

AVIATION WEEK

Program Excellence Awards 2022

November 2, 2022

The Watergate Hotel • Washington, DC

Nomination Form



INTELLECTUAL PROPERTY

(This section must be signed)

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Thank you for participating,

Gregory Hamilton
President
Aviation Week Network

Acknowledged, agreed, and submitted by

May 11, 2022

Nominee's Signature

Date

Nominee's Name (please print): Michael P. Delaney

Title (please print): Chief Aerospace Safety Officer, Senior Vice President

Company (please print): The Boeing Company

NOMINATION FORM

Name of Program: Confident Travel Initiative

Name of Program Leader: Michael Delaney, Chief Aerospace Safety Officer, Senior Vice President

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Customer Approved

- Date: _____
- Customer Contact (name/title/organization/phone): _____

Supplier Approved (if named in this nomination form)

- Date: _____
- Supplier Contact (name/title/organization/phone): _____

**PLEASE REFER TO PROGRAM EXCELLENCE DIRECTIONS
AS YOU COMPLETE THIS FORM.**

EXECUTIVE SUMMARY: Make the Case for Excellence (Value: 10 pts)

What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration?

(12 pt. Times New Roman) LIMIT YOUR NARRATIVE TO THIS PAGE.

Boeing Confident Travel Initiative

As the COVID-19 virus spread worldwide, the aviation industry faced an unprecedented threat as questions emerged about the safety of air travel. To help navigate this public health emergency, Boeing took decisive action to combat the pandemic with the launch of the [Confident Travel Initiative](#) (CTI) in April 2020. Boeing’s foundational mission: make air travel safer for everyone and ensure a global approach to supporting the industry’s recovery.

Led by teams in the U.S. and abroad, Boeing harnessed ingenuity from across the company to advance research and technology development. The CTI team treated COVID-19 like any threat to the safety of an airplane – by assessing the hazard, understanding the environment, and applying proven aerospace engineering practices and data to find solutions. The research focused on several key areas, including:

- Methods to effectively and efficiently kill viruses inside the cabin
- New disinfection technologies
- Cabin air analysis
- Passenger screening and relative risk modeling

This research strengthened air travel safety and helped inform decisions on passenger air travel protocols worldwide. Throughout this process, Boeing transparently shared [internal research](#) and closely collaborated with airline customers, global regulators, and industry associations along with academic and medical institutions. The unified approach brought much-needed support to the aviation industry’s short and long-term recovery.

Boeing sees this work and its results as a resource to the industry and decision-makers for use in the collective fight against COVID-19. Over the last year, the team has worked with government stakeholders to secure commitments at the 2021 G7 and G20 forums to harmonize standards globally. That work continues and Boeing recognizes that this effort requires a commitment to future-proof the system for similar exogenous shocks and ensure that the health and safety of passengers, crew, and communities are protected.

Do not exceed 10 pages in responding to the following four descriptions; allocate these 10 pages as you deem appropriate, but it is important that you respond to all four sections. DO NOT REMOVE THE GUIDANCE PROVIDED FOR EACH SECTION.

VALUE CREATION (Value: 15 pts)

Please respond to the following prompt:

- Clearly define the value of this program/project for the corporation
- Clearly define the value of this program/project to your customer
- Clearly define the value of this program/project to members of your team
- Clearly define the contribution of this program/project to the greater good (society, security, etc.)

(12 pt. Times Roman)

Overview

Unlike any other time in history, the COVID-19 pandemic impacted every aspect of society—including how we travel and connect with the world around us. Through the Confident Travel Initiative, Boeing took a multi-layered approach to protect passengers and support the aviation industry. The team also shared Boeing research to help with the broader global effort to better understand the virus and minimize transmissions in countries around the world. The CTI achievements brought value to airline customers by helping stabilize the aviation industry, benefited the global COVID-19 research conducted by academia and medical experts, enhanced Boeing’s rapid response to pandemics and strengthened partnerships across industries.

