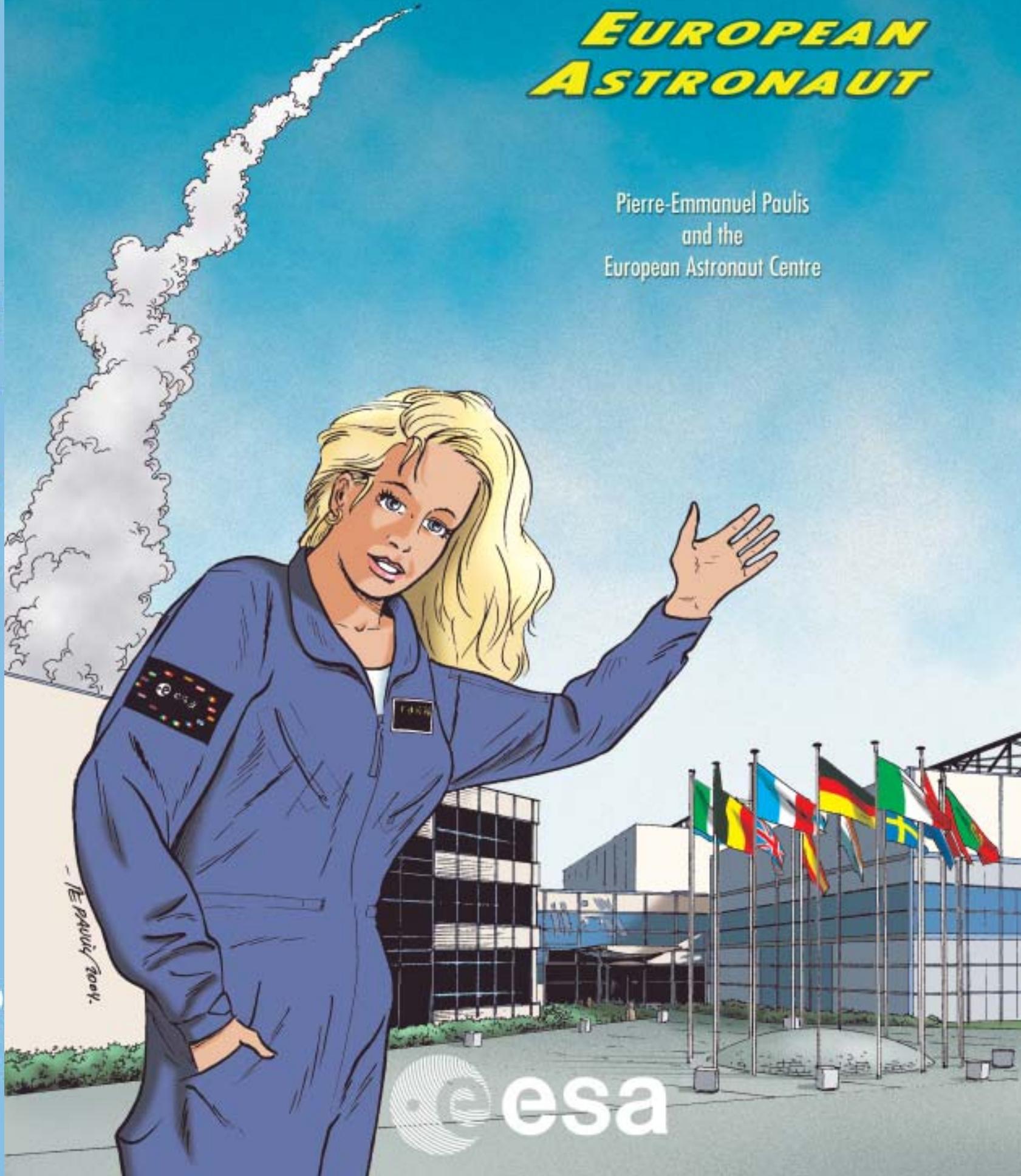


TANIA

EUROPEAN ASTRONAUT

Pierre-Emmanuel Paulis
and the
European Astronaut Centre



TANIA
European Astronaut

esa

esa

TANIA

EUROPEAN ASTRONAUT



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Cologne, Germany.



European Astronaut Centre.

Finally, my new life starts today!



ESA astronaut! Great!
Exciting adventures to look
forward to ...



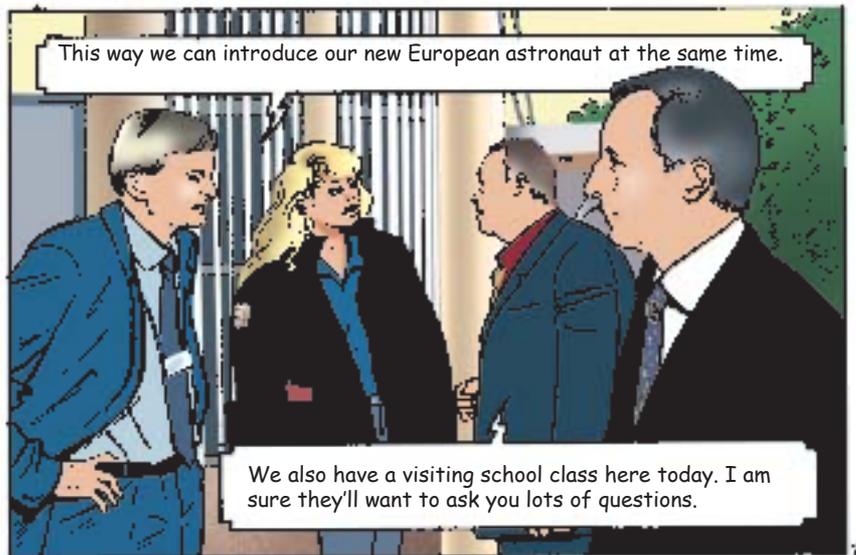
Hi, Tania! Welcome to the European Astronaut Centre!

Thanks! I'm so happy to join the team.



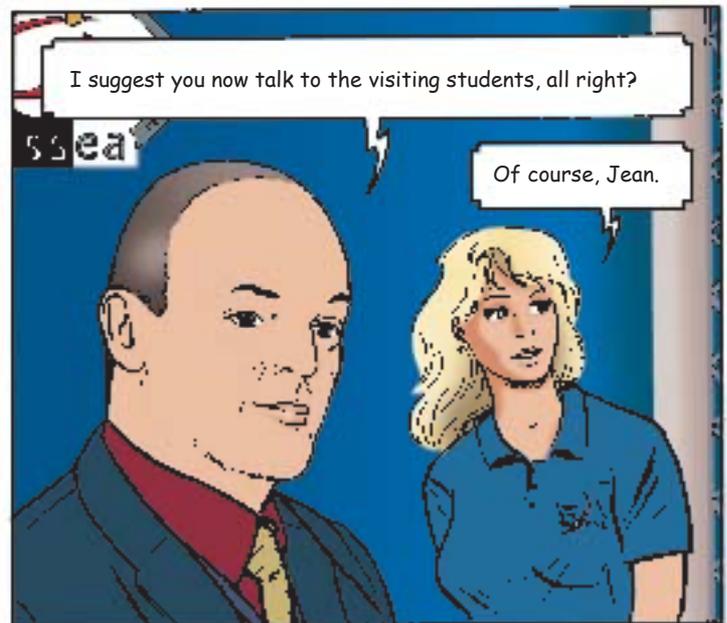
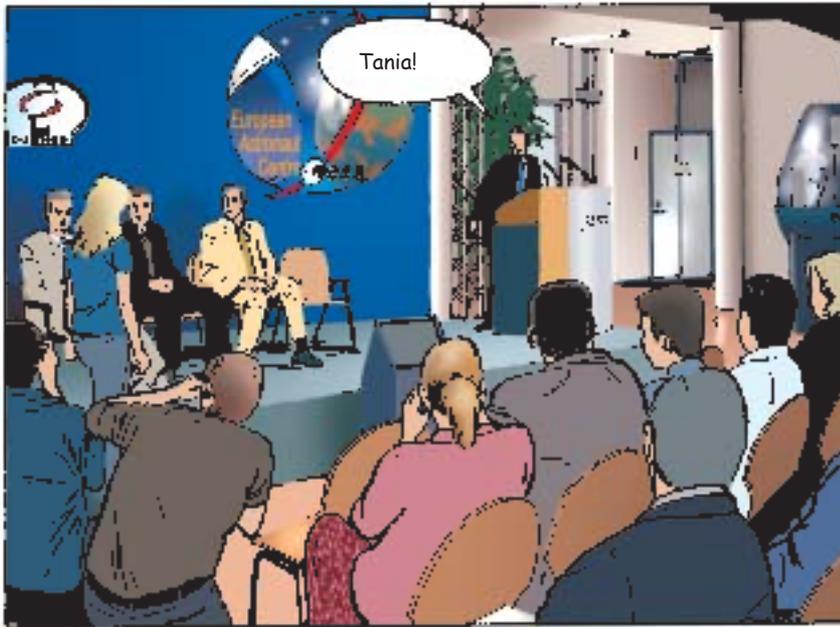
Frank De Winne is giving his post-flight conference. That's why we asked you to arrive at EAC today.

This way we can introduce our new European astronaut at the same time.



We also have a visiting school class here today. I am sure they'll want to ask you lots of questions.

*EAC = European Astronaut Centre



Every candidate must have a degree, a couple of years' working experience and a very good level of English.



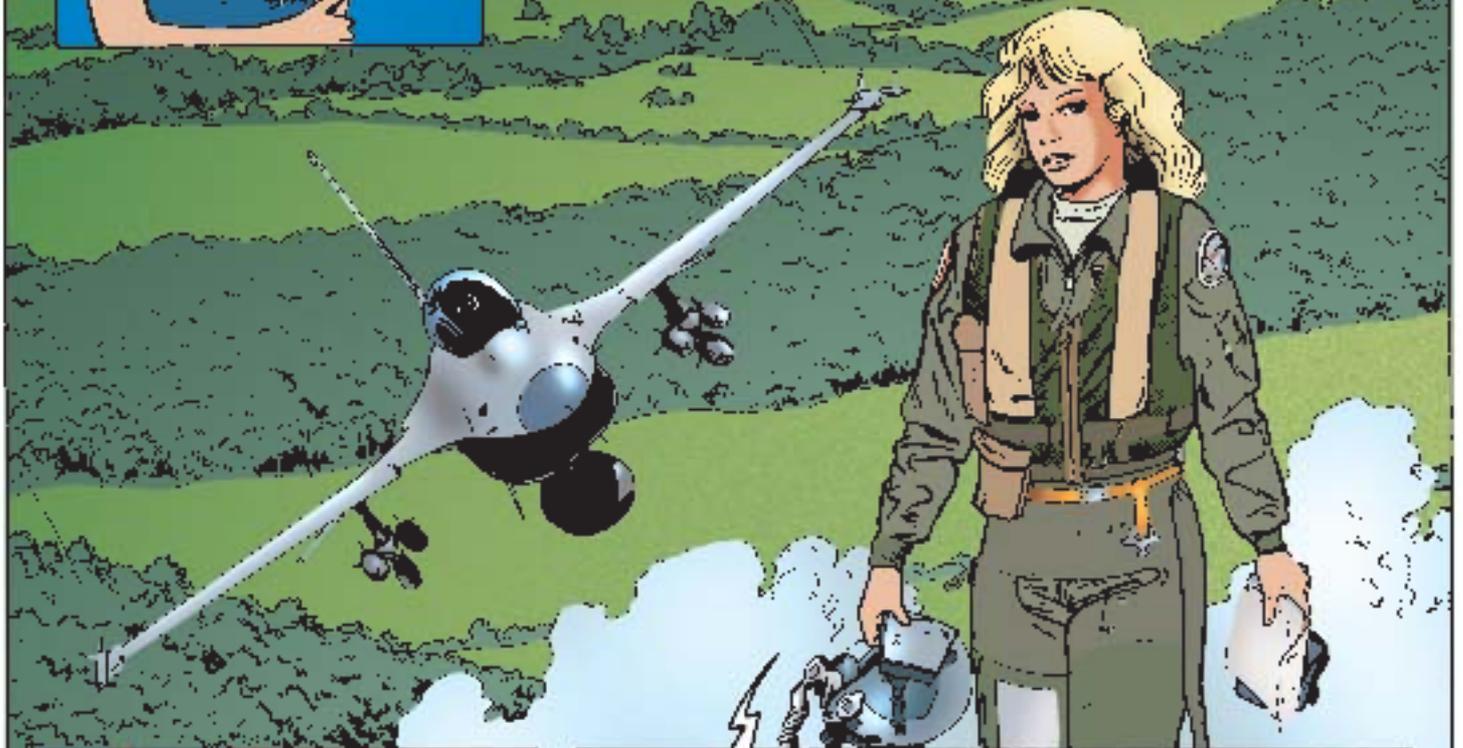
What did you study, Tania?



Well, I'm a fighter pilot and test pilot as well as an engineer.

You have to be in very good health, too. The health requirements are very strict.

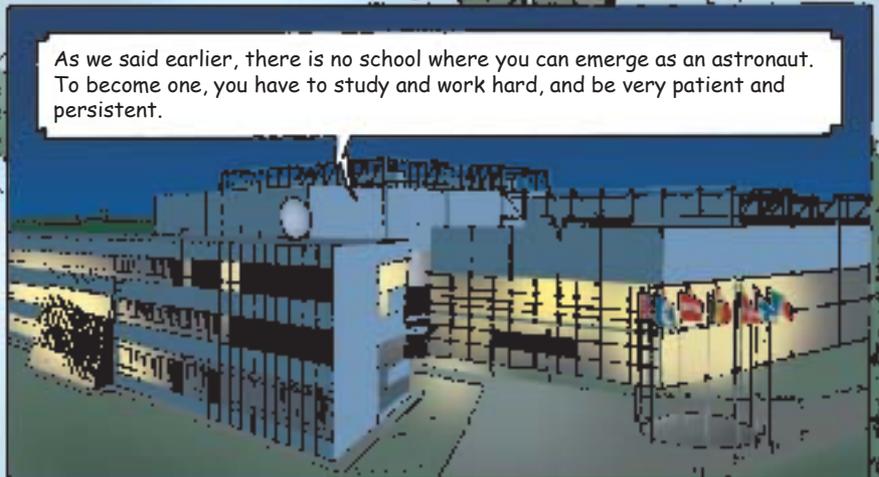
At the moment, the European Astronaut Corps has 13 members. They are pilots, doctors, scientists, engineers...



On top of all that, I had to pass many psychological tests to prove my sociability, team spirit, my skills in crisis management and much more.

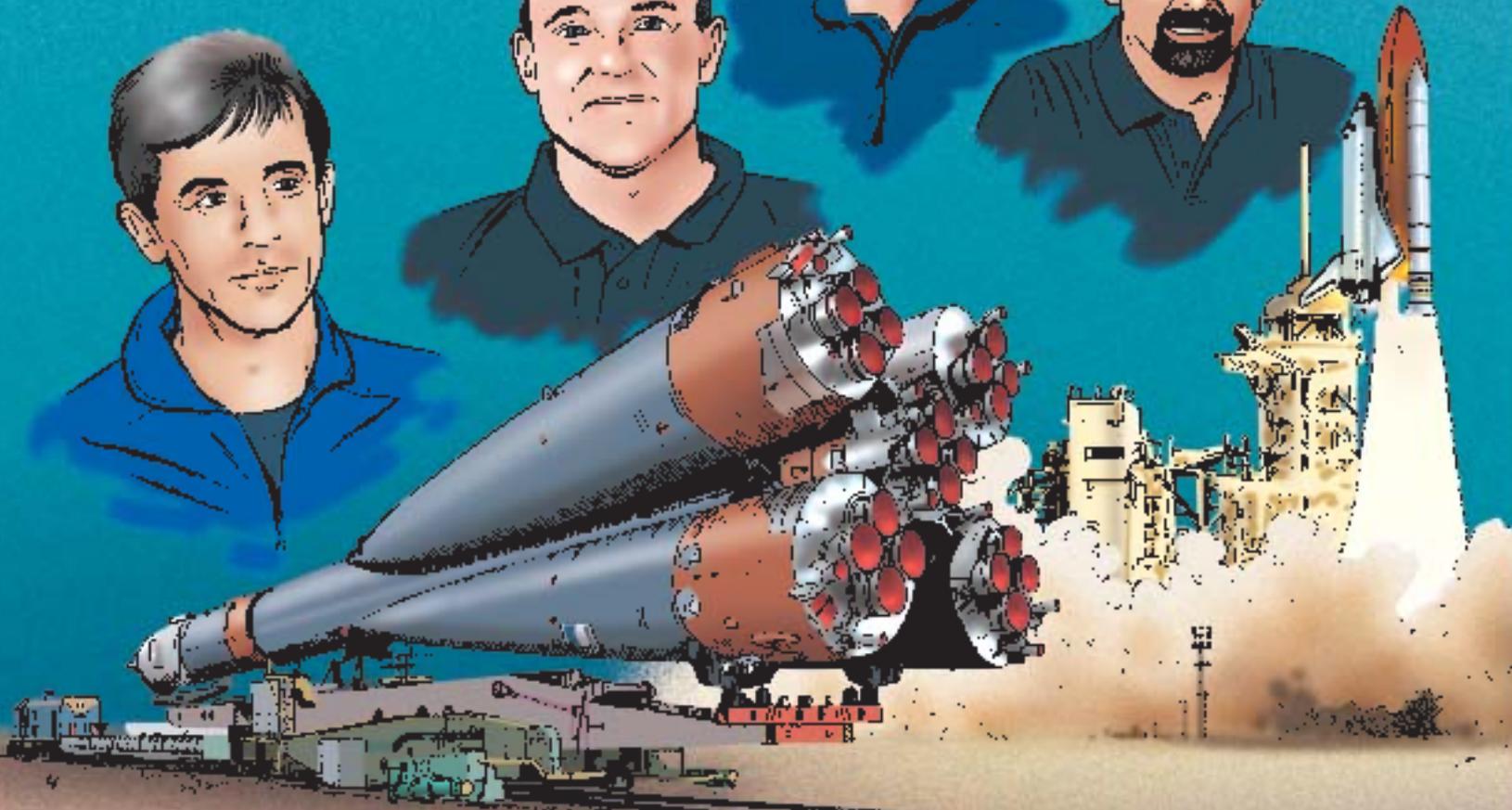
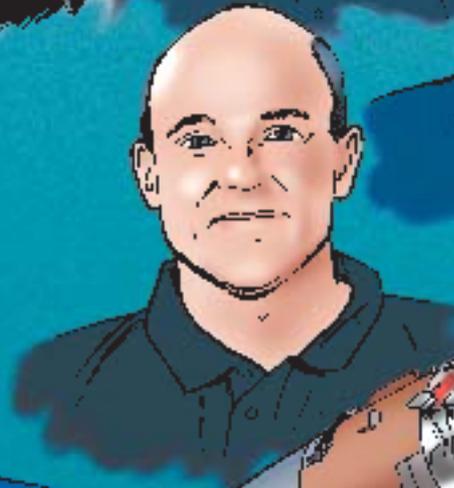
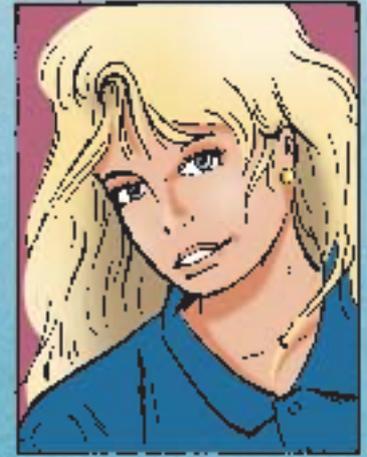


As we said earlier, there is no school where you can emerge as an astronaut. To become one, you have to study and work hard, and be very patient and persistent.

