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**Committee on the Peaceful  
Uses of Outer Space  
Fifty-sixth session**

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661st Meeting  
Wednesday, 12 June 2013, 3:00 p.m.  
Vienna

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*Chairman:* Mr. Yasushi Horikawa (Japan)

*The meeting was called to order at 3:06 p.m.*

**The Chairman** Good afternoon distinguished delegates. I now declare open the 661st meeting of the Committee on the Peaceful Uses of Outer Space.

Distinguished delegates,

I will shortly adjourn this meeting, so that the special panel on the celebration of 50 years of women in space, entitled "Space: building the future today" can be held in this room. After the panel, I would like to cordially invite all delegates and observers to attend the opening of the exhibition in the Rotunda on the ground floor of this building C, to be followed by the reception hosted by Japan and the Russian Federation, starting at 6:30 p.m., in the Mozart Room of the VIC restaurant.

Before adjourning this meeting, I would like to inform delegates of our schedule of work for tomorrow morning. We will meet promptly at 10:00 a.m. At that time, we will continue our consideration of agenda item 4, General exchange of views. We will also begin our consideration of agenda item 5, Ways and means of maintaining outer space for peaceful purposes, and agenda item 7, Report of the Legal Subcommittee on its fifty-second session.

There will be two technical presentations tomorrow morning: by a representative of Germany entitled "Changing the perspective: atmospheric research on the ISS" and by a representative of Japan entitled "Japanese international cooperation".

During lunch time tomorrow, at 2.00 p.m., there will be a screening of a video entitled "No gravity", which is 52 minutes in length. Delegations are cordially invited to the screening of this video by France and Germany.

Are there any questions or comments on this proposed schedule?

*I see none.*

I would now like to invite the speakers to the podium for the special panel on "Space: building the future today".

*This meeting is adjourned until 10 a.m. tomorrow morning.*

**Ms. M. Othman** (Director) Distinguished delegates, ladies and gentlemen. Good afternoon and welcome to the panel session celebrating 50 years of women in space. I would like to invite the panellists to come to the podium. Thank you. Ladies and gentlemen, let me begin this session by calling on Mr. Yuri Fedotov, Director-General of the UN offices of Vienna to give us a few words. But before he does that, let me inform you that Mr. Fedotov takes a very active and sincere interest in space matters and the work of OOSA. He frequently makes suggestions to enhance our work and one of them was actually to celebrate the 50th anniversary of Ms. Tereshkova's flight to outer space. So this is due to Mr. Fedotov's suggestion that we are having this session today. Mr. Fedotov, please.

**Mr. Y. Fedotov** (Director-General) Thank you. First of all I'm not sure whether I have the right to sit here at this podium because I'm sort of say, I'm disrupting the real gender balance. But first of all I would like to welcome distinguished panellists and first of all, Valentina Tereshkova, I'm very grateful for her that she accepted our invitation and came here at this important moment. At this very special session of the Committee on the Peaceful Uses of Outer Space and indeed in just 4 days we will mark the 50th anniversary of the first spaceflight by a woman. And of course, we recognize my compatriot Valentina Tereshkiva who came to take part in this panel discussion and in spite her very busy schedule; she is an active politician in Russia, and but that is very important factor for the UN in general to promote gender balance including in outer space. And of course, many young women have followed the path of Ms. Tereshkova. The recipe is simple, you need to be in good health, you need to exercise, probably you need to be a keen parachute jumper from early age and then you can be lucky enough to be accepted as an astronaut, cosmonaut.

So on 16 June, 1963 Valentina Tereshkova was launched aboard Vostok-6 orbiting the Earth 48 times and that was sort of a big leap ahead, and since then,

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nearly 60 women have gone to space. And three of our distinguished panellists today were the first women in their respective countries, Canada, China and Japan, to go to space. And just two days ago, another woman, taikonaut Wang Yaping blasted off into space on the Chinese shuttle Shenzhou-10. Might have been achieved in the past 50 years, space science and technology has made important contributions to areas as diverse as health and disaster management, climate change, mitigation or development, data collection and we can't imagine and we'd live without technologies which were developed with exploration of outer space.

The panel discussion here today with Ms. Tereshkova and our distinguished panellists, all of them prominent women engaged in space-related fields, highlights the far-reaching implications and the as-yet uncharted potential of space.

The UN Office for Outer Space Affairs is committed to supporting states in cooperating and harnessing this potential for sustainable development and the benefit of all.

There is only one sad news today, unfortunately director of UNOOSA, Dr. Othman, will be leaving the office this year. And we were very proud with her dedication, leadership and will be missing you of course, but I hope your heart will remain with UNOOSA for many years ahead.

Ladies and Gentlemen,

We face many challenges here on earth. But Ms Tereshkova and the brave women and men who have come after her to explore the vast reaches of space teach us an important lesson — to always reach for the stars and we need to think about that all the time, every day and to have more inspiration and more willingness to achieve something new and to discover new world.

I wish you an interesting and exciting discussion. And unfortunately I won't be able to stay with you longer because I have some other commitments but I wish you every success in your discussions. Thank you.

**Ms. M. Othman** (Director) Thank you Mr. Fedotov. I would now like to quickly introduce our eminent panellists. On my right of course, our icon, Ms. Tereshkova, Ms. Liu Wang, Ms. Williams from Argentina, Ambassador Paradas from France and on my left Julie Settler from the U.S.A., Ms. Mukai, a familiar face, from Japan, Amalia Finzi from Italy, Roberta Bondar from Canada and Ms. Abimbola from Nigeria. Without further a due, I would like to invite Ms. Tereshkova to tell us about breaking barriers of past, present and future in space exploration.

**Ms. V. Tereshkova** (Russia) Madame Chair, microphone please, Madame Chair, distinguished experts, participants. First of all let me thank you for this very kind invitation to take part. It really is a pleasure and I am happy for my country. I have to come out and say so. The start of human space flight era was in our country, we started, then the US, then other countries.

What's 50 years for the universe? Just one beautiful instant and fact. In human life, that means a lot of work. After Yuri Gagarin's flight in 1961, many young people, young men and women, in our country decided they wanted to not just be like Gagarin, they in fact, they wanted to join Soviet cosmonauts and it was of course Soviet time. Since I was an avid parachutist, all of us; athletes, people who had some experience jumping from airplanes in the daytime, at night landing on land or water, we already thought of ourselves as the first candidates, priority candidates, for the job of a cosmonaut. Of course, there were many candidates.

We had to go through very gruelling tests, medical tests and because there was such enormous competition among young women, it wasn't easy. In the end, 5 of us were selected Yuri Gagarin was in charge of the department, the first man in space, he was our mentor, he was our assistant and our commander and a strict one as well. Training for the first mission by a woman was really no different from the training for men cosmonauts. Unfortunately outer space has no chivalry, makes no concession to gender. It is hard for everyone and it is a hard process. The training was really tough. However, we were young and we were really anxiously, really eager to fly, to prove that a woman, just like a man, is fully capable of flying in space, working in space and doing everything as well.

The first series of spacecraft launched by the Soviet Union was spacecraft Vostok type. Admitting only one person in a very tight space, only 5 cubic meters including the gear, the chair the space suit. At the time, we couldn't take off our space suits inside the spacecraft and of course was nowhere to put it anyway and all the equipment. So the training was, as I said, hard and that was part of the training, surviving in such a tight space, such close quarters. We were trained with, we studied spacecraft, all the various systems, various types of equipment. At the training centre, we were taught to fly both transport planes and jet planes, because we were just parachutist. We had never been trained to pilot an aircraft, let alone a spacecraft, and we need that training.

And practice has demonstrated aptly over the years that spacecraft commanders and the commander of the International Space Station, they are all ex-pilots, aircraft operators. There were so many

unknowns at the time. We did not know how a woman's body would react to those conditions. We were planning 24 hour mission only but the designer in chief of our spacecraft Korolov and ourselves had a tacit agreement that if everything was ok I could apply to the state commission in charge for permission to extend the flight and they assessed all the data, all the gages, all the parameters and could issue such a permission. So once I was in space, after 24 hours, I was feeling fine. All the equipment was performing ok, so I applied for an extension and the state commission gave the green light, extended up to 3 days. Why 3 days? Because at the same time, another spacecraft was also in space, Vostok-5, with my colleague Valery Bykovsky. On June 19, we were given permission to land on the same day to re-enter, go back Earth on the same day. Not together, we couldn't do that together. It was a spherical capsule and you will understand, of course, that a sphere is not aerodynamic so we had to follow a ballistic trajectory and there was huge area over which we could have landed.

So, my colleague landed in Kazakhstan and myself in the Altai region. A long distance between us. We were happy because we successfully accomplished our missions, all the systems worked fine, everything was fine but during the first 24 hours, I noticed a mistake that had actually been built into the mission plan. Not by design, but it was a mistake. The way the spacecraft oriented, the braking system raised it to a higher orbit, rather than a lower one. I reported to the mission control on Earth. They were a little perplexed, and then they gave me a set of data to make the adjustment, to correct the way the system was operating and then everything worked fine after that. I was able to move to the lower orbit when I needed to.

We were catapulted out, ejected out of the capsule at a certain altitude, seven kilometres, and 9.5 units of excessive pressure, something we had to endure. But after three days for me and 5 days for my colleague, that did not do any serious damage to our health. All of our suggestions, comments, proposals, of course, were carefully considered. Every mission was a test, a trial. There were always lessons to be learned, adjustment to be made to the system and for experts those were important comments, that feedback they got from us, they were able to improve the spacecraft, to make the necessary corrections. We also brought back photographs which were very helpful to our scientists. Looking at the lower layers of the atmosphere, the curious processes that occur in that environment. And with that feedback they were able to make substantial improvements to the system.

So Valery Bykovsky and I, he is also marking an anniversary of his mission, of course, were happy, we

believed our missions to have been successful and we made our report. Now, 50 years later, of course, cosmonautics, as we call it, has made huge strides from the first single person spacecraft to an International Space Station. 1975 was an important year. When we embarked upon a giant programme with the United States; the Soyuz Apollo programme. That was the start of a very fruitful cooperation. Now the International Space Station has an international crew on board. People from different countries, people from the European Space Agency and from NASA, our US colleagues.

