And what fuel combination is producing that thrust? What...

Amanda Durk Frye (00:20:19):

Yeah. So uh, we use the same type of fuel propellant on both the first stage and the upper stage, and so that is a combination of liquid oxygen and RPX, which is a highly refined form of kerosene.

Thomas Burghardt (00:20:31):

Gotcha. And so those fuel and engines are all on the Rocket 3 vehicle that we're looking right now. Um, John asking, "What rocket is TROPICS-1 sitting on?" I believe even specifically it's Rocket 3.3, but can you give us just an overview of the launch vehicle that is launching today?

Amanda Durk Frye (00:20:47):

Yeah. So Rocket 3 is a two-stage launch vehicle. Um, and here you can see in the expanded diagram, uh, you can see [inaudible 00:20:53] major sub-assemblies of both the first stage and the upper stage. Uh, so we could step through them one by one. Uh, so starting at the aft end, which is the far left side of the diagram, you see the first stage engine bay. And so on the engine bay there are five electric pump-fed first stage engines. Each one provides around 6500 pounds of thrust. Uh, so as I said earlier, for a total of 30 fu- 2,500 pounds, uh, to lift the rocket. And surrounding the engine bay is some thermal protection, mostly just to protect the engine controllers and on-board computers from the high heat environment during launch.

Amanda Durk Frye (00:21:26):

Moving towards the forward end, you see the large cylindrical section there, which is the first stage propellant, uh, storage. Um, so that is a fully welded structure that's fabricated here in-house in Alameda. All those sheet metal components arrive as rolled sheets of aluminum, and our first stage production technicians perform a longitudinal friction-stir weld up each seam before sequentially joining each one together via circumferential TIG welding operations, and that is what, how it forms the fuel and liquid oxygen tank. And you can actually see some really great videos and images of our team at work on these exact operations, um, by searching #FactoryFriday on LinkedIn, uh, to see some of our posts.

Amanda Durk Frye (00:22:05):

And although the tank looks like one large volume, it is actually split into two separate tanks. Uh, one is for the RPX, which is that highly f- refined form of kerosene, and that one sits closest to the engine bay. And then liquid oxygen. And you can see the delineation line between the two, um, as the liquid oxygen tank forms that thin layer of frost on

the exterior, uh, due to the cryogenic fluids inside. And so you can see that on the live video feed of the, the rocket over on the right-hand side there.
Amanda Durk Frye (00:22:32):

Uh, continuing our way towards the forward end, that conical section is called the inner stage, and that's what houses many of our on-board avionics components. Uh, there's a radar on there, antennae, even some cameras, uh, that look down the length of the first stage during flight.

Amanda Durk Frye (00:22:48):

And again, this is a fabricated sheet metal assembly. Um, and it does have additional structural supports in there as that is how the upper stage is secured to the first stage during flight.

Amanda Durk Frye (00:22:58):

And that takes us to the upper stage, um, which is that assembly that looks like stacked spheres on this far right side of the image. Uh, the upper stage also uses RPX and liquid oxygen as its main propellants, um, and that one has a single engine, which is pressure-fed and can provide 740 pounds of thrust. Uh, the upper stage gets nestled into the inner stage during flight until main engine cut-off, when the first stage releases the upper stage for its final segment of flight. And if you look back at the first stage tank, you can see on the lock stone, those fingers that are sticking out, uh, those fingers actually do help to support the upper stage engine during the, uh, high vibrations during the first stage portion of the flight.

Amanda Durk Frye (00:23:36):

And then lastly we have the fairings, which are those two clamshell structures, uh, that go around the, um, upper stage and payload and protect it during flight. Um, and then those will pop open just after main engine cut-off for, uh, release of the upper stage. Um, and then if you do see on the right-hand image the upper stage-... Or sorry, the inner stage end fairings are also white, but that is not due to the similar frosty effect of the liquid oxygen tank. Those have a thermal protection on them, um, to protect the payload from the, uh, aerodynamic heating that is caused by the compression of air as the vehicle moves through the atmosphere.

Amanda Durk Frye (00:24:12):

So that is Rocker 3. Um, overall, we're able to deliver 25 to 150 kilograms to a 500 kilometer sun-synchronous orbit with this vehicle, and the majority of these parts are produced here in-house in Alameda. I would absolutely love to give shout-outs to every one of the technicians and engineers that help us build these vehicles. Yeah, we are on the clock this morning, so as I mentioned-

Thomas Burghardt (00:24:33):

(laughs)

Amanda Durk Frye (00:24:33):

... please take a look at #FactoryFriday on our social media sites where you can see, uh, some of our technicians at work, um, building all the various structures, um, of this vehicle. And if you've not also seen it before, please be sure to check out the factory tour that NASA Space Flight took with our vice president of operations, Bryson Gentile, last year. Uh, it's a great look at some of the incredible things our production teams are building here in Alameda.

Thomas Burghardt (00:25:00):

Absolutely. I'm looking forward to version two of that factory tour, because, uh, the factory has changed a lot since that video as well.

Amanda Durk Frye (00:25:06):

It has. (laughs)

Thomas Burghardt (00:25:06):

Um, so looking forward to maybe revisiting that as well. Um, we do have a brief update on the hold. Again, we're holding at T-minus 15 minutes. It is now confirmed, uh, the hold is due to some boats in the safety hazard area, um, so we'll provide some updates, uh, as the range and the Astra teams work that issue. Um, in the meantime, we'll happily take some more questions. So again, if you've got question on today's mission, please t- s- with @NASASpaceFlight and we'll try to bring as many of those in as we can. We are keeping an eye on the weather as this hold continues. Um, hoping to get this resolved as quickly as possible, of course. Uh, but let's see what other questions we have.

Thomas Burghardt (00:25:43):

Um, here's a good question. Uh, [inaudible 00:25:46], "Is there any particular reason that this hold is happening at the f- exactly at the 15 minute mark, or is that just kind of a convenient time?" No particular reason. Uh, we'll keep providing some more updates as we have them. Uh, but again, if you have any questions, please tag @NASASpaceFlight in chat. Uh, in the meantime, let's go ahead and listen into the pad microphones as the teams work this issue. And again, we're gonna wait for another update as we have them.

Speaker 3 (00:29:18):

This is Astra [inaudible 00:29:19] countdown. We have cleared the final clear to launch hold. UT zero is 16:12 UTC. Step 80, tango, in AV1, manage power systems. Toggle ground power system authority to true.

Speaker 6 (00:29:31):

Ground power system authority, true.

Speaker 3 (00:29:35):

And AV1, manage pulling, toggle do both ground and guidance pulling to true.

