**Huginn – The space messenger**

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| Image | Text |
| 10:00:00:00   * scary-creepy-crow-or-raven-sitting-on-tree-branch-during-a-full-harvest-moon-night--SBV-312730995-HD ©Storyblocks * ravens-on-branches-in-the-moonlit-night-slo-mo-SBV-320229073-HD ©Storyblocks * superimpose of: winter-landscape-in-mountains-at-sunset-SBV-334514089-4K + raven-flies-over-head-through-cloudy-sky-SBV-300128260-HD ©Storyblocks * superimpose of: lovatnet-lake-beautiful-nature-norway-SBV-312127167-4K + raven-flies-over-head-through-cloudy-sky-SBV-300128260-HD ©Storyblocks * View on earth from ISS – unknown date ©ESA/NASA * Animated Huginn Mission patch ©ESA | **VO:**  **Two ravens sit on Odin’s shoulders, and bring to his ears all that they hear and see. Their names are Huginn – thought- and Muninn - memory. At dawn he sends them out to fly over the whole world…**  **As does the ISS looking down to our planet and its people. Huginn – ESA’s new long duration mission – will relay knowledge and thought back from space.** |
|  | **Title: Huginn – The space messenger** |
| 10:00:34:11   * Establishing shots Andreas Mogensen Huginn at EAC - 31 March 2023 - EAC - Cologne, Germany ©ESA * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA * Andreas Mogensen centrifuge Training, Wirght-Patterson Air Force Base – Ohio, USA / Sept 2022 ©ESA/NASA * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA * Andreas Mogensen POGO EVA traning, Johnson Space Center – Houston, Texas, USA / Sept 2022 ©ESA/NASA * Andreas Mogensen EVA traning Neutral Bouyancy laboratory, Johnson Space Center – Houston, Texas, USA / Sept 2022 ©ESA/NASA * Andreas Mogensen haptics experiment -Interact Centaur at ISS - 2015 ©ESA/NASA * Andreas Mogensen haptics experiment -Interact Centaur ground team - 2015 ©ESA * Superimpose: View of ISS in orbit ©ESA/NASA + raven-flies-over-head-through-cloudy-sky-SBV-300128260-HD ©Storyblocks * GV’s Andreas Mogensen Iriss Mission at ISS – 2015 ©ESA/NASA | **ANDREAS MOGENSEN VO:**  **Huginn is my first long duration mission to the ISS and I like how symbolic the name ties into the realm of human spaceflight. When we are up there, we do experiments that are then used to improve life on earth. Much as Huginn whispering in the ear of Odin, the one-eyed allfather, we try to further the knowledge by telling others on the ground what we have learned.** |
| 10:00:59:18   * Andreas Mogensen EVA traning Neutral Bouyancy laboratory, Johnson Space Center – Houston, Texas, USA / Sept 2022 ©ESA * GV’s Andreas Mogensen Columbus systems training – EAC, Cologne, Germany – Jan 2023 ©ESA * GV’s EAC Facilities – EAC, Cologne Germany – okt 2021 ©ESA | **ANDREAS MOGENSEN VO:**  **For this mission I am training at several locations including the European Astronaut Centre here in Cologne.** |
| 10:01:06:19   * Soundbites Andreas Mogensen, ESA Astronaut- 31 March 2023 - EAC - Cologne, Germany ©ESA (2shots) | **ANDREAS MOGENSEN INTERVIEW:**  I've been doing a wide variety of things. First and foremost training of course, in particular training, uh, regarding some of the experiments that I'll be conducting onboard the space station. On top of that, I've been doing some of my medical assessments. Uh, astronauts, of course, have to be healthy and fit before we launch. And so there are a number of medical tests that we have to pass before we are given the go to launch. |
| 10:01:34:14   * GV’s Dragon Crew-4 launch – Kennedy Space Center - Cape Canaveral, Florida, USA -27 april 2022 ©NASA/SpaceX (5shots) | **ANDREAS MOGENSEN VO:**  **I will fly to the ISS as part of SpaceX Crew-7 and have been assigned the role of pilot. It is very special and an honor I am the first ESA astronaut to take on this role.** |
| 10:01:44:20   * ISS timelapse over Europe – unknown date ©ESA/NASA * GV’s Andreas Mogensen Huginn training at EAC: Metal 3D printer, generic experiment training, Kubik experiment - 31 March 2023 - EAC - Cologne, Germany ©ESA (4shots) * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA (3shots) | **ANDREAS MOGENSEN VO:**  **Once in orbit I will perform many different experiments including 10 Danish experiments. Three of them have a lot to do with living healthy both in space and on the ground. These include the Spacewear monitor, Circadian lights and sleep in orbit experiment.** |
| 10:02:01:18   * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA (3shots) * Soundbites Andreas Mogensen, ESA Astronaut- 31 March 2023 - EAC - Cologne, Germany ©ESA (2shots) * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA (2shots) * Soundbites Andreas Mogensen, ESA Astronaut- 31 March 2023 - EAC - Cologne, Germany ©ESA (2shots) | **ANDREAS MOGENSEN INTERVIEW:**  I've also been, uh, participating in what we call baseline data collection. A lot of the experiments that we do, uh, involve our own bodies as, uh, as test subjects. Uh, and what we're interested in understanding is how our bodies are impacted by the spaceflight. And so we collect baseline data prior to launch, which we can then compare with data that we collect in-flight and data that we collect post-flight. And that gives us, or that gives the scientists, uh, a way to compare or to understand how our bodies have changed due to the spaceflight. |