In our country, people like me, women involved in the space work, are also lamenting the fact that there are not enough women cosmonauts. In the space industry? Yes, there are many and probably the best of women, but few of them actually go on space missions, fly into space. Of course there are objective reasons for that, that have to do with the new types of spacecrafts. Sergey Karolov, the designer in chief, after my mission, decided that an all-female crew should fly into space and we had already started training in fact, but in 1966, Karolov passed away and was replaced by another person on a new type of spacecraft, the Soyuz series was designed and far be it for me to offend the men who worked with us, but the women were kind of pushed aside. We were told until such time as a truly safe and reliable spacecraft was created, no more women were going to fly.

And then we had a tragic accident, the Salyut crew, Dobrovolsky, Volkov and Patsayev died during re-entry and again the idea of an all women mission was pushed even further into the future. Still, all was among trainees that were women. It's unfortunate that there are so few of us still. But look at us, we are few but we are a remarkable few. Yelena Kondakova worked in outer space for more than 180 days over 2 missions both on a spacecraft and on the orbital station and also on a shuttle mission, part of our cooperation with the United States.

I think women will for sure at some point become much more active participants in space flights. They are already present, a bird can't fly with one wing only, and human space flights cannot develop further without the active participation of women. We have things to look forward to; the moon, the asteroids, Mars. Mars will never forgive men if they fail to take at least one woman with them on that mission. Do you agree?

Once again let me extend my heartfelt thanks. Our space sorority lives on and even though there are few of us compared of all of humankind, we have brought it to the attention of people on Earth that our planet is beautiful, it is small, it is in need of our

protection. When a spacecraft takes you out there, away from the Earth, you feel closer to your planet, in fact, you come to understand how many things we share. How many things we have in common. And how insignificant are the things that separate us. I wish you every success and to tell you your work is precisely designed to make humankind believe that we share much more and thank you very much.

**Ms. M. Othman** (Director) Ladies and gentlemen, I shortly call the panellists alphabetically, but before we do that, I would like for you all to watch a video message from Ms. Nyberg on board the International Space Station

*Video*

**Ms. M. Othman** (Director) As I indicated, I would be calling on the panellists alphabetically. With an exception. Ms. Naja, who was originally slotted to come, is unable to come and on her behalf to speak to us is Ambassador Paradis. I would like to call on Ms. Paradis to speak first.

**Ms. Paradis** (ESA) Thank you very much, thank you for the honour of giving me the floor first. Thank you for this very interesting and useful initiative and I would like to thank Madame Tereshkova for her telling us about her very moving experience and I am so impressed, I think you'll dream of an experience of hers, of going into space and I would really like to say thank you for enabling me to share this moment with her. As you have said, I will be speaking on behalf Geraldine Naja who has been left in France because air traffic controller strikes and she is the bureau chief of European Union relations for the director-general of the European Space Agency. And this is the message she wanted to share with you all.

European Space policy will undergo considerable development in the future; combining the development of space sector of that of European construction. In just a few decades, space has gone from being a challenge of power and prestige to an instrument in the service of many policies with a growing impact on your daily life. We use space on a daily basis, sometimes without even realizing it; for weather forecasts, for positioning, for navigation, for high speed Internet, for cell phones, for bank transfers, space is unique and irreplaceable. But space is not just an instrument in the service of citizens. As you know here within COPUOS, it is an instrument in the service of security, research, education, development and in the widest sense of the term, economy and growth. Space is an extraordinary factor of technological innovation. The constraints of space missions mean that space agencies and industries must always be creative and excellent. There is no room for mistakes in space. Over and above these

contributions, space is a place of dreams, explorations, a way of providing answers to the fundamental questions that people have always asked about the origin of the universe, the origin of life and of future. A few weeks ago, the results of the European Herschel plank mission enabled us to date the origin of the universe, 13.82 thousand million years ago. Last year the European probe, Rosetta, sorry, next year, the European probe, Rosetta, will be analysing the composition of a comet. This will be a world first. This brings us to Europe. Europe is ahead of many space subjects. The science of the universe, Earth sciences, weather, Arianespace has more than 50 per cent market of commercial launches and Europe has one third of the global market for telecomm satellites. Two of the three main satellite operators in the world and Eutelsat and SES Astra are European.

So, Europe is in space is successful, it is innovative and it is essential for many of our policies. With the European commission, the European Space Agency launched the Galileo programme 10 years ago. This was mentioned this morning in the statement made by the representative of the European Union. Galileo is the European GPS which will provide its first services from the end of 2014 onwards with incredible accuracy. We also have the Copernicus programme, the surveillance satellite system for the environment and for security, the first satellite to be launched next year.

Future development in European Space Agency will be harnessing space for citizens to increase our knowledge and employment and wealth. Space is not a burdensome toy but rather an instrument but will enable to survey the environment to better understand our planet and to better manage natural disasters and improve even maritime safety. Beyond these developments which are almost reality, and the decades to come, we will see great exploration programmes going to the Moon, Mars and to asteroids. And I look forward to participation in this panel. Thank you.

**Ms. M. Othman** (Director) Thank you Ambassador. I would now like to invite Ms. Alale to tell us about space applications.

**Ms. A. H. Alale** (Nigeria) I join everyone who has been congratulating Madame Othman, to congratulate you for the successful organization of this event. And I also join to celebrate Madame Valentina Tereshkova for being the first woman in space and for being one of the mothers of space. Was actually promoted, I mean, the interest, she's created from, somebody like me, to be in this field today. And talking of space application, I want to talk about space application in an African context. Space has evolved, its application has already made the world a global

village. As Madame Tereshkova said, when we are in space, the world is actually smaller.

One of the application of space that essentially makes the world smaller is communications satellite and that's Nigeria and indeed Africa has actually benefitted from this application. In Africa, we've applied space applications towards sustainable development, we use this as tools for sustainable development and with the help of OOSA, that's UNOOSA, COPUOS office. From 2001, Madame Othman has been working in and encouraging African countries to participate in space sector. I actually got my actual development interest then and when I came in 2001. So I went back because I saw some of the work the committee was doing, I went back to Nigeria and I said "Look, we can use space" and then we started advocating and then we said how can we get into space and then we started space; we looked at space applications.

We are not doing exploration of space but space applications. So we started some programmes. We started remote sensing programmes for disaster management and other items; environmental programmes. So, from there we moved on to the communications satellite which I was part of and we used it. After we launched the satellite in 2007, we had pilot projects; telemedicine and tele-education. Which we took to the people and we demonstrated our good investment in space sector. Our beneficiaries come into the society and since then we've seen so many African countries showing interest in outer space agency.

We have Nigeria now, with NASRDA. Kenya has just started its own space agency last year. We have Algeria, Nigeria and Algeria have been working together in disaster monitoring consultations since 2004. 2003-2004 we've demonstrated capability of working together in consultation to save, to prevent disaster using remote sensing satellites. Algeria has another satellite, ALSAT-2A that was launched in 2010 a follow-up. Then Nigeria, NASRDA has 2 remote sensing satellites that was launched in 2010 and Sat-x. Then of course, the first communications satellite that I worked on filled and we launched its replacement satellite in 2011 December. That particular satellite that we have used and started using it again to demonstrate telemedicine applications, were expanding and in the formal network, we altered education with the National Open University.

So we've gained more experience and other than that, we are also using the satellite for the direct digital broadcasting platform in readiness for the analogue to digital migration. As mandated by ITU for 2015. So these are all the projects that we used space application to being to Nigerian people and for the African to

encourage more interest in this field. The leaders in space in Nigeria, they formed the African Leadership Congress the first meeting that was in 2005. Four countries started in but now we are five with the admission of Ghana into COPUOS. The next meeting will be held this year by Ghana, hosted by Ghana, this year. So we are looking at expanding and utilizing space applications for different developments in Nigeria and of course in Africa.

Another area that I know the space application is beneficial to Africa is improving the safety within the African, using the satellite navigation, the lunar system and the GPS system. ICAO is trying to make sure that the satellites they are using actually augment the safety system for the aircraft.

Capacity-building, it's another key benefit that we have benefitted from in Africa and with OOSA's regional offices in Nigeria and we have actually trained a lot of Nigerians. We have over 150 satellite engineers right now and they are working in space application fields and we are very very confident that space contributes seriously to the development of Nigeria and indeed Africa. So I appreciate all the work that the developing countries have done and we didn't have to do, or repeat, many of the experiments we are just getting into it. We exploited the benefits and we are very happy and I am very glad to be part of this panel. Thank you.

**Ms. M. Othman** (Director) Thank you Abimbola. I would now like to invite astronaut Roberta Bondar to talk to us about science.

**Ms. R. Bondar** (Canada) Thank you very much. I have a short slide presentation that I want to put on here for you. IT's daunting to talk about science in 5 minutes. I'm going to talk about a couple of things that are dear to my heart about science and it's really now, the next five minutes, think of it as a refresher course as a commitment to using space to make our lives better here on Earth. That's a waterfall. An experiment in gravity. So, while we're mopping up that...

So human exploration really is all about science and science helps us understand the world that we are on, the world that is around us and the world that's way beyond us. I look at science that's not applied yet as basic science. And there are many people who tell us we need applied science and technology all the time. We just have.. to.. [laughter] this is really high-tech, this is very impressive. Can you see me beyond the launch pad up there? I should stand up. And really, the reality these days, it has been mentioned many times that it is a very complex world that we have because with reality of course comes the necessary cooperation.

A lot of it, and I can stand up so you can see me, is because of finances obviously, but I think in some ways of fiscal restraint is good for us because it really forces us to speak to each other to cooperate. It's nothing like having you wallets talk to us so cooperation is very good and this organization obviously has made some huge strides and unfortunately the light is hidden under a barrel most of the time because there are many people who don't know of the good things that you are doing.