Customer Value

For airline customers and the aviation industry, the CTI is helping them navigate the pandemic. At the beginning of this public health emergency, there was little known about the COVID-19 virus and passenger-to-passenger transmission. Immediately, Boeing collaborated with airlines and operators to understand their concerns and evaluate additional operational measures to keep airplanes virus-free. The CTI team focused on testing and researching aircraft cleaning methods that kill viruses, rapidly developing new disinfection technology, and conducting a comprehensive analysis of cabin air inside the airplane. This yielded data-driven solutions and validated findings that helped airlines combat the virus and protect the safety of passengers and crew.

First, Boeing advised operators on existing, EPA-approved disinfectants that are compatible with airplane flight decks and cabins while testing other sanitizers. Boeing issued a Multi-Operator Message (MoM) detailing the processes and products recommended to maintain the cleanliness of the cabins and flight decks. Since January 2020, Boeing released more than 13 updates to its MoM related to COVID-19, providing enhanced guidance on fleet issues. Through the Clean Airplane Program, Boeing provided information on cleaning regimens to kill the virus on surfaces in common places passengers touch like seats, overhead bins and tray tables.

Boeing also developed new solutions that could help airlines further disinfect and sanitize the airplane. The team created and commercialized an ultraviolet (UV) light wand that airlines can now use to disinfect the flight deck in fewer than 15 minutes. Teams also advanced research into thermal disinfection. Both methods provide operators with safe, practical alternatives to chemical disinfection while ensuring sensitive avionics equipment remain protected from damage.

Through the Confident Travel Initiative, the Boeing team conducted a comprehensive analysis of the cabin air. Using computational fluid dynamics (CFD), Boeing research validated the effectiveness of the airplane's environmental control system to remove airborne particles inside the cabin. The analysis showed significantly fewer particles reached the breathing zone of neighboring passengers on an airplane compared to people sitting at similar distances in common indoor environments. That is due to the design of the cabin and the airflow system, which significantly reduces and removes particles from the air. Boeing's CFD models were validated by airplane testing on the ground and in flight.

To safely expand international travel, Boeing experts also analyzed the effectiveness of COVID-19 passenger screening and quarantine protocols around the world. The research showed test-based screening protocols can be just as effective as quarantines when traveling from countries with a higher prevalence of COVID-19. The modeling and findings contribute to the aviation industry's data-driven, global approach to promote safe, efficient travel.

From new technologies to research, the Confident Travel Initiative helped inform decisions on passenger air travel protocols around the world. It provided airlines with enhanced health safeguards and solutions to protect passengers and crew. This helped stabilize the aviation industry and start the process of restoring travel rates to pre-COVID-19 levels.

Societal Benefit

Commercial air travel connects people, cultures, economies and products around the world. From the start of the pandemic, there was a role for the aviation industry to help society. Working with airlines, regulators, and others, Boeing aided with the essential work to move goods that keep people safe, specifically with the transportation of personal protective equipment on Boeing-owned aircraft. Through the CTI, Boeing also provided guidance to airlines on the transportation of vaccines using dry ice.

But beyond the logistics, the CTI technologies and research could be used to combat COVID-19 within the aviation industry and in other aspects of society. For example the UV wand and antimicrobial development both have applications outside of the airplane cabin. Boeing's research into cabin airflow yielded insights into the importance of air filtration and air exchanges in minimizing particle movement in everyday indoor environments. More recently, Boeing's passenger screening modeling is helping reconnect the world by providing governments, regulators, and industry stakeholders with validated findings that can help inform their decisions on safe international travel.

Through the CTI, Boeing's methodologies, solutions and findings were shared to benefit other research communities in the medical and academic fields. The CTI Team actively engaged with experts to merge aerospace-related findings with the broader research around COVID-19. Over the past year, Boeing collaborated with more than two dozen entities as part of the CTI, including:

- Center for Disease Control and Prevention (CDC)
- U.S. Department of Defense
- Cleveland Clinic
- Mayo Clinic
- Harvard University
- Columbia University, New York City
- University of Nebraska Medical Center (UNMC)
- The University of Queensland, Australia
- The University of Arizona

- National Institute for Aviation Research

In some cases, Boeing partnered to conduct research and analysis. For example, in a first-of-its-kind series of tests, Boeing and the University of Arizona determined that airlines' current cleaning solutions effectively destroy the virus that causes COVID-19 with live virus testing on an airplane. This work brought together academic theory, physical validation, and consideration for the complex aircraft environment. The University of Arizona also worked with Boeing to conduct thermal disinfection research. The University of Queensland and NASA were partners in the antimicrobial testing onboard the International Space Station. Boeing also collaborated with the U.S. Transportation Command (USTRANSCOM) and other research partners to conduct cough particle testing onboard airplanes on the ground and in flight. Those findings helped inform future decisions on how USTRANSCOM transports U.S. Department of Defense personnel on chartered flights.

