



## Flying the Pure Skies

*Leveraging material, color and design, London's PriestmanGoode offers airlines a way to regain the trust of the flying public*

By Robert Grace

**W**ith COVID-19 vaccinations gaining momentum worldwide, prospects are slowly improving for a devastated travel industry. But serious challenges remain, and one London design firm is proposing changes that could help the airlines create new lines of defense for cleanliness, and in the process regain passenger confidence.



Ready for boarding: Pure Skies interiors developed by PriestmanGoode incorporate materials innovation, design features and technology to provide a safe, hygienic flight environment. All photos courtesy of PriestmanGoode

Just how bad is it? Airplane seating capacity fell by half last year, and passenger totals dropped by 60 percent, with just 1.8 billion passengers taking to the air during the first year of the pandemic, compared to 4.5 billion in 2019, according to the International Civil Aviation Organization (ICAO), the civil aviation agency for the United Nations. The airline industry attributes \$370 billion in financial losses directly to the impact of the pandemic.

In the most optimistic scenario, by June 2021, passenger capacity could recover to 71 percent of 2019 levels, according to ICAO, while a more pessimistic scenario foresees only a 49 percent recovery.

Fear of infection is keeping many travelers grounded, but PriestmanGoode—dubbed one of the “Most Innovative Companies of 2020” by *Fast Company*—is leveraging its long history of transport-related design and user experience to propose a way forward for the airlines. Cofounded in 1987 by Paul Priestman and Nigel Goode, the company has been involved in many complex, high-profile transport projects, including the New Tube (subway) for London, Virgin’s Hyperloop passenger capsules, Airbus aircraft interiors and Hong Kong’s metro trains.

Priestman, PG’s chairman, and two of his colleagues, Maria Kafel-Bentkowska and Jo Rowan, recently took time speak in depth with *Plastics Engineering* about the Pure Skies project. The much-honored Priestman also serves as global creative director of Chinese company CRRC Sifang Locomotive and is a past president of the UK’s Design Business Association.

He left it to his colleagues to explain the company’s latest initiative, which involves a raft of design ideas offering a roadmap toward future growth and passenger satisfaction in the aviation industry. It includes a complete review of business and economy class cabins and addresses pressing consumer, business and environmental concerns.

## Designing Touch-Free Journeys

“New built-in design features, the latest technology and materials innovation all help to reduce passenger



Advanced printing and finishing techniques enable replacement of some carpet and textile applications with easier-to-clean plastics that offer a high-end look, such as on this seat-side table in business class. (above)

The seat layout in economy class, rebranded “Zone,” can be slightly staggered or offset to afford separation and privacy to travelers. (below, left) PG rebranded business class as “Room” and suggested this arrangement, where floor-to-ceiling curtains enhance privacy and separation. (below, right)



anxiety, improve personal space and hygiene, and facilitate touch-free journeys,” the company says. Meanwhile, it also suggests possible new revenue opportunities for airlines “through innovative cabin features that empower passengers to tailor products around individual preferences.” PG, which employs more than 70 designers, used colors and materials to enhance hygiene and facilitate communication and brand trust.

Airlines’ immediate priorities, the company acknowledges, lie in protecting jobs, capital and resuming services. However, as it will take at least three

years to develop and certify future cabin products, PriestmanGoode says its Pure Skies project begins to outline what these new products should be to ensure the airline industry’s future success. PG has developed the concept around three main factors—personal space, hygiene and a touch-free journey—and has leveraged color psychology as well as materials choice to help communicate with passengers and create a sense of calm and security onboard aircraft.

Kafel-Bentkowska, the firm’s head of color, material and finish, notes that the pandemic caused a huge concern over the cleanliness of transport



interiors, leading to nervousness among passengers. Obviously, she remarks, antimicrobial technology has existed for years, but PG decided to take a fresh look, to include assessing the suitability of many natural materials and coatings, and how such coatings performed on hard vs. soft and porous vs. nonporous surfaces.

At the same time, she says, the team also looked at all the crevices, split lines and “nasty gaps” in aircraft seats that previously were dirt traps but now also tended to trap virus particles and microbes. That led them to employ heat welds and tape line detailing to eliminate places for the virus to hide.

“We didn’t want to come up with a knee-jerk reaction” to the pandemic, explains Rowan, the firm’s associate strategy director. While many of these materials have been around for a long time, with many not getting much traction, the situation involving a deadly “invisible virus” provided a new urgency for all involved.

