

In-Flight Aerospace Transparencies

May 2016

In this issue:

- Get To Know Our Regional Product Support Team
- En Route



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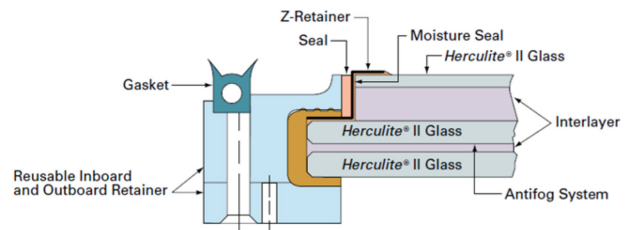
New Product Offerings for Cockpit Windows of the A320 Family of Aircraft

As the global fleet of the Airbus A320 family grows, operators are continually looking for innovative options to manage their transparency requirements. To meet customers' needs, our Aerospace Transparencies team initiated a design development program to enhance the service performance and reliability as well to offer innovative repair programs for the all-glass cockpit windows and framed assemblies. The design enhancements for all A320 cockpit windows have focused on advanced interlayers, improved moisture seals, new retainer design and environmental sustainability.

Since the introduction of the A320 cockpit window enhancements to the industry, the flight deck windows are performing very well in the field. According to Brent Wright, Global Director - Aerospace Transparencies, "Our customers report significant performance gains for both the windshield (part number NP165331-01/-02) that entered service in 2010 and the aft-fixed side window (part number NP165333A1/A2) that entered service in 2012. There have been no arcing events or other age-related failures in either of these parts since they were introduced."

Art Scott, Global Market Director - Commercial Transparencies, adds, "We expect the same outstanding performance from the sliding side window (part number NP165332A1/A2) that is now being delivered to Airbus for production aircraft builds. Our team will work closely with our customers to meet their expectations for in-service performance and service life.

In addition to performance gains for the new glass panels, we achieved a combined weight savings of 11.8 pounds (over 5 kilograms) on the 4 side window panels compared to the options offered by the other glass suppliers. These enhancements demonstrate our long term and ongoing contributions to improve the in-service performance and benefits of our cockpit windows."



New Design for No. 2 Window

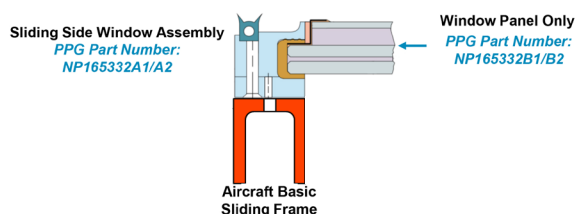
Building on the field results from the windshield and aft fixed cockpit windows, we launched a design initiative to enhance the No. 2 windows. According to Dr. Khushroo Lakdawala, Global Director for Transparencies Engineering and Technology, "When the technical team began the design and manufacturing activities for the No. 2 window assembly, we looked at design approaches for improved service life as well as reparability. These factors became design drivers to meet the requirements of our customers."

Continued on page 2



New product offerings continued from page 1

A simplified clamp design was introduced that allows easier replacement of the panel assembly and that offers options to customers for the reparability of the PPG manufactured side window panels. The new retainer design, introduced as part of the simplified clamp design, allows the retainer set to be reused to repair the No. 2 panel assembly. According to Scott, “The new and enhanced design for the No. 2 panel gives the operator new repair options for our windows, resulting in additional cost savings.”



Airbus A320 No. 2 Window

Customers have several options available for the replacement and repair of the No. 2 window panel and the sliding frame assembly.

- The operator purchases a complete window assembly (PPG NP165332A1/A2), replacing the window assembly on the basic sliding frame.
- If the operator is repairing a PPG sliding window assembly (NP165332A1/A2), the operator now can purchase just the PPG window panel (NP165332B1/B2) and re-use the existing retainers during the repair. This is the low cost option for the basic sliding frame.

All repair procedures have been approved by the Federal Aviation Administration. Operators can perform the repair per the Airbus A320 Aircraft Maintenance Manual dedicated to PPG windows, or utilize PPG’s FAA authorized repair stations. It has never been easier to take advantage of PPG’s unmatched quality and reliability.

To learn more about how you can benefit from the new designs and the repair program, contact your PPG account manager.

A full listing of PPG’s A320 part numbers and interchangeability are listed below.

Description	PPG Part Numbers
#1 LH Main Windshield	NP165331-1
#1 RH Main Windshield	NP165331-2
#2 LH Sliding Side Window Assembly	NP165332A1
#2 RH Sliding Side Window Assembly	NP165332A2
#2 LH Window Panel	NP165332B1
#2 RH Window Panel	NP165332B2
#2 LH Retainer Kit	NP165332C1
#2 RH Retainer Kit	NP165332C2
#3 LH Aft-Fixed Window Assembly	NP165333A1
#3 RH Aft-Fixed Window Assembly	NP165333A2
#3 LH Window Panel	NP165333B1
#3 RH Window Panel	NP165333B2
#3 LH Retainer Kit	NP165333C1
#3 RH Retainer Kit	NP165333C2

Responsive and Regional Product Support for Transparencies

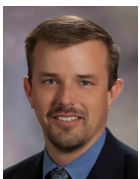
By Jason Richburg
Product Support Manager

Our Aerospace Transparencies team provides product and technical support for our product line using a global team of engineers. Each product support engineer has extensive knowledge in design, manufacturing, in-field product performance, failure analysis, and reliability analysis. Our product support team offers several services for our transparencies customers, including:

- technical field documentation
- field performance monitoring
- evaluation for in-service performance issues
- transparencies training
- failure analysis
- fleet reliability analysis

A detailed description of product support services will be included in future issues of the In Flight newsletter.