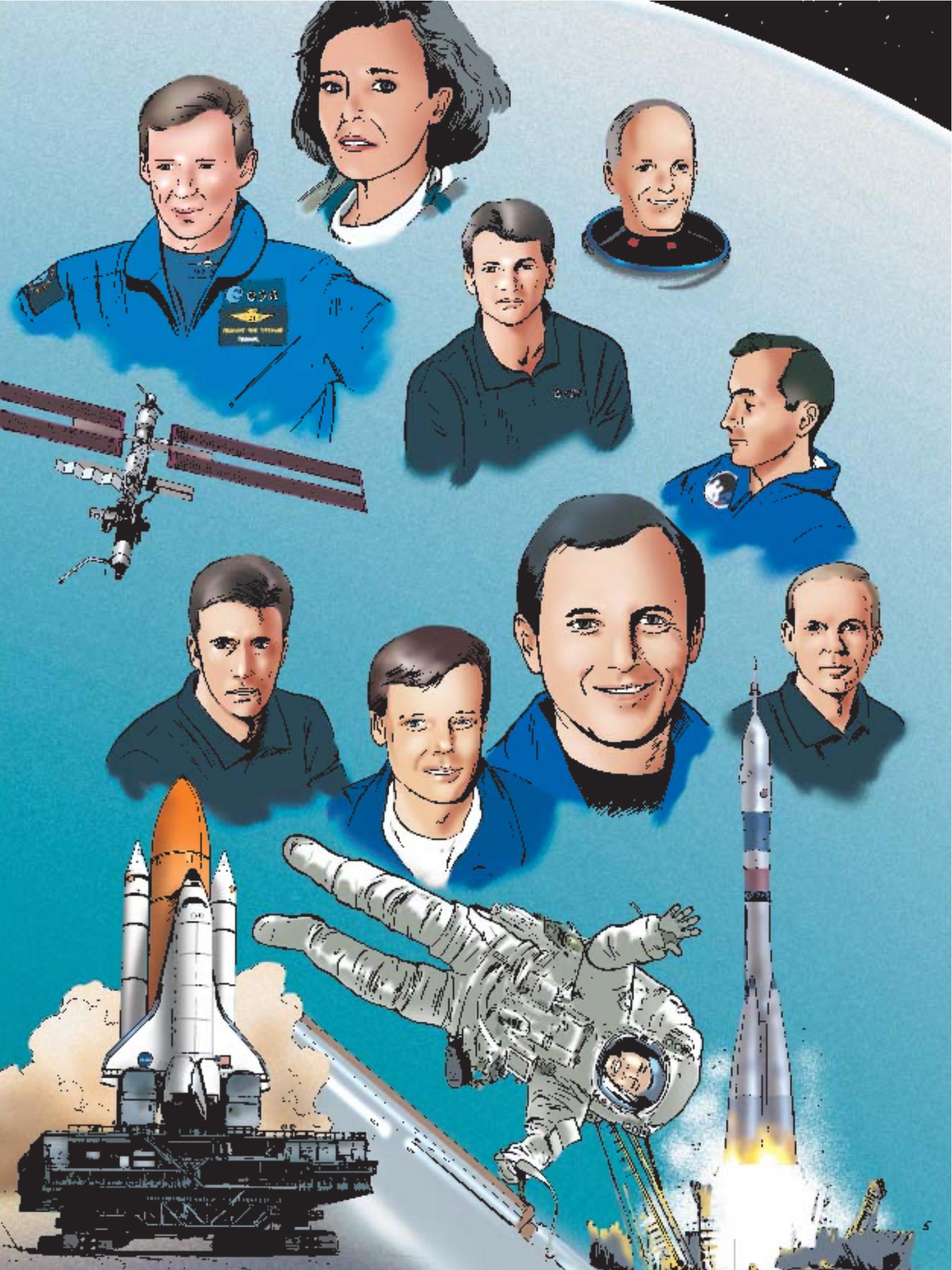


The selection process is tough. Several thousand people apply, but only a handful will be selected.

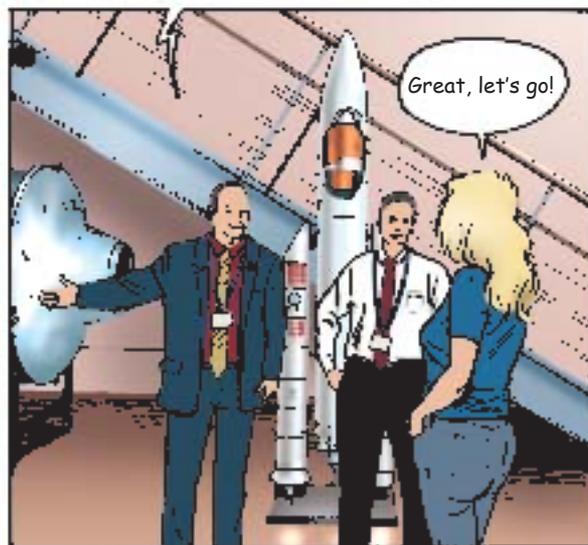
I will now start the basic training that all my European colleagues have already completed. It happens here at the astronaut centre.



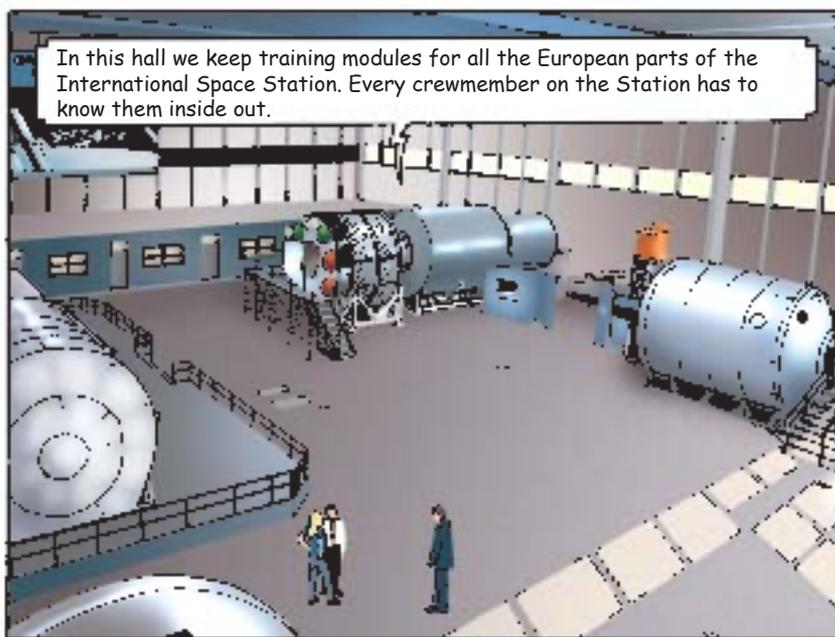
-E. RAY



How about a little tour of our facilities?



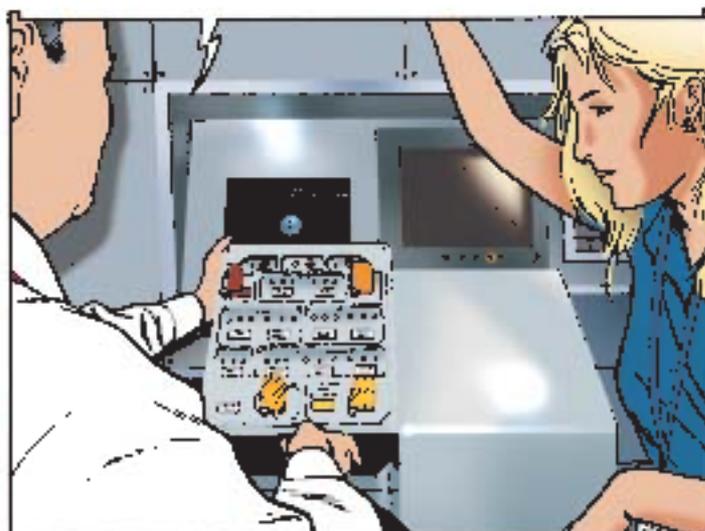
In this hall we keep training modules for all the European parts of the International Space Station. Every crewmember on the Station has to know them inside out.



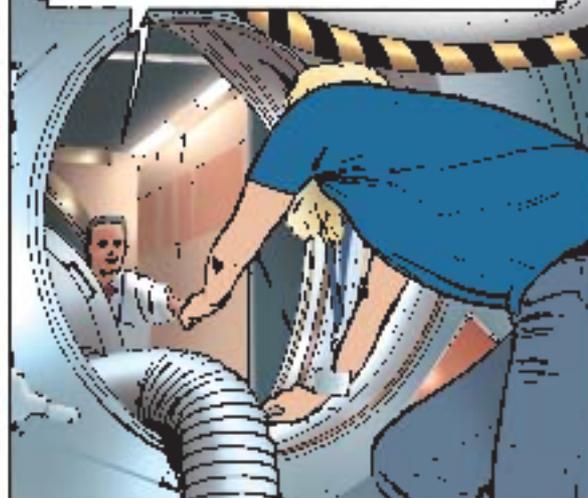
The ATV* is an unmanned European cargo ferry that delivers everything needed to live and work on the Station. It will be launched on an Ariane-5 rocket from Kourou in South America.



From the ISS, astronauts monitor the approach of the ATV and can stop it if there's a problem. We train our astronauts for that situation here.



As soon as the ATV has docked to the Station, you can float inside...

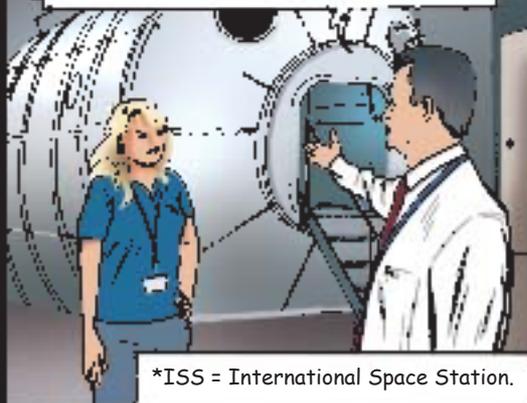


...and unload the equipment stored in these transport boxes. And the Station is supplied with water and air pumped in from the ATV's tanks.

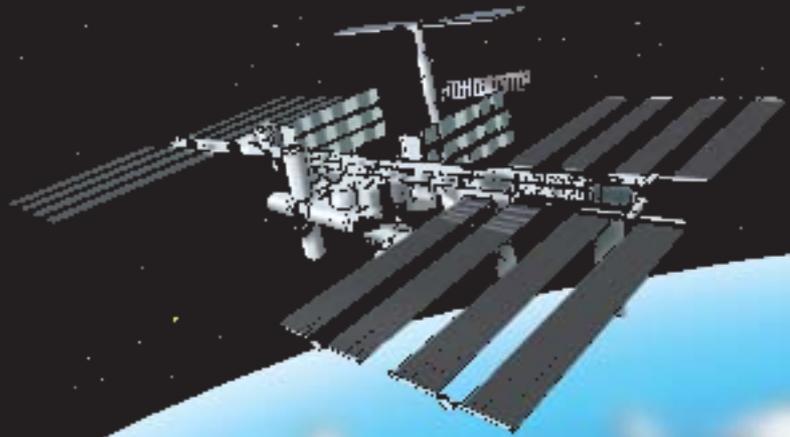


* ATV: Automated Transfer Vehicle

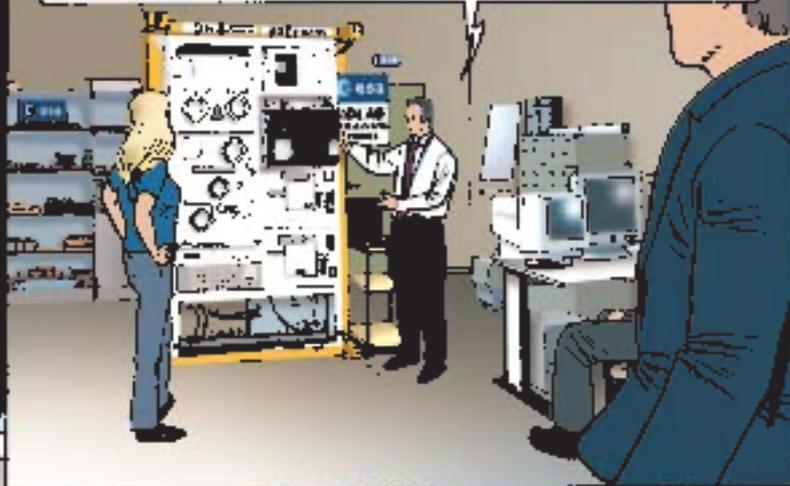
Another part of the ISS* is the European Columbus laboratory module, where scientific experiments are carried out. This is the training module.



*ISS = International Space Station.



We also have simulators for each payload rack on board. A rack is a structure like this with different scientific experiments. This is Biolab - it is used for complex biology experiments in Columbus.



Shall we take a look at the diving pool?

BIOLAB
Training Facility
Biological Experiment
Laboratory

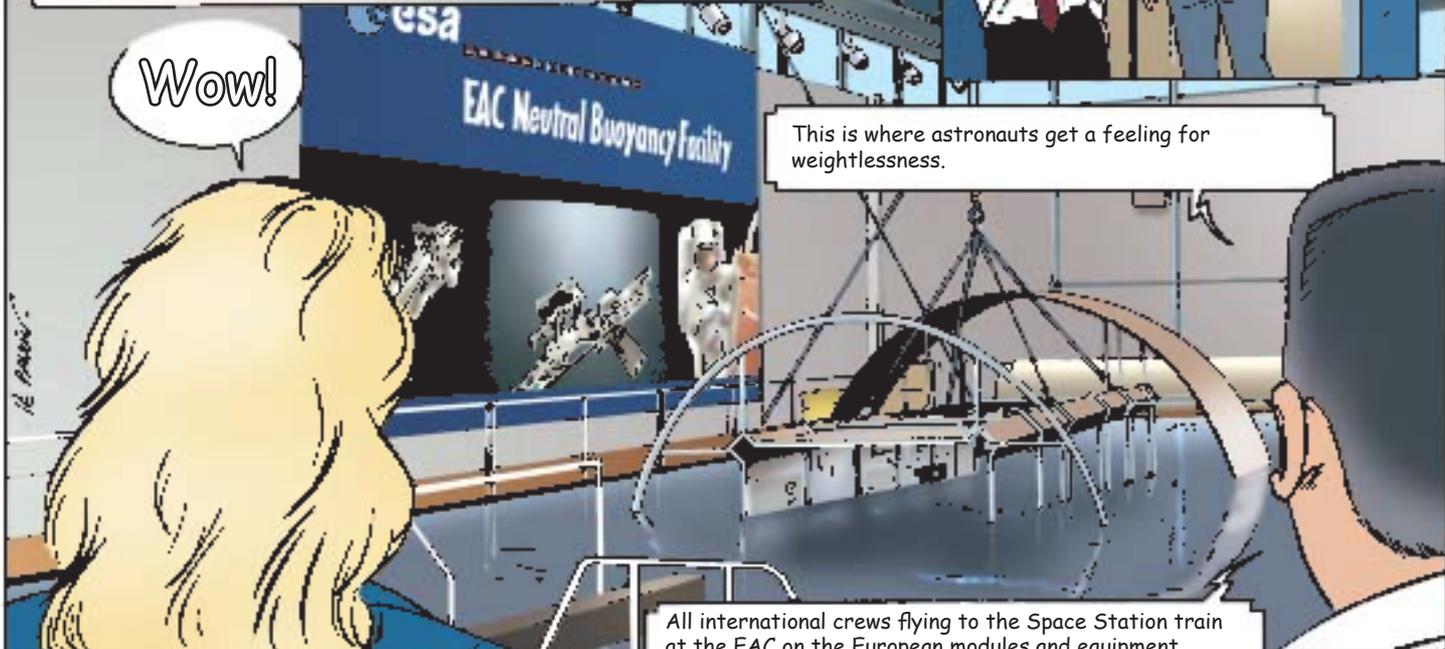
Sure!



Wow!

esa
EAC Neutral Buoyancy Facility

This is where astronauts get a feeling for weightlessness.



All international crews flying to the Space Station train at the EAC on the European modules and equipment.

The next day, Tania starts her basic training.

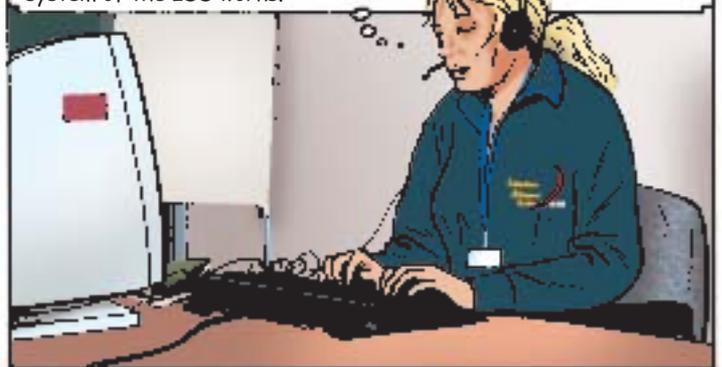
Theory lesson

...and a second rocket burn here close to the point furthest away from Earth, called apogee, to make your orbit circular...



Individual lessons on the computer

So let's have a look how the thermal system of the ISS works.



Fitness training



Practical work



Language training



Diving lessons



Most importantly, you must never hold your breath during the dive, okay? This time we'll go down to 10 m*. I will demonstrate each exercise, so watch closely and then do them exactly the same way.



