

DESIGN ICONS

Nigel Tomkins (left) and Peter Sissons (right) in discussion with Victor Tolmachev and Genrikh Novozhilov in Moscow and Joe Sutter in Seattle.



Over the past 68 years, Farnborough International Airshow has enabled leaders from the world of aviation and aerospace to showcase all of their latest innovations and technological advancements.

By creating a dedicated Cargo Village at this year's airshow, Volga-Dnepr Group and its partner airline, CargoLogicAir, gave visitors the opportunity to go onboard two of the greatest innovations ever seen in the world of aviation - the Antonov 124-100 and Boeing 747-8 Freighter – and to understand the important roles these aircraft play in aviation and aerospace supply chains across the globe.

It also enabled Volga-Dnepr and CargoLogicAir to create a moment in aviation history as they brought together three of the most iconic aircraft designers to discuss their achievements and the future of big transport aircraft:

- **Joseph Sutter**, Chief Engineer of the Boeing 747
- **Victor Tolmachev**, Leading Design Engineer of the Antonov 124-100, and
- **Genrikh Novozhilov**, General Designer of the Ilyushin IL-76

They participated in a 'live' one-hour satellite conference connecting Seattle, Moscow and Farnborough and were joined by the respected publisher and author, Nigel Tomkins, who is currently researching

a book on the story of Volga-Dnepr and its position in world aviation, and moderator Peter Sissons, one of the leading British broadcast journalists.

Introducing the event, Peter Sissons told the audience who had gathered in the Cargo Village: "Farnborough brings together the most skilled, talented and innovative people in the aerospace

industry. Their work is dynamic and inspirational and continues to push the boundaries of what the industry can deliver for its customers. They represent a new generation of pioneers in air travel and space exploration. Their interest and passion in aviation has been inspired by what has gone before, by the diverse and dynamic aircraft that have changed the world of air travel and air cargo





transportation, and by the visionary aircraft designers that took truly iconic aircraft from the drawing board into production, and into the proud history of aviation.”

He began by asking Nigel Tomkins to describe how the 747, An-124 and IL-76 have influenced the growth of the air cargo industry?

“The word is massively. These three aircraft in particular have helped to create new markets but in order to operate those aircraft you need an airline and you need an organisation behind it to inspire what these men have created. Volga-Dnepr Group, in this event, contributes for us a remarkable moment in history. This is about trade, design, engineering, passion. And I’m delighted that we are all able to witness and speak to these wonderful gentlemen,” Nigel said.

Joe Sutter added: “All three airplanes are really icons of air cargo today. I’m extremely proud of the part my people played in the design of the 747. Victor developed a special airplane that can carry oversize cargo that has been in use for many years and will last for many more years, because it is the right airplane. The IL-76 was also created to transport large air cargo. So, these three airplanes will be around here for many more years to come because of their capabilities. And, Volga Dnepr knows how

to use these airplanes. They will continue to be successfully used in the air cargo industry as they are already today.”

Speaking about the An-124 and IL-76, Victor Tolmachev stated: “I’m absolutely against calling the airplanes like the An-124 and IL-76 military transport aircraft. Even my mentor Oleg Antonov used to say: ‘What is the difference between a military transport aircraft and a civil cargo aircraft?’ **Then he gave the answer:** ‘Only the khaki colour’ because they are conventional cargo airplanes. Their use depends on who is operating them. Even a hammer can be turned into a weapon.

“When the An-124, I will call it Ruslan, came into operation it proved its good design with optimal characteristics and let the world look at cargo transportation in a different way. It became clear that all cargoes could be divided into three categories. Category 1 is cargo that can be carried on passenger aircraft. However, the other two categories are real cargoes. So, category 2 is the so-called general cargo packed in containers and category 3 is industrial cargo which is very individual and extremely heavy. That’s why the An-124 Ruslan opened the way to carry unique industrial cargoes.”