The PG team took a closer look at reactive technologies such as thermochromic or photochromic inks that Kafel-Bentkowska says to date tend to be used more for gimmicky products than for their technological benefits.

These substances react to heat or light, and have the potential, they find, to react to the types of cleaning processes often used to clean aircraft interiors.

### A Functional Palette

“We thought that this would be a fantastic way to reassure passengers,” she says, while also using cabin lighting as a further messaging tool. For the color palette, they suggested a hospital-like light blue for pre-boarding/cleaning mode, a darker bluish-purple for boarding mode and then a warm, relaxing yellow-orange mode once on board.

There is an opportunity to share this messaging with passengers as part of the reassurance communication, either on a website or via direct messages, Rowan says. This is a logical extension to the types of email and text outreach that airlines already are doing to reassure customers of the measures they are taking to keep them safe.

Still, some of the hard plastics shrouds and covers used in aircraft interiors occasionally suffer from deep scratches, which can make the surfaces look dirty even if they have been thoroughly cleaned. These additional reactive technologies and lighting modes could

help reassure passengers even in such circumstances, Kafel-Bentkowska says.

“The [passenger’s] perception and the trust is always going to be a challenge when you can’t see it,” Rowan notes, referring to the current lack of visual clues to indicate that a surface has been cleaned.

In addition to producing highly functional and cleanable surfaces, Kafel-Bentkowska says, surface aesthetics are key. “For a lot of the plastics that we did design into the seats we looked at image-infusing technology to allow us to print a much softer, tactile image on the plastics surface.” Some of it involves a sort of trompe l’oeil art technique that uses realistic imagery to create the optical illusion that the depicted objects exist in three dimensions. The end result is a surface that doesn’t look like a typical hard plastic, she says, but perhaps more like a textile or a softer, more tactile material.

### Starting at the Airport

For the Pure Skies project, PriestmanGoode also examined how to develop a more contact-less journey for passengers from the time they arrive at the airport. This involved further

## The Finish Line: Winners and Losers

What finishes and materials clean best and remain relatively germ-free. PriestmanGoode developed this list based on its experience.

### Material Finishes—Showing Up Dirt

- » Gloss shows everything. It must be clean and scratch free to look its best. This normally means it is a nonporous material that can be wiped down.
- » Soft, uneven surfaces create the perception of retaining dirt. Viruses, in fact, do not reproduce well on these surfaces since they cannot spread easily on them.
- » Fine noise textures add some interest to a surface without hindering its cleanability.
- » Heavy, deep textures are harder to clean and show dirt.

### Appropriate Manmade Materials

- » Faux suede with antimicrobial additive
- » Faux leather with antimicrobial coating
- » Antimicrobial plastics
- » Antimicrobial paints

### Appropriate Natural Materials

- » Hemp and bamboo are naturally antibacterial
- » Copper, silver, brass and zinc ion technology create antimicrobial additives.
- » Quartz is a natural stone that is nonporous, antimicrobial treated and scratch resistant.

exploring the digital experience for travelers and rethinking e-commerce opportunities for airport shops and vendors that also have been financially hammered by the drop-off in travel. For this, PG is partnering with Omnevo, a Wiesbaden, Germany-based AOE Group firm that specializes in digital platforms for transport sectors.

One concept, Rowan says, involves projecting light bubbles on to the floor of the airport that move with each passenger, especially for boarding at crowded departure gates, to help passengers better visualize social distancing “in a slightly more fun and interactive way.”

Another involves passengers using their own phones or smartwatches to manage more of the journey, including controlling the backseat in-flight entertainment system (IFE), or simply gestures to open or close storage bins on board.

Also, following a housing trend toward more hard flooring rather than carpet, PG suggests that airlines use non-textile flooring such as vinyl. The digital printing technology used now with vinyl has greatly enhanced the aesthetics of such materials, Kafel-Bentkowska notes.

PG also used this opportunity to rethink some of the names applied to the different seating classes on the planes. Business class, for example, is rebranded as “Room” and economy class as “Zone.” The aim with “room” was to create personal spaces with each passenger having his or her own cabin with a floor-to-ceiling curtain to provide privacy.

Each “room” features a gesture-controlled IFE system, synched to the passenger’s own device, a completely redesigned seat with minimal split lines, as well as a modular design concept that provides personal overhead storage, containing bedding and a personal wardrobe.

