

# LENDING A BIT OF TRANSPARENCY

to the future of large commercial and WIP aircraft



Seldom does life live up to our dreams. As a kid, I had these recurring dreams that one of the chairs in our living room could fly. It was an eggplant colored velour chair that my Dad sat in and that on rare occasions I would crawl up into before he came home in the evenings. It was so big that I'd have to stretch my hands out to reach the arms and my feet would barely make it beyond the seat cushion. My Dad was a big and powerful figure and so quite naturally, the chair he sat in itself possessed something of a magical quality, even in real life. But in those dreams it literally took on magical powers - not the least of which was the power to take me anywhere I wished to go, silently gliding above the earth and rising to whatever heights I wished.

For reasons I can't explain, my arm-chair adventures were all nocturnal, flying amid the pale blueish hues of moonlight. The most prevalent dream-scape in my memory is one in which I would skim the tops of broken puffy clouds enabling intermittent views of the rooftops and car-littered streets in my neighborhood; and best of all, the infinite starry universe above me. According to most psychologists, one of the most common dreams throughout recorded history, is that of flying unassisted. It represents an escape for most of us, a whimsical departure from the lives we live and a means of embarking on journeys guided not by our parents or our jobs, but the limitless freedom of our imaginations.



Unfortunately (after scouring the web), I can find no one working on magic carpets or flying arm chairs. Ah, but as our amazing cover image depicts, the next best thing is not only being worked on, but is only a short distance away!

Get a look, it isn't the Jetson's and it isn't one of Popular Science's far flung speculations about the future of airplanes. OK granted it also isn't a real aircraft at this moment, but it does represent a very real and highly supported prediction of what literally all major OEM's have on their concept boards right now - and fully expect to realize in the very near future. The long and the short of it is, get ready; because commercial and VVIP airplanes very similar to this are on their way. Those little 12" X 8" windows we crane our necks down to get a look out of? They're all about to go away and they'll be replaced with large panoramic windows and exo-skeletal window structures that offer expansive views of the heavens.

Technological leaps in both materials and structural engineering are poised to open up a whole other view of the world for air travelers in the not very distant future". In this article we've called on three separate entities to help us bring the near-term future a bit more in focus. First we'll speak with JP Magnano, president <and/or owner?> of 3D Visualization Service, whose close relationship with Boeing gives his company an unparalleled insight into what future airframes might look and feel like. Mr. Magnano and his talented team of illustrators developed our cover as well as the related interior studies shown here. We follow-up by speaking with two actual OEMs, Airbus and Embraer, each heavily invested in taking their concepts from screen to sky.

### **3D Visualization Service (Miami)**

JP Magnano and his company, 3D Visualization Service (Miami), have a long tenured working relationship with the largest OEM's and the top design studios in the world, giving them a rather unique insight into the current and future trends in aircraft design. Residing in such a particularly well suited environment allows them to project future concepts with substantiated credibility.





Combining that with remarkable creative and visualization skills you wind up with what you see here; a seductive concept aircraft combining known projected technologies and a studied 'pontification' of what the next generation of transport category aircraft might be like.

We asked Mr. Magnano to elaborate on the development of his concept. He started by letting us in on their initial brainstorming session. "My team and I first began discussing the future of VIP aircraft, many of the concepts that were being tossed around and how they revolved around the implementation of current technologies. One such current concept is a cabin with no windows, replaced by ultra thin TVs applied all over the ceiling. Terms like 4K, UHD cameras, etc. were discussed. For some reason, people have this fantasy that the human eye can be tricked into thinking a TV is the real thing. Unfortunately, it cannot", claims Mr. Magnano. "Anyone can immediately tell if they are looking out of a window or watching a screen. There are several reasons for this. The lack the dynamic range (brightness intensity), tonal range (color gamut) and, most important of all, depth perception. So it doesn't matter if you have 4K, 8k, or 200K - you will still be able to tell. We made an effort to look past that, thinking about our own desires - what we would like to see in the near future. One thing that everyone who loves aviation wants is a clear ceiling and/or floor. We settled for the one we thought was most viable. After seeing Airbus' exoskeleton idea, the team wanted to come up with something that could be implemented sooner. Our BBJ Sonic Cruiser concept keeps the original viable cross-section but using stronger composite materials that could structurally support the large composite-glass panels.

For the interior, the consensus was that we didn't have to innovate much. The human body will still be identical in 30 years. Thus, we don't need anything too different from what we have now. Seats will still need to be 9 or 16g, materials will still need to pass burn, etc. So, for the interior we took the best of what we liked from past VIP projects. In the images, the reader can see our Main Lounge proposal.

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We asked Mr. Magnano to elaborate on the development of his concept. He started by letting us in on their initial brainstorming session. "My team and I first began discussing the future of VIP aircraft, many of the concepts that were being tossed around it's the short list of what we would like in our own aircraft: a huge movie theater area, a large dining/conference table and some sitting areas to relax, have a drink or make out in."

