



September 20, 2024

Dear Mr Saberton/Matt

It was pleased to take your briefing on August 29, 2024 to learn more of your proposal to put UV-C onboard aircraft as a layer of bio protection. As a matter of background, the idea of protecting our aviation and transportation network as well as the rest of our indoor spaces is one I have championed now for over 40 years. Your implementation plans align directly with the best available science, the tenets of the new ASHRAE Standard 241, "Control of Infectious Aerosols" (obviously directed at buildings but the tenets are the same), the multi-layered air defense model to protect indoor air that I championed as an Air University Visiting Scholar, as well as the most recent CDC guidances.

For context, while I have been offered compensation from several commercial entities over the past decade, and especially the past 4 years since COVID focused our attention on the "*inside threat*" that shared indoor air poses, I have purposefully chosen to remain as an uncompensated advocate in the fight for clean indoor air. In this role I work individually as a member of the medical community active on the local, regional and national scenes across multiple venues as well as an Air University Visiting Scholar.

Further with support from the Mission-Next Foundation (501c3), I Co-Chair of the SAFE ASAP Campaign. ("*Safe Air For Everyone, Advocates for Safe Air Policy*"). The impressive SAFE ASAP Interns and Fellows are young professionals, many interested in Aerospace Medicine, supported in an interdisciplinary and intergenerational way, all committed to driving solutions at scale for our nation. My Co-Chair is Jim Mathews, the President and CEO of the Rail Passengers Association who is the former Executive Editor of Aviation Week. Jim is a trusted agent that I have worked with on several high visibility projects since meeting him in 2014. Jim knows transportation and public policy and knows how to get things done.

The foundation for our work is education, because we believe people make the best decisions when they have unbiased information. In this spirit we put our research into the public domain under the *Creative Commons Attribution NonCommercial-NoDerivatives 4.0 International License* to encourage dissemination and to build a coalition of advocates. I speak for Jim and the entire team in thanking you for the help at getting the word out that solutions are available to protect the air we breathe.

I was impressed by your presentation, your commitment to best available science, the team you have put together, and am excited about your well thought out and detailed pathway to getting UV-C in commercial aviation and then in other applications. Further, I was pleased that

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you have aligned yourself with trusted members of the Aerospace Medical Association. In fact, early in the pandemic, I hosted a webinar for the Mission-Next Foundation in collaboration with AsMA that reached an international audience advocating for layered clean air technologies. Here we advocated for UV-C and other technology in not only commercial aviation, but all parts of our transportation sector as well as the other critical infrastructure sectors as designated by the Department of Homeland Security.

Specifically, I am very pleased by your choice of technical advisors with US Navy CAPT (ret) Dr Kris Belland. I know Kris as a well-respected Past President of the Aerospace Medical Association. He and several of his colleagues have successfully championed an AsMA resolution calling for the use of UV-C in commercial aviation, and they have donated their time generously to the SAFE ASAP campaign and our young professional interns and fellows working for clean air for all. You picked the right people to collaborate with!

As a matter of my personal and professional background, I “grew up Air Force” and am a proud multigenerational Airman. I was born into an Air Force Family, where my father served directly for General Curtis LeMay. This was prior to and then at the very beginnings of an independent Air Force. Prior to his retirement in 1977, my Father was the Military Airlift Commander, and my son is now a retired Air Force Fighter pilot: service as an Airman was the Carlton “family business” over three generations and 80 years.

I graduated from the Air Force Academy in 1969, choosing a path of medicine and then surgery. Interestingly, at the time of my graduation, when called into the Commandant’s office (Brig Gen Robin Olds, the most competitive man I ever met) he asked me why I wasn’t going to pilot training and inferring only pilots were “real Airmen” (he did not know I had a color vision deficiency that would preclude me from meeting the pilot physical). I pushed back and told him I was “going to be a *real Airman...a Medical Airman.*” I think he was somewhat surprised but accepted my answer. I learned from **men** like General Olds, General LeMay and my Father: , the best leaders had skin in the game, led from the front, and constantly refined and practice their craft. Thus, throughout my entire career, and unlike many of my peers, I prioritized maintenance of my clinical and surgical skills, taking trauma call for Southwest San Antonio when I commanded Wilford Hall Medical Center, the Air Force’s flagship medical center well into the late 1990’s. I only stepped away from most clinical responsibilities when I moved to the Pentagon as the Air Force’s 17th Surgeon General (1999-2002).