| 10:02:40:07   * GV’s Andreas Mogensen Iriss Mission at ISS – 2015 ©ESA/NASA * Andreas Mogensen EVA traning Neutral Bouyancy laboratory, Johnson Space Center – Houston, Texas, USA / Sept 2022 ©ESA/NASA * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA * the-beautiful-lightning-on-the-cloud-stream-background-time-lapse-SBV-335178758-4K ©Storyblocks * pan-city-skyline-with-giant-lightning-bolt-SBV-300105498-HD ©Storyblocks * flight-through-the-clouds-thunder-and-lightning-SBV-314790016-4K ©Storyblocks * Andreas Mogensen Iriss Mission – THOR experiment from ISS – 2015 ©ESA/NASA/DTU Space (2shots) * space-view-of-planet-earth-globe-moving-trough-universe-galaxy-SBV-336324741-4K ©Storyblocks * beautiful-clouds-in-motion-timelapse-SBV-309547395-4K ©Storyblocks * aerial-view-emission-to-atmosphere-from-industrial-pipes-smokestack-pipes-shooted-w-SBV-332059735-4K ©Storyblocks * cloud-sky-time-lapse-cloud-moving-and-sun-light-4k-resolution-video-SBV-325404728-4K ©Storyblocks * Illustration: Arrows + animation-of-the-planet-earth-SBV-300265609-HD ©Storyblocks * rays-of-the-sun-make-their-way-through-the-branches-SBV-336482750-4K ©Storyblocks * light-beams-shining-through-clouds-time-lapse-SBV-327337780-4K ©Storyblocks * aerial-view-flying-over-the-high-mountains-in-beautiful-clouds-aerial-drone-camera--SBV-347417665-4K ©Storyblocks * realistic-sunrise-seen-from-planet-earth-orbit-SBV-346708663-4K ©Storyblocks * flying-over-craters-on-the-moon-SBV-338838248-4K ©Storyblocks * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA * GV’s Andreas Mogensen Huginn training at EAC: Metal 3D printer, generic experiment training, Kubik experiment - 31 March 2023 - EAC - Cologne, Germany ©ESA (2shots) * GV’s Andreas Mogensen Huginn training at EAC- Spacewear, Thor-Davies and general experiments - 30 March 2023 - EAC - Cologne, Germany ©ESA * View of ISS in orbit ©ESA/NASA | **ANDREAS MOGENSEN VO:**  **Another of these experiments ties in to Nordic mythology: the Thor-Davis experiment. With Thor being the God of thunder this experiment has all to do with thunderstorms, which we still do not completely understand. We have an event camera to capture the electrostatic discharge at the top of thunderclouds and then observe how the lightning interacts with our atmosphere. Lastly there is also the Earthshine experiment, and this has everything to do with our climate, one of the biggest and most important topics in science. As sunlight hits our planet part of the heat and energy is absorbed while the rest is reflected back into space. This is called the albedo effects and is a vital parameter in understanding climate. Earthshine will try and measure the albedo of the earth by carefully observing how much of this reflected light hits the surface of the moon.**  **As you see these experiments fully convey the idea of the raven Huginn relaying back what it has learned to Odin, or in this case mankind, teaching us by observing from above.** |
| **10:03:41:15** | **ESA OUTRO** |
| **10:03:53:16** | **END** |

**Huginn – B-Roll dopesheet and transcript**

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| TC per file | Text |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR001\_INTERVIEW\_Andreas Mogensen\_ENG** |
| 10:00:05:00 | **Soundbites: Soundbites Andreas Mogensen, ESA Astronaut**  **31 March 2023 - EAC - Cologne, Germany**  **English**  So the name of my mission is Huginn. And Huginn is the name of one of Odin's two ravens. Odin was a god in Norse mythology, and according to legend, every morning Odin would send out his two ravens Huginn and Muninn, to gather information about the world. And then in the evenings they would return to him and let him know what he had found. So Huginn actually represents thought or knowledge. And so I think it's a very appropriate name for for my mission. |
| 10:00:37:01 | I will be flying on SpaceX's crew Dragon from Kennedy Space Centre in Florida to the International Space Station as part of Crew-7, where I will be piloting or acting as pilot on board dragon. |
| 10:00:53:22 | I'm very proud to be, uh, nominated as pilot for Dragon. This is the first time that, uh, an ESA astronaut, in fact, it's the first time any astronaut from outside of NASA, has been appointed as pilot on a US spacecraft. And so I think that's a great honour, both for me, but also for ESA, because it's a sign of the responsibility that ESA is, uh, gaining. And we see that not just among the astronauts, but also among uh, other collaborations, particularly, uh, Artemis missions to the moon, where ESA today is a critical partner, delivering the European Service module as part of the Orion spacecraft. |
| 10:01:40:03 | Well, the International Space Station is first and foremost a laboratory, which means that my job, first and foremost, is to conduct scientific research and technology development. And that's what I will be focusing, uh, as much time as possible on. But because I'm also going to be up there for six months, I need to participate in a lot of the other activities to maintain the space station, which means, uh, maintaining and repairing, uh, systems on board the space station. Um, You know, the space station consists of a lot of electrical and mechanical systems, and they have a tendency to wear down over time, just like anything on earth. And so we need to maintain, uh, the space station and to repair anything that breaks. On top of that, there's a lot of logistical work that needs to be done. You know, we receive, uh, cargo vehicles with, um, you know, two or three tons of cargo that needs to be unloaded, trash needs to be loaded back on them and so on and so forth. So there's a lot of additional work that needs to be done on top of the science and technology, uh, development that I'll be working on. |
| 10:02:47:12 | I'm looking forward to, first of all, spending more time on board the space station. It's an incredible laboratory that we've built in low-Earth orbit. It's such an exciting place and I was sad to leave it after just ten days on my first mission. So I'm looking forward to getting back up there and really making it my home. Last time I was a visitor. This time it's going to be my home for six months. |
| 10:03:13:20 | Yes. So I'll be participating in or conducting ten different Danish science experiments or technology development projects that range from climate science to, uh, sleeping in space. Um, one is called Spacewear, which is a technology, uh, development project to, uh, monitor astronaut health onboard the space station. Uh, and also while exercising. So it's a wearable technology, uh, sort of like a chest strap, uh, that has the ability to monitor not just pulse rate, like a standard exercise, uh, pulse monitor, but, uh, other, uh, physiological, um make other physical physiological measurements as well. And the idea is that it's something that could be used not just in space, but also under other extreme environments here on Earth to monitor the health, for example, of firefighters is one example. |