So, my recommendation would be to make sure that you Tweet a lot. I think the world really needs to understand the kind of peaceful uses of outer space that we do have beyond the human capacity to be in space. Having said that, these are the three things you can take away from me today is that we won't have any cooperation or good science unless we have good heads. Intelligence teaches us a lot but on top of that we have to have the passion and the heart; we have to care about what it is we are doing and really believe we are going to make a difference. And then the cooperation part is we have to have the will to make it happen. So, astronauts going to space, we have those three things right from the get go. I am just going to show you this one little wooden engraving because it is very much about what we are doing in this room. We are about moving from where we were historically into areas using outer space to provide us with different types of answers. Philosophical things, scientific things, but none the less, we are all in the position to make change, whether or not personally we go up into spacecraft or we allow the spacecraft to do stuff for us in the remote sense.

I just want to show you this one slide. It is black and white and this is of me when I was a young girl and I look at this because we were all young girls, young boys at some point in our lives and we all looked up at the sky, something we all have in common. We have in common with the new generations that we are trying to educate about science and about the potential of us as the life form on the planet to be good to each other and to respect in a dignified manner. So when I look beyond the Earth, this is one of my childhood heroes and Valentina Tereshkova was really the light for me when I was growing up.

That we could actually have people who go into space and could be like me; they looked like me, they talked like me and it was great to see her so successfully. Of course, the late Dr. Sally Ride, in the American programme, we have a number of women in various countries who did things as are our heroes and it means so much to the people. We have Dr. Mukai who is here with us today from Japan and Dr. Ling, we

have from China and of course we have the Canadian flag that I am proud to carry along with Julie Payette, my colleague who is the other Canadian women to fly in space, an engineer. So we're very blessed to have the opportunity to do science on behalf of the scientists here on the planet. I speak to young people all the time and I tell them that hard work isn't necessarily in space, it is getting into space and we have rooms of scientists who we represent. We are the surrogate hands for science and space. We try very hard not to make a mistake because we know how long it takes to get a PhD based on some experiment we might be doing in space flight. So we take it as a sacred responsibility.

Looking at the Earth from space is what I want to just focus on now because that is the thing we have in common, whether we're men or women. The thing that we see, that we can't simulate here on Earth. You can go to a movie theatre, see an Imax movie on a 70 story screen. You can see wonderful things but you cannot be in the moment and when Ms. Tereshkova walked into the room, Dr. Mukai walked into the room, or Dr. Ling walked into the room, you can see people in three dimensions, they become real. If you have never ever seen Ms. Tereshkova before, you see her today and she is a live thing in the room with you. You bond, you engage with her, so you can imagine, seeing the planet from space we engage with reality, we see the planet. And from the moon you can see it in total around like this. But we haven't seen it for many many years like this. Hopefully soon again, a human being will take this picture once more.

When we get into space, it is the opportunity to see things differently. When we look at the Earth from space, it really teaches us about humanity and about how really isolated this little planet is, and how beautiful it is as it reflects the sunlight back to us. And so when you see it hanging upside down at first, it is disconcerting, it is like going into a room and you have to negotiate a new contract or some new passage legislation or some document and it is upside down but soon through cooperation with each other you can flip the surround and you can see the strength and advantage to you and your colleagues. And so when we see the Mediterranean from space we see Egypt and the Nile, we can think about the wonderful things that exist on the surface of the planet.

These are all images now of Earth but it teaches us that we are a planet. These are images of areas where there are not human beings. It looks like Mars but it really is Earth. It teaches us the beauty of patterns and the artistic dimensions and becomes a very philosophical thing for us. When we see water we feel very blessed and that is why remote sensing of the

oceans, the atmosphere and the Earth become extremely important to all nations on the planet, not just space fairing nations. To be see places, I know that we have representatives from many countries here, but to see places like this from space, salt fields, lava fields in northern Africa and then afterwards to be able to come down and photograph them has been an extreme honour for me.

I consider myself in the Earth explorer phase, learning about ground truth so we must never forget that when we put remote sensing satellites up we must never become detached from that information. For that information, that scientific information means so much for the people on the planet, people in developing countries, people in developed countries, we all need this information. It teaches about water and it teaches us about history. This is a rock art history painting that is thousands of years old that exists in a United Nations world heritage site in the southern of Libya and it teaches about environmental change; how you move from pictures of giraffes right through to camels on the same rock cliff. It teaches that things change, the planet is evolving. And one of the things we try to talk to people about those of us in space, is to talk about the fact that we are a planet, we should not be expecting constant temperatures all the time because the Earth is evolving at it will change.

When we go to places like Mars, and we are doing great remote sensing up there now, we are looking around a planet, looking for water because it is so precious here. Going around remotely and drilling and trying to found out things, not just about Mars, but what it teaches us about our planet. What it teaches us about being a life form. So with all of that the future of science is going to be tremendous not just with robotics systems going up and the remote sensing that drives us to develop in systems far away from us, but also about the creativity, passion and innovation of human beings. Without science we do not have the toolset, without science we cannot apply to have technology and without science we cannot understand about the world around us. And I just want to compliment all of you and thank you Madame Chair for allowing me the opportunity to stand here and speak about my favourite subject, the planet. Thank you.

**Ms. M. Othman** (Director) Thank you Roberta. I would like to request the engineers to bring down the screens, thank you. Cause I'm sure you would like to see the lovely ladies here, the screens are blocking them. And we can see what's happening in this group, up there. Thank you.

And now I would like to invite Professor Amalia Finzi to touch on technology, please.

**Ms. A. E. Finzi** (Italy) Technology is important, at least, as a science. Even if technology is considered the second class sister of science, it is not true. To get into the sky, it is absolutely important to have a strong technology that allows us to get into the sky. We started with R-1 Semyorka that was launched, the exact start the space era. On May 26 1945 Sergei Korolev made an official definition and he said that the Semyorka was able to put a warhead, a nuclear warhead. It was not true. Semyorka was not a missile, a real missile. Semyorka was a very powerful launcher to get to the sky. In fact, in this family Sputnik as air sat 1, with a fuel booster, one stage, with a liquid fuel send to space first there was Sputnik 1 and then one month later were the Sputnik with Laika that died in space. I says that Laika was the very first [interruption from audience] female, that's was female, first living was a female. That's true.

Then Vostok, do you see that Vostok is much more bigger than Sputnik, was 4 boosters, two stages, all with liquid fuel and sent to space before on 12 of April 1961, Gagarin and then 30 June, Tereshkova. I wanted to say that there is a lot of movies about Gagarin flight and very very few movies about Tereshkova. I had a very difficult find, large find, difficulty to find it. I don't know why we could not. There is some problem. Then Soyuz, Soyuz is the last family, last element of this family and it is all with liquid fuel and you see the most powerful. Looking to the report between rate, between the women, the men and the motors we can see. With Soyuz now, Soyuz is the wholly launcher, very powerful that is distinct and center to the Mars.

The European mission Mars Express, you can see the antenna of Italian experiment to find water on Mars. And then now, Soyuz can be launched by a crew and put in orbit full of the many satellites for Galileo constellation. From the other end, United States sent before the Redstone family and with Juno-1 always liquid in solid stage. Sent Explorer 1, that was the first American satellite, and then with another that is Mercury Redstone sent first American astronaut. But is this family, it was for the Titan family that was devoted to learn space operation. At the beginning, we knew nothing about how to behave in space and Titan, especially Titan, that was very powerful and we learned how to dock in space. And this is a real picture of an, a very ingenious, very simple metal beginning to make docking with first stage of engine, that like a regulator was able to dock with the Gemini capsule. For extra vehicular activities that have been taught with Gemini as with Titan.

For what concern Leonov that was the first one who have many movies, there should be a movie, but it

doesn't work, the second one was Edward White but there is a movie. For our concern, Savitskaya, was the first woman that make [...] we have only a picture and for our concern, Kathryn Sullivan in 1985, we don't have one picture related to her ever. It is strange, in my opinion, it is strange.

With Juno 5, we reached the most powerful launcher rocket for space activity and I wanted to underline it was use of hydrogen that changed the opportunity to get into space. On 1969 we went to the moon with Apollo 11 and that launcher, 110 metres high, we launch a capsule that returned to the Earth. High 2 meters. Which means lost in space 108 meters of the launcher. Now we had the space shuttle and you can see this beautiful pictures of the shuttle, space shuttle environment and liquid fuel and the first mission of the space shuttle was 1982.

The first women that was commander of space shuttle was 1999, 18 years later that the first mission of space shuttle. For Europe we were Ariane family and this Ariane 5 holds the liquid, generally with liquid, launched in December 2009, and Ariane is specialized for comet before we reached the comet, Haley comets, in 1985 and for the first time we've seen the nucleus and then we are going to the other comet with Rosetta mission and I am in particular interested because there is an experiment of mice that is flying and we land into town 2014, we land on the comet. With Vega, it is the last launcher of ESA, European, which Italy gave a big contribution. We launched, two launchers successful and we launch LARES, it is a satellite for radioactivity experiment. I don't want to go over because my, is today, but I wanted to do a consideration. Launchers distinguish for the orbit that they have reached, a capacity to put a pilot in orbit. In general, there orbit of the payload put in orbit is some per cent, that means 1,2 or 3 per cent of the total mass of the launch. So, we lose a lot of mass, we spent hours and energy to make the launcher training. We can use different booster, number of booster of different stages and you can solid or liquid.

We are working a lot on materials, electronics and so on, just to improve the performance of the launch, that is very difficult. For instance, we now use a new propellant with atomic hydrogen, we hope to use hybrid motors but with solid and liquid together, we hope to take the oxygen from atmosphere so we don't have to embark oxygen. We hope to use refuelling in orbit but that is the final consideration, no dramatic innovation since Korolev and from Brown and Vidan till now. So what we need is a new energy source but that is a job for new generation. Thank you.

**Ms. M. Othman** (Director) Thank you Amalia, I would now like to invite Chiaki Mukai to speak about space life, sciences and space medicine.