## Providing Visual Clues

Reacting to the UV-C disinfecting light or the heat-based technology that airlines already use to clean surfaces, the reactive ink on the fabric of each such seatback displays a temporary Pure Skies logo, radiating outwards in an intense dot pattern, to reinforce visually that this space has been cleaned. Eventually, the image fades and the cabins shift to



Using reactive thermochromic or photochromic ink technologies, seats and surfaces that are thoroughly cleaned temporarily display the Pure Skies logo to reassure boarding passengers.

a relaxing ambient lighting.

PG proposes redesigning the airplane seats themselves to minimize the number of necessary split lines and gaps. Current seats have breaks, for example, beneath the headrest and between the seatback and seat pan. “We wanted to create a more seamless, continuous design,” Kafel-Bentkowska says, and wherever such breaks must exist, use heat-welding with a sealing

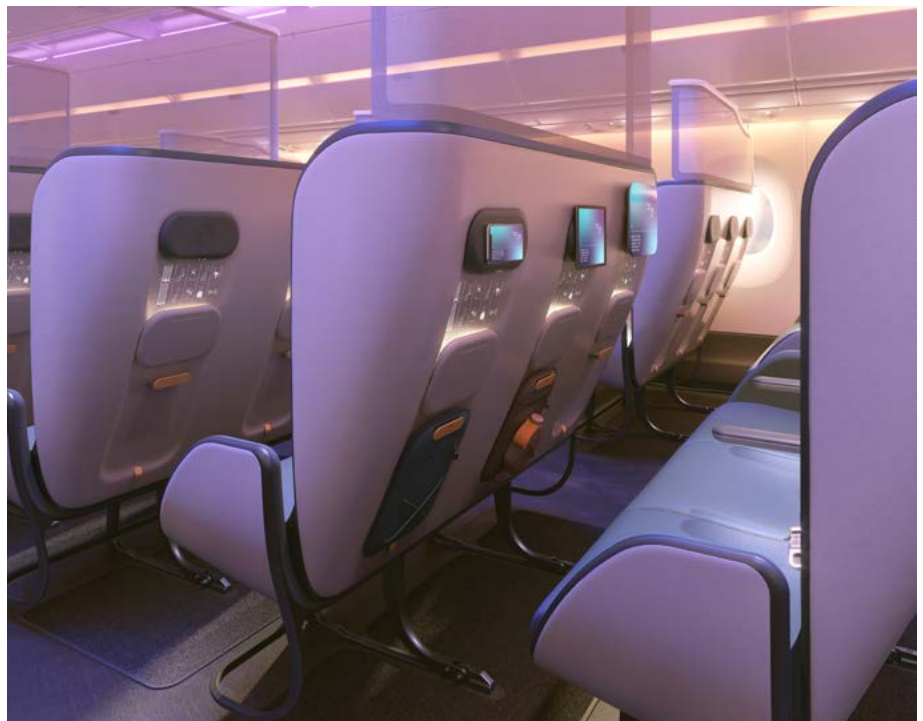
tape to create a barrier against the virus that is easy to clean.

PG’s idea with Pure Skies is to create a list of possible actions from which the airlines can pick and choose. One airline has expressed interest already, but only in the easily retrofittable cabin lighting option.

With the Zone economy class seating, PriestmanGoode aims to create different spaces depending on whether the passengers are traveling alone, or in a group of two or three. “We introduced a staggered element to the seats, to create a bit more of a definition of personal space,” Rowan notes.

The team also looked at introducing, every second row, fine-mesh cabin screens that extend up from the seat backs, made with a see-through, antimicrobial fabric. Those same mesh screens also could display the reactive Pure Skies logo to indicate those rows have been cleaned and disinfected.

And they propose installing UV-C lights underneath each armrest to project virus-killing light onto the high-touch seat belts and belt buckles. (UV-C is a powerful form of ultraviolet light in the 100- to 280-nm range. Its germicidal action is maximized at 265 nm.) UV-C light would be used only during the



Pure Skies eliminates germ-attracting seatback pouches and relies on digital technology to give passengers safety information and IFE options. Travelers operate these touch-free systems with their phones, tablets and smartwatches.



pre-boarding cleaning process, and not while passengers are seated or during flight.