| 10:04:25:17 | Another exciting Danish experiment is Thor-Davis which is actually a further development of one of the experiments I conducted on my first mission in 2015 called Thor, the purpose of which was to photograph and film giant lightning strikes from space. These are what are also called blue jets and red sprites that shoot up upwards toward space from the top of thunderclouds. It was a the Thor-experiment in 2015 was very successful. I managed to film a Blue Jet as it pulsated, which is the first time that's been captured on video. This time I'll be using a specially developed camera that can take the equivalent of 100,000 frames per second. And hopefully I'll be able to capture again some of these blue jets and red sprites, and that will give scientists an ability to study them, uh, in a very high definition, uh, with data from very high definition, uh, because of this high frame rate of the camera. |
| 10:05:36:17 | Yeah. I'm working with the Danish chef, Torsten Schmidt, again, who also made bonus food for my first mission. It was. It was such a success that as soon as I found out I was going going on a second mission, I asked Thorsten if he would be willing to make food again for my upcoming mission, and luckily he said yes. And he's been making some special space rocks, chocolate and energy bars that I'll be able to enjoy on board the space station. |
| 10:06:13:12 | So the special thing about the both the Space Rocks chocolates and also the, uh, the energy bars is that they are made, uh, from what you might call health foods. Uh, they don't contain, uh, sugar or chocolate. Uh, but they taste just like chocolate. Um, and then the space rocks additionally are made to look like space rocks. There are chocolates that look like moon rocks, Mars rocks, asteroids. And so it's also supposed to be visually appealing and perhaps also involve a bit of a guessing game for us and or for me and my crewmates as we eat them. Can we guess what the what the ingredients are? Because each space rock has a special, uh, ingredient that, uh, makes each space rock a little bit particular. |
| 10:07:09:04 | This week at the European Astronaut Centre. I've been doing a wide variety of things. First and foremost training of course, in particular training, uh, regarding some of the experiments that I'll be conducting onboard the space station. On top of that, I've been doing some of my medical assessments. Uh, astronauts, of course, have to be healthy and fit before we launch. And so there are a number of medical tests that we have to pass before we are given the go to launch. I've also been, uh, participating in what we call baseline data collection. A lot of the experiments that we do, uh, involve our own bodies as, uh, as test subjects. Uh, and what we're interested in understanding is how our bodies are impacted by the spaceflight. And so we collect baseline data prior to launch, which we can then compare with data that we collect in-flight and data that we collect post-flight. And that gives us, or that gives the scientists, uh, a way to compare or to understand how our bodies have changed due to the spaceflight. |
| 10:08:21:11 | Every day from now until launch is packed with training activities. So there is still a lot of training to be completed, although a lot of that training is also refresher training, because one of the challenges is that some of the training I completed, was completed six months ago and I might not get to work with certain experiments or certain systems onboard the space station until several months into my mission, which means it might be a year from when I actually do an activity on board the space station from when I actually trained it. And so there's also refresher training to remind me of what I did a year ago. |
| 10:09:06:15 | Yeah. So a lot of the remaining training is also focussed on, uh, the Dragon spacecraft and, uh, all the phases of flight from launch to rendezvous to undock and landing. Uh, some of that training is conducted with the full four person crew. Uh, but some of the training is also conducted just for Jasmin and I. Uh, who are, uh, or who will be the, the commander and pilot of Dragon. And so we have some, uh, training just for the two of us, uh, where we can look more into depth, into the various phases of flight and learn more about more detailed information about the dragon systems. |
| 10:09:50:16 | So my mission is called Huginn, which is the name of one of Odin's two Ravens. I personally pronounce it huginn, I've heard other people say, Huginn. Exactly how you pronounce it, I don't know. It comes from Old Norse, the old Nordic language. I'm also very happy with the patch, which shows the raven Huginn as he's flying towards the future. Embedded in huginn wing is a silhouette of Denmark, which is the country I'm from. Then there's also a constellation, even though it's not a real constellation, but it's a constellation that represents the old Nordic rune for Safe Travels. And so I thought that was really appropriate. There's also a streak in the wing which represents or shows a launch from Copenhagen, my hometown, up to the International Space Station. |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR002\_INTERVIEW\_Andreas Mogensen\_Dansk** |
| 10:00:05:00 | **Soundbites: Soundbites Andreas Mogensen, ESA Astronaut**  **31 March 2023 - EAC - Cologne, Germany**  **Danish**   * What is the name of your mission and what does it mean? * What are you looking forward to most? * What is special about the food you will take to the ISS? |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR003\_INTERVIEW\_Andy Lundt\_English** |
| 10:00:05:00 | **Soundbites Andreas Lundt: Crewsupport Lead Huginn Mission, ESA**  **30 March 2023 - EAC - Cologne, Germany**  **English**  My name is Andy Lundt and I'm the assigned crew support lead for Andreas Mogensen and his huginn mission |
| 10:00:14:04 | Crew support is responsible for Andy. So what we do is we ensure that Andreas can focus on his training, on his mission while he's on board the station. And we take care of all the other details and little things he shouldn't bother about. |