The audience was reminded that 15-16 years ago the future of the IL-76 looked over when it was prevented from operating to major markets in Europe, the U.S,

Japan and Australia due to environmental concerns. While some airlines basically gave up on the aircraft, Volga-Dnepr was committed to modernising it and 10 years ago, the new version of this aircraft was approved for global operations. **Nigel Tomkins was asked why it was so important to safeguard the long-term future of the aircraft, replying:** “The answer is because there is nothing else like it. The IL-76 is a pride of Russian aviation engineering. It is the only aircraft capable of operating on short airfields with the loading and unloading capability that it offers. When Volga Dnepr stepped in, it invested substantially in reducing noise and emission output to put the aircraft back into favour.

“When the IL-76 first came onto the market in what we called the Soviet era, the rest of the world did its very best to ignore it but the cargo business always had faith in this aircraft. And Volga Dnepr has proven this to be right.”

Victor Tolmachev was asked to comment on Volga-Dnepr’s plans to now modernize the An-124. He stated: “We used to modernise the An-124 constantly. Unfortunately we faced an obstacle due to the collapse of the Soviet Union and due to the fact that I had to leave the Antonov design office and come back to Russia, to my motherland. Nevertheless, we have been quite successfully working with all the



companies related to the An-124 so we have managed to implement over 22 main design changes and over 350 secondary design modifications. The industry professional will understand what I'm talking about. And we keep working on it. However, now we have some difficulties due to the known situation with Ukraine but I'm sure we will get through these and find a way to resolve this problem. So, we will keep further modernising the aircraft.

"I want to say that when the An-124 pointed out a market niche for unique air cargo transportation, The Boeing Company published a report entitled 'Revolution in Air Cargo Transportation. Outlook for the 21st Century' and this proved the requirement for the IL-76 and AN-124



characteristics because this report really looked quite closely at them."

Joe Sutter made the point that these three 'professional' aircraft really do a good job when it comes to transporting large cargoes. His expectation that they will continue to fulfill this role for many years to come also stems from the fact that 'it costs a lot of money to create an all new airplane of this kind'.

In congratulating Genrikh and Victor on their iconic aircraft designs, he quoted a statement by Victor from Volga-Dnepr's book about the An-124 in which he discusses the challenges a designer faces when designing a new airplane.

It states: 'In general, every aircraft design should be a bold compromise between many technical requirements. Each particular solution should not be the best one, rather the combinations should provide for producing an optimal overall benefit'.

"I think, Victor painted it very well in describing the design of an airplane. Planning a large vehicle like the Antonov 124 is very, very difficult. I give credit to the An-124. This airplane will be around for many more years because it is able to do a good job today just like it did it in the earlier days. The IL-76 is just in the middle of its career and it is going to be around for many more years too and the Boeing 747 is going to be around for 20-30 years. This is because in each case the basic design is sound as Victor played out in his book. The solution was right at that time, it is still right today. I think the future of air cargo is with these three airplanes," Mr Sutter added.

Discussing the initial plans for the IL-76, Genrikh Novozhilov said: "When we were designing the IL-76, the main objective was its ability to use non-prepared unpaved airfields with a short runway. That's why we had to mechanise the wing, the slat and the triple-slotted flap and provide a special landing gear. Another peculiarity of the IL-76 design should be noted: we were seeking a solution to decrease the airplane weight. That's why we started widely using titanium alloys. It gave us an opportunity to decrease the weight. Titanium is an interesting material because it is robust but difficult to process. Somewhere in the mid-70's I also discussed this issue with Joe. Nowadays, titanium is widely used in Boeing airplane design."

Victor Tolmachev was asked to describe the most difficult engineering challenge that had to be overcome in the design of the An-124. He answered: "It's hard to say what was the most difficult problem. We had a lot of problems. Here, I absolutely agree with Joe Sutter that every aircraft design should be a compromise between many technical requirements. However, I can say the An-124 has a lot of quite innovative solutions with a high level of inventions. I think over 200 inventions were implemented in this aircraft.