Outside of research partnerships, Boeing worked directly with the academic and medical communities to conduct independent, third-party analysis of the CTI research findings. Boeing worked extensively with the University of Nebraska Medical Center, Harvard University, and Columbia University. This proved pivotal to validating the CTI findings as well as strengthening Boeing's relationship with these institutions to conduct further joint-research efforts.

Boeing also published more than a dozen in-depth research papers on the Boeing Confident Travel Initiative website. These covered a variety of topics including air ionization, ultraviolet light disinfection, thermal disinfection, airplane airflow analysis using computational fluid dynamics, modeling and analysis of effective screening protocols and SARS-CoV-2 transmission risks. Although focused on aerospace, the underlying research is applicable to the medical community and other industries. The published research papers allowed others an opportunity to analyze and review Boeing's methodologies and findings.

From the beginning of the CTI, the objective was to strengthen air travel safety and combat COVID-19. As part of this effort, Boeing has led the integration and alignment across industries by uniting different elements of society together around air travel. This included discussions with health experts and universities along with trade association groups that included other original equipment manufacturers like Airbus and Embraer, and major industry travel associations and regulators including the International Air Transport Association (IATA), Federal Aviation Administration (FAA), International Civil Aviation Organization (ICAO), and Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation (CAPSCA). Through networking and transparency, Boeing research contributed to a better understanding of the COVID-19 transmission risks and the current work underway to keep passengers safe.

Boeing Value

For the company, the initiative strengthened Boeing's ability to rapidly respond to a global crisis. Through the CTI, Boeing set a new standard for successfully aligning efforts across the enterprise to address the safety threat posed by the pandemic. The global research team was intentionally structured to include experts in various fields from engineering to mathematics, which provided a diversity of thought to find solutions. This allowed Boeing to take a systematic, holistic approach using aerospace principles and practices to implement protections to keep people safe.

Throughout this process, the CTI team documented its engineering approach, best practices and team structure to accelerate research and technology development. This allowed the company to capture, maintain, and share knowledge, as well as record lessons learned, that will pay dividends on future

programs. Additionally, this enhanced the development of the research team, which will take these learning with them throughout their careers.

The initiative provided development opportunities for many on the team. Leadership roles within the program were based on knowledge and capability, rather than title. Team members were empowered to connect directly and establish working relationships with internal and external leadership, and aviation industry stakeholders.

By operating transparently, Boeing also deepened its relationships with others in the aerospace business and established new partnerships with universities and medical communities. With airlines and industry associations, Boeing remained in constant contact, providing updates, guidance and new technology research findings. With other stakeholders, the CTI forged relationships that opened up new opportunities to work together on air travel safety.

METRICS (Value: 15 pts)

Please respond to the following prompt:

- What are your predictive metrics?
- How did you perform against these metrics?
- How do your predictive metrics drive action toward program excellence? Please provide examples.

(12 pt. Times Roman)

Given the dynamic environment and the need to remain agile, the CTI team established three simple metrics to track progress towards program excellence. This included passenger traffic trends, sentiment analysis, and tracking the harmonized global policy standards as it relates to the air travel industry. These metrics allowed the CTI team to focus their advanced research efforts and identify potential pivot points to support the industry.

The first of these three metrics was passenger traffic trends. The team tracked both domestic and international Revenue Passenger Kilometers (RPK) trends and bookings to understand the changing landscape throughout the various stages of the pandemic. This provided crucial data and helped identify where passenger traffic was picking up and slowing down and supported strategic decision-making for the initiative. Since the objective of the program is to safely restore domestic and international travel to pre-COVID levels, tracking passenger traffic is a fundamental step to determining progress and focusing CTI resources to support global markets.