| 10:00:34:15 | So we make sure that he stays connected to his family and friends, be it via email that we arrange private family conferences which we will coordinate on a weekly basis for him and his family. We also take care of special conferences, be private or public. We support and assist in the launch campaign. We organize also the direct return for him to Europe. We make sure that he has all the software and apps available on station. He wants to use be it music, movies series he wants to watch. So that's that falls under our responsibility where he should not bother about. |
| 10:01:23:10 | Before the launch we take care of requesting all the apps, software he wants to use. We upload or arrange the upload of music, movies, series. We also coordinate the development of the crew preference food items so the items he can choose by himself. This we coordinate with the chef, then together, make sure that this is produced in time, has all the paperwork meets the deadline, have it ready for shipment and then for launch. We also make sure that he has all the items ready that he wants to fly to station, but also items family wants to to send to him via cargo vehicles that this is arranged and in time. |
| 10:02:13:06 | So crew support, our team leads Alex Gerst, he will join Andy and his family in isolation. This usually starts three weeks before the launch. The rest of the crew team, which is assigned to Andreas Mogensen's mission, is then taking care of the extended family, but also friends, which are invited to watch the launch in Florida. And this is usually what's an intense phase not only for him and his family, but also for the friends where we provide an escort service, but also acting as a kind of travel guides that we make sure that all the invited friends and family have the passports and the right visa. So we're making sure that their stay is as comfortable as possible and also without being off, Andy's attention. |
| 10:03:16:19 | So usually the workload of crew support during the mission is a bit lower than before or short after his return. But what we make sure is that he can stay focussed on this mission, on his duties on station, that we take care of the rest. We communicate to him and his family. We arrange the weekly private family conferences for him. That those happens on the right timing. We also try to facilitate each request Andreas might have for his family. In case he would like to watch preferred football or sports events. We make sure that he gets it sent up to station. Also recent movies. Any requests he might have, we try to facilitate. |
| 10:04:14:17 | So before his return, we make sure that he will get everything necessary once he has landed that he can wear comfortable clothes, have his passport handy because he will jump on the plane soon after. He will have his mobile phone back, that he can contact his family and friends. But not only this, that we coordinate the landing for him, arrange everything he would like to have, but we also make sure that he is then sent directly back to Europe, where he will undergo an intense program, first of all, and most important for rehabilitation, but also lots of medical exams, scientific exams, finalisation of experiments. And this is where we keep control of the overall schedule. Coordinate this with the different parties involved and make sure that he has everything necessary. |
| 10:05:14:03 | Well, there's certainly things we will or have arranged for him, but this might be, should be a surprise to him. We have already coordinated his crew preference food items, which was coordinated with the Danish chef, Torsten Schmidt. This was based on his wishes, ideas Andreas had. So this has already been developed, coordinated and is at NASA and ready to be to be launched on station. |
| 10:05:49:10 | Andreas, of course, tasted the food to Torsten Schmidt developed for him. And that's important because you want to make sure that the the items or the food items are really based on his wishes, requests and meet his expectations that he doesn't get any bad surprises when he's on board and takes the first the first bite of it. |
| 10:06:21:16 | Crew support is very important in terms of the mental state and condition of the crew member because you have to imagine even before his mission, he he started one and a half years before with training where he has to travel a lot. So he is away from his family already during that stage. And once he is on station for about six months, it's very important that he can stay connected not only with his family and friends, but also is aware of what's going on on Earth so that you can follow as much as possible. And this is what we try to facilitate, but also to keep his focus on the mission. We deal with the rest of this stuff and make sure that his motivation is constantly high. And this we will also try to arrange with surprises. We can prepare uploads or the family can send up crew care packages. So yeah. |
| 10:07:22:23 | So interesting or important items we send up to crew, for Crew was definitely the music instruments. We have astronauts in our corps which play instruments and those were sent up and they have been on board for quite a while so that they could use them when they went up again for the second mission. But anything can be very important for crew. It can be painting of the kids, it can be small things which makes them feel like home connects, connects them to to home. So yeah, even small things can be very important for crew. |
| 10:08:07:14 | So Andreas picked as his crew preference food items chocolates produced by Torsten Schmidt from Denmark. Those items are called Space Rocks and Space Chocolate Bar. And the space rocks are seven different rocks. They look like asteroids, different colours, different flavours. And the space bar is mainly a chocolate bar with several ingredients. Very tasty. And this has been has been the wish of Andy that those get produced and be shipped up to station as his crew preference food items then yeah, he will definitely share them also with the rest of the crew during special occasions like Christmas, maybe his birthday. So Food is very important for them, especially if it gives them some of variety on station. |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR004\_INTERVIEW\_Andy Lundt\_German** |