Speaker 6 (00:29:39):

[inaudible 00:29:39] Both ground and guidance true.

Speaker 3 (00:29:41):

GNC, do you require an additional self-test at this time?

Speaker 8 (00:29:45):

Yes, please.

Speaker 3 (00:29:46):

In VB1, turn on off PDBs. Tango, please toggle GNC self-test to true. GNC, call out upon completion.

Speaker 8 (00:29:53):

[inaudible 00:29:53].

Speaker 6 (00:29:54):

GNC self-test [inaudible 00:29:55].

PART 1 OF 5 ENDS [00:30:04]

Thomas Burghardt (00:30:00):

TAT self test passed.

Speaker 9 (00:30:42):

Copy. FTS team confirm that the FTS is still enabled.

Speaker 10 (00:30:52):

[inaudible 00:30:52] can confirm.

Speaker 9 (00:30:53):

Copy. Tango in fuel four operate. Please toggle full and fast to true.

Speaker 11 (00:30:59):

Four operate. Full. True.

Speaker 10 (00:31:04):

Got you.

Thomas Burghardt (00:31:15):

All right. So as you may have just heard, we have a new T-Zero. The countdown has resumed. Just under 11 minutes to go. The new T-Zero is 9:12 AM Pacific Time, or 12:12 PM Eastern Time. 16:12, UTC. The range has cleared that boat in the hazard area, and everything now on track for launch in just under 11 minutes.

Thomas Burghardt (00:31:34):

Um, so we should be now coming up on the go/ no go poll for today's flight. So let's go ahead and listen in to the count at it, as the teams work through the final 10 minutes of the count.

Speaker 11 (00:31:47):

Currently non idle.

Speaker 9 (00:31:49):

Please set the idle.

Speaker 11 (00:31:50):

Setting to idle.

Speaker 11 (00:31:59):

Idle.

Speaker 9 (00:31:59):

Pleas- please set fuel four operate to idle. Or, sorry. Standby on that one.

Speaker 9 (00:32:06):

Please make sure pump battery two manage pump battery charges in idle.

Speaker 9 (00:33:14):

Go. Tango in zero, machine activator toggle launch machines to true.

Speaker 11 (00:33:19):

S-, zero machine activator, launch machines to true.

Speaker 9 (00:33:29):

Tango, activate launch machine.

Speaker 11 (00:33:35):

Launch machine is active.

Speaker 9 (00:33:36):

Toggle locks topping to true.

Speaker 11 (00:33:38):

Locks topping, true.

Speaker 9 (00:33:41):

This takes us to step 90. This is the poll for tank pressurization and launch.

Speaker 9 (00:33:47):

Payload, please conf-, -term, confirm there are no concerns for flight and that the payload is ready.

Thomas Burghardt (00:33:54):

Payload ready.

Speaker 9 (00:33:56):

Copy.

Speaker 9 (00:33:57):

Astra team, after this point, any system issue must be called as a hold, hold, hold on the countdown net. If there are no concerns for flight, call go.

Otherwise, no go. Red lead.

Speaker 12 (00:34:08):

Red lead is go.

Speaker 9 (00:34:09):

FTS.

Speaker 13 (00:34:10):

FTS is go.

Speaker 9 (00:34:10):

GNC.

Speaker 13 (00:34:11):

GNC is go.

Speaker 9 (00:34:12):

Athena.

Speaker 14 (00:34:14):

Go.

Speaker 9 (00:34:14):

FAO.

Speaker 9 (00:34:16):

FAO is go. CVH.

Speaker 15 (00:34:17):

CVH is go.

Speaker 9 (00:34:18):

Tango.

Speaker 11 (00:34:19):

Tango is go.

Speaker 9 (00:34:20):

Astra safety.

Speaker 10 (00:34:21):

Safety is go.

Speaker 9 (00:34:22):

Flight is also go.

Speaker 9 (00:34:28):

Tango, verify that the vehicle still looks ready for launch aside from tank press and final topping.

Speaker 11 (00:34:34):

Confirmed. All CCs are met.

Thomas Burghardt (00:34:35):

All right, so the teams have pulled go for today's launch attempt. Under seven minutes to go. Really quick, let's go ahead and preview what we're expecting to see in just under seven minutes. Amanda?

Amanda (00:35:17):

Yeah, so at T-Zero, the first stage engines will fire at the full 32,500 pound thrust to start LV0010's journey toward space. Uh, just six seconds into the flight, the onboard guidance will start to pitch the vehicle over towards its orbital trajectory. And just over one minute into flight is where the vehicle will reach Max Q. This is a really important milestone that tests the structural integrity of the first stage body during flight. Uh, it is the period of maximum aerodynamic load on the vehicle.

Amanda (00:35:44):

At the three minute mark, we will have reached Main Engine Cut-off, or MECO, as it will be called out. Um, which is where the first stage engines will receive the command to shut down, allowing the vehicle to briefly coast before stage separation.

Amanda (00:35:57):

From there, we have a series of three closely timed events. The fairings will pop open and fall away from the vehicle, immediately followed by stage separation, which is when the first stage releases the upper stage into atmosphere and concludes the first stage milestones for the flight. And just around three minute, fifteen seconds, the upper stage engine will ignite and be on its way to delivering our customer's payload's orbit.

Amanda (00:36:18):

After a roughly five minute flight, the upper stage will receive the command to shut down its engine, followed by payload deployment. As I mentioned earlier, we are hoping to see one of the two payloads being deployed through the upper stage onboard cameras, however it is possible that it can take up to 90 minutes or a couple of orbits of the satellites in order to have this confirmed. And that is entirely foreseen, this is due to the nature of the groundlings relative to the satellite's location in orbit once the deployment occurs.

Amanda (00:36:47):

Uh, so we will be ending the live stream broadcast as soon as deployment happens, um, and likely before the satellite communication has been confirmed. Uh, but please remember to follow NASA's twitter handle, @NASAEarth, for confirmation once the satellite communication's been received. And we will also provide an update of our handle, @Astra, when we have confirmed with our NASA partners.

Thomas Burghardt (00:37:07):

Awesome, and at T-Minus 5 minutes and counting. We also should r-, quickly just acknowledge that the new mission control look, which may have looked different from last time...

Amanda (00:37:14):

Mm-hmm.

Thomas Burghardt (00:37:14):

Uh, Amanda, do you want to talk a little bit about why mission control here in Alameda looks a little different today?

