

JEAN-YVES LE GALL

President of the Centre National d'Études Spatiales (CNES), President of the International Astronautical Federation (IAF), Chair of the Council of the European Space Agency (ESA)

Jim HOAGLAND

I wanted to ask you to begin, since you were here last year, you were at IFRI's World Policy Conference last year, take us through the past year in terms of cooperation and competition in the space area, by the international community. In which direction are we moving? Can you also then go back a decade and tell us what have been the major changes in space?

Jean-Yves LE GALL

In fact, since last year, we have had a number of changes because of what is made in the US. In space you have six large space powers: the US; China; Europe; Japan; Russia; and India, but the US is definitely the biggest space power. Last year a new administrator was appointed at NASA, Jim Bridenstine and the Trump administration tried to change a number of points in the US space policy. I would like to emphasize two points, which are in my opinion quite important. The first one was a new interest in going to the Moon, but to go to the Moon not to come back to the Moon, because you have probably seen many movies on the Moon, with the Moon landing 50 years ago, the last one being First Man, which is a very good movie. The idea is to come back to the Moon but with private initiatives and this is why NASA is now contemplating a so-called Deep Space Gateway, with private companies that could be interested in going to the Moon.

This is the first point, the Moon. The second point is you know that in the US today there are five forces in the army, the US Air Force, the US Navy, the US Army, the Coast Guards and the Marines. President Trump wants to add a sixth one and it is a view, because in fact the US are very active in the field of defence assistance, which is developed for space. We have a budget for NASA which is USD 20 billion, a budget for the DoD which is roughly the same, but there is obviously a political will from President Trump to create a sixth force and we will see if he does it. These two important factors are shaping the new landscape of space policy worldwide.

Jim HOAGLAND

Do they affect the ability to cooperate by the international community?

Jean-Yves LE GALL

For the Moon it is clear that we will probably have the follow-up of the International Space Station, but on it today we have the US, Russia, Europe, Japan and Canada and two space powers are not in the Station, India and China. The big question mark is: are we going to see China and India being a part of the back to the Moon? It is an open question. There are pros and cons. It is clear that it is a project that will be very, very expensive. China this year will probably be the space power with the biggest number of launches, with more than 30 and so there is a question mark. At the same time, you know better than me, the relationship between the US and China, which is not so easy. This is an open question for international cooperation and it is clear that if we now have a sixth force for defence, it will also open up a number of new issues and probably reinforce the will of other space powers to also have a military space programme.

Jim HOAGLAND

Tell us a little bit about Russia's space programme these days. How important is it?

**Jean-Yves LE GALL**

The Russian space programme is quite important. They have a fantastic heritage, but as a matter of fact they are suffering technical difficulties. You probably saw what happened two weeks ago when a Russian and a US astronaut tried to go to the Space Station and after 90 seconds into the flight, they were obliged to jettison the Soyuz capsule and to come back with a parachute, because there was a malfunction in the Soyuz launch vehicle.

Jim HOAGLAND

Could you talk now a little bit about this incredible amount of data that is assembled by the space satellite system. Who owns this data? What happens to it and how important is it to the world economy today?

Jean-Yves LE GALL

In fact, the question of data is absolutely crucial, because we have more and more satellites sending more and more data. They transmit data for telecommunications, but this point is not really an issue. The issue is what to do with the data related to Earth observation and in particular, data related to observing climate change? There are two options on the table. There are some countries that say this data must be proprietary and stay in the country which owns the satellite. Some other countries, and this is the case of France and Europe have an open-data policy. Personally, I think it is the right option, because with all these satellites we have today two points that are at stake. The first one is to have a kind of standardisation of data, because when you observe the Earth, if you do not observe exactly the same data you will have a dispute between China and the US, when the US will say to China that they pollute a lot and have a lot of greenhouse gas effects and China will not accept that. We need to standardise the data, and this is what we are doing now. After that, this data must be in open policy and in my opinion, it is quite important because it is a very strong political effect and it also creates a number of start-ups that will use this data, which will develop new models. I am sure that the future of space will probably rely on an open-data policy.

Jim HOAGLAND

When you say we are moving to standardise data right now, explain to us what that means. What is standardising?

Jean-Yves LE GALL

For instance, if you observe the concentrations of carbon dioxide in the atmosphere, there are many possibilities for observing these concentrations from space. You could measure the height of a kind of virtual column with carbon dioxide, you can describe the clouds, etc., but if you do not observe exactly the same data, you will have a lot of debates between scientists. This is why we are now preparing, and I hope we will be able to sign this charter during the next One Planet Summit, organised by President Macron, the first one took place in December 2017 in Paris. The second one last September in New York City and the next one is planned for Nairobi next March. I hope that in Nairobi, we will be able to sign a charter defining exactly which data should be observed in order to have this open-data policy.