This is great, I'm breathing under water and feeling like I'm weightless...

*Depth of the Neutral Buoyancy Facility (NBF) at the EAC.

She also has to do survival training.

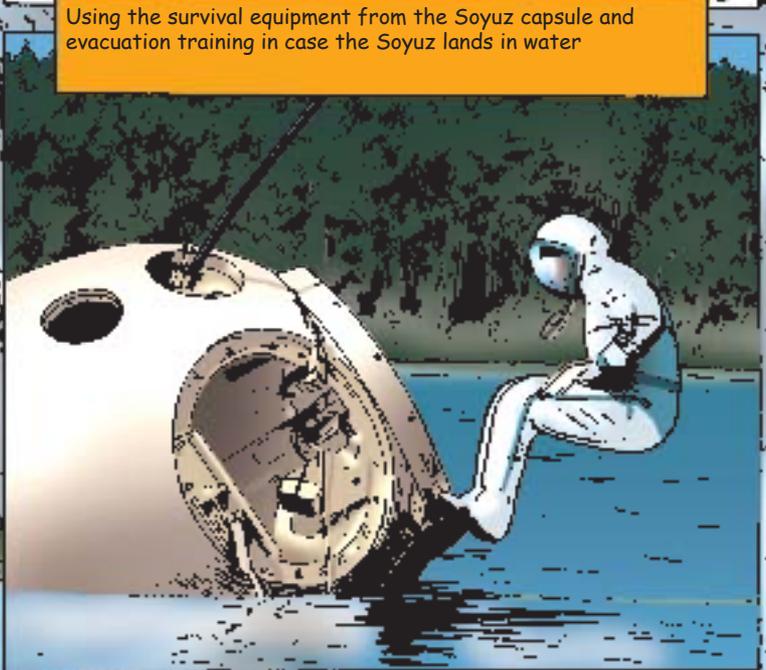
The training helps astronauts to survive the harsh conditions if the Russian Soyuz descent capsule comes down outside the planned landing area.



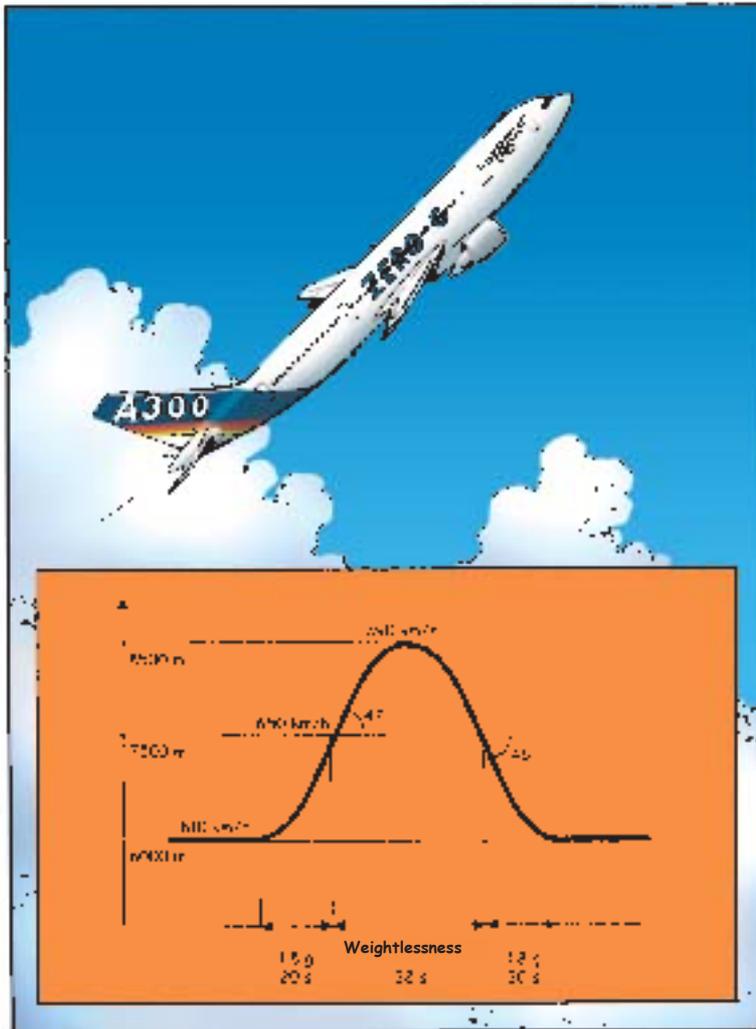
Building a shelter



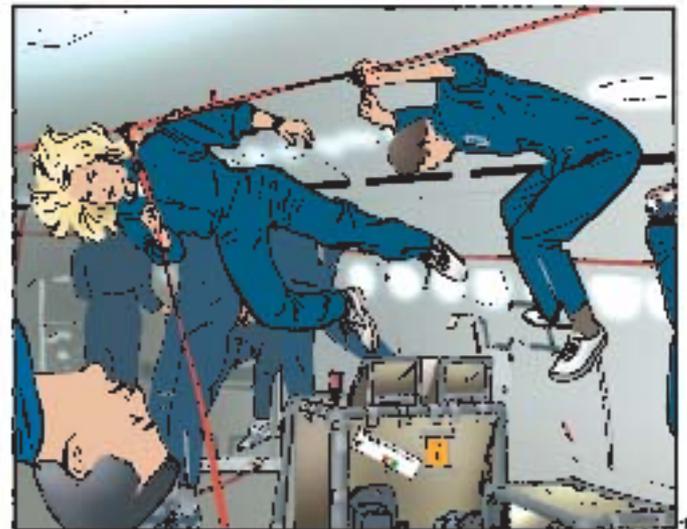
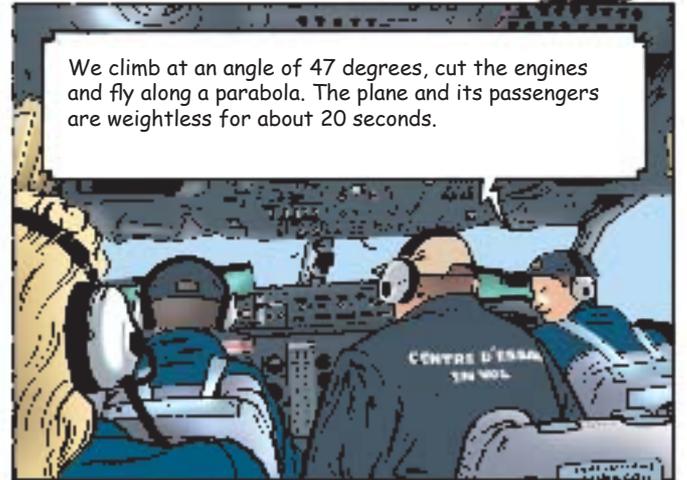
Using the survival equipment from the Soyuz capsule and evacuation training in case the Soyuz lands in water



Onboard the Zero-G Airbus, Tania is introduced to the challenges of working in weightlessness.



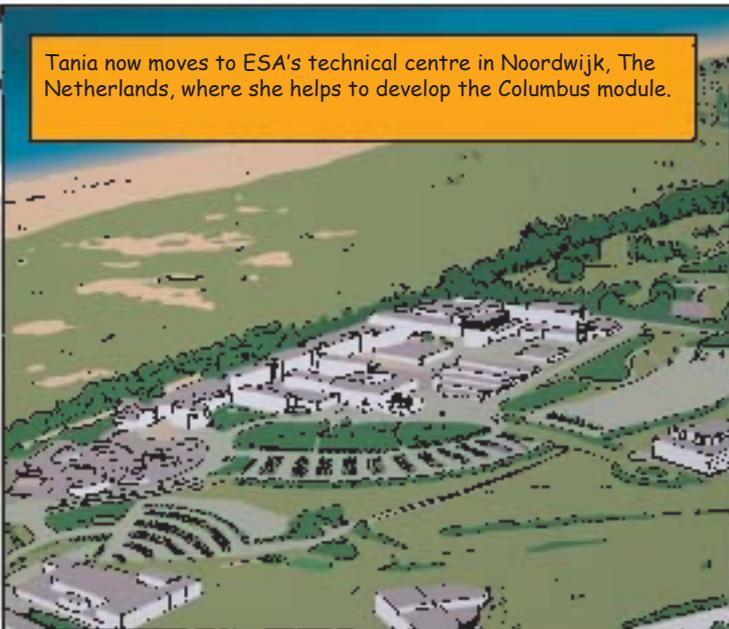
We climb at an angle of 47 degrees, cut the engines and fly along a parabola. The plane and its passengers are weightless for about 20 seconds.



On completion of her basic training, Tania receives her certificate from the head of the training section.



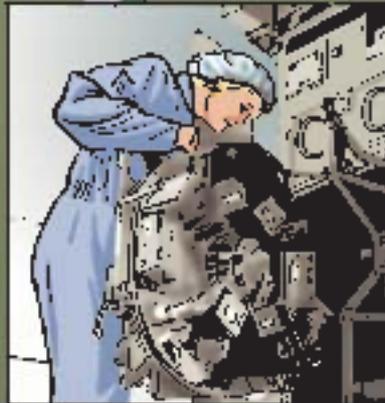
Tania now moves to ESA's technical centre in Noordwijk, The Netherlands, where she helps to develop the Columbus module.



Can you control the camera remotely during the approach?



In the cleanroom, Tania takes part in final approval of the Biolab flight model.*



*this is the equipment she will use on board the Station.

ATV training

It's important to find out exactly from how far away the crew can control the ATV.



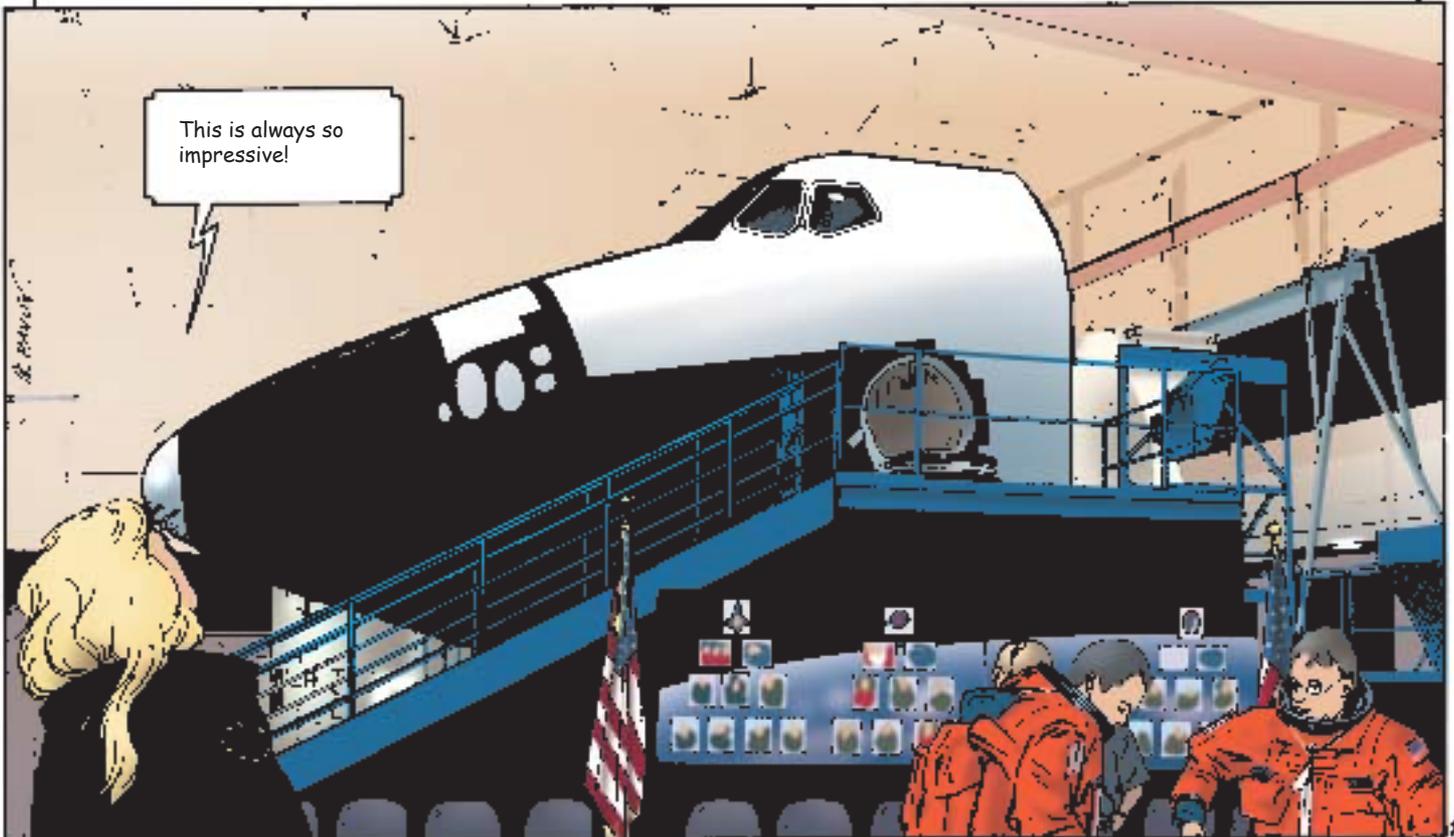
Six months later, Tania is training with a team of international astronauts getting to know the systems of the International Space Station. This is called Advanced Training, and all astronauts have to do it before they can be selected for a flight.



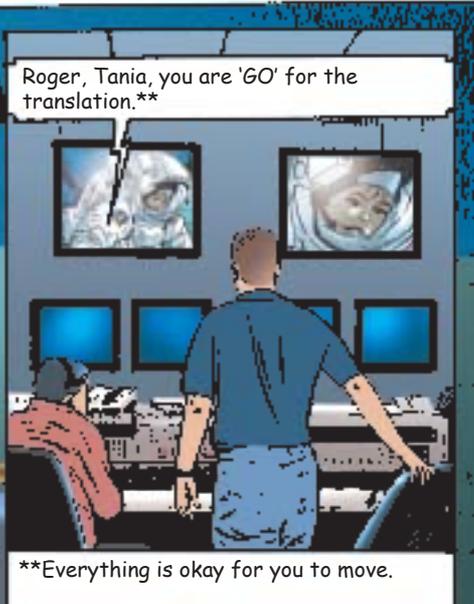
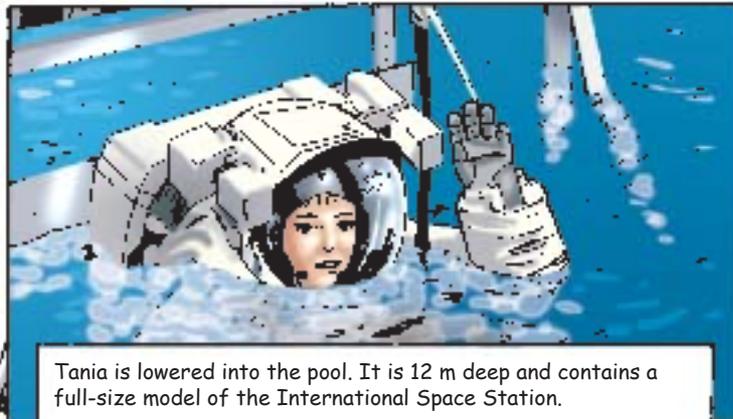
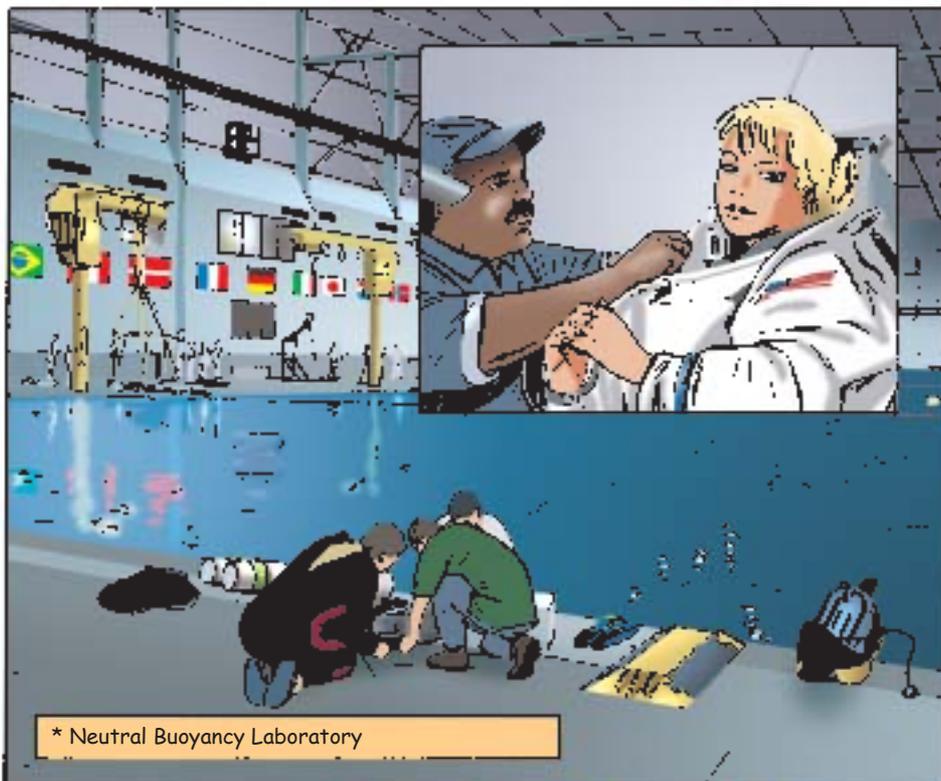
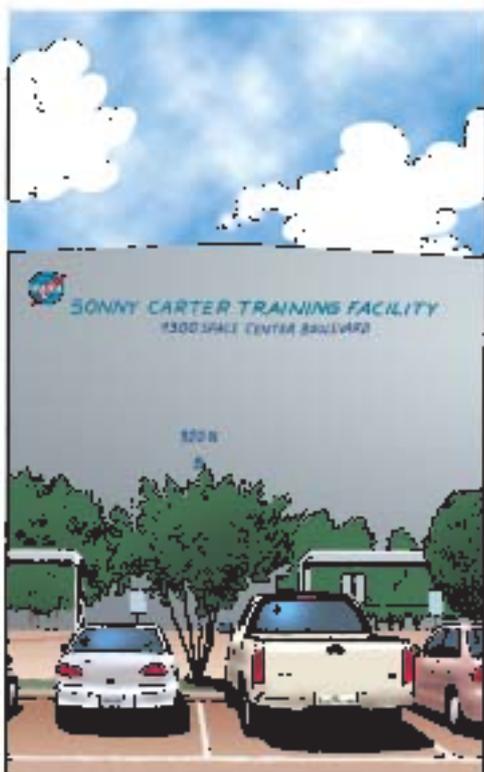
It all starts at the Johnson Space Center in Houston, Texas, with the introduction to the American modules.