Amanda (00:37:18):

Yeah, so our mission control has gotten an upgrade. Um, par-, a lot of that is trying to improve our operational efficiency and streamline our process. As it used to take, you know, six plus team members, and now we've gotten that down to our four t-, uh, key team members, uh, in the mission control pod. And these pods are portable as well, so we can perform mission control from anywhere, uh, that we need to.

Thomas Burghardt (00:37:38):

That's awesome.

Thomas Burghardt (00:37:41):

So, about four and a half minutes to go here, and everything appears on track for launch. So with that, let's go ahead and listen in to the countdown, and we'll listen to the teams go through the final steps for launch. Of course, myself and Amanda will provide any updates as we have them, but let's listen in as the first TROPICS flight approaches liftoff.

Speaker 9 (00:38:07):

Four minutes.

Speaker 9 (00:38:27):

Rock, flight on countdown.

Speaker 16 (00:38:28):

Rock.

Speaker 9 (00:38:29):

First of 94, please verify range is recording telemetry at this time.

Speaker 17 (00:38:33):

Telemetry recorders are running.

Speaker 9 (00:38:35):

Copy. Thank you.

Speaker 9 (00:38:38):

And reminder to control room, if you require RFD, that'd be prepared to switch over your pages at liftoff. Reminder to all that any three word hold from here on out is an immediate abort regardless of source. And MFCO, please be prepared to issue option when rocket IIP marker passes min MECO, and was in, and is within disperse trajectories calling out at event.

Speaker 18 (00:39:39):

MFCO copies.

Speaker 9 (00:39:46):

ACE, start PSD recordings and down range ground station recordings at this time.

Speaker 19 (00:39:51):

Will do.

Speaker 9 (00:40:07):

Two minutes.

Thomas Burghardt (00:40:11):

Two minutes and counting, and everything on track so far.

Speaker 9 (00:40:24):

Hold, hold, hold.

Speaker 11 (00:40:27):

Pulling [inaudible 00:40:28].

Thomas Burghardt (00:41:16):

Okay, so as you may have just heard, a hold was called on the countdown net, so we're going to standby for another update, uh, to see what the issue may, that may, the teams may be working is. We'll provide that update as soon as we have it, but again, the count has entered a hold.

Amanda (00:49:53):

We do have an update for you. We are still holding to complete final locks conditioning. Uh, and so once that is complete, we will likely get a new T-Zero time shortly from mission control for you.

Thomas Burghardt (00:50:04):

Yeah. We'll keep the updates coming, again, as soon as we have them. Everyone holding at T-Minus 31 seconds, expecting a recycle for a new T-Zero shortly. Um, also in the meantime while we wait for that recycle, we'll go ahead and take some more questions.

Thomas Burghardt (00:50:16):

Um, first one off, I'll just start with one on the screen. No, that cruise ship is not violating the range right now. Uh, that ship in the background is not within the protected launch corridor. It's beyond where the rocket sh-, planned trajectory is. So, no worries there. But, feel the need to address that since it's on screen.

Thomas Burghardt (00:50:31):

Uh, but otherwise, we've got some other questions to come in while we wait for this hold to clear. Um, so let's start with, um, this one here. Uh, Scribes asked, "What kind of material is the vehicle made out of?" Amanda?

Amanda (00:50:43):

Uh, yeah, so a lot of our first stage structure is made out of aluminum. Uh, we, we try not to have any exotic materials on the vehicle that are difficult to obtain, or hard to machine. Um, that really helps to ensure that the vehicle is scaled for, uh, manufacturability.

Thomas Burghardt (00:51:03):

Got ya. Um, another question from Sergeant Scott is, "How tall is the rocket, and is it heading to orbit today?"

Amanda (00:51:09):

Uh, so the vehicle is 43 feet in length. So, it is able to fit into a standard 45 foot shipping container, which makes it very easy for portability to our various, uh, space ports. Um, and our launch attempts today is, uh, the countdown will be, um, resuming soon. Uh, and so once that happens, our, uh, targeted I-, orbit for this mission is, um, you have to deliver the TROPICS-1 payloads to the 550 kilometer orbit, at again, that 29.75 orbital inclination relative to the equator.

Thomas Burghardt (00:51:43):

Got ya.

Thomas Burghardt (00:51:54):

Yeah, so on the screen here, we could actually see that graphic of the planned launch trajectory. It's pretty much due east out of Cape Canaveral, uh, within that kind of safety corridor. And if we go back to that camera that showed the cruise ship, that's looking south, um, actually towards Port Canaveral, for those of you that live, or have been around the Canaveral area may know what I'm talking about. Um, that is south, whereas the rocket will be flying w-, kind of left out of frame from this view t- to the east.

Thomas Burghardt (00:52:16):

So again, just reiterating that that cruise ship is not anywhere it's not supposed to be, and is not a problem for today's flight. Um, the current hold is to complete final liquid oxygen conditioning on the vehicle. So, waiting for a new T-Zero regarding that as well. Um, but in the meantime, more questions.

Thomas Burghardt (00:52:32):

Uh... We do have a (laughs) funny question here. Musical wolves is a regular in the chat, who says, uh, "Are the mysterious four towers portable for Astra, since the rocket and ground equipment are portable?" I don't think the lightning protection towers are some of the things that Astra ships out, right?

Amanda (00:52:48):

(laughs) Those are not. That is part of the permanent infrastructure at, uh, the space launch complex.

Thomas Burghardt (00:52:55):

Got ya. Always got to ask about the towers though, it's a rule around here.

Amanda (00:52:57):

(laughs)

Thomas Burghardt (00:53:05):

Uh, we do have a quick question here from Dike, who asks, "When does the launch window close?" Today's launch window extends until 2 PM Eastern Time, or 1800 UTC. Um, so we're still well, pretty early in the launch window, and, uh, hoping for a quick recycle and a new T-Zero here shortly. Uh, while we wait for another update on this hold... Again, hoping that it'll clear soon, but we're going to go ahead and take a break and wait for another update. We'll provide that as soon as we have it.

PART 2 OF 5 ENDS [01:00:04]

Thomas Burghardt (01:01:53):

Okay, so as you see, we're still holding here. We're waiting for this hold to be resolved, but Amanda, I do believe we have an update regarding the weather for today's attempt?

Amanda (01:01:59):

Yeah. So we have recently heard from the range that we are good for another 20 minutes. After then, the weather will, uh, become, uh, too difficult for us to be able to, uh, likely proceed with today's launch.

Thomas Burghardt (01:02:10):

So yeah. So we'll keep an eye on that, but it looks like we've got at least another 20 minutes to go. Um, so hopefully, if this recycle can occur a little bit quickly, well, you should still have another chance to launch today. So again, keeping an eye on that, and we'll provide more updates as we have them as they continue to work this launch conditioning issue. In the meantime, I think the audio cut out earlier. So I wanna ask this question again, earlier we had that hold at T minus 15 minutes. Do you wanna talk a little bit about why that was the whole point?