"I can say we were the first ones to start using long-length moulded panels for wings

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with winglets. We also were the first ones using 7x2 metre forged parts of aluminium alloys. Just imagine a 7x2 metre forged part! When the An-124 was presented at Le Bourget airshow, the aviation media gave a lot of messages and titles about this aircraft. I remember only a few of them. For example, someone wrote: 'It's a know-how salvo' and another one said the 'pure aerodynamic shapes of the aircraft inspire respect'. Even the cargo floor lowering system, when the aircraft neared the ground for loading, was called 'a schooled elephant dance!'

"I heard a lot of these kind of comments. So, in conclusion, the An-124 was ahead of the level in the 1980's when it was designed by 50% in technology and by 40-50 years in terms of time. That's why it will keep flying for a long time, I think until 2035-2040."

Recalling the design of the 747, Joe Sutter said: "The air cargo industry before the 747 was just sort of an add line to the regular airline service. The capacity and characteristics of the 747 made air cargo viable as an industry in itself for all kinds of cargo. Its big side door and a nose door

are very unique for all airplanes. When a fully-loaded 747 lands and those two doors open, the load can be taken off and a new load put onboard the airplane in less time than it takes to refuel. The airplane is in the air more so the deliverable of the airplane is much higher. And because of the basic design characteristics of the airplane, that makes such a success.

"That airplane was laid down a long time ago but just like the An-124 it was laid down at the right dimensions at the start and that's why it exists today. As an example of the An-124's special characteristics, today most bigger airplanes are just twins with huge engines and very large fans. The only airplane that can carry that type of engine is the An-124. It doesn't do it every day but when it does it is a very valuable chain for the airlines that are operating it because all these engines are very enormous in cost."

He added: "The fact that air cargo is now one of the major industries in the world is because of the unique characteristics of what it can carry and how quickly it can be utilised."

Asked for his views of how long aircraft like the IL-76 will continue to serve the global air cargo market, Mr Novozhilov began by referring to the modernisation of the freighter: "First of all, I would like to say that in 1995 we had already installed the new PS-90 engine on this type of airplane because we understood the noise and the environmental impact had to be decreased. However, it took several years until Volga-Dnepr got an opportunity to order these airplanes in 2005 and I can only express my gratitude to them for doing so.

"As far as the service life is concerned, I think it is a very interesting issue. The IL-76 is the second cargo airplane that was put into a serial production for the second time. The highest number of airplanes, around 1,000, were manufactured in Uzbekistan at the Valery Chkalov aviation plant in Tashkent. Nowadays, this airplane is put again into a serial production in Ulyanovsk and I'm absolutely sure that the IL-76 hasn't had the last word yet. We are going to increase the fuselage length. This new modification has already passed the tests, so now everything depends on the requirements. It also stands taking into account that the IL-76 has exceptional take-off and landing characteristics. Currently this airplane is being used in Antarctica on a number of non-prepared airfields. Honestly speaking, I'm very happy that our ideas got implemented in real life."

Nigel Tomkins stated his confidence that Volga-Dnepr's An-124 modernisation programme will reach a successful conclusion, commenting: "A modernised version of the 124 is highly likely. I was fortunate to visit Ulyanovsk in Russia to meet engineers and crew members, all very enthusiastic, well educated, smart, intelligent people. They spend their time solving problems. Among the problems they are solving is the modernisation of this fleet of aircraft, which means before it comes to a new version. I'm convinced it will be successful and that the fleet of Volga-Dnepr will be here for many decades yet. It has to be, because there is nothing else that's coming through."





Peter Sissons asked the three designers for their views on what the future holds for wide-bodied cargo aircraft design?

Joe Sutter: “Well, if I have to predict the future, I believe that the An-124, the IL-76 and the 747 will be running for many, many years. And, while these airplanes continue to carry cargo in a very efficient manner, it’s going to be very difficult to develop a new type, including using new technologies, because it’s a very, very expensive process. So, you will have to wait many years until an all new design.”