Did he just say "make out"!? Love it! Someone finally putting in it terms we can all appreciate!

"This is our vision of what the near future could bring to the industry", Mr Magnano explains in closing, "The next step for 3D Viz? An invitation. Come experience this airplane with our full body Virtual Reality system. Everyone is invited."

Without hesitation, JetModa accepts your invitation!

EMBRAER Embraer Business Jets - Melbourne, FL

Next we had the opportunity to speak with Jay Beever and Frank Sanchez at Embraer Executive Jets in Melbourne, Florida. During our interview, I posed several questions designed to get at the heart of why and to what extent this trend is occurring, what the drivers are and how soon we might actually see these expansive windows on Embraer jets. That Q & A went like this:

*JM: These new panoramic windows are a radical departure from what we have now. I think we can assume there have been some major technological advancements that are driving this shift. Can you tell us what these advancements are, how they evolved and how soon they will afford these windows onto Embraer aircraft?*

EM: The portrait view windows are in fact something that has been used in the past. We have an observer window version for the ERJ145 platform that was developed for maritime surveillance a few years ago. Utilizing Embraer's sandbox of technology and intellectual property we were able to put this portrait view window on our private aircraft offerings. Embraer Executive Jets has the ability and plan in place to install these portrait view windows on our lineage 1000E platform utilizing the proprietary engineering data and techniques we have developed. Due to the Kyoto airship concept we have received several request for proposals utilizing large windows on the lineage combined with the customers bespoke interior design.

*JM: In some of the earlier renderings we've seen, Embraer seems to be one of the only OEM's proposing "vertical" shaped windows as opposed to more longitudinal shapes. It's a very evocative play on the idea. Can you tell us how this evolved and what considerations were involved in the decision?*

EM: There are several benefits to having large vertical style windows in the fashion that we have conceptualized. One is the ability to immerse passengers and owners into their environment versus concealing them from it. Additionally, by not having to cut horizontal through several frame stations we believe this makes for a more structurally sound development.

The vertical window idea was a collaboration with Boat International and Yacht Designer Patrick Knowles out of Ft Lauderdale, Florida. This combined effort, which resulted in the Kyoto airship, became the answer to how Embraer Executive Jets can provide the customer with more "yes" than "no" answers. In this situation we had a hypothetical customer from Japan who wanted a similar dining experience on their airplane as they would have had on their boat or in their home.





*JM: These kind of really expansive windows are alluring on almost every level. I think all of us love the notion of being able to observe the sky and the earth from these high altitude cabin vistas. But the thought occurred that there will be times of the day when all the direct sunlight might be undesirable to passengers. What solutions are you looking at to manage this issue?*

EM: There are two ways to resolve this concern. One is with a large vertical roller shades for complete blackout in combination with electronically dimmable windows for sunlight reduction.

*JM: Can you tell us about the window material itself? What sort of polymer / glass composites afford these kind of large windows without posing a risk to structure, pressurization and the other forces on an aircraft during flight?*

EM: Much of the information about the glass composition and lay up itself is proprietary to the vendors we purchase these windows from. However, these windows utilize tried and true technologies and systems combined with advancements in laminate's.

*JM: It seems like most of these large windows we see in the renderings are within the "constant section". Are there limitations on the structure or window material that make it harder to allow such windows within the compound curve "non constant" parts of the aircraft?*

EM: When we approached our Engineers with this concept we were asked to stay within the constant section and forward of the wing spar. In the Lineage 1000E this window placement falls in what we call zone 1 which is an ideal location since you are forward of the wing providing an incredible unobstructed view.

*JM: Are these windows something Embraer would roll out on its commercial aircraft - or will they be reserved initially as expensive options for VIP customers?*

EM: Unfortunately, we cannot comment on future development projects within our sister Business Unit (Commercial Aircraft). These large portrait view windows are for the moment exclusive to our Executive Jet product line only.

However, if there is one thing we want the market to know about Embraer it's that "Boldness and Innovation are our hallmarks", this is one of our strongest values and we take pride in creating new solutions for all customers.

*JM: From a design standpoint, these windows appear to be a "game changer"; elements that afford all sorts of interior layout and styling possibilities that have not been possible before. Can you tell us how your design group sees these windows and what possibilities they are exploring.*

EM: Our design department definitely agrees that these large windows are indeed a game changer in two ways. First is that we've changed the dynamic of how a passenger looks at the horizon outside of the aircraft. These portrait view windows allow us to look down more effectively providing the scenery we all desire to look at. The second way is in the sense that we believe technology disappears as it improves and therefore should allow the environment, or a more analog experience, to be present. This is a departure from many of the concepts seen in the industry which provide synthetic environments inside the cabin versus the use of windows.

*JM: We have on occasion seen rendering from designers - playing around with the notion of "live plants" within the cabin. Is this something you may have looked at in consideration of these now larger windows with greater exposure to sunlight?*

EM: This is a very interesting idea and surely the extra sunlight would benefit any living plant inside the aircraft. However, we have not considered this as a feature to be provided by Embraer Executive Jets. Nonetheless, customers will utilize their interiors the way it benefits them the most and perhaps this is one of those ways.