* turn on the power and check that it is reaching compartment 1.



At the NBL,* Tania gets to know the American spacesuit for extravehicular activities (EVAs - spacewalks).

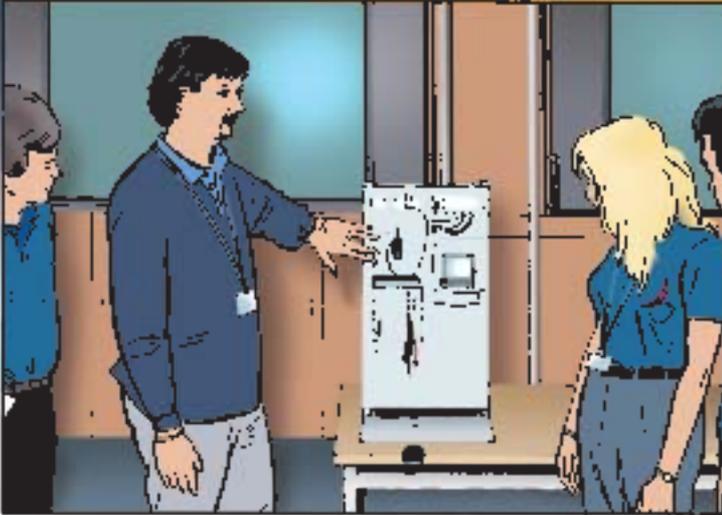


After a couple of weeks, Tania returns to Europe.

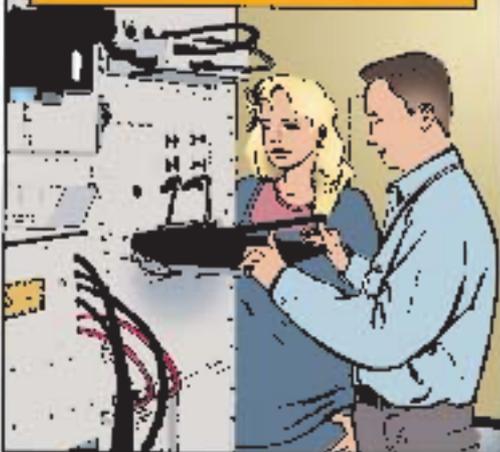


We find her again at the EAC in Cologne.

Training course for the Columbus laboratory. They work on full-size training units in the simulator.



Working procedure in the FSL simulator.*

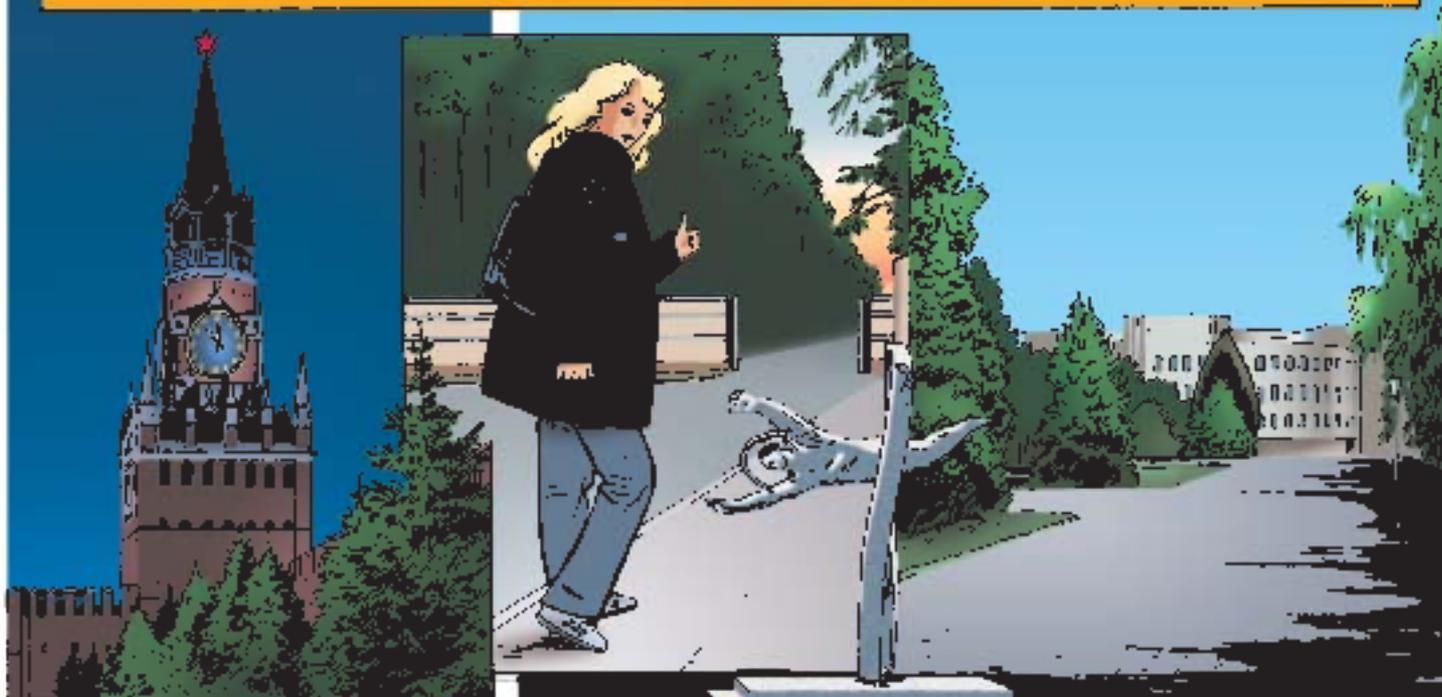


Tania rehearses the transfer of drinking water from the ATV to the ISS in the ATV simulator.

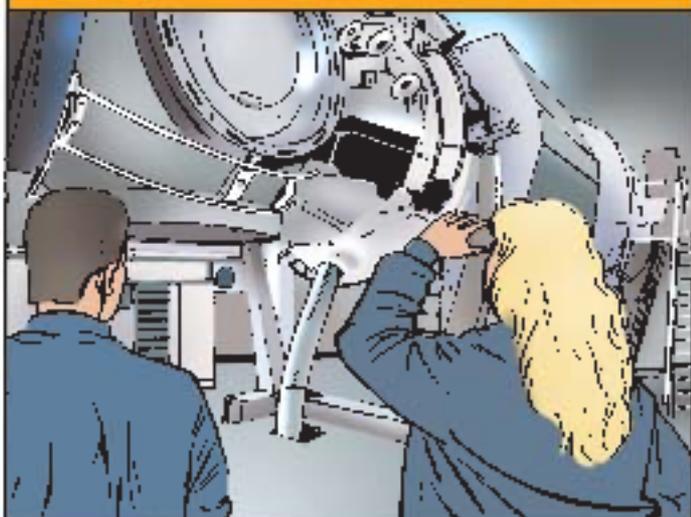


*FSL: Fluid Science Laboratory.

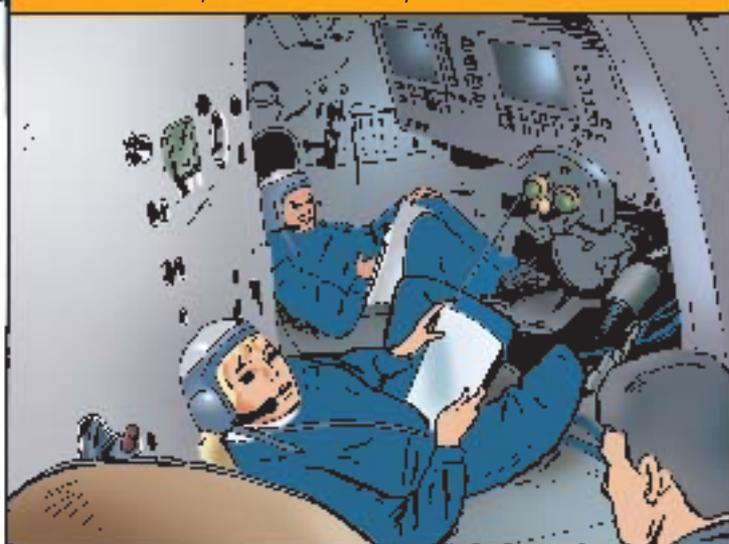
The next Spring, Tania flies to Star City near Moscow



Here she learns about the Russian modules of the Space Station...



...and becomes acquainted with the Soyuz simulator.



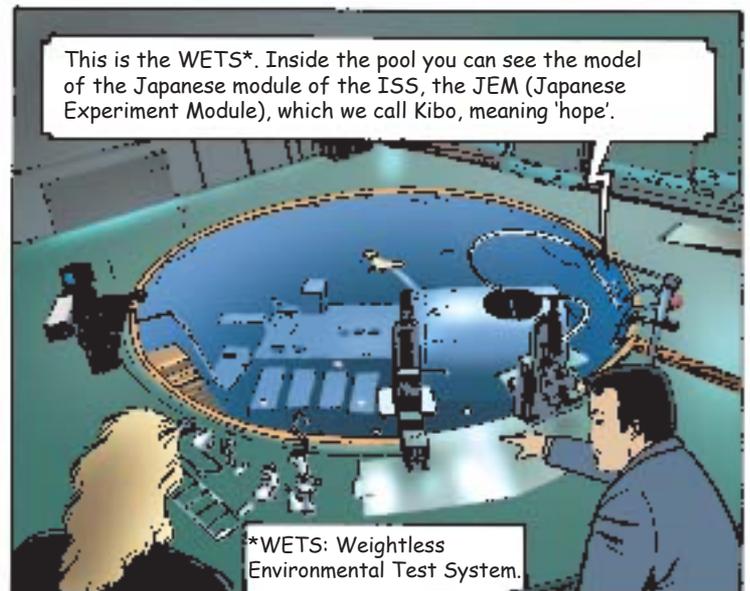
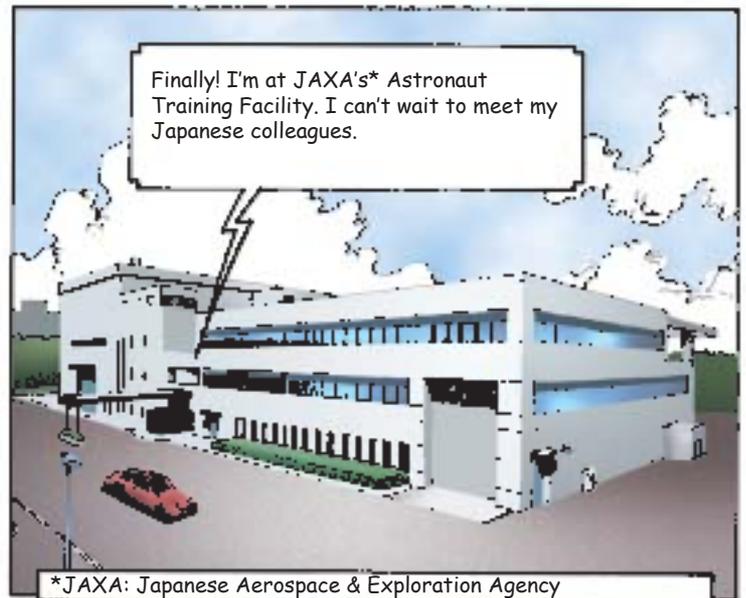
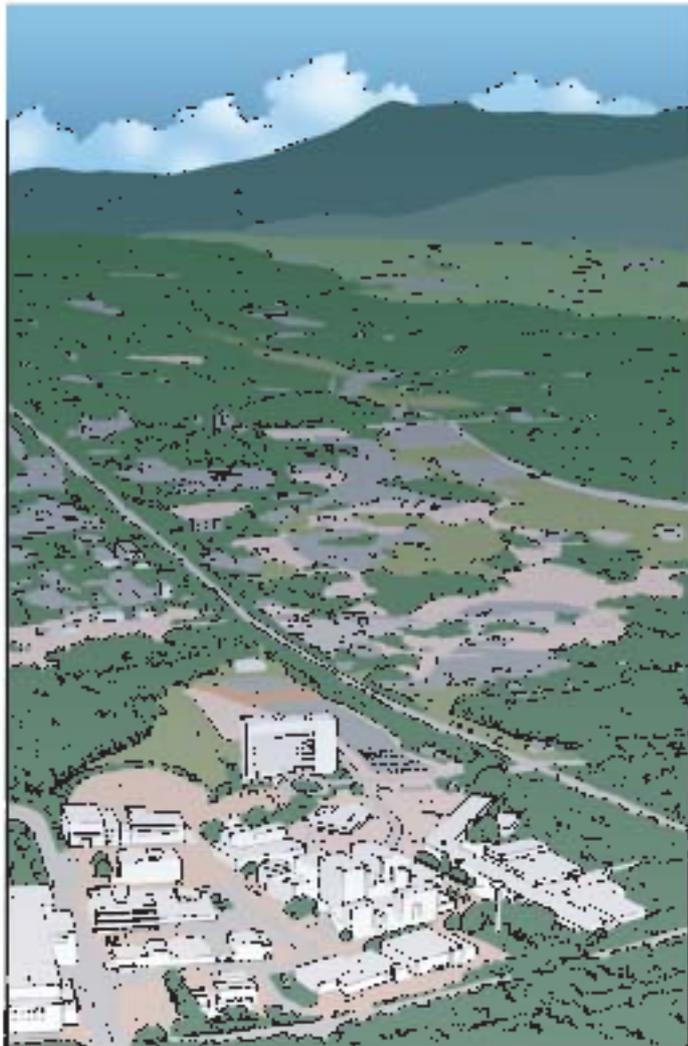
She can also show off the Russian skills she acquired during basic training.



*Okay, did you understand? We meet in one hour at the pool.



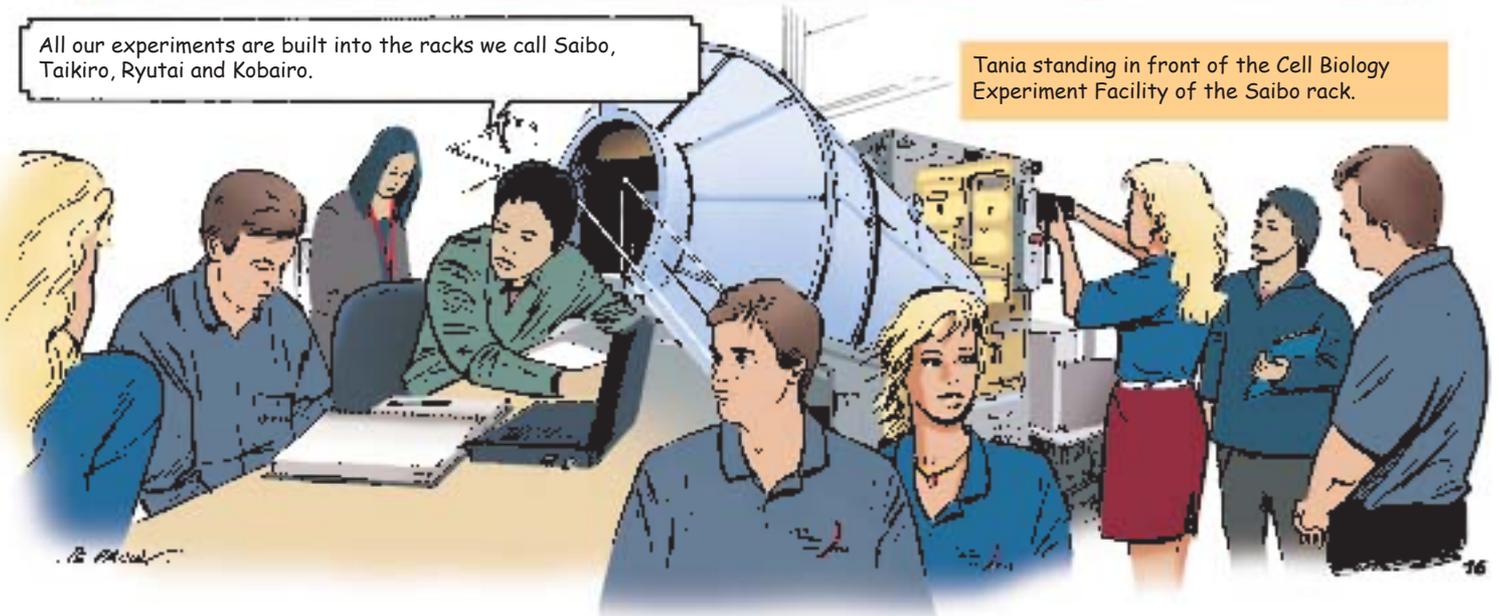
From Moscow, the journey continues to Japan. After a 10-hour flight, she arrives at Tsukuba Space Center 50 km to the north of Tokyo at the foot of Tsukuba mountain.

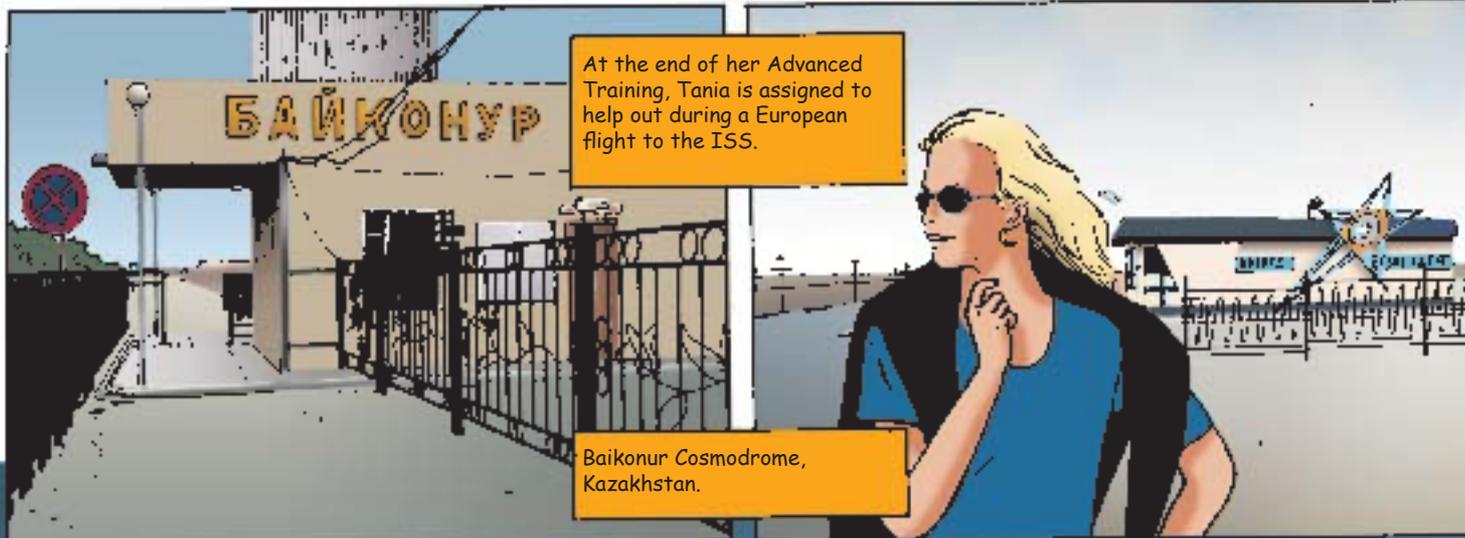


Over the next two weeks, Tania and fellow astronaut Léopold Eyharts train intensively on JEM and the Japanese experiments. Léopold is back in Japan to become a Kibo Module Specialist.

