ADVANCING AEROSPACE TECHNOLOGY

An interview with the General Director of the NLR

After graduating from the TU Delft with a specialization in Avionics, Michel Peters immediately started working at the National Aerospace Laboratory (NLR). Today he is the General Director of this key center of expertise for aerospace technology in the Netherlands. In the same room where key players in the aerospace industry gathered every two weeks to write the Knowledge and Innovation Agenda for Aviation, we sit down to talk and find out more about the General Director and NLR.

TEXT **Jan Schneiders and Lucia Wamiti, members of the Editorial Staff Leonardo Times**

Did you always know you wanted to be involved with Aerospace Engineering?
I always wanted to do either something related to avionics or to electrical engineering and have been quite persistent on that. First I wanted to become a pilot - who doesn't - but since I wear glasses, I ended up studying Electrical Engineering at the TU Delft. I've always found computers, software and electronics very interesting. Even as a child I found it amazing to see that for example, an autopilot, a small box of electronics, could be responsible for the taking off and landing of a Boeing 737, and I still find that very fascinating. That's also why I decided to specialize in Avionics. I graduated with Fred Abbink, the former General Director of NLR, after which I started working here, switched to work at Martinair for a while, but came back to work as division manager of Aerospace Systems in 2002.

There are 700 people working at NLR, are there also many AE graduates?
About 25% of the researchers here come from the faculty of Aerospace Engineering. Within the Netherlands, NLR is one of the biggest employers of AE graduates. However, we are seeing an increase in people who also have backgrounds in human sciences. Mainly because while obviously the development and design of an aircraft is done by people with a technical background, the operation of an aircraft and the ground system is not necessarily done by people with the same technical background. Teamwork is becoming more important as well, leading to an increase in researchers with that type of background, but they are still in the minority.

Should engineering studies focus more than they currently do on non-technical skills?
It is difficult to say because you always need to find the right balance. There is obviously a limited amount of hours in a day, and while it would be nice to learn everything: that's impossible! I think it's good that attention is given to the non-technical aspects, because they are important in the workplace. I also think giving students the opportunity to take courses from other faculties is important to learn

Figure 1. The Cessna Citation II PH-LAB research aircraft, which is operated jointly by NLR and the Faculty of Aerospace Engineering at the TU Delft

to see things from a different perspective. Because the problems which engineer must solve in their job are not confined to one discipline. Problems are seldom of a mono-discipline nature, nor are the solutions. It is beneficial when you as an engineer have a broad knowledge base, to get an idea of where you may find solutions. At the same time it is very important to realize that you don't know everything. It is a good character trait to understand that you may need help from someone else, with a different specialization in order to find a certain solution. The T-shaped professional as it is known these days is the direction the industry is moving in. Of course it is important to have specific knowledge, but if you can't talk about it or understand it in the context of the bigger picture – then you have a problem.

Do you prefer AE graduates over graduates from other technical faculties?
[laughing] Oh yes, definitely!

How is the working atmosphere at the NLR?
There are working 700 people at the NLR which makes it a relatively large technological organization, but not too large to make it an uncoordinated organization. We only have three hierarchic levels: there's a department manager, division manager and the general director. This leads to a fairly flat organization and I think also an informal organization, where everyone has his own responsibilities.

NLR is a non-profit organization, how is it financed?
Roughly 25% of our turnover comes as government contribution; it is used to build strategic knowledge and facilities. The remainder, which is with 75% the largest part of the turnover at NLR, comes from the market. This however can also include regular contracts from the government, for which we first have to write a good proposal in order to win the contract. The purpose of NLR, as a 'knowledge enterprise' is not to make profit, but certainly also not to be loss-making. If certain projects cause large losses, we have a problem which we really cannot solve by asking the government for more money.

What have the effects of the economic crisis been?
The government will need to cut, to solve the budget deficit. But we all need to cut down, they also need to save money at DLR in Germany and ONERA in France. The situation forces us to keep a sharp eye open on our price-quality relationship and operate in a more cost efficient manner.

I hope the new government will keep in mind, and not neglect the importance of knowledge and innovation. Even in times of economic crisis, investing in knowledge and innovation is very necessary. In the Netherlands, the economy is based on these factors. Through innovative

> "Within the Netherlands, I think the NLR is one of the biggest employers of AE graduates."

Figure 2. The Generic Fighter Operations Research Cockpit Environment (GFORCE) can be used for prototyping new cockpit concepts


Figure 3. The PH-LAB in action

products that come from industry we are able to afford our highly paid workforce, and this requires well educated people in order to have innovative solutions which the customer wants, and for which they are prepared to pay. We don't have many natural resources in the Netherlands, except for perhaps the gas reserves, but that's all. So knowledge and innovation is of upmost importance, and you should be investing more in these areas, instead of cutting funding.

