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Introduction

Next we have Herbert. Herbert is the policy director of the environment for Boeing in Europe and his remit is to assist the development and implementation of Boeing's environmental strategy in Europe. He liases with European environmental decision makers, government scientists and NGO's, and is responsible for reflecting European environmental concerns in the Boeing design process.

Herbert started to work for Boeing in 2001 having completed a Masters Degree at Cranfield, and he worked in European aviation first at Manchester and then he ran the Airline Pilots Union in the EU. Although Belgian, Dutch speaking by mother tongue, he speaks English, French and German, so you can't fool him in any language.

Herbert Lust

I speak them all equally badly. Thank you very much. Listening to the conversations this morning I would like to change my presentation slightly. There are two issues to pick up immediately. What previous speakers have noticed is that there are two different time horizons. Politicians, NGOs have fairly short time horizons. Aircraft manufacturers on the other hand have longer time horizons as aircraft development lead times are pretty long. Sometimes these different time horizons are conflicting.
As Boeing we have started addressing these more short-term issues, so throughout this presentation I'll not only be talking about long-term issues, but I'll also be talking about short-term fixes, if I may call it that.

A second issue was discussed this morning that I would like to address. Professor Green addressed the issue of environmental trade offs. The issue of trade-offs is also an issue for a manufacturer going into a process of designing a new aircraft. As a manufacturer you receive conflicting signals about what environmental aspects you're supposed to design to. When asking NGOs, to airlines and politicians what the environmental priorities should be for designing an aircraft that will fly maybe until 2040 , you get very conflicting signals and you get very conflicting design drivers. I think that needs to be kept in the back of our minds when deciding upon establishing public policy instruments and regulatory instruments,

Within Boeing the philosophy is to design products and services for the environment. The prime focus of any debate on aviation and the environment is of course on the operation of aircraft. But as Boeing we also want to look at the environmental aspects of manufacturing aircraft. This implies looking at the way we use resources, the amount of chemicals we use, but we also want to look at leaner manufacturing concepts.

As mentioned we face both short-term and long-term challenges in addressing the environmental concerns of aviation. In response to the long-term challenges I will refer later to the EU target 2020, within target 2020 we're aiming at is 50% less climate change emissions and halving aircraft noise. In this presentation I will also be talking about some of the solutions we have found for the short-term challenges, including noise-friendly departure procedures and air traffic management improvements. But, as Professor Green and other speakers have already identified ,

there are environmental trade offs to be made, and some quite serious trade offs. As said the issue of trade-offs not only makes aircraft design more difficult but also makes regulatory issues a lot more complicated. There is a risk that as we are looking at a short-term time horizon when writing regulations, we might actually be creating more serious environmental problems in the long term.

I have already referred to long-term technology goals and I know other people will be talking about this in more detail. I just wanted to present a comparison between the European 2020 targets, the so-called ACARE targets and the NASA targets from the US. So actually on both sides of the pond we're actually working towards the same long term goals.

The next chart is one that many people in the room have already seen, it tracks progress in jet aircraft sound reduction historically from the start of the jet engine until now; and as you can see there has been a significant reduction in noise.

The problem now is to look at ways of continuing that downward trend. The cost of reducing another dB is increasing as the amount of research needed for that and the time needed for that research has actually increased. Looking at the progress we have made so far, if you look at an older aircraft, the 737-200, basically you had 11.3² km noise contour around. Comparing that with a newest technology aircraft, the Boeing 737-800 the noise contour has actually reduced so now it covers 82% less area. Our current research projects aim to reduce the noise footprint further and one of the technologies we have developed for that is Chevrons. As Carl Burleson already identified these Chevrons actually reduce noise by 3 dB reduction in aircraft .

But what I wanted to demonstrate with this actually is, if you would put a time line under here, the start of the research into chevrons was about ten years ago, and included computer modelling, wind tunnel testing to actual in flight testing. We aim to reduce noise not only by designing new, quieter aircraft but we also aim to reduce noise with current technology aircraft. The next slide shows an example of a project we did at Luxembourg airport together with Cargolux. We actually redesigned operational procedures around Luxembourg airport, and we specifically designed with noise in the back of our mind. What we actually succeeded in doing was not only reducing the take-off noise, but also reducing the approach noise with 3 dB and at the same time through careful design succeeded in bringing Cargolux 900 tonnes of annual fuel savings.