Victor Tolmachev: “I absolutely agree with my colleagues that the existing, aforementioned types of aircraft will be operated in their own market niches for a long time and will be certainly updated. But everything finally comes to its end. It’s very difficult to forecast when it should happen but I’m absolutely sure on one thing: mankind will keep developing, mankind will

use new technologies, find new solutions, and start new productions. My conclusion is that this particular class of aircraft, even of a next generation, will still be demanded.”

Genrikh Novozhilov: “I would like to say to young design engineers, first of all, that they should be aiming at designing more simply because it is more reliable. As for characteristics, they should be aiming at decreasing the airplane weight, improving the aerodynamics and the fuel consumption through engines to reduce the cost of transport. I think that today it is possible to design an airplane capable of carrying 160 or even 240 tonnes of cargo. Everything depends on the requirements applied.”

Giving his thoughts on the future, Nigel Tomkins added: “This a very exciting time for this business because it’s a multifunctional aviation operation covering a whole spectrum of customer

requirements. And for that you need this fleet of aircraft. This industry is gradually moving away from the legacy airline industry that we had in the 50’s, 60’s, 70’s, 80’s, 90’s and 2000’s. Now it’s moving. It’s moving away from the legacy carriers to leaner specialists including from countries like Russia, China and the Middle East, and maybe also in the future Africa and Latin America.”

Closing the conference, the three iconic aircraft designers were asked if they had a message for each other:

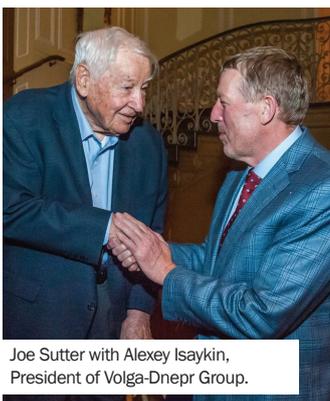
Victor Tolmachev: “I would like to say keep working as long as possible. Certainly, you shouldn’t work with your hands, but with your head. This is our tool which I think we should never lose.

Secondly, I wish you sound health, a strong spirit and an ability to overcome all obstacles.”

Genrikh Novozhilov: “I wish for my young colleagues to have the same good relations as I have had with Joe Sutter for the last 50 years. I’m proud of it.”

Joe Sutter: “When I look back at my career and the opportunities that I had in regard to airplane design, I feel very good about it. When I get to have good friends like Genrikh and Victor, I know I’ve had a very rewarding life.”

In today’s constantly changing world, few designs stand the test of time. In the An-124, Boeing 747 and IL-76, Victor Tolmachev, Joe Sutter and Genrikh Novozhilov have established legacies that will continue to serve all stakeholders in world trade for decades to come and that will inspire the next generation of aircraft design engineers to aim so high.



Joe Sutter with Alexey Isaykin, President of Volga-Dnepr Group.

JOE SUTTER: 1921-2016

Volga-Dnepr Group is deeply saddened by the news that Joe Sutter, the ‘Father of the 747’ passed away on 30 August 2016 at the age of 95.

Ray Conner, Boeing Commercial Airplanes’ President and CEO, said: “Joe lived an amazing life and was an inspiration – not just to those of us at Boeing, but to the entire aerospace industry. He personified the ingenuity and passion for excellence that made Boeing airplanes synonymous with quality the world over. Early in Joe’s career, he had a hand in many iconic commercial airplane projects, including the Dash 80, its cousin the 707 and the 737. But it

was the 747 – the world’s first jumbo jet – that secured his place in history. Fittingly, he was on hand to celebrate our centennial at the Founders Day weekend. He was one of a kind. Joe was loved. He made a difference in the world. He made a difference to us. We will miss him and cherish our time with him.” Volga-Dnepr Group sends its deepest condolences to Mr Sutter’s family and friends and to the entire Boeing Family.