These experiences shaped me in several important ways throughout my career. I never forgot that I served in my Father’s Air Force, the one that I had inherited. Here we sat on hair trigger launch authorities. It was one where we focused on the “*outside threat*” coming from strategic airborne missiles and bombers attacking the homeland. Further, as an operating wartime

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surgeon, I led a team that constantly looked at ways to improve surgical outcomes, which included infection control techniques and technologies. When others saw a problem, we saw an opportunity to find solutions to save lives and enable the mission. Finally, because I continued to serve my craft as a surgeon for almost my entire career, I recognized that while our plans may be big and strategic, we must always remember that wars are fought by small teams of dedicated individuals. It was here at the pointy end of the spear, or in my case the scalpel, that we win or lose the war: my responsibility was to ensure these small teams and individuals are adequately organized, trained, equipped... and protected... so they could do their mission.

This way of thinking served me well from the beginning to the very end of my Air Force career. On September 11, 2001, I found myself as the Air Force Surgeon General on the ground at the Pentagon directing rescue operations based upon concepts we had exercised the month before. The irony was that my Father's Air Force, and the one that I had inherited, was so well prepared for the "*outside threat*" from strategic attack from bombers and missiles, but we were in fact highly vulnerable from a threat that attacked through the air and launched from within the homeland. I call this the "*inside threat*."

COVID raised our nation's awareness that the "*inside threat*" could once again attack us through the air, in this case by way of a biologic agent. Our lackluster national response has demonstrated our nation's vulnerability, and my fear is that this pandemic, whether engineered or naturally occurring, could be the forerunner of a bio-attack. Our adversaries, whether state or non-state, recognize our weakness and lack of preparation, which makes it all the more likely that they could utilize a bio-weapon that could cripple the United States and our place in the world. Once you understand this imperative you can not ethically look away: that is why I do what I do and I am pleased you and your team feel the same way.

Further, all of us who served in uniform during the 1970's and into the 1990's recognized the threat from full-spectrum warfare as we prepared to face an adversary willing to use all available weapons, including conventional weapons but also chemical, biologic, and nuclear ones. What really brought the magnitude of the risk into perspective was a tabletop exercise I commissioned and oversaw in 2001. In the UNCLASSIFIED debriefing of this exercise, we demonstrated that an infectious disease easily dispersed at the San Antonio International Airport could circle the globe within three days and disrupt the functions of society, both friend and foe, for the entire developed world. Again, once a person sees this, they must not look away.

Based upon the science that informed how to mitigate this airborne threat, I worked through the 1980's to my retirement in 2002 to protect our Air Force airlift, medical and en route care

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capabilities. After retirement, I began a long association with the Texas A&M University, serving as their Director of the Homeland Security Initiative at Texas A&M University Health Science Center. Here I was able to lead a team that was focused on comprehensively addressing at scale human health threat mitigation for the nation. I realized that the solutions we looked for transcended government, academia and business: we must all work together to address these vexing issues that threaten our society.

During this time I found a small group of professional engineers working on practical solutions, including a small Houston, Texas HVAC manufacturing company run by an application engineer, Bill Tillman. Bill was developing tailored multilayered solutions to protect the air and had set up a home workshop and laboratory in Fredericksburg, Texas. I have learned much from him and continue to work closely with him as an advisor. We have had excellent success with the work he has done for both defense, medical and commercial applications. I extend a standing offer from me to meet you in Fredericksburg to tour Bill's laboratory and workshop and exchange ideas...you have much in common and both are working towards solutions with a common goal to protect society against the airborne threat.

While now retired from Texas A&M University, I maintained close relationships with several of the departments there. Further, from 2015 until the present I have served as an Air University Visiting Scholar, lecturing and engaging with faculty and students while supporting both their educational and research activities. Remaining engaged with the education of our young people and the research they do is a way for me to pay the lessons passed on to me to a new generation.

In late January, 2020, I briefed the Air University LeMay Commander about the need to mobilize the University to proactively respond to the threat of COVID. In late February 2020 I helped stand up and then chaired the "Air University COVID Survive to Operate" task force. We were a unique entity, an interdisciplinary and intergenerational group of subject matter experts bridging the Air Force and Department of Defense, academia, government, business and philanthropy charged with developing a strategy to keep our nation's 16 dual-use (military-civilian) critical infrastructures functioning.