This is just one example at one airport, but we believe these types of solutions should be taken on by the industry to improve environmental performance of current technology aircraft.

Aircraft fuel efficiency is of course directly linked to emissions. When looking at the historical trend of aircraft fuel efficiency one could say that in the 1950s, if you would say that we were using one litre of fuel, right now we've gotten down to 0.3 litres of fuel. That's a 70% improvement and I dare you to find any other mode of transport that's actually had similar improvements in fuel efficiency. This of course does not imply that we want to just rest on our laurels.

One of the issues about reducing emissions is not only to address climate change concerns nut also to address airport air quality concerns. One of the things that we're developing in a Boeing research centre that we have in Madrid is actually a replacement for an APU by replacing it with a fuel cell. The potential of the fuel cell lies not only in improving local air quality, it also means that we would actually be able to take less energy from the main engines, bleed less energy from that and

actually increase the fuel efficiency of the aircraft in total. So we think that not only having a fuel cell as a APU replacement would improve airport air quality, but also it would improve the overall fuel efficiency of the aircraft with 1 or 2%. Now the aircraft you see on the slide is a demonstrator for this fuel cell research. As a basis we use a powered glider and we will replace the actual engine with a fuel cell.

I said earlier on at the start that environmental performance is not only about operational issues like emissions and noise, it is also about the way we work with current technology and with our current customers to reduce their impact on the environment. A first aspect of this is waste policy - on the chart you see the example of the Boeing plant in Wichita, Kansas which is a zero discharge plant. So from this plant all water is recycled
A further example is the Boeing team that that works with operators particularly in third world countries to change their flight planning, to modernise their flight planning systems, and for some operators that has resulted in a 3-4% fuel burn reduction.

Also when we look at maintenance we now provide all of our customers with advice about how to do the maintenance on their aircraft in the most environmentally friendly way. Further issues we are looking into is the increased usage of lightweight materials. One of the ways we can reduce fuel burn is by using a lot more lightweight materials. Lightweight materials not only include composites but also to new aluminium alloys that are very, very promising as to their weight. A further example is a system called a quiet climb system that basically links the FMS to the throttle in order to cutback on the engine, and consequentially on noise, over a noise sensitive area around an airport. And also we now look at our newest aircraft design from the life cycle analysis point of view. Life cycle implying that we are thinking about the disposal of aircraft at the end of their productive lives.

This is not short term, this is medium term. This is the new Boeing aircraft, the 7E7. It looks like the conventional aircraft that Professor Green describes. What we're working at is a step change in environmental design and I think the best way to show that is actually show the fuel burn targets that we have. This is a chart showing where current four engine aircraft are fuel burn wise. This is where twin aircraft are at the moment, and the range we're looking at with 7E7 is around 30% improvement on fuel burn compared to current four engine aircraft, and around 20% improvement on current twin engine aircraft. Now that's a significant change. That's a step change in technology. Most of that comes from using lightweight materials and improved engine technology.

To get back to some of the points I made earlier. At Boeing we see it as a necessity to proactively work towards environmentally friendly aircraft design and manufacturing, but we also like to stress, particularly in Europe, that one of the biggest possibilities for reducing environmental impact will actually come from operational changes, particularly in the air traffic management area, which depend considerably on the regulators. When discussing regulatory instruments we can only stress that all instruments that are used have to be economically reasonable, technically feasible and environmentally beneficial. A lot of the regulatory proposals that are being discussed right now are very blunt instruments, which mainly will take money out of an already money starved industry, whilst offering little environmental benefits.

Another issue is when designing instruments we should urge consideration of the trade offs involved.

So to sum up. Our commitment is that we will minimise the environmental impact of our products not only in operation but also in the way in which we manufacture them, and also in the way we design maintenance procedures. We are committed to improving on our past performance, the 7E7 aircraft is proof of that. Our goal is safe and efficient affordable aeroplanes with excellent environmental performance. So with that I'll close off. Thank you.