**Ms. C. Mukai** (Japan) Thank you. Good afternoon ladies and gentlemen. Chiaki Mukai, from Japanese Space Agent. I work as a JAXA astronaut and also work as a director for the centre of applied space medicine and human research. Today, the title give to me is the education of space life science and medicine. If I think about the women's dedication to this field. To tell the truth, 1961, the first man, the cosmonaut Gagarin flew and 2 years later, 1963, the cosmonaut Tereshkova was the first women who flew. So, to me, both men and women worked together during this past 50 years to dedicate of the advancement of space life science and medicine. So let me talk about those 50 years, what we have so far done in this field.

First of all, the medicine supported by life science research is essential for humans and living organisms to live in any place. Space is not exclusion, space we need it. So, if we think about the space environment, and its health risk, if you would just take a look at this slide, even 450 kilometres, lowest orbit, environmental-wise, microgravity crossed the confined multicultural environment and cosmic radiation did 3 effects on the human body.

So the space environment actually effects on human health. Space medicine is for ensuring health of people living and working in space. So if we think about the role of space medicine there are two roles; the one for the space explorers of course, it is the space medicine. And space medicine is the infrastructure of human space exploration, survival technique, occupational medicine, environmental medicine and preventive medicine. This is very important because nobody wants to become ill, so that prevention it is everything. Then prevention is also the one that we can apply this technique which applied to astronaut to the people living on Earth. So, the second role of the space medicine is for the people living on Earth.

Which plays an important role in improving the quality of life on Earth. If we think about the International Space Station in lower Earth orbit as a unique environment. If you just take a look at the green part, phenomena augmented and if you just take a look at the green part, follow the large square for example, decrease of the bone density. Astronaut has ten times more than the menopausal women on Earth. Even the young, healthy astronaut, ten times more bone becomes brittle. If we think about the muscle atrophy, astronauts' muscle atrophy is two times more than the people on the Earth; bed ridden people. So it is great, which is a tremendous amount of the degradation of the health on the space fliers. If we think about the [...]

it is also interesting when the doctors see the patients usually we won't see, or we cannot observe the causes or onset part but since we send healthy astronauts who doesn't have any disease at all but who flew in space develop some disease like situation we can see the entire clinical cause, the cause, onset, adaptation to the recovery.

This also one of the fascinating things that we ask astronauts to participate the life science and space medicine research. And also going to the yellow part, problems, like physical problems, psychological problems, more visible and clarified as I mentioned the phenomena augmented and also in space, resources very limited, so no place to escape. So the fewer buffer systems to dilute problems. So on the ground, maybe the problems, so many problems, have not seen yet, we will be able to see easily in space. So the solutions, countermeasures in space could be more effective on Earth.

So, the dedication of the space life science research is for humankind. So the green part is for the astronaut. The health and mental care for the people living in space. Which is a stepping stone for human exploration to moon, Mars and beyond. Without having space life science and space medicine, we would not be able to send the human being into space. And the yellow part is on the benefit for the people living on Earth. Through this kind of experience to maintain astronauts' health, we have learned so many things which can educate people living on the Earth. Like, for example, JAXA our space agency developed this kind of small pamphlet and the title says Keys From Healthy Long Life Learn From Space Medicine or Keys For Health Promotion Learn From Space Medicine. I have the copies if you want, anybody who wants to learn about the secret tips which is to learn from the space medicine. You are welcome to have this copy.

Here, there is a summary. During these 50 years, we have done this summarizing this page. International Space Station or lowest orbit is a unique facility where it's existing gravitational level is nearly zero. So this is very unique. So the space life science medicine enables us to understand gravity shapes life as we know it, to explore space to help people living on Earth so, from this view point, men and women, dedication for the past 50 years was great. And I believe that the education will continue to the next 50 years to come. So the challenge of the space life science and space medicine, provided by men and women is to explore farther, longer, safer so that we can explore more and more in space. So thank you very much.

**Ms. M. Othman** (Director) Thank you very much Ms. Mukai. I would now like to invite Julie

Sattler to tell us about the business aspect of the space enterprise.

**Ms. J. A. Sattler** (USA) That you Ms. Director. I am honoured to be here today. It is very humbling to be at this event. And amongst so many distinguished women in aerospace and from so many countries, I thank you. So how does our industry. Women are playing an increasing role in shaping the direction of companies in the space industry. Space inspired us for decades, providing internal drive to explore and challenge our boundaries and to enhance our knowledge. Women are found throughout industry, leading and shaping exploration.

Decades of space development have generated staggering gains in technology you have heard today. Global communications, navigation, weather forecasting, medicine and materials and have a significant impact on economic, education, scientific knowledge and international relationships and all of this was driven by private industry working in concert with national Governments. It involved casting and sustaining great visions, engaging the imagination, navigating budgetary and political challenges and maintaining perseverance in the face of all manners of setbacks. As we heard, space can be an unforgiving environment, but when done right, it can be punctuated and provide great insights to our world. Today we see proof of major developments that underscore the industry's dramatic evolution and progress from its earlier days. Many nations and new companies are embracing the vision of space. Even smaller nations who do not have their own organic space industry are interested and acquiring space assets and they are developing their inorganic capabilities. Space has truly become a global enterprise. Commercial satellite communications and environmental sensing have become big businesses globally. We are now also seeing commercialisation in the space transportation sector.

Space has provided opportunities for international cooperation; International Space Station illustrates that point. The ISS brought us not only scientific advances, but political and cultural ones as well. So where are we headed? In keeping with our theme, industry is engaged to create tomorrow today. But the road to the destination is a challenging one. Due to the on-going global economic situation, nations continue to experience budgetary restraints, which effect investment. Combined with that, competition is increasing as more players are entering the market. But this competition combined with national budget limitations, is necessitating greater innovation and spurring affordability gains. Companies are focused more relentlessly on cost, value, reliability,

performance and relevance. To the extent, this plays out, industry can only become more disciplined and customers will get better value.

The economic climate is helping, is helping to drive increasing partnerships and collaboration among nations in an effort to share and drive down cost, to realise economics of scale. Governments are working to reduce economic and political barriers making it easier to conduct international business and enable technology transfer. Companies are building a greater in country presence in those nations where they seek to do business. This enables them to build strong working relationships and to better understand customers' unique requirements and their budgetary parameters. A need for connectivity is only intensified as cell phones, tablets or mobile devices continue to proliferate. Space is crucial for meeting this voracious demand.

Environmental sensing of small communications satellites are technological entry points for developing countries. Demand for satellite communications continues to grow, regions with large populations and growing economies are expanding, use of satellites for television and the Internet. Overall there is a significant regional and international cooperation in the civil space area as a key catalyst for cross Government collaboration in information sharing.

I'd like to pause now and talk about something that is very near and dear to all of our hearts. And that is how we go forward and how critical it is for the future of our industry in building our future work force. It is an area that industry is taking a more active role in. If we are to continue to make great advancements in space, we must reach, inspire and develop tomorrow's engineers, scientists and innovators. Aerospace companies, for example, are engaging with schools, universities and educators and are sending engineers into classroom, providing teachers with resources and industry access to shape curriculum and offering hands on interactive events for students to bring math and science to life.

Space is still a source of inspiration for young people. We must continue to leverage the appeal of space to help them see how industry can offer the potential of a personally rewarding career. In closing, industry is adapting to the global market realities to ensure that we continue to work closely with Governments and other customers around the world to meet our space exploration needs. In the future we must not lose sight of this vision. Even as nations around the world contend with budget constraints that might make it tempting to cut space investments. But ultimately and fundamentally we explore because it is inherent to who we are. The impulse to explore, to discover and create something new traces back to the

beginning of mankind and is the catalyst to our future. So let us to continue to go forward in the development of space jointly and the collaboration and the world as it is today. Thank you.

**Ms. M. Othman** (Director) Thank you Julie. And now to touch on space law, I invite Professor Williams.

**Ms. M. Williams** (Argentina) Thank you very much Madame Chair. What a privilege it is to share a few thoughts from the optic of international law with these remarkable scientists, real experts in the field of space law activities. I am also grateful to the counsel for scientific research of Argentina for its support to be here on this memorable afternoon. Madame Chair, I was thinking that what better example of the role of women in today's society than your work as head of the Office for Outer Space Affairs and the work of your energetic and very dedicated team. Really admirable.

Fifty years ago women made it to space. Madame Tereshkova was the first of a few examples, not so many, but some are with us today. But it was Valentina who amazed the world on that 16 June 1963. And remains the icon to inspire the generations. No doubt a matter of pride.

I shall now highlight a few landmarks achieved by the UN in the legal field over the past 50 years. This includes 5 treaties, all of them in force, 3 sets of principles and a number of United Nations General Assembly declarations and resolutions. Also, of a very recent vintage, are the optional rules for arbitration of disputes relating towards our space activities and the framework of the permanent court of arbitration. These rules became effective of 6 December 2011. And I had the honour to take part in the drafting. In those initial days of drafting of the space treaties, to speak of space exploration and use still seemed science fiction to many. In 1959, COPUOS was set up as a permanent body and at that moment, the field was dominated by two crucial legal arguments. Notably, international responsibility and rescue and return of astronauts.

With the 1967 outer space treaty, the United Nations began the progressive development of unique branch of international law. Departing, in many ways, from the traditional rules applied so far. Sovereignty, claims of sovereignty were ruled out and international cooperation was given a major role to play. Those were the days when ambassador Cocca from Argentina and ambassador Maiorski from the then U.S.S.R. engaged in epic encounters over the scope and implication of the term common heritage of mankind and this is duly recorded in the summary records of the legal subcommittee of the time. It was also the time when

Bin Cheng, now professor Emeritus of London University published his profound analyses of each and every article of the outer space treaty and this was published in the *Journal de droit international Paris* 1968 just before the first man landing on the Moon.

Every word of this publication remains valid today. In those days there were private institutions were set up to study the various issues arising in space law and in those days the International Institute of Space Law was presided over by Professor Pepin from France and I am happy to see that the current president of International Institute is with us in this room and it is Ms. Tanja Masson-Zwaan from the Netherlands. The ILA space law committee was set up at the same time. It was chaired by Professor [...] of the Netherlands and the committee was made up of, composed of eminent jurors like Professor Zukoff, Professor Jennings, Professor Meyer from Germany and in more recent times, by Professor Kopal who honours us as a very active member of the ILA. Indeed, the specialists and a few others, both from industrialized and developing countries addressed the legal issues with authority and are to be remembered for laying down the pillars upon which the space law has developed so far.