Jim HOAGLAND

Can you explain a bit more about this forum where this will be discussed? Does it have any private sector companies that are members, or have a way to put input into it?

Jean-Yves LE GALL

Yes, of course. We have a system with satellites that are owned by the governments, but after that the use is made by private companies and they use this data, which is free and create value. In fact, we have to consider this data as a kind of infrastructure, which is provided by the government.

Jim HOAGLAND

Since we are sitting here on the shoulder of Africa, tell us a bit about Africa's role in space.

Jean-Yves LE GALL

Africa is now opening a space chapter. Up to 10 years ago, there was a very small number of space powers, for the simple reason that owning a satellite was immediate several hundreds of millions of dollars. Now, because of digitalisation and militarisation, the cost of the satellites is decreasing very strongly, and you have more and more countries that have a space programme. 10 years ago, we had six big space agencies today we have 60, 10 times more. Africa was out of space until a few years ago and now you have a space programme in Algeria, Kenya, Egypt and probably the most important is the one here in Morocco, because Morocco decided to buy two very smart Earth observation satellites to help manage the development of Morocco. We launched the first one last year from French Guiana, the so-called Mohammed VI A and the next one, Mohammed VI B, will be launched on 20 November from French Guiana as well. They are very, very smart satellites that are manufactured in France and this is what we used to call the African chapter, because now Africa is using more and more data for its development.

Jim HOAGLAND

In announcing this Space Command, the United States emphasised, or Vice President Pence certainly emphasised his desire to maintain the superiority in the military realm in space, that the United States has today, he says, on Earth. Is that a realistic objective? Is it an objective that we should wish happens?

Jean-Yves LE GALL

I think it is a realistic objective. I am not sure that it will be what is described today. We had this situation 30 years ago when President Regan decided to develop Star Wars and there were a number of projects, which finally did not exist, but the consequence was that the Federal budget injected a lot of money into the US space industry and strengthened it considerably. At the end of the day, nobody knows what the consequences will be of the decision of President Trump, but everybody knows that it will reinforce considerably the US space industry.

Jim HOAGLAND

For my last question, before I throw you to the audience and appeal to their mercy, talk a bit about commercial travel in space. How is Elon Musk doing? How is Jeff Bezos doing? What are the patterns developing in commercial space travel?

Jean-Yves LE GALL

To be very honest, I have a lot of doubts for the next 10 or 20 years, about space travel. Not all of us here can be astronauts. When you go into space, after eight minutes of very strong gravity, you are in zero gravity and most people are immediately sick and it is very, very difficult. There are some projects, for instance, from Elon Musk with the big Falcon rocket, when they say that they could go from Paris to New York in 30 minutes. Okay, it can be done, but it will not be at all like a jetliner, because it will be 30 minutes in zero gravity, which means that after a few minutes most of the people will be sick. I think that it will not happen in the coming years. After that, perhaps after 20 or 30 years we will find specific devices which create artificial gravity or something like that. However, in a nutshell, in my opinion it is not for tomorrow.

Jim HOAGLAND

Should Europe aspire to a role in commercial travel in space?

**Jean-Yves LE GALL**

We have a number of projects in Europe, but frankly speaking there are a lot of projects in the US and other countries, but today they are only futuristic, and I do not see space travel for the next 10 or 20 years.

Jim HOAGLAND

What about travel on Earth that we talked about last year some in our panel on the interconnected nature of the Internet. There was discussion of the ability of people in Sao Paulo to telephone for a, not necessarily a spacecraft, but a high-altitude vehicle. How is that developing?

Jean-Yves LE GALL

In fact, we also have a number of projects that exist, but during the last year some of them were strengthened. We spoke last year about Galileo, which last year had 50 million users and now we are at more than 500 million users, for the simple reason that the chips on the smartphones are now equipped with Galileo worldwide. It means that every time someone buys a smartphone, they are a new user of Galileo because it is much more accurate than GPS and your smartphone chooses by itself the most accurate. One or two years ago, everyone was connected to GPS and in three years from now, everyone will be connected to Galileo. It will be the reality of what I said last year, because when we started to speak about Galileo a lot of people told me that Galileo is the European GPS and I replied that in three years we will say that GPS is the US Galileo and I am sure that it will be the case.

Jim HOAGLAND

Very good. Now, I will take some questions from the audience. Please identify yourself and keep questions succinct if possible.