NLR is also affiliated with the Dutch military – what kind of research do you do for them?
The military research we do is to develop training systems so that, for instance, fighter aircraft can do training exercises without there needing to be a second aircraft to act as the enemy. Now, the benefits of such a system are fairly obvious as it increases the training accuracy, while reducing the number of flight hours. But more importantly, I think that since as a country we take part in coalition peacekeeping missions in dangerous places, I think the people involved deserve to have the best protection available. That way they can do their work well prepared, and as safely as possible, because it's always more dangerous than just sitting behind your desk. I think we owe it to those people.

And do you do any research into weapons?
No. We strictly do research on training aids, mission- and planning systems, maintenance improvements and flight safety for personnel. It is all about allowing the pilots to fly as safely as possible. We have also been performing research into maintenance for the various transport types, aircraft and helicopters for a long time. We record data on every aircraft and on the basis of that information, we try and make sure that all aircraft have


Figure 4. The HPS can be reconfigured for a variety of rotorcraft such as the NH90, Apache and Chinook helicopter types as well as tilt rotor types

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the same amount of use. That way you can do maintenance in a logical manner.

What is the balance between aeronautical and space related research at the NLR?
Well, first off, maybe it's good to note that we don't do fundamental research; all our research is always aimed towards an application. So in terms of the income generated, the balance is about 90/10 for aeronautical/space. We do have a separate department for space research, but there is a lot of cooperation between the two – for instance the department of Aerospace materials will also help build constructions for the Arianne 5 launcher. If you look at the importance of the two disciplines, one finds that many fundamental techniques developed for the space industry get a spin-off in the aeronautical industry. So I use that figure of 90/10 with some reservation. While in terms of income that may be true, in terms of the technologies involved, the balance is quite different – and for me, they are both equally important.

Looking at the space sector in the Netherlands, you can split it up into two areas: the upstream segment, that is – the building of the actual satellite and all its components. And the downstream segment, which uses the data that comes from the satellite. The downstream segment is becoming more and more important. Everything has become dependent on it – com-

munication, navigation, meteorology; you see up-to-date weather maps each news broadcast. Everyone knows and many people use GPS for instance, and at NLR we are working on the European equivalent: Galileo. This becomes a little bit of a problem actually, that because the technology works so well, and it becomes so normal in everyday use, people don't realize the importance it has in society and our dependence on it. If people knew the level of technology that is involved, they would be very surprised.

That's an interesting point - do you think people are aware of the importance of technology in our everyday lives?
Well, I think this brings up an interesting point regarding communication. Engineers should be able to explain to people how to solve a problem, even when the solution is very complex and technical. Some of the problems we are asked to find solutions for come from the general population and it is our responsibility to ensure that not only do we do our best to find a solution using the technical knowledge we have, but we should also be able to explain this simply and clearly to the population at large, in language they can easily understand.

Do you think that more needs to be done to raise awareness?
Yes, certainly! Look, technology is a means to an end, and it has done great things for us. But you see in Germany and France that science and technology, in one way or another have a higher level of interest. We have good contacts with DLR and ONERA, and it seems as if science and technology is more respected over there. But the Dutch government is making a lot of effort to promote science and technology. For instance by encouraging girls to take up the sciences. So in some aspects the government is starting to do the right thing.

One of the big issues these days is sustainability. How is NLR involved with, for instance, reducing the use of fossil fuels and reducing CO2 emissions?
That is normal business for us these days. The problem of finite fossil fuels is hanging above our heads like the sword of Damocles, and I think the main question is that of how to propel the aircraft in a sustainable way. The improvements you make to your aerodynamic design will help – but is it enough? Well, it doesn't help enough because at a certain moment, all the fossil fuels will be gone. Therefore finding alternative ways of propelling the aircraft will be the most important thing in the very long term future. In the more short term, and I'm talking about the next 10 to 15 years, the aim will be to try and find the most efficient engines, better aerodynamic design, and the most efficient operational methods in order to fly from A to B. So that we can at all times continue to use air travel the way we are used to and even better, in a clean and responsible manner.


Figure 5. The head office of the NLR


Figure 6. The HPS can be reconfigured for a variety of rotorcraft such as the NH90, Apache and Chinook helicopter types as well as tilt rotor types

Finally, is there something you (definitely) want to have realized when you retire?
Right now, NLR is doing quite well in being 'networked' with all the relevant stakeholders in terms of industry and government, and I hope that that not only continues, but spreads. So for every client of ours, whether that is industry or the government, we can offer optimal solutions; not just products, but real solutions to their problem. That way all the companies or the government can say 'Oh, NLR – thanks to their knowledge, I was able to develop my project further' or 'Thanks to NLR I was able to develop this or that product which gave me a great advantage, a head start on my competitors!' And we can provide this in the form of technical know-how, as well as advice which can help solving some of the social challenges we face today.

Over the coming period, before I retire, I think we will have made a step further within Europe of course. Right now the situation is a bit mixed because on the one hand, every country has their own NLR, but at the same time, there is Europe, which has a vital role to play in the world economy as well, also to our own benefit. So NLR will have to play two roles, on the one hand making sure we stay relevant in Europe, and on the other hand, performing our job well within the Netherlands.