Amanda (01:02:33):

Right. Yeah. So the T minus 15 mark is when we enter our terminal count and it... That is a really important milestone. Um, that's when we can start to transfer the control over to the vehicle, uh, it's also where we would likely revert back to in case of a recycle. Um, and another key milestone is at approximately 10 minutes from liftoff where we perform, uh, the go-pole for lunch and take pre- tank pressurization. Um, and then at six minutes is when the range provides the authorization to launch.

Thomas Burghardt (01:03:02):

Gotcha. So while we're waiting for this hold, if you are just joining us, this is the live coverage of the TROPICS-1 Mission on Astra's LV0010 vehicle.

Amanda, do you want to just give a brief overview for the new people that may just be tuning in about what today's mission's all about?

Amanda (01:03:17):

Right. Uh, yeah. So this mission marks, again, our second mission with NASA, um, and we are launching... It's the first of three launches to deliver the NASA TROPICS satellites, uh, to lower earth orbit. Um, and so the objective for today, uh, is to deliver the two identical cube sets to an orbit of 550 kilometers at a 29.75 degree inclination. Um, these payloads are about 3U in size. Uh, so they are fairly small. Um, and the payloads, uh, are used to monitor the weather of incoming storms. Um, and so the imagery will actually penetrate into a storm cloud layer and be able to

provide, uh, precipitation, temperature, and humidity data measurements for scientists meteorologists to help understand how storms form grow and intensify throughout their life cycle.

Amanda (01:04:08):

Um, and then we do have, uh, uh, a great blog, um, that NASA has provided for us. You can find that with a more overview of the, uh, satellites themselves. You can find that at astra.com/mission/tropic-1.

Thomas Burghardt (01:04:21):

All right. And while we wait again for more mission updates, we have a couple more questions coming into the chat here. So we'll go ahead. Um, and we have one asking about the space ports that Astra operates out of. Of course, this is Cape Canaveral, not the first time Astra's launched from here. Astra has also launched from Kodiak in the past. Can you talk a little bit about, uh, the differences in those space ports and where else Astra might begin launching from?

Amanda (01:04:45):

Uh, yeah. So, uh, we... The two main space ports that we launch out of right now are Kodiak, Alaska and Cape Canaveral. Um, so Kodiak is beneficial because it is a commercial launch site for both orbital and sub orbital vehicles. Um, and then we did actually recently announce a partnership in May with SaxaVord in UK spaceport. You can learn more about, uh, that partnership astra.com, and also our video recording from our space tech day. Uh, so we're very excited about this partnership as it would expand our capacity to reach key inclinations.

Thomas Burghardt (01:05:15):

Gotcha. And speaking of other locations regarding Astra, where was this rocket built?

Amanda (01:05:21):

This rocket was built right here at our headquarter factory in Alameda, California.

Thomas Burghardt (01:05:27):

It shipped to via road all the way to Florida, right?

Amanda (01:05:29):

Yep. This one went, this one, uh, rolled via truck.

Thomas Burghardt (01:05:35):

I believe we actually have a video of that arrival if we can show that. This is the video of the rocket being shipped out to Florida for today's launch. So again, that's how the rocket got here. And of course, there was a static fire test prior to the launch attempt. And today's launch attempt is currently in a hold. We're waiting for another update on this launch's conditioning issue. Uh, once that hold clears, there'll be a recycle point and a new T zero. Um, so once we get a little bit more information and an update on that, we'll go ahead and come back. But let's go ahead and take a break, and we will come back to you with more information as soon as we have it. Again, stick with us.

Thomas Burghardt (01:06:39):

(silence) All right. So we are still in a hold here at, uh, T minus 31 seconds expecting a recycle and a new T zero, hopefully before too long. The window does last all the way till 2:00 o'clock PM Eastern time, 18:00 UTC, and we're keeping an eye on the weather with regards to that as well. But still holding for an update, uh, hoping for another recycle still, excuse me. But, uh, in the meantime, we do have some more questions coming in. So, uh, first off Amanda, how much thrust does Rocket 3 have, and what's the thrust weight ratio with that?

Amanda (01:15:19):

Uh, yeah. So the overall thrust of the first stage vehicle is 32,500 pounds. Uh, so there are five, uh, first stage engines on our engine bay. And each one of those deliver about 6,500 pounds of thrust individually, and there's 740 pounds on the upper stage.

Thomas Burghardt (01:15:37):

Gotcha. Um, and that thrust again, we talked about earlier about the, uh, fuel combination of RPX kerosene and liquid oxygen. Uh, Martin is asking is the rocket propellant, uh, the kerosene, uh, component not cooled 'cause you could see only the liquid oxygen tank is frosty there.

Amanda (01:15:51):

Right. Yep. No, the, the, uh, kerosene is not cool. That is at atmospheric conditions.

Thomas Burghardt (01:15:56):

Gotcha. Uh, another question here, uh, what is the payload capacity of Rocket 3?

Amanda (01:16:02):

Yeah. So Rocket 3 is able to deliver anywhere from 25 to 150 kilograms of payload up to a 500 kilometer sun synchronous orbit.

Thomas Burghardt (01:16:11):

Gotcha. And again, the rocket, uh, for today's launch still in a hold. We're gonna provide another update again, as soon as we have it, but the teams are hoping to recycle. Um, so keep those questions coming in the meantime. Go

ahead and tag us at NASA Space Flight in chat. Um, we're gonna keep looking for some more questions, uh, while we wait for another update as well, and we'll come back as soon as we have it.

Thomas Burghardt (01:17:42):

(silence) All right. So we are still waiting for an update on today's countdown. Again, we'll provide that update as soon as we have it. Uh, in the meantime, let's go ahead and take a look at this overview video about the NASA tropics mission and partnership with Astra.

TROPICS video

Martin Attiq (01:26:01):

A peer research poll showed that of nine different categories that NASA should focus on, number one on the list is to observe the Earth's climate. The TROPICS mission is a mission that Americans really care about because it is directly observing our climate.

Dr. William J. Blackwell (01:26:15):

TROPICS has a very specific need for their overall configuration. We need to go to a 30 degree inclined orbit, and no one else really wants to go there. The ride shares are all going to sun synchronous orbits, or mid inclinations. So it's very well-targeted to a, uh, smaller vehicle with a very targeted insertion where they can get us exactly where we want to go. And Astra is perfect for that.