| 10:00:05:00 | **Soundbites Andreas Lundt: Crewsupport Lead Huginn Mission, ESA**  **30 March 2023 - EAC - Cologne, Germany**  **German**   * What is your role of crew support * What are the thing crew support takes care of? * What is the role of crew support during the mission and how is the astronauts family supported? * What is special about the food Andreas will take to the ISS? * Why is the role of crew support important for the mental wellbeing of the astronaut? |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR005\_INTERVIEW\_Luca Anniciello\_English** |
| 10:00:05:00 | **Soundbites Luca Anniciello: Increment traininglead for increment 70, ESA**  **30 March 2023 - EAC - Cologne, Germany**  **ENGLISH**  My name is Luca Anniciello. I'm increment training lead for increment 70 and of course, following Andreas Morgensen mission. |
| 10:00:16:17 | My role in the training division is to integrate the requirement for a specific mission and follow the training of the mission from the start to the end. What we do, we work in close cooperation with NASA, Roscosmos and JAXA and integrate together the training that an astronaut needs to be able to fly on the space station. |
| 10:00:47:11 | So a mission requires that an astronaut is capable of doing specific tasks. Of course, there are several areas. You can imagine that one of the most important things is to maintain the space station. This is call system. So big part of this training is system training. The other thing we do, of course, the astronauts need to go to the space station and this is called vehicle training. So if you go with Space X and the crew Dragon, you will train with them and be able to pilot the spacecraft. If you fly on a Soyuz, you will train in Russia and get ready to to fly the Soyuz. On top of this, of course, astronaut do a lot of science on board the space station. A big block of their training is related to scientific experiment and perform experiments. Not to forget, they also get prepared for extravehicular activity and they train a lot in the pool at the Johnson Space Centre. And of course, the robotic arms that do not only help the crew during EVA, transporting astronauts around the space station but is used also to capture arriving vehicles, some of them need the robotic arm just to be berthed to the International Space Station. |
| 10:02:11:06 | To train an astronaut to fly on the space station requires around two year of pre-flight time. This means that that two years before launch, they get assigned. The first thing we do, we assess how much knowledge they have from any previous experiment, and therefore the time can be reduced in case they recently fly or they maintain a certain skill over the period that they were not flying to the space station. |
| 10:02:42:13 | Before becoming an astronaut, you basically become the training that is called basic training. Basic training makes this candidate astronaut up to the same level of knowledge. You know, that they can be engineer, medical doctor, pilot. We need to bring them at the same level of knowledge. And this is done and achieved through the basic training. Basic training covers a lot of aspects, cover all orbital mechanics, space engineering, history of spaceflight, for example, media relations. We start training EVA, giving them already a lot of knowledge on the on what is the science on the ISS, what type of science we do. We cover a specific aspects, let's say from the scientific point of view on each and every branch of the science we are doing on the space station. Basically at the end of the basic training, the candidate astronaut as the right amount of knowledge to then start a specific mission. |
| 10:03:51:21 | So Andreas is assigned as the pilot of the crew Dragon. So the first big block of training, will be training together with the commander to to control the crew dragon. He will be of become also commander of the International Space Station. And for that it will have a specific training flow that is called Commander Flow. And of course, there will be some experiments coming from the Danish scientific community that he will be executing on orbit. |
| 10:04:25:15 | Commander training, basically prepares the astronaut to be a leader on the International Space Station and make sure he fully understands what are his responsibilities and how to execute and lead the group in an emergency scenario and therefore getting him prepared to cover this role. |
| 10:04:51:21 | So we are a few months away from from Andreas' launch. Most of this system training is almost complete. We are now approaching the phase where we start training the scientific experiments and the payloads they will be executing on orbit. He will also coming into the phase where simulation for the crew dragon are getting really heavy together with this commander. And on top of this, we also, as I say, we start the scientific training, but we start also what is called the baseline data collection. So for the physiology experiment that he will be executing on orbit, we start collecting data that we will use later on to compare with the actual experiment that we perform on orbit. |
| 10:05:43:20 | Training as a pilot is being capable of handling nominal and off nominal situations on the crew dragon in plus in addition to that, commander and pilot need to be equally trained because of course, in case of any issue, any one can take the commander role. This means that they will run a lot of simulation in the ascent phase, rendezvous and docking and re-entry and just to make sure that their knowledge and reaction to any off nominal situation is trained and successfully implemented. |
| 10:06:23:04 | Andreas will be the first European to pilot a US commercial crew vehicle. Is not NASA vehicle, it is a fully commercial. So I would say this is an extremely special case that we are, we reached the agreement to actually have a pilot non-American that is flying and piloting an US commercial crew vehicle. |