However, these men were not left alone in their endeavour, two unforgettable women broke new ground in the field. Namely, Eileen Galloway from the United States and Isabella Diederiks-Verschoor from the Netherlands. The quality of the contributions of these exceptional women grows stronger with the passage of time. Shortly after the space treaty, came the astronauts agreement in 1968. It was an agreement of an essentially humanitarian nature. The word astronaut or cosmonaut, I would like to remark had not been defined in any space treaty so far. The doctrine has provided a few examples a few descriptions, especially Professor Bin Cheng and Professor Peter [...]. In 1972, the liability convention followed. It contains a very wide definition of what ought to be understood for damage. It establishes as a general rule that liability should be absolute for damage. With only one exception and that is when the damage is caused elsewhere than on the surface of the Earth. When in case of collisions, for example, and in this case, liability based on fault is to be applied.

As a necessary consequence in 1975, came the liability convention, came the registration convention and in 1979 the Moon Agreement is now in the limelight, having in mind the recent treaties carried out in Mars such as a Curiosity, for example, which would mean that this agreement which also includes celestial bodies in its title, would become applicable to Mars as well. The Moon Agreement brought to a close the UN treaty making phase. The UN then moved on to the

adoption of principles first, first in 1982 the principles on direct broadcast television. In 1986, the principles on remote sensing of the Earth. In 1992, the principles pertinent to the use of nuclear power sources in space.

Among the many applications of space technology, I would like to mention, for example, disaster response, water management, treaty behaviours. To which I would also like to add, today, the use of satellite data in court particularly in the field of boundary disputes and on this point, I would like to mention the declaration made by the Russian judge of ICJ and a boundary dispute involving Qatar and Bahrain and where he was not in agreement with the sentence, for the judgement concerning the legal nature of islands. Though islands which had never shown before in traditional maps and the case was taken to the ICJ and it was decided in 2001 also I should mention the statement in a dissenting opinion made by the Venezuelan judge Parra-Aranguren in Botswana/Namibia decided by the ICJ in 1999 where he sharply questioned the validity of using aerial photography and satellite imagery in court. There were two opposed opinions but both of them were a real model of legal precision .

About remote sensing, I would like to call your attention on the fact that we are light years away from the days when the United Nations principles on remote sensing were adopted in 1986. Now we are in a completely different international context. Developing countries on the basis of agreements based on international cooperation have managed to create a unity of action. To allow them collectively for the time being a position in outer space affairs which individually was still beyond the reach. On the other hand, space technology is day by day growing as commercial activities. Hence principle 12 on remote sensing which, in the initial days, caused a lot of controversy between the developing and the developed world has now lost momentum, has now lost dramatism because developing countries now, not only are they being sensed, to use the term of the art, but also they have become sensing States on the basis of these agreements.

The latest contribution of the UN, as I said at the outset was the PCA rules on arbitration for dispute settlements relating to space activities. These rules stand out for the flexibility, for the procedural nature, for being open both to public and private parties and also for minimizing the risk of disrupting procedures by an expected claims on sovereign unity. So, Madame Chair, these are some of the many milestones marked by the United Nations in the development of space law to date. To which I may also add the organization of regional workshops in different countries and different

latitudes and the preparation of an education curriculum on the field, among others.

Madame Chair I shall close this summary with a final thought, as the new technologies develop the role of women in the field of space becomes more evident in many ways, most importantly with their professional contributions which we have been listening to today and let alone sensing the mood of a meeting for decision making in good light and similarly ironing out everyday differences during negotiations. So, however much the world at large may still be unaware of the many space applications of the many applications of space technology I can say that the stage of disbelief and fear of the unknown is a thing of the past. As the years unfold I look forward to looking for many other convincing examples in this sense. Many thanks Madame Chair.

**Ms. M. Othman** (Director) Thank you Maureen and as the last but not least, our speaker from China, Liu Yang who will talk about human space exploration.

**Ms. L. Yang** (China) Ladies and gentlemen, good afternoon. I am taikonaut Liu Yang from China. Thank you Ms. Othman for inviting me to attend this COPUOS session in the beautiful and music capital of the world, Vienna and share my flight experience with you. Today is the dragon boat festival in China so today I wish everybody a happy holiday. Fifty years ago Madame Tereshkova bravely opened the door to space and took the first step in space exploration by women. That was a brand new beginning of which every women should be proud. In the past 50 years, many women curious about the universe bravely set out to space. And I'm one of them.

On June 16 2012 my colleagues Jing Haipeng, Liu Wang and I flew into space in a [...] developed space trip on a 13 day space journey. On June 29, the spacecraft returned safely to Earth after accomplishing a successful mission. The success of the Szenzhou-9 mission was very significant to the development of human space flight in China. For the first time, manual rendezvous and docking technology was validated for the first time we entered the Tango-1 lab. Comprehensively validated the ability for Tango-1 to support the working life of astronauts and systematically carried space scientific experiments which accumulated valuable experience for future space station missions. It was in this mission that Chinese realised for the first time their dream of a space flight although China's space programme started late, it has been progressing steadily according to plan. As you many know yesterday our Szenzhou-10 successfully launched once again into space with another woman, Chinese woman astronaut onboard.

Here I sincerely wish my colleagues a successful mission and safe return.

I was very lucky to be part of a space mission and have an unforgettable space journey. During the flight, the launcher and the spacecraft performed flawlessly in just 574 seconds, a rocket lifted us accurately into orbit. The perfect performance of the rocket made it much easier for us to deal with much more than training G-load. And this mission I was mainly responsible for space medical and scientific experiments. The spacecraft figuration and control and helping the other two taikonauts to carry out two rendez vous and dockings. Of course just like every astronaut who entered outer space for the first time I enjoyed the wonderful feelings of space flight as much as I could. In space, everything seemed to have taken on light, awakened from a deep sleep.

The body floated in the unique space environment. I felt like a freely swimming fish. This feeling was really awesome. On June 16, the spacecraft docked perfectly with Tango-1 and we moved into our new home which had waited for us in space for some time. A much more spacious than our spacecraft, Tango-1 was like a small apartment with 2 bedrooms and a living room. We loved our new home in space. Here we had a roomy working space where we could carry out space experiments and ride a stationary bike freely. I also tried many somersaults and performed a tidy routine there. We also had a cozy private spaces. Much to my surprise, our Vienna friend was waiting for us in this new space home. She was a surprise sent by our ground support staff and a fourth crew member. During the thirteen days, she always accompanied us and brought much happiness. Look at this photo, in my hand was a traditional Chinese ornament called Chinese knot which I wove in my spare time in space. I'd like to send this knot with this moral of good luck and happiness to friends all over the world. One world, one home.

Peace and tranquillity on Earth and happiness. Everyone who has ever been to outer space will without exception be awed by the beauty of the universe and the Earth. If I ask you what is the shape of the Earth, chances are you will it is irregularly spherical, yes, I would give the same answer but when I saw the Earth out of a porthole for the first time, I couldn't help shouting like Columbus did when he spotted the new continent "look look the Earth is really round!". Very funny was it but today I still really remember the scene when I first saw it. During our breaks the three of us would always love to look out at the Earth by the porthole. I saw the fringes of its arc, the oceans in different shapes in blue, I saw the clear contours of land, the long coastlines. I saw the

brownish land, vast oases and the rivers, small rivers. This is our Earth, planet Earth, mother Earth, that has fostered the human race from generation to generation and to love, cherish and protect it by each one of us. Unfortunately, however, I also saw large tracks of yellowish desert. Happy times always go by quickly.

During the 13 days we gained new technologies with perfectly realised with accurate data the manual rendez vous and docking of Tango-1 and Szenzhou-9, the first step of manual rendezvous and docking in China. We accumulated a new experience experimental data and results. I hope that they can help us further understand the universe and explore the universe and benefit the world and our life on Earth. And also I am very much looking forward to my next flight. Chinese taikonauts all wish to communicate and cooperate with astronauts from other countries and contribute jointly to peaceful utilisation of outer space for the benefit of humanity. I thank you once to Ms. Tereshkova for your contribution to the exploration of the universe by women. Thank you to all the friends who have contributed to space exploration. Thank you Dr. Othman for the invitation and thank you for your attention. Thank you.

**Ms. M. Othman** (Director) Thank you Liu Yang. I would like to proceed by first asking a special question to Ms. Tereshkova and then I'll throw a few questions to our panels, hopefully they will answer them very quickly so that you can then ask your questions. So, Vasilis, do you mind if we just wait for me to open the floor to all of you after we have had them answer a few questions?

Ms. Tereshkova, birds can't fly with one wing, I like that, and you say that Mars will be very upset if we sent an all man team to the planet. So I think we should all take heart and remember that. Ms. Tereshkova, you've been referred to as a superstar, a legend, a cult figure but the one I find most intriguing is the BBC says she is the Greta Garbo of space [applause] and lately we have heard that you are prepared to go to Mars on a one-way trip! So, you are indeed this fearless icon that we know and love. So let me ask you one question. How does the presence of women in space add value to the role of women in general?

**Ms. V. Tereshkova** (Russia) Thank you for the question and for the comparison. As regards a mission to Mars, a one-way flight to Mars, I think that was a bit of an exaggeration from my part. All of us understand that a mission to Mars would require new technology, new spacecraft, new power units and new level of reliability. I've already mentioned the fact that space industry, space science employs a great many women. Wonderful experts. And I'm sure even though to quote the Russian poet Krasnov, I will not be fortunate

enough to live at that beautiful time but I'm sure the time will come, maybe in 20, 30 years, but still in this century the 21st century, there will be a human mission to Mars. Maybe robots, automatics might choose the right landing area but returning to Earth would be probably be the hardest part. Those windows of opportunity, when Earth and Mars are in the right position relative to each other are very short. Maybe the first such, the first missions we undertook, the road we paved to outer space would be helpful to those who will get to land on the moon and other planets. Our experience might be helpful. But me too, personally, I would very much want to be one of those who will fly to Mars. What's wrong with dreaming actually.