To provide our customers with regional and rapid response for product needs in the field, our product support team is strategically located at our Huntsville, Alabama and Sylmar, California transparencies manufacturing facilities, as well as in key locations in France and China. We are committed to working with you to address all your transparencies needs. Please refer to the list below for the members of our product support members and their areas of responsibility, including aircraft supported. You are welcome to contact me or any member



Jason Richburg
Product Support Manager
Huntsville, Alabama
jarichburg@ppg.com
Major Programs: Boeing



Adam Kennamer
Lead Product Support Engineer
Huntsville, Alabama
akennamer@ppg.com
Major Programs: Airbus, Embraer, Sikorsky



John Wetzel
Product Support Engineer
Sylmar, California
John.Wetzel@ppg.com
Major Programs: Boeing, Bombardier, Lockheed, Sikorsky



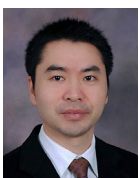
Connie Griesemer
Product Support Engineer
Huntsville, Alabama
cgriesemer@ppg.com
Major Programs: Bombardier, Cessna, Comac, Dassault, Gulfstream, Mitsubishi



Man Huynh
Reliability Engineer
Sylmar, California
Man.Huynh@ppg.com
Reliability Analysis and Quality processes



Christian Costecalde
Product Support Engineer
France
costecalde@ppg.com
All technical inquiries for Europe, Middle East, and Africa



Shaocheng Liu
Product Support Engineer
China
sliu@ppg.com
All technical inquiries for Asia Pacific



En Route

- New technologies commercialized that offer greater value.
- New products developed for existing and new aircraft.
- Focus on investment for technology, product development, infrastructure, and customer support.
- Innovative products required to meet customers' evolving needs.

By Brent Wright

Global Director, Aerospace Transparencies

The past year has been exciting for PPG's transparencies business during a time of change for the aerospace industry as a whole. As any participant in the aerospace industry knows, the various industry sectors have posed different opportunities and challenges.

- Lower fuel costs have helped the airlines realize significantly improved profits. At the same time, airframe manufacturers are seeing margin pressures from increased competition driving them to focus on business improvement initiatives and improved cost offerings.
- In the business aviation sector, aircraft builds and flight operations have remained significantly below the peak period in 2008, continuing to put downward pressure on revenue and profitability.
- The military sector continues to be impacted by ongoing budget concerns and geopolitical uncertainty.

These dynamics have driven aircraft manufacturers and suppliers to respond with new offerings in products and services and deliver new innovations to strengthen their product and cost competitiveness.

In 2015, we responded to these challenges with a combination of internal and external initiatives across all product segments. The results are providing new and differentiating products and technologies that offer greater sources of value for both airframe manufacturers and operators. I have listed below some of these new technologies and products that we delivered to our customers.

Technology Milestones

- PPGs Alteos® interactive windows systems, our electronically dimmable windows, are flying on multiple aircraft models and represent an exciting new aesthetic design option for advanced aircraft interior design.
- PPGs Opticor™ advanced transparency material took to the skies as an innovative, alternative material to stretched acrylic for cabin windows. OPTICOR advanced transparency material offers a lighter weight, environmentally durable option to other transparent plastics for cabin windows as well as other aircraft transparencies.
- We obtained FAA and EASA approvals for our Intelligent Windows technology. One benefit of this technology is to provide aircraft operators with a warning ahead of a potential failure so that cockpit windows can be replaced on a more controlled and scheduled basis. Longer term, the data collection capabilities of Intelligent Windows will support our ongoing product health management activities.

Product Milestones

- We obtained FAA/EASA approvals for redesigned #1/#2/#3 cockpit windows for the Airbus A320 and for associated repair processes for those windows.
- In November 2015, we introduced an FAA-approved, state-of-the-art windshield for the Hawker 800/1000 business jet.
- Our PPG transparencies were onboard the Embraer KC-390 and Mitsubishi MRJ for first flights in 2015 along with the COMAC C919 that was rolled out last year.

Along with the new technologies and products, we continue to invest in product improvements and lean manufacturing operations across many product lines. The investments in these new technologies, products and infrastructure are driven by our ongoing and long term commitment to our customers and the aerospace sector.

As we look forward we are cognizant of continued changes in the aerospace industry, the economy as a whole, and our customers' evolving needs. We will be proactively engaged in meeting those needs with commitment and conviction.