| 10:06:48:11 | Having a previous experience, of course, gave the chance to us in training to assess the specific needs. Even if you are 15 days in space. You get qualified, for example, for Columbus and you were already trained on certain items before. For sure has been quite a long time between this first mission and this one. But that's why we do assessment. So it's like kind of exam where we can assess the knowledge you retain and then eventually waive and reduce the training implemented. This at least from the training perspective, of course, from the space mission perspective, for sure he will already know what to expect once he's on orbit and the way the body will adapt in the first week of his mission. |
| 10:07:47:08 | Planning astronaut training is can be extremely easy, on one side, can become extremely complex, on the other side. We all start with a generic flow set that we have. So the first thing we receive is what Andreas will be doing on orbit for his mission. This gives us basically the flows that we have to embed into this training program. So we start from there. Building a nominal training, we lay out our plan. We sync Andreas training with his crewmates. As I said before, for example, he will have to train together with his commander all the time for the vehicle. This means that we have to make sure that Andreas and the commander are together in training at the same time. So we start syncing the various crew members of the mission. But we have to take into account also that there are several other crew members in training that are flying before Andreas and that will fly after Andreas. So we have to take into account the loading of the resources, so how many person we can have. For example, in Houston at the same time, how many personcan have here in ESA and we basically build this plan. Of course, the best plan can always be changed by a launch date change, by an issue that there is a delay in the vehicle production. And of course, when you extend it, of course, it has an impact, that is much easier to enter. But when it is advanced, then the issue becomes in making sure that you still achieve the same objective that you want before the crew is flying to space. |
| 10:09:34:03 | I will not say that astronaut training is hard. From the physical demands, definitely from the mental point of view, it is a challenge. Imagine being in training constantly, almost six hour days for two years, and you can imagine that that this is really a mental challenge. On top of this, you add that since the ISS is a cooperation, every one of us is responsible for a block of the training. NASA is responsible for the NASA-segment, ESA is responsible for the European segment, and so for Roscosmos and JAXA, means that not only we train six hour a day for two years, but the crew is forced to travel location to location. And of course this has an impact on the private life of the astronaut, I would say. So we also take into account this when we start the planning, making sure that they spend enough time at home, they get the proper vacation and we try to distribute in the proper way to travel so that they are not so heavy, I would say, impacting the life of the crew. |
| 10:10:53:15 | The skillset that an astronaut should have is looked at since the selection phase. The selection criteria make sure that the candidate astronaut that then started the basic training have the proper broader skill set that we are looking for. Doesn't matter the technical background, because we say that an astronaut can be an engineer, can be a medical doctor, can be a geologist, can be a pilot. But the capability of being piloting a vehicle and a general awareness of what's going on around you, have the capability to decide very fast and try still to reflect on the course of action. These are embedded skills we want into into an astronaut. And usually you can't train those, you can train all the rest. But this you have to as a person. |
| 10:11:58:14 | Training will change a lot in the transition from the ISS to moon and then beyond moon. Right now, you have to imagine that in a few hours the crew arrives to the International Space Station and then they can start either a two weeks mission or a six months mission or even a year mission. We have several cases with the crew stay a year. In those cases, what we do is make sure that we prepare the crew as much as possible on ground, so that on the ISS the time they use is devoted to science first and then, of course, maintaining the space station. When we transition to the moon. Travel are still not extremely long because we are talking about days. Mission on the moon will be rather shorter than the one on the International Space Station. But what we are looking for are different skill sets because they are going to explore the lunar surface. We want them to have geological skills, and that's part of new training especially is ESA implementing. So the rest will be similar: system, science... But on top of this, since they are exploring in this new surface, we have to make sure that they have additional skill like the geological one. When we talk about Mars, the mission is totally changed because the mission is not the travel actually is not anymore a few days. But we are talking about months, if not years, with the technology we know right now. So crew will have plenty of time during the travel to train. And this is something today we don't have. This means that the training will change. We will for sure train part of the mission on ground, but we will have time during the travel to complete the training and to make sure that they keep the proficiency in certain skill so that once they arrive on the Mars surface, they will be ready to perform their task. |
| 10:14:14:09 | The most important aspect of developing training is, first of all, we have extremely well-prepared persons as a students in our classes. They have a lot of background knowledge on on space, on the space system. So developing training for them means really try to focus on all operational aspects that they will need once they are on orbit, focusing on the operational hints, give them the additional skill set they that are really specific to the task they are training for. And of course, getting the training efficient is one of the other important aspects. As I said, we train to prepare a single mission for two years. We have to make sure that we just convey the right amount of information, making sure that the training flow will not explode and stay in this proper amount. |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR004\_INTERVIEW\_Andy Lundt\_German** |