We published these findings and recommendations throughout the spring and summer of 2020. At the time we were collaborating between the Air University and the McCrary Institute at Auburn University, which reports through the Cybersecurity and Infrastructure Security Agency to the Department of Homeland Defense. I have included a copy of our most comprehensive document, which was distributed widely across the Federal Government and industry in the summer of 2020. Of note, this document, written in May of 2020 and published in early July 2020. This as you will recall nearly a full year (May 2021) before the Centers for Disease Control

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admitted that airborne spread of COVID is spread predominantly through the air. Further, the Federal Government did not actually encourage aggressive actions based upon best scientific information until the *“Clean Air in Buildings Challenge”* released by the Biden Administration and the EPA in March 2022. The logical conclusion is that to prevent disease transmission you must protect the air we all must breathe. It took our nation fully 24 months to come to grips with this at the cost of trillions of dollars and over a million lives.

While I of course continue to support all of the traditional public health guidance such as social distancing, cough etiquette, judicious use of masks, vaccines, and hand washing, in reality many of these interventions were probably little more than “COVID theater” and clearly not enough. (The focus on bleaching packaged food from the grocery store is an example). The key is really a multi-layered model based upon the NIOSH Hierarchy of Controls, which gives preference to engineering solutions as more effective than either personal protective equipment or policy.

The Air University and several other collaborating institutions acted based upon on our early 2020 recommendations by investing in both layered technologies and better ventilation systems based upon the best science we had at the time. Several of these successful applications included UV-C. Each early adopter showed excellent results through the beginning of the pandemic with the ability to function with minimal operational impact from COVID. Our recommendations from 2020 and early 2021 not surprisingly aligned with the July 2023 release of ASHRAE standard 241 “Control of Infectious Aerosols,” which places an emphasis on increased air exchanges with fresh filtered air, followed by air exchange equivalents using UV-C and HEPA filtration as next line protection. Your approach fits right in with these recommendations.

Our group advocates for the application of layers of both active and passive technologies. The discriminator for me is that for passive technology to work (far or shielded UV-C, HEPA filtration and micro-coatings), we must bring the pathogen to the technology. This requires good airflow and air mixing, like what is found on commercial airliners. Active technologies (either through the use of ionization or UV activated photocatalytic plates) in theory produces charged “pathogen scavengers” to deactivate or agglomerate the micro particles (< PM 2.5) that pathogens travel on. Both types of technology have their place in practice, but I recommend starting with air exchanges with fresh filtered air with layer of UV-C and HEPA filtration as first line approaches.

For many years we have said “sunlight is the best disinfectant” and there is considerable truth in this statement. This was already being examined in the late 19th century, and when I reviewed the original data of the Spanish Flu pandemic from Fort Deven’s in Massachusetts, the attending Surgeon reported an almost 3 times mortality for patients housed in the rooms of the

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hospital compared to those housed in tents. This was likely because those housed in the tents breathed a replenished supply of clean air, likely disinfected by UV-C from the sun. As you know, of all the technologies I have described, far or shielded UV-C has the longest track record for both effectiveness of pathogen inactivation with a favorable safety profile with applications in the 1930's for measles control and later in the 1950's and 1960's for Tuberculosis control.

Incidentally as a physician I find it very frustration that my many of my colleagues still focus almost exclusively on surface transmission and ignore the role that airborne transmission has in infectious disease transmission. This fatal flaw in our education system is because of a 100-year embrace of "germ theory" and ignorance of other modes of pathogen transmission. Only now are we beginning to recognize that facility maintenance professionals who control the quality of the air we breath probably have more impact on our respiratory health than our doctors do.

Clearly as you know a non-profit 501c3 such as the Mission-Next Foundation and the SAFE ASAP Team can not and will not endorse any particular company or product or give the impression of engaging in commercial activity. Rather education is the cornerstone of our efforts along with the SAFE ASAP Team of young professionals and has been since our founding in early 2021. On a personal level I thank your team for their tireless advocacy of education at all levels as well as their volunteer work with the SAFE ASAP Team.

I am, however, willing to go on the record as an uncompensated professional to educate decision makers on how to protect their enclosed shared air. This includes commentary on commercial cost-effective proposals that align with the multi-layered model, are based upon the best science. I standby to discuss the model and implementation strategies with anyone committed to our shared values. This includes discussion of where the UV-C technology you are proposing fits into the model and brings a safer environment for passengers and crews.

Please share my contacts with anyone who may be interested in discussing more, with warm regards,

Lt. Gen. (ret) Dr. PK Carlton, Jr.
17th Surgeon General of the US Air Force
Co-Chair, SAFE Indoors Campaign, ASAP Council

Attachment 1: A Multi-Layered Air Defense Model to Protect Shared Air in Critical Infrastructure Sectors (Auburn/McCrary- Air University, July 2020)

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