Martin Attiq (01:26:34):

And so being able to launch three different times for \$8 million is unprecedented. Because of our unique ability to get to three different orbital in a very short period of time at a low cost.

Chris Kemp (01:26:46):

Why I'm excited about TROPICS is coming out of NASA having the opportunity to fly satellites, uh, for the organization I used to work for is, is personally gratifying for me. It's also a really important mission because we can detect tropical storms, we can help people evacuate, we can save lives. And it's a mission that's really well-designed for Astra's capability, being able to put multiple rockets up into multiple planes rapidly.

Hemant Chaurasia (01:27:12):

And we have the honor of being the final and most important piece at this moment in time of their mission, which is get that hardware in space exactly where it needs to go. We see that there are increasingly smaller satellites that are smarter, that are doing cool things in orbit, but they need to go to particular destinations at particular times.

Dr. William J. Blackwell (01:27:30):

The real end game here is improving our ability to forecast tropical cyclones. What we're trying to do is make measurements in the microwave wavelength region, and those have the advantage of being able to penetrate the cloud tops and see the storm thermodynamics underneath the clouds. We're gonna get something we've never had before in the history of weather satellites, which is revisit rates of better than one hour.

Chris Hofmann (01:27:52):

For the team itself, just this will be a massive culmination of the last three years of work of developing this launch system to be able to do these things that we set out to do from the very beginning.

Dr. Adam London (01:28:03):

From Astra's perspective, it's really important because we believe in space at scale, and to do that, you need to have much more frequent launches and access to space. And so this has been an opportunity for us to really understand how can we further compress the turnaround time between launches, both in terms of building the rockets in and conducting the launches.

Martin Attiq (01:28:28):

What this milestone means for us is delivering a really important mission for our customer, but also demonstrating the capability that others can leverage in the future.

Chris Hofmann (01:28:38):

And so the opportunity to be a part of something like TROPICS, where you get to make a difference and make a really large impact in the lives of people and help humanity as a whole does mean a lot to me. And it really excites me as well, going into this mission, knowing that we can help do something to make the world a better, safer place for people.

Thomas Burghardt (01:28:55):

All right, everyone. Again, we're still waiting for an update on today's countdown. The window does last again till 2:00 o'clock PM Eastern Time, our 18:00 UTC. So we'll provide updates as we have it. There is still time left in the window, and the teams are continuing to work to resolve this hold. So stand by for and update as soon as we have it.

PART 3 OF 5 ENDS [01:30:04]

Thomas Burghardt (01:36:40):

All right everyone. Thank you for your patience and sticking with us. We'll keep providing an up- we'll provide another update again as soon as we have it. Right now teams are just still working to resolve this hold in the window that, again, lasts for another hour. So plenty of time in the window but standing by for another update and we'll provide that and a new T-Zero as soon as we have it.

Thomas Burghardt (01:36:58):

In the meantime we do have a couple more question that we can go through here. So, let's see, uh, if today is scrubbed, when is the next likely launch window, Amanda?

Speaker 20 (01:37:06):

Ah, yeah, we do have one more day in our launch window, which is tomorrow, Monday, June 13th.

Thomas Burghardt (01:37:11):

Right, and we're not- again, we're not push to that just yet, but there is a backup opportunity tomorrow. Um, for tomorrow, ah, does the weather look, ah, favorable for tomorrow's attempt?

Speaker 20 (01:37:20):

Ah right now, it does look like the weather is actually more favorable than it is today.

Thomas Burghardt (01:37:22):

Got it. The weather still kind of holding out for today.

Speaker 20 (01:37:25):

Mm-hmm.

Thomas Burghardt (01:37:25):

So we- we're gonna keep an eye on that. But, um, and an-another attempt with favorable weather forecast tomorrow. So, again, provide that update as soon as we have it. Um, other questions here. We did have a question earlier, we were talking about how the teams were working on launch conditioning, can you actually elaborate on what that means, and what- what- what's, ah, you know, wha- wha- what they were might have been working on, with regards to launch conditioning?

Speaker 20 (01:37:46):

Right, so, that's part of our propellant loading procedure. Ah, it's filling up the liquid oxygen into the, uh, liquid oxygen tank. Um, as the vehicle is sitting on the pad, obviously, is- it is a cryogenic fluid, um, you know, that fluid is boiling off, um, and so as it sits there, we do need to top off the tank. So, we can- need to continue to continuously ah, refill the liquid oxygen as the vehicle is sitting on the pad, pro-prior to launch.

Thomas Burghardt (01:38:09):

Got it. Uh, another question here from Kanen, who asked, "Is Astra hiring?" I believe that's a great question for you, right now [inaudible 01:38:16].

Speaker 20 (01:38:16):

(laughs) It is. Yeah, Ash- Astra is hiring. Um, please check out our website, uh, for the over 100 different posting that we're currently recruiting for. Um, and we have an amazing recruiting team. So, please reach out to any of them. We'd be more than happy to share with you all of the opportunities that, uh, Astra has to offer. Um, I personally spent 11 years in the aerospace industry, in test geoengineering before I took the, uh, huge step, uh, to join the operations team here at Astra. And it really has been one of the most rewarding experiences. Uh, sending rockets to space is hard, as you can see. And this team works really hard but they take care of each other. Uh, and we aim to give everyone ownership and autonomy over their projects. Uh, so, come work on something amazing with us. You know, we're looking for mechanical engineers, technical engineers, test engineers, fluids engineers, anyone with experience is valves, or automation, uh, or even software systems help us design uh, our next rocket. And we're also looking to scale up our team in the operations department, as well, to help us build and qualify each of these vehicles as it leaves the building. So, looking for production supervisors, production managers, as well as build technicians. So, please check out our website at [Astra.com/careers](https://astra.com/careers).

Thomas Burghardt (01:39:25):

Awesome. Some other questions we're getting here and we have one question about are, "Have there been any major changes since the last launch from LV0009?"

Speaker 20 (01:39:32):

Um, so we are continuously seeking to improve the functionality, uh, and reliability, uh, of the vehicle. So, there have been some minor software updates, uh, that have been implemented on LV0010. But, there have not been any major material or mechanical grades to the vehicle, uh, since LV0009. Um, we do have the remainder of our TROPICS vehicles currently in work on the production floor. Um, they're actually directly behind us right now-

Thomas Burghardt (01:39:57):

Mm-hmm.

Speaker 20 (01:39:57):

Is the final integration lane and so our team, our team is actually working to transition away from Rocket 3 and towards our Rocket 4. So, we did see a question, ah, in there about the progress of that. So, we are at a transition point right now for our production floor, as we're ramping down our Rocket 3 production efforts, and building in more of those development builds for Rocket 4.