| 10:00:05:00 | **Soundbites Luca Anniciello: Increment traininglead for increment 70, ESA**  **30 March 2023 - EAC - Cologne, Germany**  **Italian**   * What is your role? * Whatdoes Astronaut training look like? * How will astronaut training change in future with missions beyond the ISS? |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR007\_INTERVIEW\_Ruediger Seine\_english** |
| 10:00:05:00 | **Soundbites Ruediger Seine: Lead of the Space Training Team at EAC, ESA**  **30 March 2023 - EAC - Cologne, Germany**  **English**  My name is Ruediger Seine. I'm the lead of the space training team at the European Astronaut Centre in Cologne. |
| 10:00:12:14 | As the lead of the space training team. My role is to make sure that within the ISS program we train the ESA astronauts, we train the international partner astronauts, the Russian, American, Japanese and Canadian astronauts for the ESA components on the International Space Station. But we are also training the ESA flight control teams in the Columbus Control Centre and the user support and operation centres for their role to support the crew during the mission. |
| 10:00:45:06 | The astronaut training for ISIS is essentially in three phases. We start after hiring new astronauts with a basic training that takes roughly one year. Then comes a variable duration training phase that we call pre-assignment, and that captures it well. It's pre-assignment. So depending on when the assignment happens for the astronaut, we continue with training activities until they're assigned for a mission. And once they are assigned to a mission, they go into the assigned crew training, which takes another two years. |
| 10:01:20:12 | The mission specific training is really specific to the tasks of every individual astronaut. So that means we have different trainings for each astronaut depending on the specificities of the mission. They do a certain set of experiments of payloads. They have certain tasks in repairing and maintaining the vehicle. They may go on an extravehicular activity. All that drives what we're training for. There's a certain set of common trainings for everybody. Like everybody gets training on the Columbus module such that they understand how to work with that. But. That is working in the normal environment. Repair, training, etc. is only done for things that are on the plan or that will be done on short notice. |
| 10:02:10:17 | The training today essentially prepares astronauts for staying on orbit on the ISS for half a year. That is a very long time. For the foreseeable future, we don't see that we have mission durations coming up that are much longer. So most of the training we're doing, especially the training on human behaviour and performance, is very applicable to training also for future missions. Obviously once you go on the moon, there's additional training in surface geology and surface operations that will be needed. But the basic tasks and skills are going to be roughly the same that we have on the International Space Station. |
| 10:02:54:12 | Staying in a confined environment for a longer period of time, like the six months that astronauts face on the ISS, is extremely challenging mentally and physically because you have a lot of stress factors that you cannot take away. You have to deal with no day-night rhythm. You have to deal with the fact that you don't pick your crewmates. You don't have your usual support team at home, your family, your friends. You have not so optimal personal hygiene conditions and things like that. And all of those stress factors, of course, affect the performance of astronauts. In the training process, we're giving astronauts an experience of similar challenges on the ground with the chance to be observed by a team of trained observers that provide feedback on how the astronaut is doing, how communication is working, how the feet of how the teamwork is going, and that lets them learn how to work as a team and how to see when they need help themselves in stress situations and when they can provide help in stress situations. And that essentially is is an excellent preparation for making sure they can cope with the stress on the ISS. |
| 10:04:20:03 | The crew support team that we have at ESA works very hard, especially during the mission, to make sure the astronauts get as much support as we can by providing them with news that they're interested in, providing them things also to switch off with at times, but also providing opportunities to talk to the family via conferences and other means to just make sure they have at least a bit of the support structure from people that they know and trust and that they can talk to somebody outside the operational concept. |
| 10:04:58:18 | If an astronaut has been to space and flies for a second time, that changes the approach of training quite significantly. They've seen the ISS and they have worked on the ISS and they've worked in the Columbus module. So a lot of the training that we provide internally to ESA is refresher training because we don't need to start from scratch. And for some topics, they actually have more experience than the instructors on the ground because they've been there and they've seen it. On the other hand, it also opens up opportunities. The fact that Andreas has already been to space makes it possible for him to become an ISIS commander. We typically do not choose people that have never been to space to command a mission. The fact that he's been there, he's worked a lot on the ground in support of other missions as well, makes him an excellent candidate to also become a commander. |