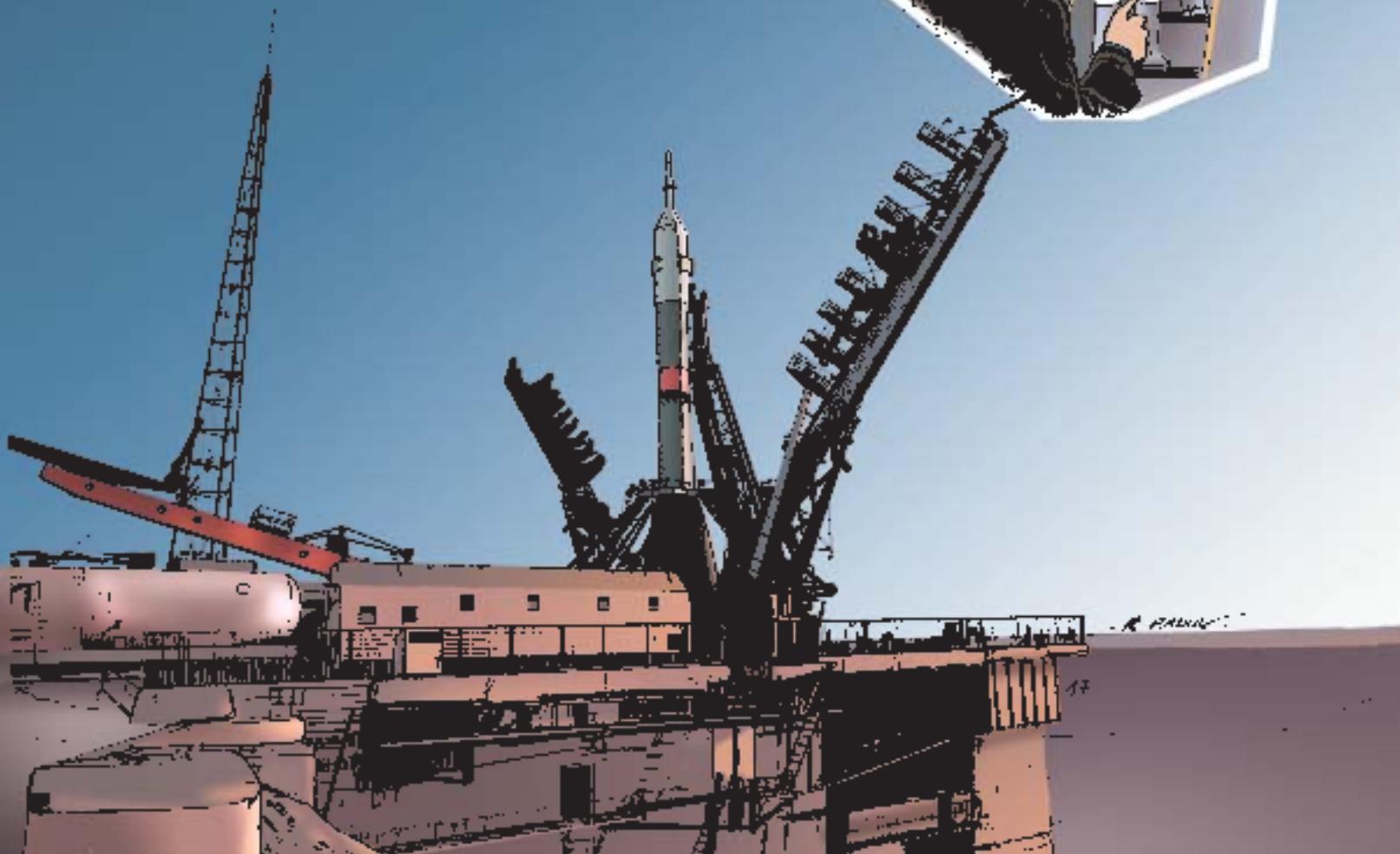
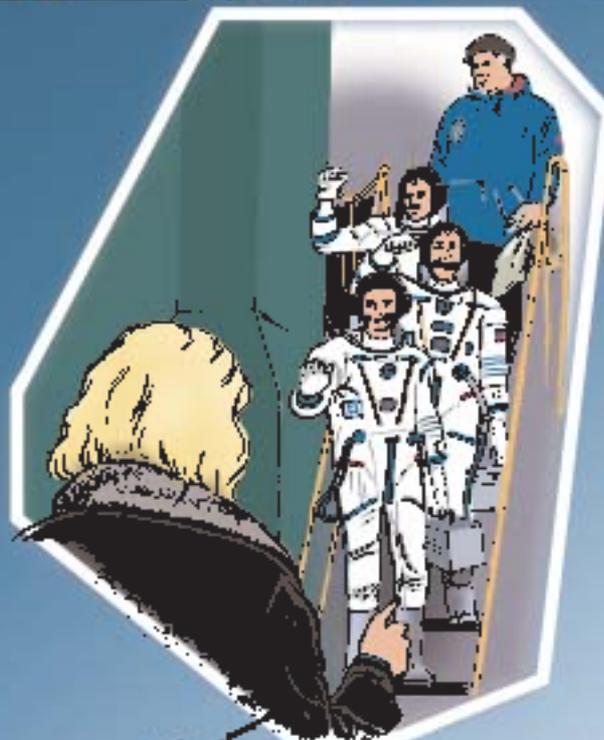
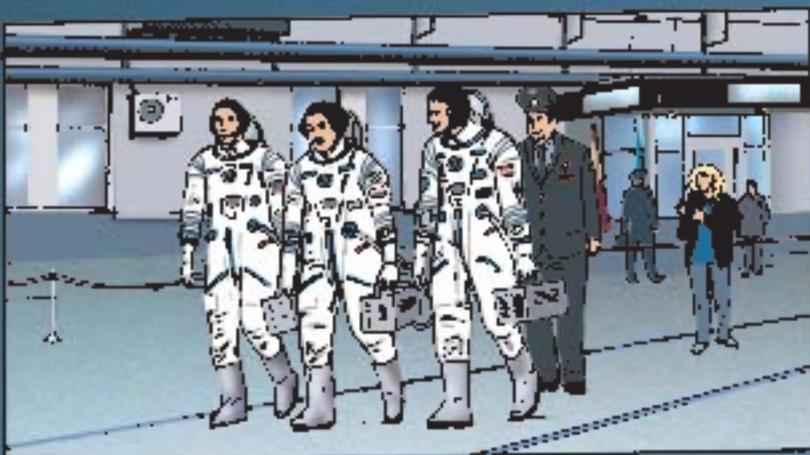
All our experiments are built into the racks we call Saibo, Taikiro, Ryutai and Kobairo.

Tania standing in front of the Cell Biology Experiment Facility of the Saibo rack.





A European astronaut with two cosmonauts just before their launch.

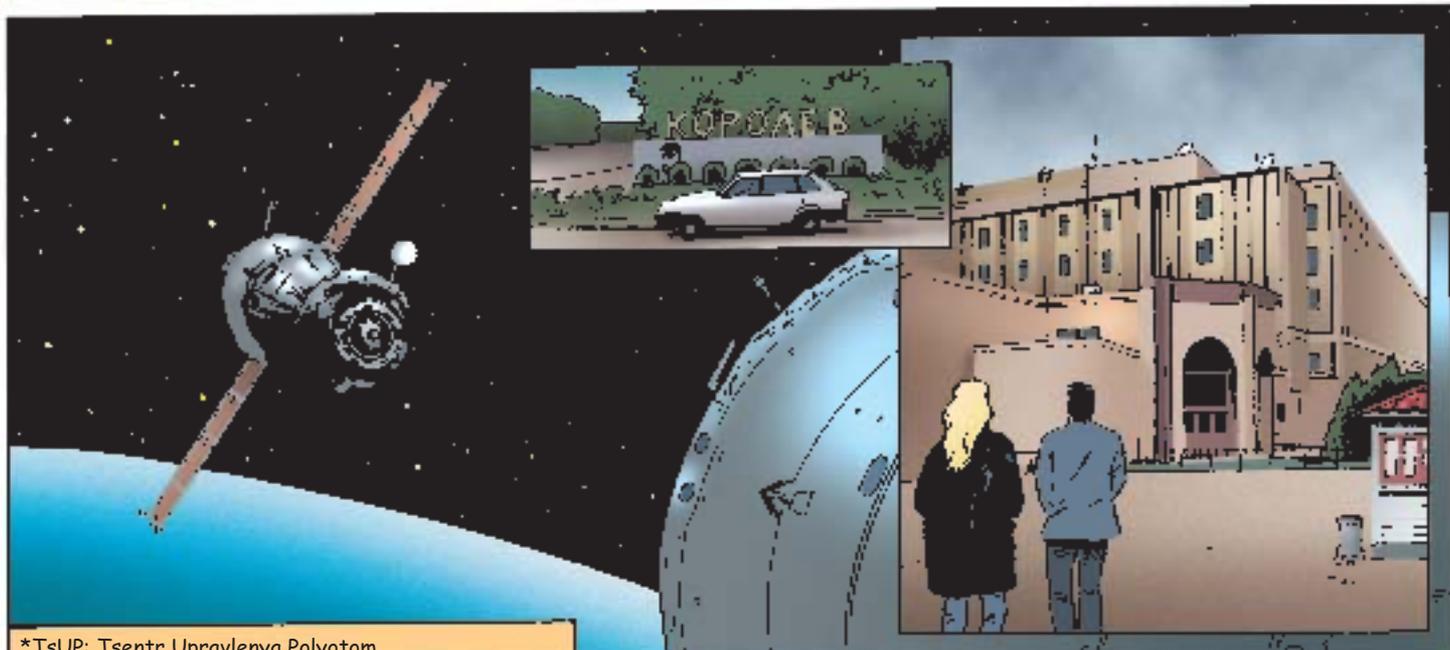


Right on schedule, the Soyuz rocket blasts off into the desert sky with a deafening roar...



I hope it'll be my turn soon...

While the Soyuz spacecraft is on its way to the Station - and especially during the docking process - Tania works in the TsUP* Russian control centre in Korolev, a Moscow suburb.



*TsUP: Tsentr Upravleniya Polyotom

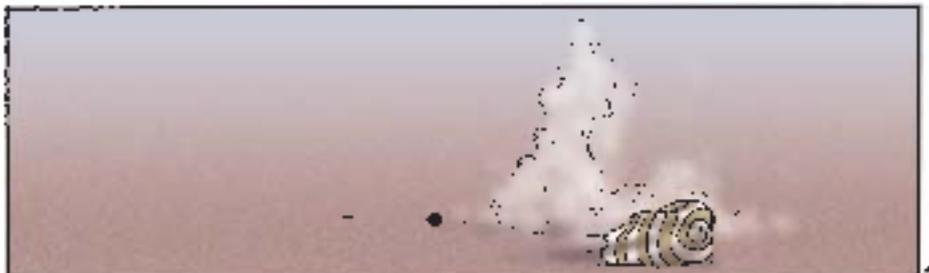
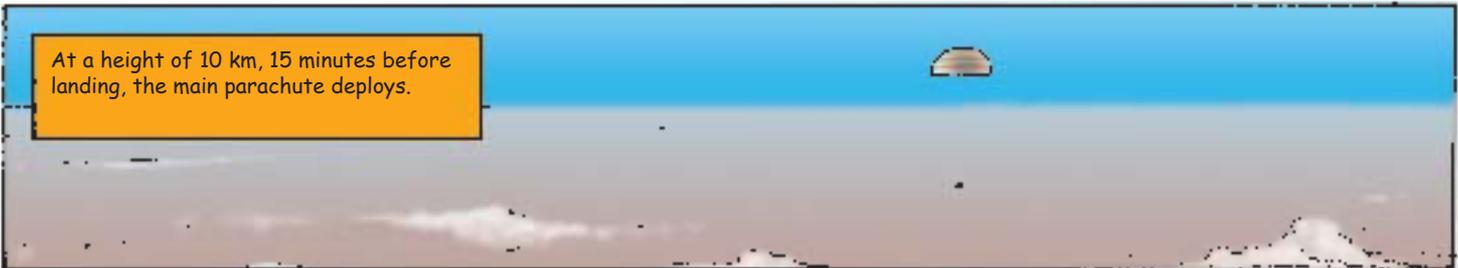
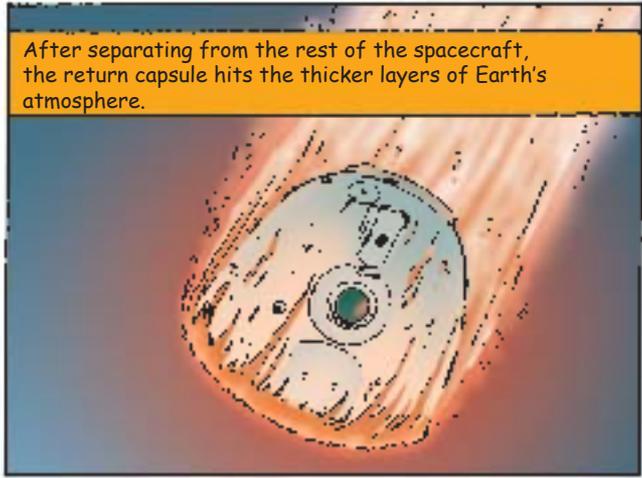
In her role as Crew Interface Coordinator (CIC), she makes sure that communications with her colleague in space work flawlessly.

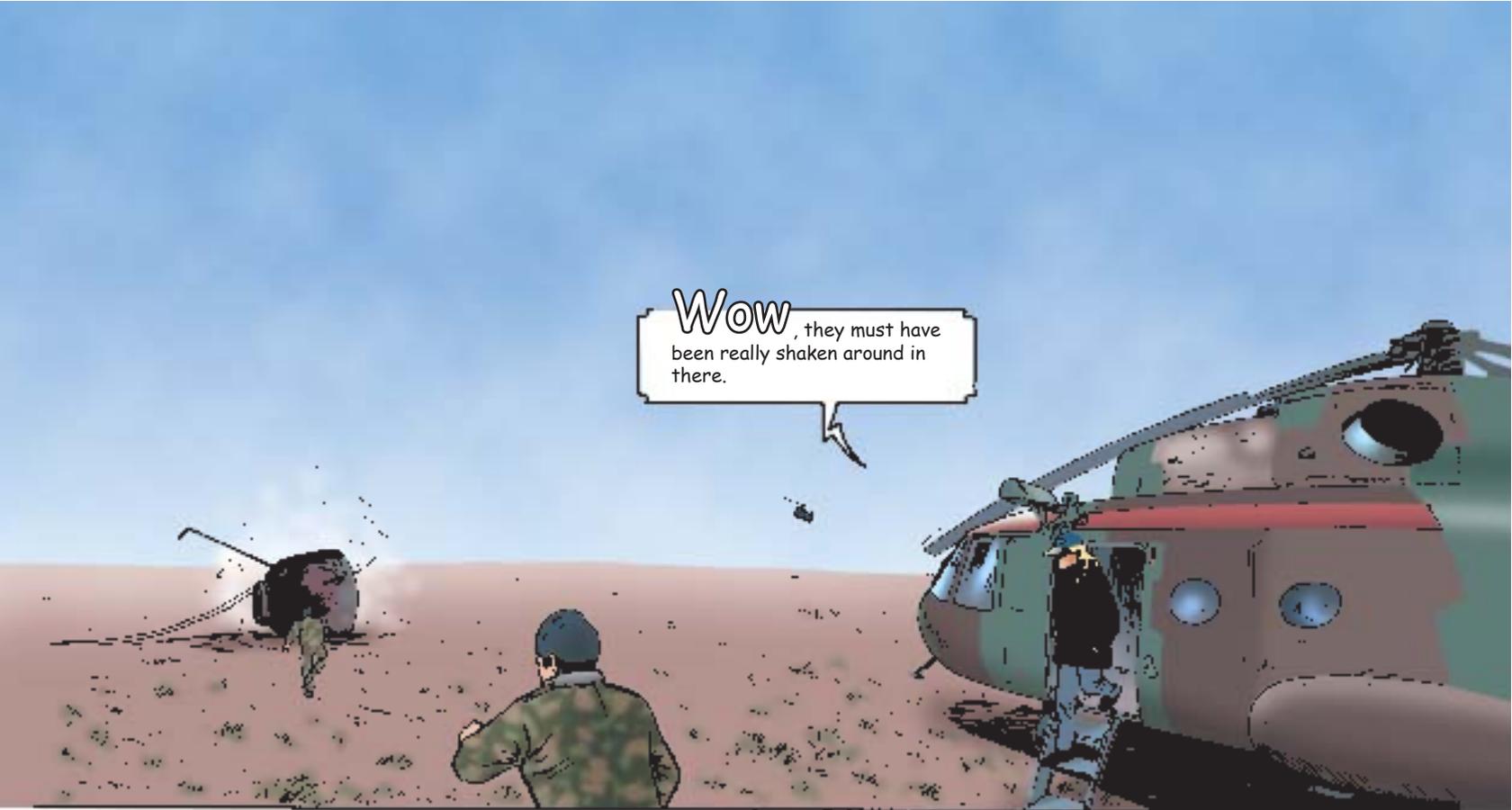


Okay, Pedro, here are the recommendations for today's activities.

Roger, Tania, go ahead.

At the end of the mission ten days later, Tania travels to the Kazakh desert to take part in recovering the crew.





Wow, they must have been really shaken around in there.



Hang on - we'll get you out of there!



Finally, the hatch opens...

Hi Pedro!

Tania! It's good to see a familiar face again!

Welcome back to the Blue Planet and congratulations on your great mission!