Thomas Burghardt (01:40:19):

Nice. See, another question we had was, "How long before the launch does the fueling take place?" 'Cause of course when we go live, you guys just see, propellant loading has already been well under way. So, how long before launch does Astra start fueling their rocket?

Speaker 20 (01:40:32):

Yeah, so it typically takes about two hours to start the fueling process from, uh, from beginning to when the vehicle is ready to go, and sometimes if we do need to recycle, it can often take up to 30 minutes, uh, to recycle the- the vehicle.

Thomas Burghardt (01:40:46):

Gotcha. In regards to that ground supported equipment that is of course, involved with fueling and all these other things. Um, can you talk a little bit about how that ground supported equipment gets transported, along with the rocket to the launch site?

Speaker 20 (01:40:58):

Yeah, so the amount of ground support equipment that goes with each of the vehicles depends on where we're launching from, and what type of infrastructure we already have set up in the area. So if it's Kodiak, Alaska, or the Cape, then we have, uh, you know, some of the ground support equipment that is left there from our previous launches. But if we were to set up brand new at a new pl- at a new location, um, believe we can bring all of our ground support equipment in, in roughly five containers. Un, and that includes, you know, our consumables, uh, the helium [inaudible 01:41:27] containers, our pro- our fuel, brings- uh, brings in the- the Cube, and even, um, the Cube for the launcher system, and the rocket, and then we also have a clean room that we bring among in a... in a shipping container. So, roughly around five shipping container is what we need to set up a new space.

Thomas Burghardt (01:41:42):

Five shipping containers for an orbital launch system, that's- that's pretty cool.

Speaker 20 (01:41:45):

(laughs)

Thomas Burghardt (01:41:53):

Again, everyone, if you just stick with us, we are waiting for another update on today's countdown, still in a hold right now. Uh, the window lasts until two 'clock pm Eastern time, and we will provide another update, agan, as soon as we have it. The team's still working on resolving that hold. Uh, but, uh, keep the questions coming, tag us @nasaspaceflight and chat, and then we'll come back with some more updates and some more questions and answers, uh, once we have them.

Thomas Burghardt (01:57:17):

Uh, go ahead [inaudible 01:57:18].

Speaker 20 (01:57:18):

(laughs) We do have an update for you. Ah, we are going to finish our configuration loads and checks, and do a terminal count pre-poll, and we'll be checking back in with the range to see if they are go, or no go. It does appear that the weather is favorable until at least 10:45 am Pacific.

Thomas Burghardt (01:57:36):

Yeah, so that Florida weather doing the Florida weather thing.

Speaker 20 (01:57:39):

Yes.

Thomas Burghardt (01:57:39):

[inaudible 01:57:39] might just hold out long enough. So, we'll keep an eye out on that. But sounds like we are getting close to a new T-Zero, so stay tuned for that. Um, in the meantime, we do have a couple more questions to go through, so we'll keep those coming with that update. Uh, first question from Hoppy is, "What is the expected time for launch tomorrow? I have exams and don't want to miss the launch."

Speaker 20 (01:57:56):

(laughs)

Thomas Burghardt (01:57:56):

I can relate to that. But what is the launch window for tomorrow?

Speaker 20 (01:57:58):

So the launch window for tomorrow would be at the same time as it was today. Uh, so that would be starting at 9:00 am Pacific, 12:00 pm Eastern.

Thomas Burghardt (01:58:05):

Gotcha. But hoping that we don't need that because it sounds like we might get lucky today. We'll stay tuned for that. Um, other questions coming in here? Uh, GamingViper asks, uh, "What engines are being used for this rocket?" So, what are the engines on Rocket 3.

Speaker 20 (01:58:18):

Right. So the Rocket 3 engine, ah, so on the first stage, ah, there are the five, um, electric pump fed engines. Uh, each one has 65,000 pounds of thrust. Un, so those are fed via the RPX, [inaudible 01:58:34], highly reformed- refined form of kerosine, as well as liquid oxygen. Um, so there's a total combined thrust of 23,500 pounds on the first stage engine bay. Um, and there is one engine on the upper stage, and that is a pressure-fed engine, that can provide 740 pounds of thrust.

Thomas Burghardt (01:58:50):

Gotcha. And then you mentioned earlier, we were talking about the new mission control set up, that's still here in Alameda, right?

Speaker 20 (01:58:58):

Yes. Yep, yeah, so even though this pod is portable, the intention is for mission control to stay here in Alameda, rather than actually transporting these pods to the launch site. Mission control is intended to be at headquarters. However, we do have our smaller team that does head out to the launch site, that is our red team. Uh, so the intention is to make sure we have two small teams supporting each of the launches. One that does travel to the launch site, but then also the mission control pod staying here and supporting on-site headquarters.

Thomas Burghardt (01:59:26):

Yeah, gotcha. So, again, the launch site out there in Cape Canaveral, Florida, if you are just joining us, this is live coverage of the LV0010 Launch Vehicle, which is slated to launch the TROPICS-1 mission, the first of three flights for NASA's TROPICS mission, uh, from Cape Canaveral, Florida. Right now the teams are in a hold but they're working on resolving it with some last minute checks and things. Sounds like we should get a new T-Zero, hopefully very soon. The window lasts until 2:00 pm Eastern, and weather is continuing to cooperate. Maybe just long enough for our launch today. But we're gonna stay tuned for another update. And we'll provide T-Zero as soon as we ha-

PART 4 OF 5 ENDS [02:00:04]

Thomas Burghardt (02:00:00):

... [inaudible 02:00:00], uh, but we're gonna stay tuned for another update. We'll provide that T-0 as soon as we have it, so stay with us.

Speaker 9 (02:00:23):

Okay, Tango, can you confirm for me that an AV1-managed power systems toggle ground power systems authority is still true?

Speaker 21 (02:00:34):

Uh, Tango on countdown. AV1-managed power systems authority, uh, ground power systems authority is true.

Speaker 9 (02:00:41):

AV1-managed polling, do both ground and guidance polling is set to true?

Speaker 21 (02:00:47):

Setting both ground and guidance polling to true.

Speaker 9 (02:00:52):

GNC...

Thomas Burghardt (02:00:54):

All right, so as you can see now, the countdown clock has resumed. It's just about T-12 minutes and counting. We're gonna come up on another go/no go poll, like we heard earlier. Um, the teams are back into a recycle and aiming for a new T-0 of 10:43 AM Pacific Time. That's 1:43 PM Eastern time, local time in Cape Canaveral, or 17:43 UTC. Again, now just under T-12 minutes, and the teams are tracking towards a new T-0 for today's launch.