| 10:05:56:09 | When an astronaut has been to space, the first thing that we do essentially when he comes back down to earth is for him to have a debriefing with the training team. So we are collecting the feedback from the astronaut concerning the training they've had, whether it's, Oh, I missed something or Oh, this was way too much, I didn't need that training. That is something we collect immediately after the mission and it feeds back into our training flow so it improves the training flow for all follow up astronauts. If like Andreas, somebody comes back for a second training, they will frequently say, Oh, yes, I remember this one, and then we'll just gloss over it because we know they remember. But sometimes they will also say, I had problems with this one and it didn't come up potentially in the debriefing and then we'll spend some more time there. So it is a it is a more give and take discussion also between the instructor and the astronauts if the astronaut has already been in the space. |
| 10:06:59:04 | The role of the European Astronaut Centre is first and foremost to be the home station for the ESA astronauts. On top of that, we are preparing missions from here for the ESA astronauts, but we are also training all ISS partner astronauts for the European components when they go to the International Space Station. We coordinate a lot of activities in training and medical activities in crew support with the international partners from here, and we also run part of the operations out of EAC, for instance, the EuroCom that speaks to the crew while they on orbit for all the European experiments and all the Columbus activities, is located at the EAC and is staffed out of the crew support, medical and training teams here, because then we have people speaking to the astronauts that have already talked to the astronauts while they were in training. So there's a bit of a more personal connection. |
| 10:08:00:17 | The training that we have at the EAC is very much coordinated and in line with the trainings that the other partner agencies do. We have to make sure that we're not having gaps between the US, the Russian, Japanese, Canadian training and ours. But we also don't want to have a big overlap because otherwise it would be extremely frustrating for the astronauts to spend hours in sessions where they already know the content. So we are very closely aligned. There's some. Differences in strategy. The Americans are very much hands on. We tend to be quite hands on, on the Russian and Japanese side there is a tendency for more theoretical training that comes out of the teaching history in the respective countries. But there's not the one thing where I would say, know, we're doing this totally different than the other agencies. Not at all. |
| 10:09:01:00 | For future missions that will go beyond Earth orbit, be it to the gateway, be it to the lunar surface or even further out to Mars. What is more important and what needs to become more evident in training is training for the crew to be autonomous. The further out we venture, the less support you can get from the ground, especially on short notice. So the crews will have to be able to deal with any kind of problem, any kind of situation on their own and not rely on help from the ground. In the ISS-frame, on the contrary, we have 90% voice loop coverage and commanding coverage. So for a lot of things, the crew is offloaded. The crew will need for future missions, more technical knowledge, but will also need to have more tools on board and at their hands to deal with the situation and to thoroughly analyse the situation. |
| 10:10:01:16 | The XR-lab at EAC is a small group of people that look into virtual reality, augmented reality applications with a view point at using them in training, but also for other applications in space flight. We have used virtual reality as a demonstration for the human interface testing for some of the gateway modules. You can simply step into the module and check if you can reach some place or if the environment is too tight without the need to send astronauts across the continent, so to say. The other thing we've done is we've taken an established robotics training, the generic robotics training that was developed by NASA and CSA, and we've put it into virtual reality. And the product is so convincing that NASA is now using this generic robotics training in virtual reality to train their new astronaut candidate class. And obviously we are also going to use it for our new astronauts. |
| 10:11:14:02 | The robotics training prepares astronauts for the use of the robotic arm of the station. It is not specific to the arm it trains the astronauts, on reference frames, on how to use camera views to judge whether you're moving in the right direction at the right speed. That's why it's called generic. It's not on the specific station arm. It is a generic skill that helps you with all kinds of arms and potentially can even be built further out to manoeuvre something like drones, etc.. But we haven't looked into that yet. |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR008\_INTERVIEW\_Ruediger Seine\_German** |
| 10:00:05:00 | **Soundbites Ruediger Seine: Lead of the Space Training Team at EAC, ESA**  **30 March 2023 - EAC - Cologne, Germany**  **German**   * What is your role at EAC? * What does Astronaut training look like? * Does training vary from astronaut to astronaut? * What is the role of EAC? * How might astronaut training change in the future? * What work is being done at the XR-lab at EAC? |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR009\_GV's Andreas Mogensen Training** |
|  | GV’s Andreas Mogensen Huginn training at EAC:  Spacewear, Thor-Davies and general experiments  30 March 2023 - EAC - Cologne, Germany |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR010\_GV's Andreas Mogensen Training\_2** |
|  | GV’s Andreas Mogensen Huginn training at EAC:  Metal 3D printer, generic experiment training, Kubik experiment  31 March 2023 - EAC - Cologne, Germany |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR011\_GV's Eurcom** |
|  | GV’s Andy Lundt working at Eurocom  30 March 2023 - EAC - Cologne, Germany |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR012\_GV's EAC** |
|  | GV’s EAC  31 March 2023 - EAC - Cologne, Germany |
| 10:00:00:00 | **2023.003\_ESA\_Huginn\_BR013\_set-up A Mogensen** |
|  | Establishing shots Andreas Mogensen Huginn at EAC:  31 March 2023 - EAC - Cologne, Germany |