**Ms. M. Othman** (Director) Indeed, there is really nothing wrong with dreaming. I'd like to ask our panellists a short question. And we hope you give short answers so that we give the chance to our animated audience here to ask you questions. I'd like to ask what is the greatest contribution of your particular field to space activities. Can we start with you Roberta?

**Ms. R. Bondar** (Canada) I'm going to speak, you know, Dr. Mukai's talk, but just a little thing about life science. I'm a firm believer that space is such a gift for those of us who are doctors. To understand the things about the human body that are masked by gravity down here on Earth. The theories that we think we really can explain in certain aspects of fluid in the lungs, for example or distribution of blood in the body and then you take somebody into space and you find that there is some other mechanism at play and so it teaches us that although our theories are good down here, there's much more to be learned in space. And space is really the opportunity for that shepherd to look into the night sky and learn from space flight.

**Ms. M. Othman** (Director) Thank you Roberta, Chiaki, would like to add onto that?

**Ms. C. Mukai** (Japan) I think that the greatest achievement from the space medicine is that it have enabled human space exploration. If we think about the 50 years ago, the staying in space is just only a few hours and then it is extended from few hours to many days and weeks to months. And now, International Space Station, six months stay is routine. Everybody who flies to International Space Station stays around 6 months safely. And then the Dr. Polyakov in Russia stayed more than one year and then if now our new challenge is to extend 6 months stay routine to one year and then if we send the human beings to Mars more like 2 years or 3 years so that is a great achievement from the space medicine. And space life science as Roberta mentioned, role of gravity has been kind of discovered, threshold of the gravity, sensing the mechanisms, G expressions, some genes which we are

not using on the ground are switching on in space so the scientist approach this to understand what kind of gene is switching on or off by gravity. This is great. So that is a great achievement, I think on my field.

**Ms. M. Othman** (Director) Thank you Chiaki. And this pivotal role of technologies, so what is the greatest contribution to space activities, it's a no brainer, but please tell us, Amalia.

**Ms. A. E. Finzi** (Italy) I don't want to talk about the particular technology improvement. For a great benefit for humanity, but the methodology that is much more general. The methodology is to go to space, we need small volume, small mass, small price, if possible, small use of energy and that is the master for us. Otherwise we can't go to space and now we onboard some things that are so incredible, for me, there is a space mission Prisma, for mission flying around the world techniques. That embark an engine that is fifty millimetres by 40 millimetres, that is like that, this dimension. And it work very well. So, miniaturization is absolutely important and we thought to humanity because now on the Earth, we try to do things as small as possible. Like for instance, mobile phones. Remember the first mobile phone in 1973 was one kilo and cost 4,000 dollars at the time. That means 8,000 dollars. Now, mobile phones are less than 200 grams and cost very few. So, small is important in my opinion, small is beautiful and that's important for people small like me.

**Ms. M. Othman** (Director) Thank you Amalia. And Abimbola, how do you think, what is the greatest contribution of space applications itself to host this enterprise?

**Ms. A. H. Alela** (Nigeria) Communication satellite applications have really benefitted the entire world and especially Africa because in Africa now, people in remote areas can communicate where fibre can't go and even the operators would not go, in the villages. Satellite, V-sat applications has been able to provide communication to people in society. So I feel that for space and Africa communication satellite is growing so much and of course in most sensor satellites and navigation satellites, we done a lot for disaster application and space based weather prediction and all of that. I think satellites in general. Yes, exploration is good, we are benefitting, but I think the satellite applications have done very very well for us.

**Ms. M. Othman** (Director) Thank you Ambibola. Now my next round of questions will be to ask our, the rest of the panellists, how will the particular sector drive future developments on space? And I would like to hear from Julie!

**Ms. J. A. Sattler** (USA) It is the journey of innovation and it's for industry customers who come to us with their most challenging needs. It is either increasing band width that their looking for communications or sensors or phenomenology. And from very challenging missions. It used to be the Moon, then Mars and now we're humans to Mars and asteroids and inter-planetary. So the private sector and its continue investment in working with the users of space and in this journey as stated before, small is good, we have been able to miniaturize electronics. Taking 60 pound boxes that used to fly and putting them on the size of a euro coin, putting them in those terms. We have been able to do a lot from digital to analogue, from materials to processes, to manufacture and in produceability that transfers into other industries. So, how are we going to service the users of space, the journey of innovation.

**Ms. M. Othman** (Director) I'd like to post that question in the field of space law to Maureen.

**Ms. M. Williams** (Argentina) Thank you Mazlan, in fact, as you were asking, I was scribbling a few thoughts. In the field of space law, our greatest contribution is that what you are asking. Well, education at all levels, capacity-building within the international law association, our committee is very good, very attractive cross section of specialist coming from different parts of the world and representing different legal systems. Also, I consider the addressing of the issues from, very strong inter-disciplinary approach.

We, the lawyers, need the precise information from the scientists, so that we can then design realistic proposals, otherwise we would be speaking different languages and that would be just like a jump into a void. This we have started and have been doing all the time and I think we manage to bridge that gap, that before existed between law and science. Also, another contribution within the international law association where the national projects of other countries are incorporated is the use of space technology to detect the alterations in the ozone layer at different times of the year and different parts of the stratosphere. We get a precise information in docs and units of how the ozone layer and the stratosphere has been affected. And that is very helpful because we are able to measure the problem and when you measure a problem then this certainly eases the way to solutions. Thank you.

**Ms. M. Othman** (Director) Thank you Maureen. And Liu Yang, how will human space exploration drive future developments in space?

**Ms. L. Yang** (China) Today, one thing I'd like to share with you is the country which I live in, the environment which I work for, I would like to talk about our contributions to the exploration of space. In order to promote the future development of human space missions, China will continue with the Space Station. We will launch the Tango-2 space lab module. We are going to have more applications by 2020, we will be building up the long-term international space stations in orbit. My department is a training centre for astronauts, taikonauts. Basic task is to select and train the would-be astronauts as well as the live security system. We do all kinds of experiments. We select astronauts, the drivers, the engineers as well as pilot specialists. All kinds of astronauts and taikonauts. So as to provide qualified crews for the missions. We also provide guarantee for the training of astronauts for example, medical as well as protection, food, catering as well as the space suits, as well as a whole set of simulation equipment and facilities. Of course, we will play a great role of the space station will provide us as open experimental environment; let us make contributions to the common involvements in space for all of mankind. Thank you.

**Ms. M. Othman** (Director) Thank Liu Yang. So, it's your turn. I'd like to invite all of you now to ask questions to our eminent panellists any question you like. Now if you put your thing up, I will call you. The distinguished delegate from Greece. Please Mr. Cassapoglou.

**Mr. V. Cassapoglou** (Greece) Thank you very much. It is difficult to me from the sentimental point of view to address these fabulous women. First of all, Madame Tereshkova, I admire her for almost, I will that almost half a century. However, I have in her introduction, I automatically, because of this lack of female presence in space activities and in space flight. I just make my new addition of my book on the national law of space activities, very brief statistic, in about grossa moda, 600 human space flights, only 54, as of yesterday, now 55, with the new Chinese lady, that is less than 10 per cent, but when I heard to Madame Tereshkova, and I don't remember who spoke about like, I admire her from that time. The first female evaluation and the criteria, the biologists in Moscow, they used in order to select like and with your kind permission, allow me to say, Madame Tereshkova, that when they select you, you were not a professional aviator, not a military, you are a great worker! A common, excellent female that all the women of the world and that is the most fantastic in your contribution to the humanity. I have to say that many times, I compare the heroic beginning by Yuri Gagarin. Heroic flights, which is beyond the human, the common human possibility is how we say in ancient Greek [...].

I say that you put like Icarus, the humanity outside the labyrinth because his father, Daedalus, created this palace prison, the labyrinth.

But today, you gave me the opportunity to say maybe Icarus with his father escape from labyrinth in flying with the way we knew but with selves, to leave and to exit from labyrinth was a woman, Arianne, who gave him the thing to go out. So, we are, there is the last thing I want to highlight and emphasize, if you allow me. Women are more qualified by nature to make economy in everything in the ancient Greek sense. That means manage the house affairs. So, and I am also grateful to my Italian, I think, my Italian neighbour when he spoke about minimizing economy. So, it is up to you to make this economy, economies and also help humanity to be united.

And on this opportunity I have the honour and the pleasure on behalf the director of the University of Paphos in Cyprus. Paphos has, you know very well, is the place of the hypothesis of the women beauty, Aphrodite. He, through me, ask you to visit you and the youngest, the Chinese lady, to come to Paphos as soon as possible and the University will honour you for your efforts for humanity. Thank you very much, believe me all I have said is not political it is just the *de profundis animo*. Thank you very much.

**Ms. V. Tereshkova** (Russia) I wanted to thank you, Sir for your kind words. I'm happy to have been among those who cut the path through the stars. It wasn't easy, it wasn't a hard happiness but it was our contribution for the future and hopefully it will help those who will come after us. Thank you.

**Ms. M. Othman** (Director) Are there any other questions? Distinguished delegates from Austria. Imgard, please.

**Ms. I. Marboe** (Austria) Thank you very much. I'm really grateful for this remarkable event and specifically I would like to thank Mazlan Othman, I know that you are the initiator, the driving force behind this remarkable event and you yourself are really a model for us here to be active, I myself I'm active in legal issues and space law, but I would like to take up one question, you put yourself on the panel, perhaps we can have some more answers of the panellists, namely, how or to what extent do women in space effect or have an effect on societies on Earth? Do they have any or are they just the exception to the rule? Are they perhaps only symbolic? Exceptional figures or figureheads? I would like, perhaps, one or two answers from your panellists.