Slowly...

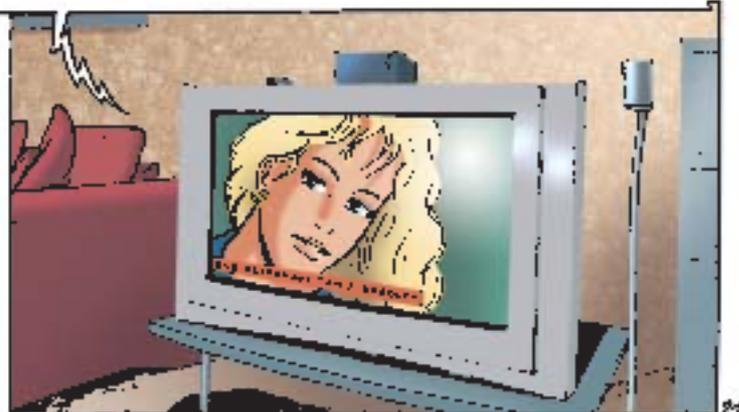
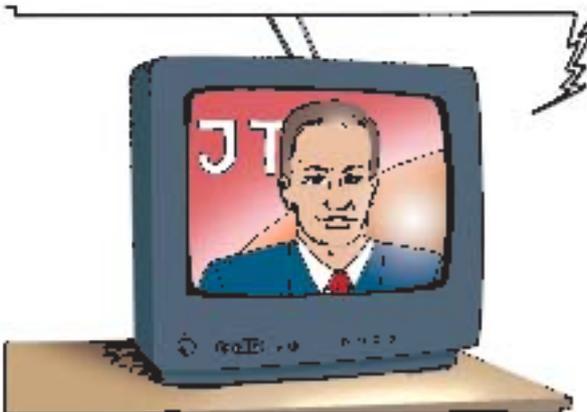


How do you feel, Pedro?

My legs are still a little heavy, but otherwise I'm fine.



We have just learned that a European astronaut has been selected for a Shuttle flight. Tania Bradley will spend ten days on the International Space Station, where she will be responsible for important scientific research.

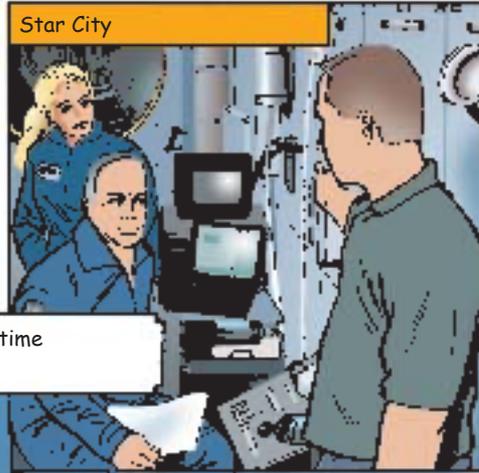


Tania now has to go through intensive training at the training centres of the different international partners.

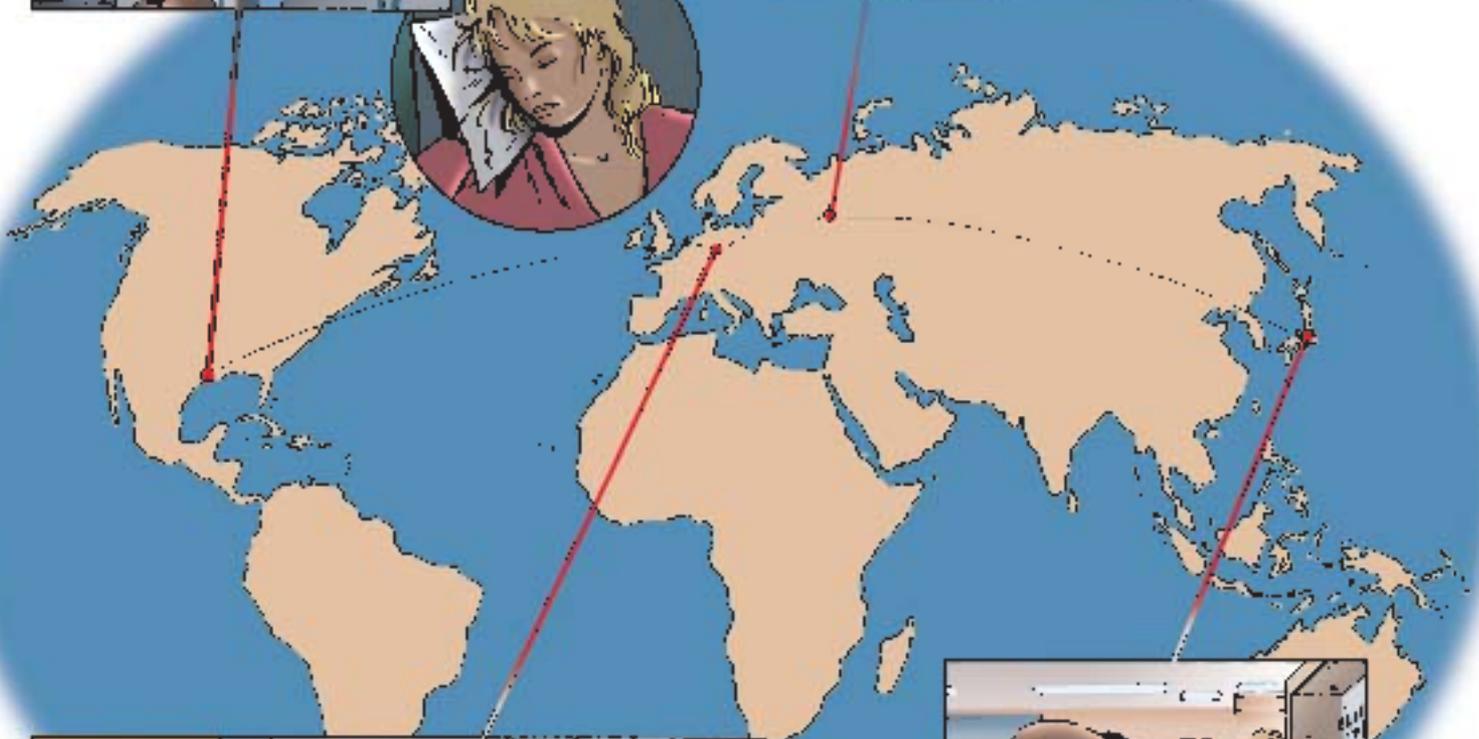
Houston



Star City



I'll never get used to the time differences...



Cologne



Six months later, at NASA's Johnson Space Center in Houston, a couple of weeks before the big journey...

Tania is training as the Flight Commander in the Motion Base Shuttle Simulator, which simulates the Shuttle's movements.



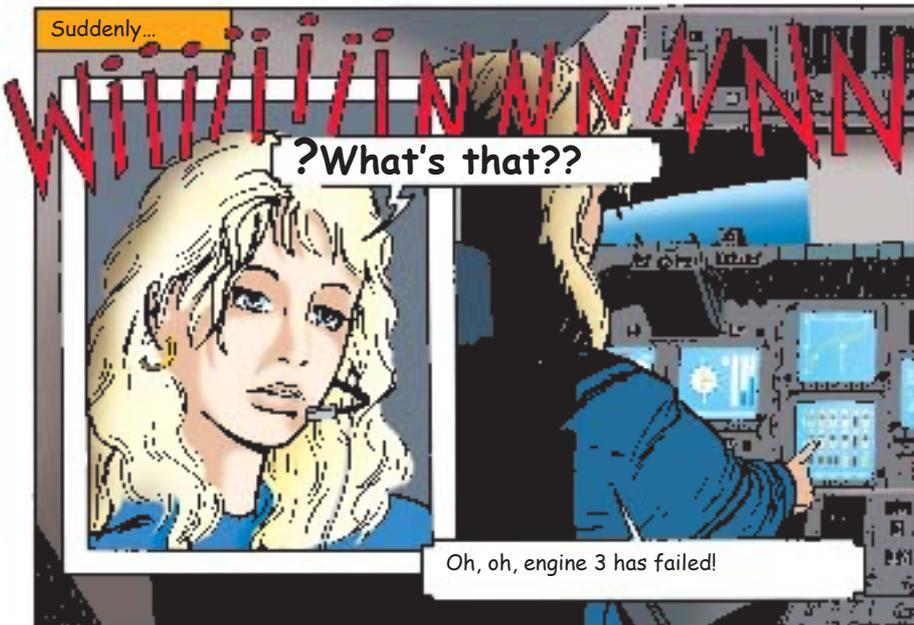
At a height of 45 km, the Solid Rocket Boosters (SRBs) separate as planned.



Houston, Atlantis, we confirm SRB separation.

Tania checks the booster separation on a cockpit display.

Suddenly...

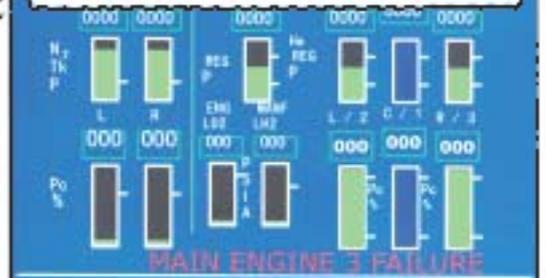


?What's that??

Oh, oh, engine 3 has failed!

Houston, Atlantis, number three main engine has failed.

OK, Atlantis, you are 'GO' for a two-engine RTLS abort.



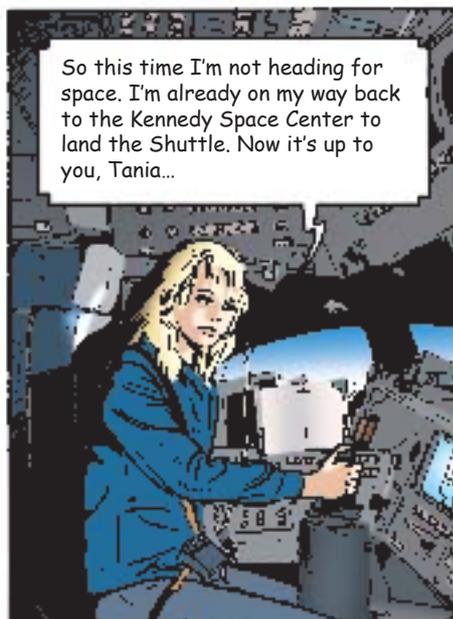
One of the three Shuttle engines has problems and has been shut down by the onboard computers. There is not enough thrust to reach orbit. Using the remaining engines, Tania must turn the Shuttle around and 'RTLS': return to launch site.

Roger, two-engine RTLS abort. Two-engine RTLS checklist: abort mode is RTLS. Abort button pushed.



Tania begins RTLS by turning the 'Abort Mode' dial to 'RTLS' and pushing the 'Abort Button' to confirm the command.

So this time I'm not heading for space. I'm already on my way back to the Kennedy Space Center to land the Shuttle. Now it's up to you, Tania...



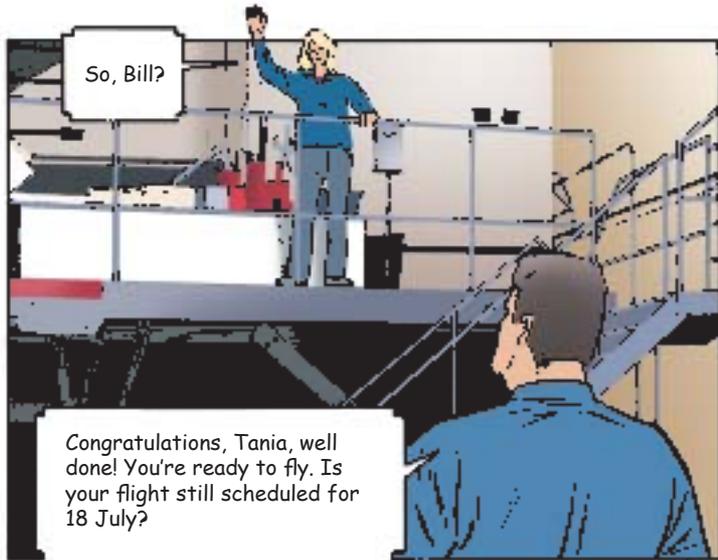
A couple of minutes later, during a perfect manual landing ...

Atlantis, control, gear down, over.

Roger, gear down and locked.

Main gear at ten feet...five feet...four feet...two feet...one, contact.

Just before landing, Tania releases the landing gear and checks that it is locked in place. She performs the final landing glide and touches down on the long runway at the Kennedy Space Center.



So, Bill?

Congratulations, Tania, well done! You're ready to fly. Is your flight still scheduled for 18 July?



Yes. After all this training, I can't wait to get up there.



Tania!

? Yes?



Kent would like to talk to you immediately.

Kent?



Come in.



Tania. I've got bad news for you...

?

Because of recent problems on the Station, the goal of your flight has been changed.

At the moment, EVAs are more important to carry out the necessary repairs. Your science mission had to be cancelled.



What?



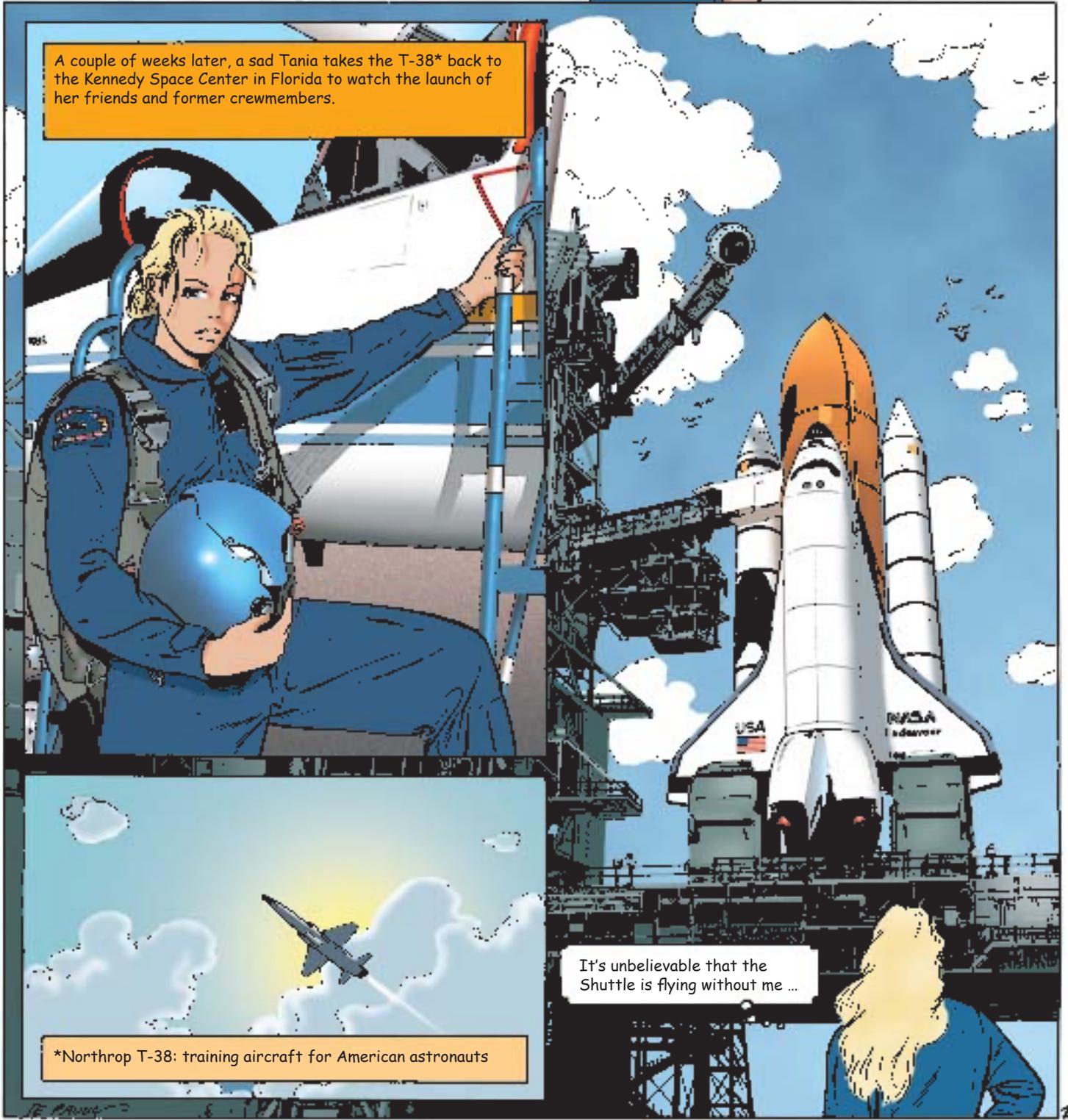
It can't be true... everything falling to pieces so close to launch.



I'm sorry, Tania, but the flight is only postponed. You'll be reassigned as soon as possible.



All my efforts for nothing! I feel completely useless...being an astronaut can be pretty tough sometimes.