Thomas Burghardt (02:01:22):

Really quickly, we can do a brief overview of the mission timeline again, if you are just joining us, this is what we would expect to see after the last 10 minutes of this countdown, so, Amanda?

Amanda (02:01:31):

Yeah, so T-0 is when we have, uh, first engine ignition and liftoff. Um, and then just six seconds into the flight is when we begin our pitchover, which is when the onboard guidance will start to pitch the vehicle over towards its, uh, downrange orbital trajectory. And then, just over on minute over into flight is when the vehicle will reach Max-Q. Um, again, this is when, uh, the vehicle's structural integrity will be tested, um, because this is when, uh, the [inaudible 02:01:57] maximum, uh, dynamic pressure on the, on the vehicle during flight.

Amanda (02:02:02):

Um, then just at the three minute mark is when we will have reached Main Engine Cut-off, or MECO as it will be called out. Um, and this is when the first stage engine sh-, engines will received the command to shutdown, which allow the vehicle to briefly coast before stage separation. Uh, from there, we will receive the command to have the fairings pop open and fall away from the vehicle, um, which will then be followed immediately by stage separation. And so, that is when the first stage releases the upper stage, uh, into the atmosphere. And then, at around three minutes fifteen seconds, the upper stage engine will ignite and be on its way to orbit. And then, after a roughly five minute flight, uh, the upper stage will receive the command to shut down its engine, followed by payload deployment. Um, and as we mentioned earlier in the livestream, we are hoping to see live video feed from one of our onboard upper stage cameras of one of the two payloads being deployed. However, uh, it is possible that we will not see confirmation of this for up to 90 minutes after the satellite deployment. Um, or at least a couple of orbits. And that is mostly due to the location of the satellites in their orbit relative to their ground communication links once deployment happens.

Amanda (02:03:11):

Uh, so, we will be ending the livestream right as deployment occurs, but again, the satellite communication may not be confirmed for up to 90 minutes. Uh, so, please remember to follow NASA's Twitter handle, uh, @NASAEarth, who will provide confirmation once, uh, that satellite signal confir-, is confirmed. Um, and then we will also provide an update on our handle @ Astra when we have confirmed, uh, with our NASA partners.

Thomas Burghardt (02:03:34):

As the teams get ready to go to the last few minutes of the countdown, let's go ahead and listened in as they go through the final go/no go poll.

Speaker 9 (02:04:00):

Okay, team. This is, takes us to step 90. Hold three for tank press and launch. Customer, can you please confirm if the payload is ready for flight?

Customer (02:04:14):

Payload ready.

Speaker 9 (02:04:16):

Copy. Going around the room, team. After this point, any system issue is a three-word hold on the countdown net. If there are no concerns for flight, call go, otherwise call no go. Red lead.

Speaker 22 (02:04:28):

Go.

Speaker 9 (02:04:28):

FTS.

Speaker 23 (02:04:29):

Go.

Speaker 9 (02:04:30):

G&C.

Speaker 24 (02:04:31):

Go.

Speaker 9 (02:04:31):

Athena.

Speaker 25 (02:04:32):

Athena is go.

Speaker 9 (02:04:33):

FAO.

Speaker 26 (02:04:34):

FAO is go.

Speaker 9 (02:04:35):

CDH.

Speaker 27 (02:04:36):

CDH is go.

Speaker 9 (02:04:36):

Tango.

Speaker 21 (02:04:36):

Tango is go.

Speaker 9 (02:04:38):

Astra safety.

Speaker 28 (02:04:39):

Safety is go.

Speaker 9 (02:04:41):

Astra flight is also go.

Thomas Burghardt (02:04:49):

All right, as you just heard, the teams have once again polled go for launch. Uh, T-8 minutes and counting. You could see right now, that's the mission control team. Amanda, you wanna give us an overview of the personnel that are supporting today's launch?

Amanda (02:05:02):

Uh, yeah. So, in the mission control pod, uh, you see, they're sitting here at our headquarters in Alameda. Um, so, in the bottom left hand side of the screen there, you see Joshua Green. He is our controller, also the call-sign Tango. Uh, his responsibilities are executing commands that are being called out for the ground support equipment, as well as the rocket and automation, and also just make sure that all the clicks in actuation are running properly.

Amanda (02:05:25):

On the bottom right hand side of the screen there is Jarrett Bullion. He is our command and data handling, or call-sign CDH. Uh, and his responsibilities are just debugging some of the automation, monitoring progress, and looking for any anomalies in the launch system.

Amanda (02:05:39):

In the back right there is our assistant flight director for today. He is training. Uh, that is Derek Hamilton. He is hidden behind his monitors right now. Um, but then, uh, on the far left is Chris Hofmann. He is our flight director for today. He leads the launch operations procedures, and is ultimately our final launch authority.

Amanda (02:05:57):

Um, in addition to the launch operations team, we do also have an engineering backroom, uh, that helps to monitor the rocket, update software, and perform other various task during operations. These are generally the engineers that are responsible for the system elements, um, and they're, they are there to ensure that things are working properly, and to assist the launch operation team when troubleshooting if needed. Uh, and these folks are scattered across their facility at their own consoles.

Amanda (02:06:22):

Uh, so, huge thank you to this team, launch operations is a multi-day effort with many checkouts and procedures that need to go perfectly in order to give our team the okay to launch.

Thomas Burghardt (02:06:36):

I believe also, in addition to those here in Alameda, you do wanna go over the folks that are out at the launch site for today's mission.

Amanda (02:06:42):

Yeah, so we also have our red team. Uh, the red team are the folks on the ground in Cape Canaveral. Uh, these are the field engineers that travel with the rocket, and they provide onsite support during the delivery, the setup, and all of the final pre-launch preparations for the vehicle. They're basically responsible for all of the physical work that needs to be done on the vehicle after production has officially handed off the vehicle and launch system to launch operations. Uh, so basically find and debug all the mechanical problems.

Amanda (02:07:09):

Uh, so Adam Fish is our red lead. He is the pad leader that has the final say on the things at the pad itself, and leads the activities at the launch site. Then our have our red two through four members. Uh, it's Eric, uh, Larsen, Cory Biels, and Benjamin Barrow. And they're responsible for just doing a lot of the assembling and troubleshooting of the mechanical and electrical tasks at the launch site.