**Ms. M. Othman** (Director) Yes, maybe Roberta would like to take that on?

**Ms. R. Bondar** (Canada) Sure, very good question. There are many answers to that I could maybe provide. Just a couple of quick ones. The symbolic nature of anyone in an unusual environment such as space flight, is rewarding for all of mankind, humankind because it means that we were able to do things in a different way, to take humanity to a different level. One of the things that I have found in many of my colleagues who have been years separated from their mission, or even if they are fresh down from the mission, is the whole participation in education and I think that if you look at the percentage of women versus men who are moving from the astronaut programme, I think you will find a large number of women who are very very interested in the educational component. I know Dr. Ride had a big science programme. I had my own foundation, it was environment science. I know Dr. Mukai and I'm sure Taikonaut Yang will do the same and I know Dr. Cavanaugh, who is here for the United States, who has flown three times who sitting over there, all are very keen on having an education, and I think that nurturing part, that has traditionally been in the women's domain now finding that men also are trying to emulate, so it almost the other way. They are trying to learn from us and our skill sets. So, there are different types of symbolism here that you mention but I think that would be my short answer.

**Ms. M. Othman** (Director) Thank you Roberta, Chiaki, your thoughts.

**Ms. C. Mukai** (Japan) I think that fifty per cent of the human population is men and fifty per cent is women, so I think that ideally I really want to have 50/50, like for example, here, COPUOS members, I can see a lot of women delegations and if we think about the 50 years ago I don't know how much percentage of the women are dedicated from the countries. So, I think the progress of the society is the one that the men and women as human beings work together. That is very very natural and if it is natural, the programme will continue and if it is not natural, I don't think it won't continue. So that's why I would like to have more women to get into this programme. That's what I think.

**Ms. M. Othman** (Director) Thank you Chiaki. Ms. Tereshkova, would you like to address that? No, ok, Maureen, you want to...

**Ms. M. Williams** (Argentina) Yes, just to say that international cooperation is at the very root of your question Ingmar, so, if international cooperation is duly observed, the personality of that woman in space will be enhanced. That's all. Thank you.

**Ms. M. Othman** (Director) Distinguished delegate from Saudi Arabia.

**Mr. Tarabzouni** (Saudi Arabia) Thank you very much for this presentation and I think that it is really a great thing but I will say a story. In 1965, we had an exhibition in our high school and I had 50 stamps from Hungary, from Ukraine, from the Soviet Union and all of it is for the astronauts Gagarin and Valentina and I was explaining to the King of Saudi Arabia what are these and what is given and what have. Therefore, the King of Saudi Arabia gave me a scholarship to go to the United States to study mathematics and physics and finally I end up with an aerospace engineering for my master's degree and PhD and thank you for your flight and it is really a great thing what it is.

**Ms. M. Othman** (Director) Shoukran, she says. Any other questions. Yes, the distinguished delegate from Belgium.

**Mr. Mayence** (Belgium) Thank you. It's not much a question but I was thinking about different paradoxes thanks to Ms. Tereshkova, we are celebrating such an important date today but thanks to her and all the other women here, I hope that my daughter or her daughter will find that we do not need to celebrate the first women in space. I think, and if that does happen, will be thanks to all of you as pioneers. I think that it will be a reality for all of us in our future, I hope.

**Ms. M. Othman** (Director) The distinguished delegate from Mexico, please.

**Mr. S. Camacho** (Mexico) Thank you very much. I would like to first of all thank the panellists for very stimulating interventions that they made on behalf of science and technology and in particular on including women in space activities as sophisticated as being in space but also in applications here on Earth. More than a question, well I actually do have a question but I think it is for the secretariat or for the director, Mazlan, and I noticed that this being taped. Will the video of the panel be available so that this could be downloaded and shown to schools, to motivate, in particular, I think this will motivate also young boys but it would motivate, for sure, young girls. I don't know if it will be possible to download, it was taped, or maybe we could request a tape, buy a tape. I don't know.

**Ms. M. Othman** (Director) Thank you Sergio for that question. I know we were trying to organize a webcam, a live webcast, I don't know whether that has happened. But secretariat over there, can anybody answer that? No. They must be listening upstairs but Sergio, I will find out. We have done this before and I'm sure it can be done if not there are cameras there

that have been videotaping this whole, the whole proceedings. Did you want to say something else, Sergio?

**Mr. Camacho** (Mexico) Thank you. Only my heartfelt congratulations to everyone on the podium.

**Ms. M. Othman** (Director) Anybody else with a question? Yes, the distinguished delegate from Poland.

**Mr. P. Wolanski** (Poland) I have a very simple question. You know, I heard many times that the ability of women in space are comparable to men in space. But we have only about 10 per cent of the women astronauts or cosmonauts, how you think when this number will change in the future and probably, maybe the reverse trends than is now?

**Ms. M. Othman** (Director) We'll pose this question to Ms. Tereshkova. She's already having an answer.

**Ms. V. Tereshkova** (Russia) I think that depends on the men completely, on you guys. We're ready, we are prepared.

**Ms. M. Othman** (Director) See, we're ready, we are prepared. What the distinguished delegate of Nigeria thinks.

**Mr. C. Brisibe** (Nigeria) Thank you very much Chair, Dr. Othman, for giving me the floor. We would very simply like to take the opportunity to express our deep appreciation for the excellent range of presentations that have been delivered today based on the panel that you have put together. Recall your initiative when this idea was first mooted and I would like to see that all the steps have been taken in the intervening period to present really what has been a spectacular and suddenly historical event in the history of the committee of the mankind as a whole. Thank you and congratulations.

**Ms. M. Othman** (Director) Thank you. Any other questions? I can't see where you are from.

**Ms. S. Marin** (Romania) I apologize, I'm not really sitting behind the flag. I am from the permanent mission of Romania. So I am a diplomat not working in space field as you all here, are from the panel, working. I just had a feeling to really take this opportunity and to thank you all, especially the women who are there in space. And just to express the kind of feeling which, is different perhaps, from diplomatic perspective, and to thank all the ladies to make real the dreams. Perhaps a lot of women who might never be, or never been selected or will never be selected, to go up there but through you perhaps, the dream came true. And really take this unique opportunity to ask you a little more about feelings for women up there when

you are in space. I'm thinking, it is really interesting to find more about medical, from the medical perspective how the body, or how the feelings are changing there. How are you feeling up there if, I don't know if you had children at the time you were there, thinking back to your family or, I don't know, special feelings of special women feelings when you were up there in space. I mean, I think it is for me a unique opportunity to ask you these directly and not really read articles or hear news but really ask you directly. And yes, thank you, thank you all and I think that this discussion really enriched us a lot and will stay in our mind from now on. Thank you so much.

**Ms. M. Othman** (Director) Special women feelings in space. I think I know what those are but let us therefore ask the astronauts here on the panel. Maybe we can ask the floor as well, I would like to start with you Ms. Tereshkova.

**Ms. V. Tereshkova** (Russia) I was 26 when I flew into space. I wasn't married, I did get married after the flight, I had a daughter. My daughter's a physician and doctor and I have two wonderful grandchildren. One is going to 18, he's just about to finish high school and enrolled in Moscow University and the youngest is going to 9, he's started third grade. I am happy to have my daughter. My mother was very ill for a long time and that may have motivated my daughter to choose her profession to become a doctor. The most moving thing, may be, one feels once one is in orbit, is the beauty of our planet. Whichever part of it you are flying over, it is amazingly beautiful. And you just feel this admiration, every continent, every ocean all of it is beautiful and has its own special colouring. I was really I wasn't an artist, a painter to convey all of this beauty to people. And when I got back, the first thing I wanted to share this impression. Thank you.

**Ms. M. Othman** (Director) Liu, would you like to answer that?

**Ms. L. Yang** (China) I would be very pleased to answer this question. In the report, just now, I talked about my feeling in space. I felt very unique when I first entered space. Everyone knows about China's Kung Fu films, when you enter into space, you feel you are a master of Kung Fu, you can fly in short film. You feel you are a swimming fish. There's no gravity from Earth. You can do anything. This feeling is very unique and very wonderful. With the progress of technology everyone can become a taikonaut or astronaut to enter into space, to get this feeling in space. You can have a lot of feelings. Not only missing your family, your parents, your friends, when you are away, very far away from the Earth, you feel the Earth is so close to

you, you miss our Earth even more. We miss this planet even more.

**Ms. M. Othman** (Director) Chiaki?

**Ms. C. Mukai** (Japan) It is very difficult question about the special women feeling, because I have never been a man, I cannot compare what's the special feeling that women have. For example, if you just ride on an airplane how do you as men, how do you feel as women. As a special fee lining when you just ride on an airplane. It is very difficult but instead of stating the answer to this difficult question, there is evidence that more women or more female mice or something like that getting into space, from the view point of research. Like for example, 2010, April STS-131 space shuttle mission the 7 crew member, 3 out of 7 crew member were women. And International Space Station, the one woman is waiting for 3 women to join so the 4 making, making 4 women out of 13 crew members. It's more than 10 per cent so it happened.

Also, in research field, we called wise programme, it is a European study, women exclusive only study which means so far, this kind of research is solely done by men but now we expect more women, flying into space so we need to research on the women's body. So that's why we have women only study ongoing. Also, NASA is now plans to fly mice in space to understand the gene expression in microgravity and interestingly enough if you use a certain amount of cage which is a single cage. We bring only 10 male mice because they actually fight together if they put more. But if we just put female mice in the same cage, we can bring 20. Twice, women are more harmonious, so that they can work together in small cage. So, NASA decided to send female mice rather than male so that is the trend.

**Ms. M. Othman** (Director) And I'll say I rest my case. That is wonderful news. Roberta, please.

**Ms. R. Bondar** (Canada) Yes, I just have two quick things. One is that I use this example all the time to encourage more women to become engineers, especially those interested in space travel, and that is, and I don't think it has changed much, the bathroom poses a huge challenge. There is a difference between men and women, as they've always said, men are made for picnics. There's a difficulty in performing a perfect seal around certain places in the body that are required if you don't want yellow Jell-O floating around. So female engineers would be very good, but just to answer question, as a physician and a science fiction buff, when I was certainly younger, I had an experiment I wanted to do in space. And I think it was because I was thinking a lot about my mother. And about the fact that I wanted to be a spaceman from the

time I was a little girl. And being encouraged by my parents back in the 1950s when this kind of thing wasn't done and wasn't thought of and that was the Arthur C. Clarke movie *2001*, there was a scene, there was a fetus floating around right towards the end of the movie. So this one time, when I had about extra 2 minutes on my hand from not working, I went into the waste collection unit system, which had the nice little curtains come down on the top, no one could see me and I had all my clothes off and I tucked myself into a little fetal position and I floated right near the window that looked out onto our planet Earth and that was the closest I could get to my mother again. No clapping?