### The Reclining Seat Issue

The seat design proposed by PG also addresses another pain point for airlines—reclining seats that intrude on another passenger’s space, often causing friction on board. Seats in the Zone feature an optimized, hard seat shell that is fixed in the furthest-back position. An internal mesh membrane between the seatback and the shell allows for a modest amount of recline without impeding the person seated behind.

Another low-touch proposal involves a more minimalist seatback, which replaces the germ-ridden seatback literature pouch with a digital projection on the back of the seat shell providing the information and entertainment choices often associated with magazines and printed flyers. A hard, oval pad positioned about eye level on the back of the seat in front of a passenger employs biomimicry and an existing nanotech technology called Dekke Slope that borrows from the suction power of gecko feet. It would allow one to stick their phone or iPad to that area, where it would be firmly held in place.

The technology’s suction technology employs two pads that consist of a special type of nano-foam with thousands of microscopic air pockets across its surface that act like tiny suction cups. Pressing an object with a flat surface against the nano-foam forces air out of the pockets, thereby creating a vacuum and a strong grip.

The proposed PG design also dispenses with the traditional fold-down meal tray in favor of a small cocktail ledge that also serves as a mounting bracket to receive the meal trays delivered by flight attendants. This seat shell also is fitted with a UV-C light that projects onto this small ledge area during the cleaning process. The meal tray itself would be collected, washed and sterilized after each use, which would be a huge hygienic improvement, given that PG’s research revealed that aircraft tray tables



Passengers no longer handle physical menus to discover what’s being served on a flight.

are not cleaned between every flight.

### Food Service Au Naturel

Speaking of food service, PriestmanGoode previously tackled a separate project aimed at reducing single-use plastics waste on airlines. From September 2019 till February 2020, the firm oversaw an exhibition it created at the Design Museum in London called “Get Onboard: Reduce. Reuse. Rethink.”

The International Air Transport Association estimates that each year airlines generate some 5.7 million metric tons of cabin waste on passenger flights around the world. To compound the situation, the infrastructure is often lacking, especially on international flights, to recycle the single-use plastics waste involved.

The aim was to showcase ideas for replacing single-use plastics in food service with more eco-friendly



Detachable trays affix to a small cocktail ledge and can be removed for thorough cleaning. A UV-C light is activated between flights to help disinfect the ledge.

alternatives. The team explored various materials, and in the end produced a lightweight food tray with containers and cutlery that were all either edible, biodegradable or

commercially compostable.

The designers used various certified food-safe materials, ranging from coffee grounds and husks mixed with lignin binder for the tray and coconut wood for the combination spoon/fork, to rice husks with a polylactic acid binder for the outer cup, algae for the cup liner and bagasse (the dry, pulpy residue that remains after extracting juice from sugar cane) for the main meal lid. It was primarily a thought-provoking exercise, designed to get airlines and passengers alike to think anew about waste and alternative materials, but it has gained much traction in the industry.

## Good Reception

Rowan says that PG's presentation about Pure Skies to airlines so far "has gone down very well," as it addresses many hot topics of the day. Different aspects of these wide-ranging concepts are resonating with different airlines, she adds.

Meantime, the firm is working with its suppliers on fleshing out some of these concepts. On the plastics front, PriestmanGoode works closely with thermoplastics suppliers Simona Boltaron Inc. of Newcomerstown, Ohio, and Sekisui Kydex LLC of Bloomsburg, Pa., among others. It takes time, they note, to develop these concepts and bring them to market.

While the focus currently is on the airlines, Rowan notes that many of these technologies apply equally well to railways, cruise ships, subways and other forms of transport. Having

Pure Skies to show people is "starting the conversation" with many potential customers, as they can see the benefits and applications.

The digital aspect of "the contactless journey" is right now massive and fundamental, Rowan says. "We know this project is ambitious." While it may not be the right time for some financially struggling airlines to invest significantly in such concepts, they do have the time to reflect on how they wish to move forward, and how best they can attract and serve their customers, she notes.

### ABOUT THE AUTHOR

Robert Grace is a writer, editor and marketing communications professional who has been active in B2B journalism since 1980. He was founding editor of and worked for 25 years at Plastics News, serving as editorial director, associate publisher and conference director. He is now both editor of SPE's *Journal of Blow Molding* and a regular contributor to various outlets. A long-time member of the Industrial Designers Society of America, he runs his own firm, RC Grace LLC, in Daytona Beach, Fla., and can be contacted at [bob@rcgrace.com](mailto:bob@rcgrace.com).



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