After concluding our Q&A, Mr. Chavez and myself had a little time to sit down and have a less formal chat about Embraer Executive Jets and the role they play, not only in the development of these large windows but other internal developments and concepts underway in Melbourne.

"The Melbourne facility is our customer center for the Legacy 450 and 500, the Phenom 300 and 500 and the Lineage" says Mr. Chavez. He also was proud to underscore the fact that for four years now, the Phenom 300 is the most delivered aircraft in the world. When I asked him to elaborate, he says "what I mean is, that of all aircraft OEM's in the world, Embraer has held the record for having delivered the most of any one single aircraft (the Phenom 300) for four straight years now". He also followed up by telling me that it's by quite a margin. It outpaces the closest runner-up by more than 11%. That's pretty impressive when you consider Boeing, Airbus, Bombardier and Gulfstream are in that mix.

The Melbourne facility also maintains full-scale mock ups of the Phenom, Legacy and Lineage. Chavez points out that unlike many customer mock ups "we utilize real aircraft parts throughout; all systems, including many cockpit components are fully functional as they would be in the delivered aircraft". When I asked why it would be important to extend mockup functionality to the cockpit, he had a very good answer, "because many of our customers are themselves the pilot. And so we want them to experience that as they would in the actual aircraft; right down to the resistance on the main joystick."

Getting back to the expansive panoramic windows, I asked Mr. Chavez to elaborate on some of their engineering characteristics and developmental challenges. He explained that much work has gone into systems that don't allow fogging, electronic sun-glare with variable opacity controls and advanced structures that actually make these windows as strong as the surrounding structure itself.

When I asked why these windows would only be available in sections of the fuselage forward of the main wing spar,

he said "In aeronautical design, we think about areas forward of the engines as those being pulled and those aft, being pushed <I'm not certain, but logically one would think of the area forward of engine as being pushed and aft being pulled>. Two very different things occur at each of those locations", he explains. The turbulence created by jet-wash aft of the wing cause many more stresses on structure. So for now at least, our engineers have recommended the use of these windows be restricted to constant sections forward of the wing."

#### AIRBUS - The Future by Airbus

Last but certainly not least, we will hear from Airbus, a company that has been working with various partners around the world on this and other concepts for more than a decade now.

Utilizing radical innovation, and out-of-the-box thinking, Airbus has set a goal to meet its eco-efficiency goals to ensure that air travel continues to be one of the safest, and most eco-efficient means of transportation. As the air transport sector continues to grow, Airbus believes that the industry as a whole must concentrate on technological advances; only partly illustrated by these huge panoramic cabin windows. A myriad of advancing solutions are being studied - each designed to meet passenger and market demands, the growing population and its demographic profile; all collectively respecting various global environmental concerns.

After celebrating four decades of innovation, Airbus now is looking to the next 40-plus years – actively working with other industry stakeholders and experts in an effort to anticipate the global needs of a better-connected and more sustainable world.

According to Airbus, it all begins with one question: "what will air transport look like in the year 2050?" In its report "The Future by Airbus," Airbus hypothesizes how the industry, aircraft and passengers might change by that time – and thereby highlighting potential steps to meet those needs when tomorrow arrives.



Based on extensive research into the ways the world's population is changing, the Airbus Concept Cabin illustrates what the future of flight might look like from the passenger's perspective. Inspired by nature - and designed to protect it - aircraft cabins of the future will be custom to the needs of each passenger.

The exo-skeletal concept cabin depicted here doesn't conform to traditional cabin classes found in existing commercial aircraft. First, Business and Economy class will have been replaced by zones that target more individual needs like relaxing, playing games, interacting with other passengers or holding business meetings with people on the ground. The cabin's bionic structure and responsive membrane combines panoramic views with an integrated neural network pulsing through it, which can identify and respond to the specific needs of each passenger. And the fittings and furnishings will take care of their own cleaning and repairs thanks to innovations inspired by nature, like dirt repellent coatings and self-healing covers.

Panoramic window structures clearly play an important role in how Airbus envisions its future commercial and WWIP aircraft. One thing is certain, the Airbus flight experience of tomorrow will feel radically different from how it does today and is already unfolding a remarkable leap in aircraft design and cabin functionality.

And with that, I'm calling it a 'temporary' wrap on Transparency, having learned quite a lot about the advancement of large windows in commercial and WWIP jets. Why temporary? Because certainly this is an evolving story and you can rest assured JetModa will be revisiting and updating it for our readers, as the months and years bring us closer to the reality of such windows.

So in concluding this piece, something occurred to me. These remarkable windows may not yield exactly the same experience as piloting my own personal velour chair through the night sky - but ya know what;

when I consider the notion of lying back in a leather upholstered sleeper, legs crossed and sipping a scotch while I stare through a transparent ceiling at the starry stratosphere traveling at mach 1.2; it might just be, I can let go of my childhood dream.

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