**Ms. M. Othman** (Director) Thank you Roberta for sharing that very personal experience. Is there another question, because I would like to wrap up by asking one question too. All the panellists, well, please, if there are any urgent questions. Ok. So let me ask the last question to all the panellists. Oh, yes, please, the distinguished delegate from Romania.

**Mr. D. D. Prunariu** (Romania) Yes, Mazlan. This time not a delegate of Romania but as the representative of the Association of Space Explorers. So we had today wonderful persons, wonderful minds, wonderful women speaking about space. The Association of Space Explorers numbers now about 370 members, all astronauts and cosmonauts from 35 countries. All of these women, but only one and Liu Yang, I expect you to apply for the Association of Space Explorers. Are members of this Association and our main goal, it's not only to provide professional forum for us but also to educate the young generation and all this wonderful astronauts and cosmonauts that are with us now, there very inspirational persons for all of us. For all the young generations. And also for the young girls because as you said, there are only 10 per cent women astronauts. We need more and of course, we send them more together into space as Chiaki Mukai noted that they could deal much better than men up there if there are many. Thank you very much to all of us and I expect you tomorrow evening at the public event.

**Ms. M. Othman** (Director) Thank you Dorian. So, last question to all my panellists here, what future development in your own sector, we have all the different sectors here, and this is the UN after all, will in your view, have the greatest impact on humanity. I'd like to start with Ms. Tereshkova.

**Ms. V. Tereshkova** (Russia) I'm sure that humankind must keep flying into space, exploring outer space. We must find out what is in store for us out there. For us earthlings and for that we must explore Mars and Venus and of course, like any

women, Venus is maybe too hot to handle, but Mars is definitely on the agenda. The Moon and Mars. I'm sure humankind will not stay in its cradle. As the Russian scientist Tsiolkovsky referred to Earth. We will penetrate the upper atmosphere and then beyond and space exploration will bring tons of bread and tons of power to all of us.

**Ms. M. Othman** (Director) Liu Yang, could you answer that please? Thank you.

**Ms. L. Yang** (China) With great pleasure. What I would like to say is that in my sector, the most unique thing is the space science, combined with Chinese medicine. The traditional Chinese medicine is very important. In spaceflight, there will be a negative impact for human bodies. To keep astronauts safe and healthy in space is always, has always been the research project for all the space faring nations. China has used traditional Chinese medicine into research for our house for astronauts. And the Chinese medicine has special features to help astronauts. It can help digestive systems, for brains and we have first introduced the human body studies and we also test the muscle reductions studies and do a lot of medical research which will help to solve many issues for space health and we hope all these research results will be a use on land for our human beings.

**Ms. M. Othman** (Director) How about the business sector?

**Ms. J. A. Sattler** (USA) When it comes to the business sector, if you look at communications satellites, navigation sensors and all the rest that will be there and then will be around. Matter of fact, a lot of us have been very numbed and used to them being around. I mean, when you ask people about GPS system, they usually point their cell phone or something and they don't say there are 24 satellites around the world making this Geo location Positioning for us. So from a humanitarian stand point and our greatest contributions come through the humans space exploration and the inter planetary aspects. It's the high visibility. the technology challenge that human spaceflight possesses and poises. It fosters collaboration and sharing internationally, the technology, the resources and it challenges innovation because of the environments that must be endured by human space flight and inter planetary. So, going forward with the human spaceflight interplanetary will give us great contributions.

**Ms. M. Othman** (Director) Thank you Julie. Abimbola, your thought on this?

**Ms. A. H. Alela** (Nigeria) I agree with the speaker from the US, yes, space will always be here. The application satellite to compete with some fibre in

terms of cost and volume of gigabyte available to give enough broadband, yes, advances in that area it is very good but of course more science, more research would continue to improve what goes on and what is available in communications satellite. So, more research through exploration is very very welcome.

**Ms. M. Othman** (Director) And related to that technology, Amalia.

**Ms. A. E. Finzi** (Italy) I beg your pardon but I am a technologist so I look also for technological solution. And in my opinion, not to have, will be, a strong impact on humanity, will be a different way, a different way to travel in space. Now, we are always looking for faster and faster travelling way. For instance, in China we have the harmony train, that reached 581 kilometres per hour. It is a lot. Or but a train in Japan it is not exact, but it is very very fast. How can we change the way to travel in space? By space planning, spaceship and not, one that will reach suborbital elements. Not to get in orbit but to travel from place to another place with a suborbital orbit. Now we have some solution of it, for instance some weeks ago Virgin Galactic made a test of space ship 2, space ship 1 it is done. Space ship 2 in this case the spaceship is on board makes the first part of this travel on a Mother ship, that put on altitude and from that it is propelled until 70 kilometres or 90 kilometres.

Anyway, from that they have a fall free phase and then we arrive on the Earth. The problem is that the advantage is that one, that can start, can use a convention airport so you can start when you like, not exactly but, when you like, and come back. For a travel long when you decide what you decide. In my opinion, there are many advantages for that. The first one is the cost. The cost is a lot less than a cost of for an orbit. The flexibility, you can decide what to do. The private investment for entrance galactic had the other private society not political and institution that are elephantiacs. No. You can organize right on demand. That means you have an experiment that is ready to fly, you can decide to fly in a very short time and you can guarantee a rapid turnaround. So advantages are very very, are many but there also two, other two. One is tourism. Space tourism, you can put people not in orbit but into the position to see the Earth and not to go to Space Station but for very few time you can see the Earth and its curvature. But also you can experiment weightlessness and that is a very particular sensation. And you can save time. You can travel from Australia to Europe in 90 minutes. You can travel from Europe to United States, New York in 60 minutes, from Europe to United States. It is important to shorten this way, time. But I ensure that at that time you spend a lot of time in the airport to wait the flight has to fly.

**Ms. M. Othman** (Director) Wow, thank you Amalia. And the space law impact? Maureen?

**Ms. M. Williams** (Argentina) Space law has a common denominator I would mention in capacity-building and creating awareness on the many possibilities that are offered to the legal sector. We are currently working on the use of space technologies for remote presence and that is a very new topic for us. And we expect report to the Legal Subcommittee next year on this because opens many way and it creates, raises many problems from the legal standpoint. Especially criminal, international criminal law and offences of all hierarchies. Also, we are worried about security in space. And to quote Geneva the space debris, the danger of an arms race in space and also the near Earth objects which are natural objects and the possibility of an impact on the planet Earth. The risk is not great but still it is spoken of and there are many problems we should start to solve or make suggestions because it also gets very political who should do something about that threat in outer space? Those who have the technology? And who will decide when to deflect that natural object or destroy it? And what about damage to be caused in the course of these measures put into practice? So the terms of reference in the International Law Association coincide with what Amalia was saying, definitely suborbital flights are important.

We also will keep a watch on the way the PCA rules on dispute settlement fair during the forthcoming month. We shall continue to see to what extent satellite data and international litigation is used and what are we going to do in the face of claims for manipulation. Are we going to have archives to collect the data as soon as collected as raw data and then keep a watching eye during the different stages of interpretation until that evidence to be submitted to court is an end product. There are many suggestions, there is slight climate of suspicion. The judges don't like to be told by the experts who interpret the satellite data because they no longer are deciding by themselves but on the grounds that of what the experts are telling them. And also we continue with the question of space debris. The ILA had prepared an international instrument and has been circulated, presented at the Legal Subcommittee and well, these are the main topics that I feel are necessary to face. With of course disaster response in all the fields, in all possible fields. Thank you.

**Ms. M. Othman** (Director) Ms. Tereshkova says there are also issues of safety.

**Ms. C. Mukai** (Japan) Space medicine's dedication is two things, the two directions. The first for the space exploration, for both professional astronauts, for further, the Mars or Moon etc. And also

the exploration for the tourist, to the lowest orbit in the future. And also the other direction is the helping people living on the Earth, because space medicine is preventive medicine so we can utilise this idea for public health and education. So the combination of space medicine as the preventive medicine and for example satellite technology, for example, communications technology and also Earth observation, we can utilise space technology for disaster monitoring intervention and prediction of the Earth. And also intervene the people living on the area. So, as a result, more people enjoy the benefits from the space technology that's how I think we can give the space benefit for more people to enjoy, which means more humanity use for the space.

**Ms. M. Othman** (Director) Wonderful words Chiaki and Roberta. From the context of science.

**Ms. R. Bondar** (Canada) From the context of science, I think it's the doubly energy and environment. I do believe very strongly that things that we do because we have a desire to go into space. The actual development of technology to do that is something that we need here on Earth and I think energy was mentioned earlier, it's going to be one of the big things. Secondly is we have to deal with environment issues and as much as we do remote sensing, to look at how to manage things and how to actually remotely look at space debris as well. We really need to come to some kind of, we got to get past the impasse of dealing with the environment on the Earth and around the Earth. So I think those are going to be two areas that science is going to really have a huge impact on humanity; energy and environment.

**Ms. M. Othman** (Director) Distinguished delegates, ladies and gentlemen, it has been, for me, the greatest pleasure, the highest privilege and a singular honour to have moderated this panel. Of really eminent women. Would you please join me in giving them a big applause [applause].

So there we have it, a panel of women addressing space, building the future, today. It is also my task to tell you that we should all know go to the Rotunda for the opening of the exhibition of the 50 years of women in space. And also remember we have the reception hosted by Japan and Russia after that. So please, distinguished delegates, ladies and gentlemen, let us proceed. Thank you very much.

*The meeting was adjourned at 18:00*