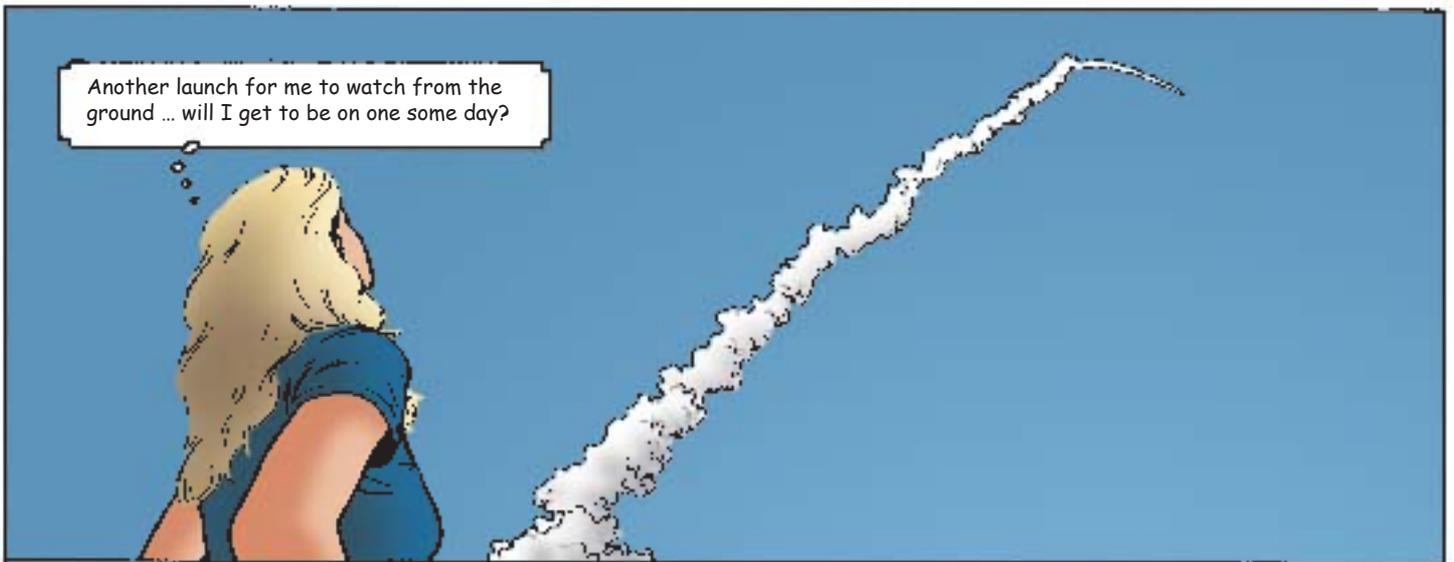
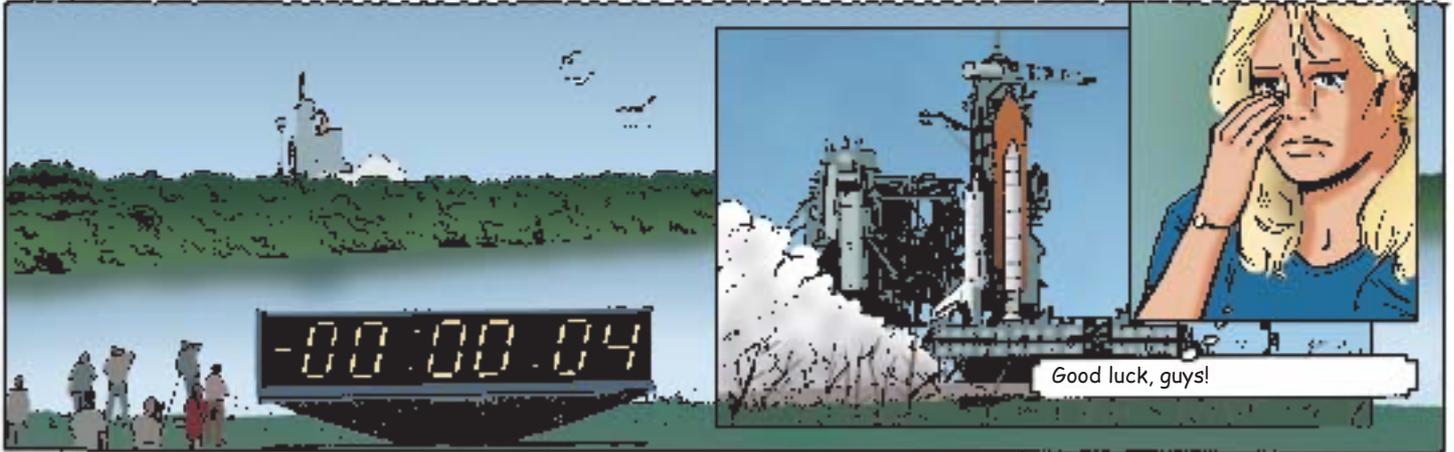
A couple of weeks later, a sad Tania takes the T-38* back to the Kennedy Space Center in Florida to watch the launch of her friends and former crewmembers.

It's unbelievable that the Shuttle is flying without me ...

*Northrop T-38: training aircraft for American astronauts

The next day...

T minus 7... we have the go for the main engines start... three...two...one...



Six months have passed. Tania is in her office at the EAC.





The MCOP* has selected you for the next long mission to the ISS.



Wow! I don't believe it!



And the best thing is that you will make three spacewalks!

I must be dreaming. This is more than I ever hoped for!

* MCOP: Multilateral Crew Operations Panel - the people in charge of selecting astronauts for flights.



Congratulations, Tania. Your patience has been rewarded. You deserve this. Bravo!

Thank you, Michel.

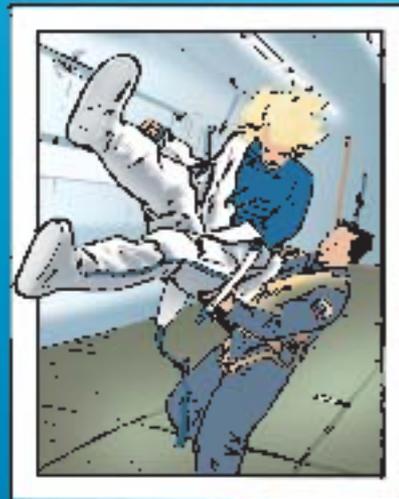
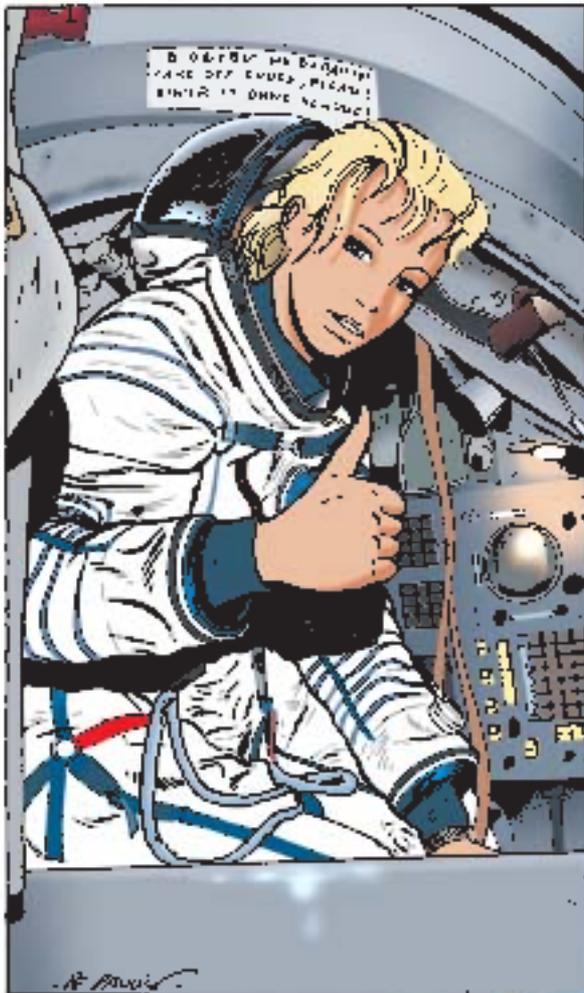
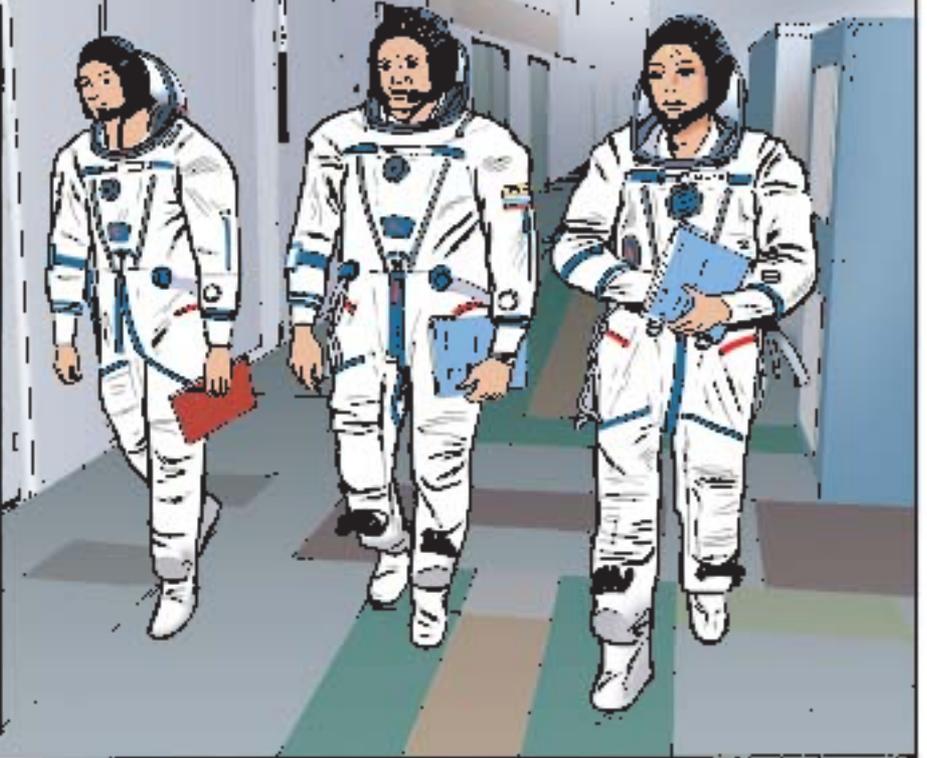
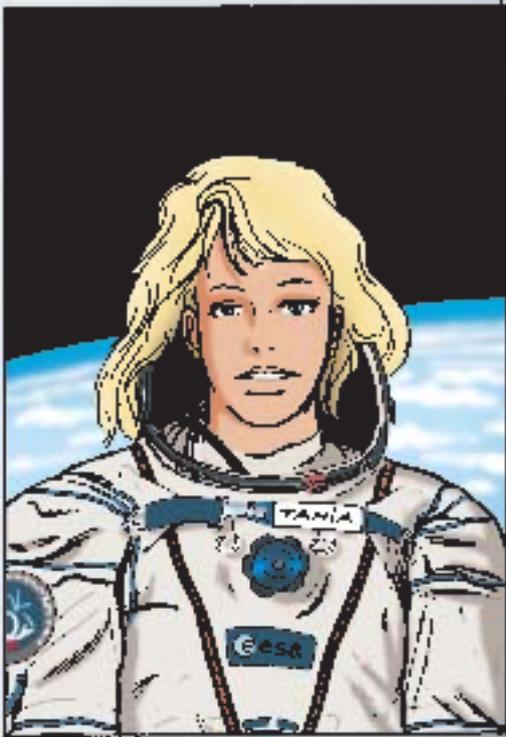


Well, I just hope everything goes well this time...

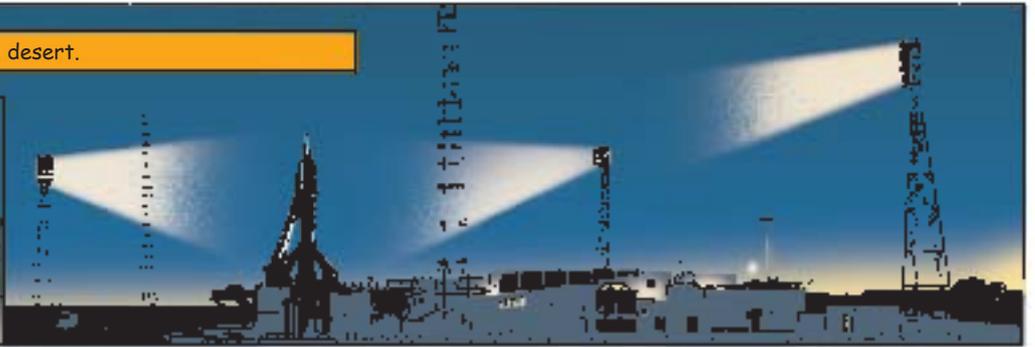


PE. HAYING

A new round of intensive training begins, this time including simulations in the Soyuz capsule and exercises for EVAs. Tania will be launched to the ISS from Baikonur.



Launch day! The big day in the Kazakh desert.

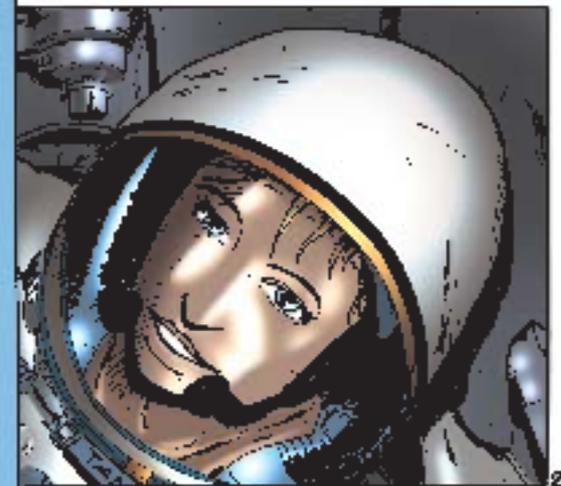


This time it'll really happen. Only two more hours and I'll be in space!



Come on, Tania, GO! GO!

She's achieved a lot since she joined the EAC. We can be proud of her!



Eight minutes after lift-off, the Soyuz spacecraft is in orbit.

At the same time in the medical control room at the EAC.

I've just heard from Ulrich that he's had a first chat with Tania. He confirms that she's well and getting used to weightlessness.

What are the conditions like on board?

Everything is okay, Filippo, Tania confirms that temperature and humidity are normal.

What a view! I can't describe it. It's beyond my wildest dreams.

Thank you, Volker, I will pass the information on to the ISS crew doctor at the MCC-H.*

Tania, just have a look outside! This is our very first sunset!

After the busy time of launch, the cosmonauts get to relax a little. They can remove their pressure suits and do a little sightseeing.

Travelling at 28 000 km/h, the astronauts circle the Earth every 90 minutes and see 16 sunrises and sunsets per day.

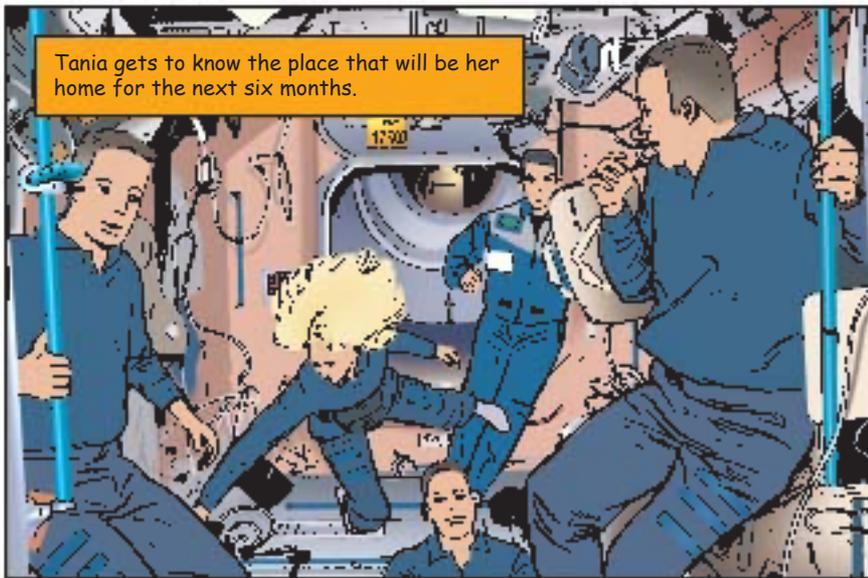
After a two-day journey and 34 orbits around the world, the Soyuz capsule docks with the International Space Station.

At last they meet the current occupants.

Hello, Tania, welcome on board!



*MCC-H: Mission Control Center-Houston.

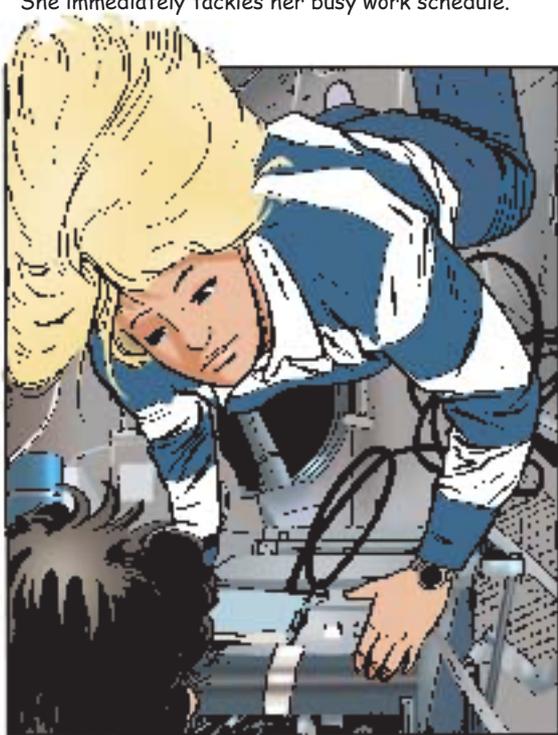


Tania gets to know the place that will be her home for the next six months.

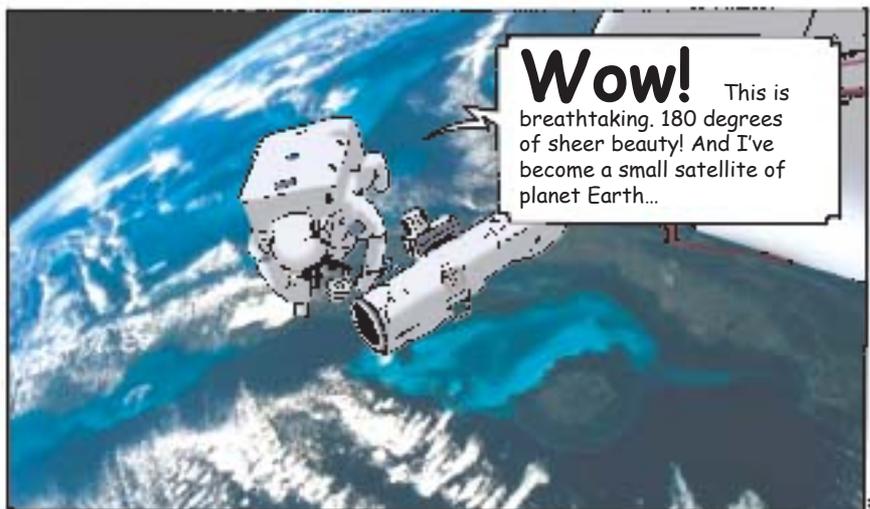


This feels great - floating around in the huge Space Station. This freedom of movement feels strange but natural at the same time.

She immediately tackles her busy work schedule.