Amanda (02:07:29):

Uh, and then we have Melissa Cornelius, who is our Astra safety officer. Uh, their responsibility is ensuring a safe launch, uh, so that requires a lot of coordination between the range, FAA, and internal Astra personnel. And then we have Eric Steinberg, aka Steiny as our red IT. He is our onsite IT and network professional, uh, basically ensures that our cameras, communication, and data at the launch site, uh, is working. And, as we mentioned earlier about hiring, there are positions on our careers site for launch field technicians. If anyone is interested in traveling to our sites and helping us assist with, uh, our launches.

Thomas Burghardt (02:08:02):

All right. So, coming up on the T-5 minutes mark. We're gonna go ahead and listen in to the mission controllers as they work through the final few minutes of the countdown. Again, if you are just joining us, we are five minutes away from the next launch attempt for TROPICS Flight One on Astra LV0010. Let's listen in.

Speaker 9 (02:09:07):

Four minutes.

Thomas Burghardt (02:09:13):

T-4 minutes and counting.

Speaker 9 (02:09:33):

Rock flight on countdown.

Speaker 29 (02:09:35):

Rock.

Speaker 9 (02:09:36):

At this time, can you verify range has restarted telemetry recordings?

Speaker 29 (02:09:40):

Telemetry recorders are running.

Thomas Burghardt (02:09:43):

Can see some of the teams here at Alameda gathering to watch today's launch.

Speaker 9 (02:09:46):

[inaudible 02:09:46] control room, if you require RF data inflight, be prepared to switch over your pagers. MIFCO, flight on countdown. Please be prepared to issue option on rocket IIP marker, passes min-MECO marker, and is it within disperse trajectories calling out at event?

Speaker 30 (02:10:13):

MIFCO [inaudible 02:10:14].

Speaker 9 (02:10:27):

Reminder all that any three-word halt call from here on out will be onboard.

Speaker 9 (02:10:37):

Ace, please start PSD recordings and downrange ground station recordings.

Speaker 31 (02:10:44):

Done.

Speaker 9 (02:10:44):

Two minutes.

Thomas Burghardt (02:11:09):

T-2 minutes, all systems go so far.

Speaker 9 (02:11:11):

90 seconds. 60 seconds. Vehicle is on internal control.

Thomas Burghardt (02:12:11):

Less than a minute to go. Everything looks on track.

Speaker 9 (02:12:22):

First stage LOX tank coming to liftoff pressure. First stage fuel tank coming to liftoff pressure. 30 seconds.

Speaker 9 (02:12:47):

20.

Speaker 9 (02:12:47):

15.

Speaker 9 (02:12:53):

10, water on.

Speaker 9 (02:12:58):

8, 7, 6, 5, 4...

Amanda (02:12:59):

[inaudible 02:12:59] is launched and is on its way to low-earth orbit for the TROPICS launch mission-

Speaker 9 (02:13:20):

Chamber pressure's nominal.

Amanda (02:13:23):

Our next objective is Max-Q, which is the period of maximum dynamic pressure on the first stage structure during flight, which is coming up just after one minute.

Thomas Burghardt (02:13:37):

There's a tracking shot of the rocket [inaudible 02:13:38] from Cape Canaveral, on its way to space.

Thomas Burghardt (02:13:47):

You can keep track of the mission with the timeline on the bottom, as well as live telemetry on the bottom right of your screen.

Thomas Burghardt (02:13:51):

One minute into flight.

Speaker 32 (02:14:14):

[inaudible 02:14:14].

Thomas Burghardt (02:14:21):

[inaudible 02:14:21] maximum aerodynamic pressure. Now getting some more important views of the rocket, you can see Cape Canaveral below.

Amanda (02:14:46):

Our next milestone is going to be the Main Engine Cut-off, which will be called out by launch ops as we go. Once that option is confirmed, they can [inaudible 02:14:54] shut, set to shutdown the five first stage engines and allow the vehicle to brief coast, to coastly, to briefly coast. We will then signal to pop open the fairings, and allow those to fall away from the vehicle. The first stage will then release upper stage for the final segment of our flight.

Thomas Burghardt (02:15:37):

Two and a half minutes in the flight, again, coming up on Main Engine Cut-off and just about T+3 minutes. Everything looking good so far.

Speaker 30 (02:15:53):

Flight, MIFCO options sent.

Speaker 9 (02:16:04):

Confirmed, option received.

Thomas Burghardt (02:16:10):

Now looking an onboard view, looking up. There you see payload fairing separation. This is a camera on the upper stage. And there is stage separation, and ether ignition. Upper stage ignition. Now the upper stage will burn for just about five minutes on its way to low-earth orbit. Again, everything looking good so far.

Thomas Burghardt (02:16:58):

Can actually see from the onboard telemetry, the vehicle is actually already in space. However, it has to get that horizontal velocity needed to stay in space via achieving low-earth orbit. And so, we're gonna be watching that velocity marker, uh, tick-up on the bottom right of your screen. About four minutes into the flight, everything is looking good so far. You can see on the left there, the path that the rocket has trace so far in its trajectory, pretty much due East right down the center of the corridor. Five minutes into flight, everything looking good. And, we're gonna expect this burn to continue until about eight and a half minutes after liftoff.

Amanda (02:18:27):

Yeah, the eight and a half minute mark, that's when we will receive the Second Engine Cut-off, and at that point will be payload deployment. And, just as a reminder, we, uh, should only be able to see one of the two payloads deploy from this mission from our onboard upper stage camera. However, it is likely that we may not see this video feed, and we may not receive signal confirmation of the satellites, um, for up to 90 minutes after deployment occurs. Again, this is completely expected, and it due to the location of those satellites in orbit relative to their ground communications links.

Thomas Burghardt (02:19:00):

Yeah, we'll have to wait and see exactly, uh, what we see there. But hoping to get some cool views. The teams at Alameda watching on as the flight progresses. Again, the flight going well so far, six minutes into flight. You can keep an eye on that altitude, you can see the rocket already over 510 kilometers in altitude. Again, the target orbit for today is at 550 kilometers of altitude.

Thomas Burghardt (02:20:08):

And you can see also that velocity continuing to climb towards orbital velocity of course, which is good. Seven minutes in the flight. Just a little over a minute left in the planned upper stage burn.

Amanda (02:25:16):

We had a nominal first stage flight. However, the upper stage engine did shut down early, and we did not deliver our payloads to orbit. We will end the broadcast here, and thank you for sticking with us today.

Thomas Burghardt (02:25:28):

Thank you to Astra t-, for partnering with NASA Spaceflight to help bring live launch coverage to you, and stay tuned for more news coverage. But that wraps up our coverage for today. Thank you all for watching.

PART 5 OF 5 ENDS [02:26:40]