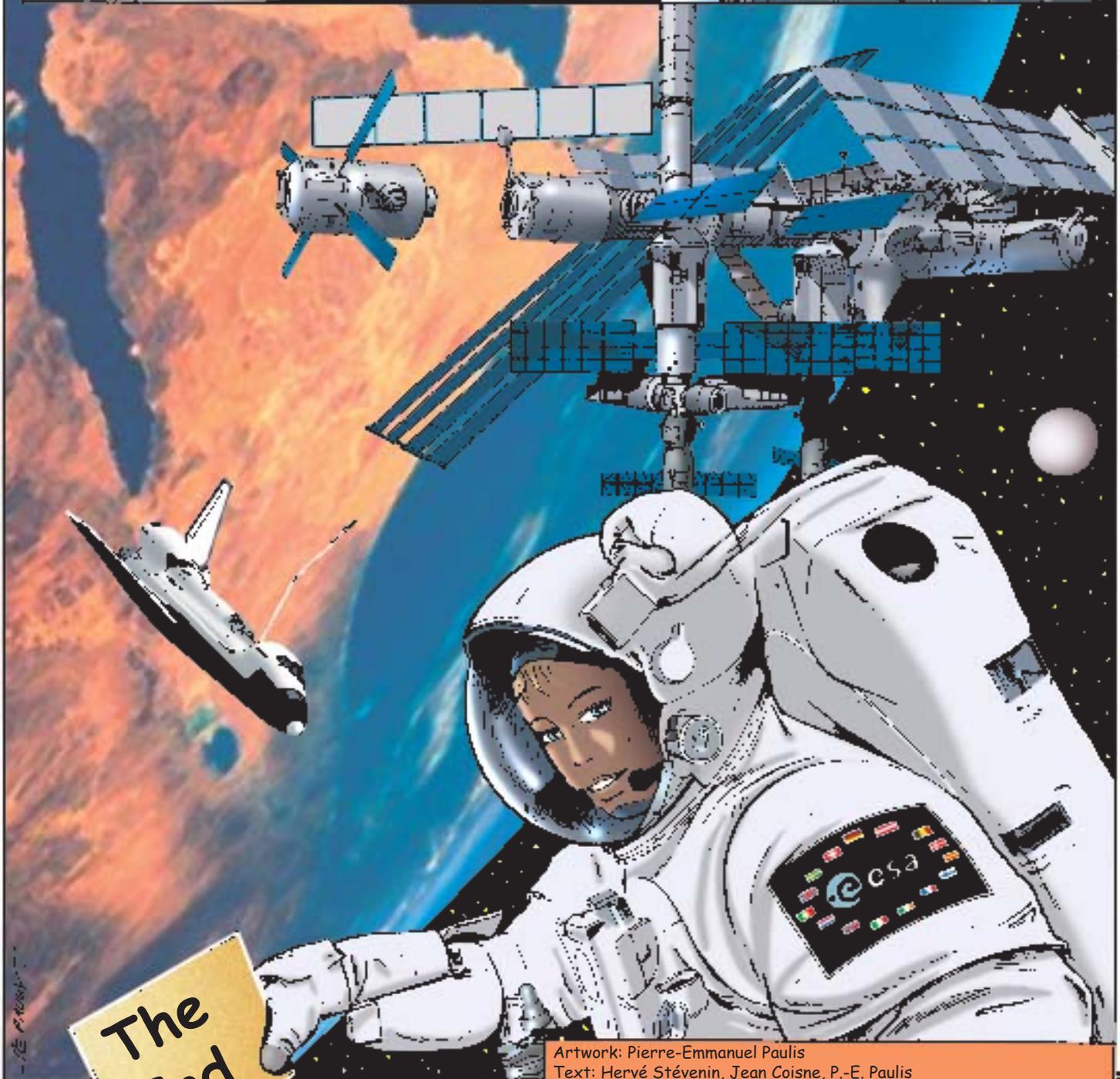
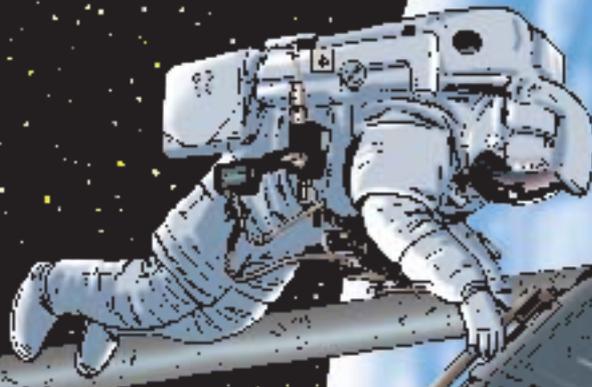


A couple of weeks later and it's time to begin the detailed preparations for Tania's first EVA.



Wow! This is breathtaking. 180 degrees of sheer beauty! And I've become a small satellite of planet Earth...

During her long time in space,
Tania won't have time to get bored.
She has to take care of a long set
of scientific experiments in the
Columbus laboratory and perform
three spectacular spacewalks.



Artwork: Pierre-Emmanuel Paulis
Text: Hervé Stévenin, Jean Coisne, P.-E. Paulis
Colour: Françoise Pirart and Alain Maury

How to Become an Astronaut

The bulk of European astronaut missions in the next few years will be to the International Space Station (ISS). Seven astronauts from the European Space Agency (ESA) had already flown aboard the ISS by the end of 2004, and other missions are in the pipeline. This is by far the largest spaceflight project of this era.

Schooling –in patience and perseverance!

There is no actual school for would-be space travellers. The space agencies building the Station – NASA, CSA, FSA, JAXA and ESA* – all choose their own astronauts to fly an agreed list of missions, and then share the astronauts' training. The space agencies are all making different contributions to the Station, which entitle them to use it in different ways. ESA does not have its own spacecraft for carrying astronauts, so naturally it flies fewer missions than NASA, who can carry 7 astronauts on each Shuttle flight, or Russia, with 3 cosmonauts aboard each Soyuz.

NASA selected its newest group of astronauts in May 2004. This group of 11 is made up of three different types of astronaut:

Pilot: 2 test pilots from the US Air Force and the US Marine Corps;

Mission Specialist: 3 engineers from NASA's Johnson Space Center, 2 doctors (1 from NASA); 1 Commander from the US Navy Special Forces;

Mission Education Specialists: 3 science and maths teachers.

They are aged 28-43 and have joined the pool of 101 NASA astronauts, 51 of whom had gone into space by the end of 2004.

Russia, for its part, has 44 cosmonauts, 18 of whom have already flown. The European Astronaut Centre, set up in 1999 to draw together Europe's various national astronauts, has 13 astronauts.

How do you become an astronaut?

Before they are selected, most astronauts are scientists, engineers, doctors, pilots or even several of these at once. Selecting an astronaut begins with an advertisement by the space agency listing the allowed age range, the level of academic qualifications and professional experience, and the main medical requirements. You will receive a huge questionnaire probing your medical history, experience, outside activities, reasons for applying, and so on. This questionnaire is the first hurdle. Many would-be applicants take one look at the high level required and give up at this stage!

But let's assume that you are not at all daunted and have had the patience to complete the long questionnaire through to the very end. This is where the competition really starts – and there can only be very few winners!

*American National Aeronautics & Space Administration (NASA), Canadian Space Agency (CSA), Russia's Federal Space Agency (FSA), the Japanese Aerospace & Exploration Agency (JAXA) and ESA.

Almost four-fifths of these applications are rejected. If you are among the lucky ones to get through this preliminary screening, you are summoned for a thorough medical examination in hospital. If you also make it over that major hurdle, you have to endure special fitness tests, like being whirled around in a centrifuge. These tests eliminate many of the remaining candidates. As a finalist, you now have to face interviews probing your personality and technical knowledge. Bear in mind that skills in foreign languages are an asset in this lengthy and detailed selection process. Indeed, English and Russian are musts for the Space Station programme. The final selection is made by a panel of experts.

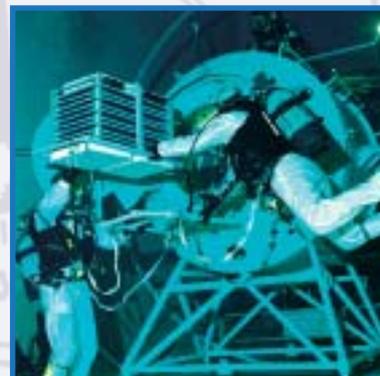
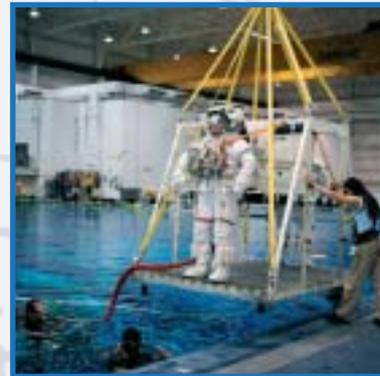
So there you are – a selected astronaut! Congratulations! But your astronaut training hasn't even started yet. This is still only the very beginning.

Training as an astronaut

Having been selected, you follow the same training scheme as all your fellow astronauts assigned to missions to the International Space Station. The syllabus has been worked out among the five partner agencies in the Station programme. There are three main stages:

- Phase 1: Basic training,
- Phase 2: Advanced training,
- Phase 3: Specialised mission training.

So let's take a look at each of these steps in some detail.



Basic training

As a European astronaut, your basic training at the European Astronaut Centre (EAC) in Cologne, Germany lasts about a year. It includes classes on astronautics and how the Station, the US Space Shuttle and Russia's Soyuz and Progress spacecraft are built and flown. Learning Russian is an important part of your basic training. Your physical training includes underwater diving in a 'neutral buoyancy facility' – a swimming pool – at EAC



to simulate the weightlessness of walking in space ('extravehicular activity', or EVA). Then you have to endure zooming flights in a jet aircraft that create about 20 seconds of weightlessness on each climb. But be warned: some people end up sick! In case your spacecraft makes an emergency landing far from help, you have to learn how to survive in a desert, jungle, blizzard or ocean.

The process is a little different at NASA. There, basic training for new astronauts takes about 4 years. They learn much the same things as you, but they also help out in other space projects, developing or improving equipment. At the end of this time, they are awarded their 'active astronaut' certificates.

In Russia, the basic training given to cosmonauts is also spread out over several years.

Advanced training

After your basic training, you put your new skills to real use and help out on actual space missions, working on new items of space equipment, improving existing ones, preparing for missions, and even talking with crews in space as the 'Crew Interface Coordinator' (also known as the 'Capcom', or 'capsule communicator').

At the same time, you continue to build your individual skills. Additional training helps you to become a specialist in an area such as robotics, space walks, computers, rendezvous and docking, the Space Shuttle and the Station itself.

Now you can begin advanced training for the International Space Station. You join a team of international astronauts and train to live and work aboard the ISS. Together with your American, Russian, European, Canadian and Japanese team mates, you travel to all the training sites of the various space agencies. Your goal is to be picked for a future flight, although usually you will first become a backup, ready to step in should anything prevent the main astronaut from flying. As a backup, you gain valuable experience that prepares you for your own flight.

Each space agency is responsible for training all the astronauts on its own contributions to the International Space Station. For Europe, that means:

- the Columbus laboratory module,
- the Automated Transfer Vehicle (ATV),
- the four miniaturised scientific laboratories: the Biology Laboratory (Biolab), the Fluid Science Laboratory (FSL), the European Drawer Rack (EDR) and the European Physiology Modules (EPM).

Your advanced training has several trips lasting several weeks and is spread over 1-2 years. You will share your time between:

- NASA's Johnson Space Center (Houston, Texas, USA),
- Gagarin Cosmonaut Training Centre (Star City, Moscow, Russia),
- Canadian Space Agency (Montreal, Canada),
- Japanese Aerospace & Exploration Agency (Tsukuba, Japan),
- European Astronaut Centre (Cologne, Germany).

You get to know all the many different modules and parts of the International Space Station, the experiments and the spacecraft for travelling to and fro. The ISS will continue to grow for a long time yet, and you need to be familiar with the most intricate details. But your advanced training has still not prepared you for your own mission.

At the end of this advanced training, you are ready for assignment to a mission aboard the International Space Station. This might be quite a brief flight, lasting only 8-10 days as you help to deliver a fresh emergency-escape spacecraft. Or you might be lucky enough to be given an 'Increment' mission, and stay in space for up to 6 months.

Mission training

Well done! Here you are, ready to be assigned to a mission at last. As a general rule, you will first be on the backup crew, standing by to replace a prime-crew astronaut if there are any last-minute problems. And it does sometimes happen – so you have to be on your toes! Your mission training takes about 18 months. You really need to become an expert on the spacecraft, methods and the experiments you'll perform. You have a gruelling timetable with a very heavy workload. This is punctuated by a lot of travelling between the various training sites right up to 3 months before launch.

In Cologne, you learn how to use the Columbus research module and its laboratory racks by practising on simulators and mock-ups. The various experiments fitted inside Columbus hold no mysteries for you – you have practised so much that you can do them all with your eyes closed!

You also learn to supervise the approach and docking of the unmanned Automated Transfer Vehicle (ATV). This cargo ferry supplies you and your crewmates with water, oxygen, fuel, food, clothes, experiments and other equipment.



At the end of these long months of mission training, the main crew is launched on its mission ... while ever-patient you returns to your home space agency. But since you now have valuable experience working on a back-up crew and are finally ready to fly, you are now a frontrunner for assignment to a main crew. Indeed, your recent experience and advanced knowledge of the International Space Station will be a great asset on any future mission.

Just be patient a little longer ... and then the great day is finally here! It is announced that you have been assigned to a long Increment mission aboard the International Space Station. You now have to begin yet another 18 months of specialised and intensive training to prepare for the work you have to do in space.

A tight schedule and heavy workload take up all your energy. And you spend yet more time travelling between the various training sites around the world. Jet-lag is your constant companion during this final stage of training.

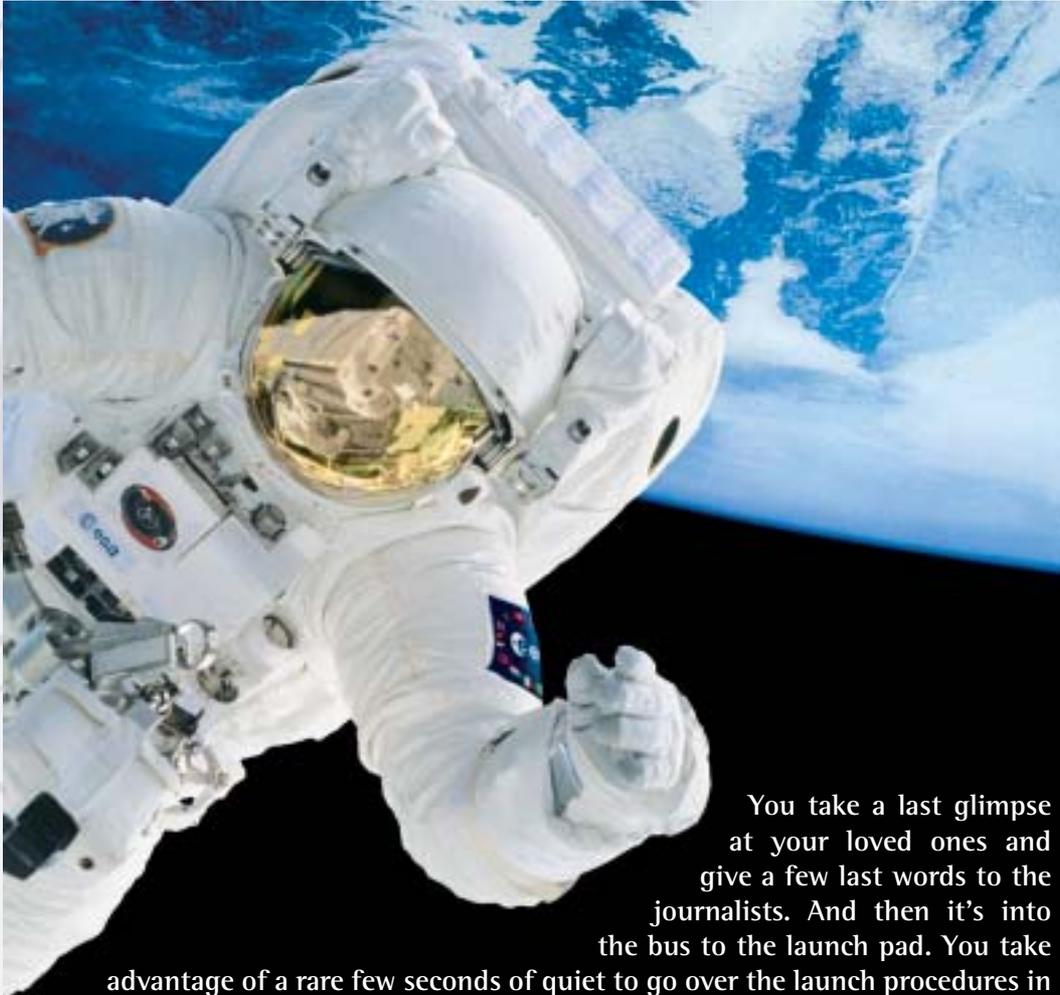
Lift-off at last!

At long last, the much-awaited launch date is just round the corner. There is now a frantic dash to complete all the last preparations. Finish the training. Allow for any last-minute changes to equipment and procedures. The final technical checkouts and medical check-ups by the panels of experts who certify you as ready to fly. You scarcely have time to see your family. Time itself seems to be speeding up. The demands of all kinds are never-ending. And you have only just enough time to think about a few personal belongings that you are allowed to carry along.





There you are, sitting in your spacesuit during the suiting-up. Surrounded by technicians carrying out the final checks on your equipment. Then the awesome responsibility that you are required to shoulder really dawns on you! This handful of men and women are the last links in a long human chain. That overall chain represents years of dedicated teamwork to ensure the success of this mission – which is assigned to you! It is through you that all of these dedicated men and women are taking part in this great endeavour. Deep inside, you know that you are ready.



You take a last glimpse at your loved ones and give a few last words to the journalists. And then it's into the bus to the launch pad. You take advantage of a rare few seconds of quiet to go over the launch procedures in your mind. You try to imagine what the sensations at lift-off will be like. Your fellow astronauts have told you all about their flight experiences: the incredible workload you have to get through onboard, at times even to the point of forgetting that you are actually up in space. Then, the return to Earth. The intense media pressure for a few days. The debriefings with technicians and scientists. Then the return to your home space agency to prepare for other projects. Other missions for other astronauts. And so the dream of being an astronaut continues ...

But the hatch of the spacecraft is now closing fast. A last farewell and smile of encouragement – and now you are heading for the stars! This mission takes you up to only a few hundred kilometres, but it is only the beginning. In a few years, perhaps you will have the chance to fly to the Moon or even to far-away Mars!

But that's another story ...

*Finally, I made it! I'm in the European Astronaut Corps!
Let me tell you the exciting story of how I did it
and about my work aboard the International Space Station
and Europe's Columbus science laboratory.
This is the story of how I was selected as an astronaut,
how I trained and how I finally flew into space.*

Tania

*This comic was produced by ESA's European Astronaut Centre in Cologne (Germany)
and the Euro Space Foundation (Belgium).*