The next predictive metric used was sentiment analysis to gauge public perception surrounding air travel during the pandemic. This analysis was completed through a number of survey, market research, and communications methods to identify public concerns where Boeing could focus its expertise and provide data to restore confidence in air travel. For example, early survey results found that, on average, the part of the air travel journey where most people had concerns was in flight. This insight drove the CTI team's focused and purposeful response in developing the Clean Airplane Program and the cabin air analysis research, both mentioned previously in the CTI's achievements. Throughout the program, the CTI team used sentiment analysis, along with input from customers, industry and other key stakeholders, to set research priorities for the program. In addition, the analysis provided data-driven research showing an increase in passenger confidence.

Finally, the CTI team tracked the global progress towards a data-driven, harmonized approach to air travel policy. The team developed a number of "scorecards" to track the harmonization of protocols. One example was a one page analysis that detailed each of the G20 countries' current international travel

protocols and the associated relative risk reduction of those protocols (calculated as an output of the Initiative’s relative risk modeling). This metric provided an at-a-glance understanding of where protocols were syncing across the globe, and where progress was stagnant or declining. This information then provided a basis for strategic discussions on where to focus efforts. As international travel corridors, COVID-19 health credentials, and protocol frameworks were developed and implemented, the CTI team continued to use these tracking methods to identify opportunities to contribute to the conversation and arm decision-makers with the research and data to help facilitate the re-opening of borders.

These three metrics proved pivotal to tracking the CTI team’s progress towards program excellence. They provided simple, clear metrics tied directly to Boeing’s key objectives of ensuring the safety of everyone who travels and supporting the industry. Moving forward, the benchmarks will continue to be utilized to monitor the short and long-term recovery of the industry.

DEALING WITH PROGRAM COMPLEXITY (VOLATILITY, UNCERTAINTY, COMPLEXITY, AMBIGUITY, OR VUCA) (Value: 25 pts)

Please respond to the following prompts:

- 10 pts: Describe areas of VUCA faced by your program and why.
 - 15 pts: Explain how your team responded to these challenges.
- (12 pt. Times Roman)

Overview

Volatility, uncertainty, complexity, and ambiguity (VUCA) are all words that accurately capture the early days, weeks and months of the COVID-19 pandemic. At this time two years ago, there was little known about the deadly virus threatening billions of people worldwide, but it required immediate action to protect everyone. Against this backdrop, Boeing launched the Confident Travel Initiative to lead in the effort for the aviation industry. The CTI team approached the problem from an engineering perspective aimed at reducing air travel risk by rapidly responding to the VUCA posed by this new virus.

New Air Travel Safety Threat

In response to the pandemic, Boeing mobilized to combat this new threat to the safety of passengers and the broader aviation industry. The CTI team engaged with airline customers, industry associations, medical experts, and policy makers to gain insights into the complexities of the virus and industry impact. This included hundreds of stakeholder meetings, symposiums, and other engagements. In addition, the team conducted several rounds of market research and sentiment analysis to understand the specific concerns of passengers. This work helped the CTI team prioritize the immediate needs to stabilize air travel and long-term solutions to improve the system.

As a result, the CTI established research work streams for various aspects of air travel safety. Through a natural progression, this research was always expanding and evolving as we learned more about COVID-19. Initially, the research focused on assessing the existing safeguards throughout the air travel system, such as disinfection methods and solutions to keep the airplane virus-free and the effectiveness of the environmental control system at removing airborne particles from the cabin.

This research complimented Boeing’s work to advance new technologies that improve the system. To help airlines, Boeing validated two new methods that could change the way airplanes are sanitized. Boeing engineers developed and confirmed the efficacy of a UV wand in just six months. Teams

conducted extensive thermal disinfection testing proving it reduces viruses on the flight deck. In addition, the team made advancements with research into a new antimicrobial coating.

These technologies were all active research projects within the company prior to the pandemic. Through the CTI, the Boeing team was able to fast-track these development efforts to address the public health emergency. All of this research was driven by Boeing's focus on safety and helping the aviation industry—which is dealing with an ever-changing COVID-19 threat that continuously poses new challenges requiring solutions.

Global Regulations and Protocols

With COVID-19 outbreaks increasing worldwide, air travel restrictions and government policies emerged in the months following the start of the pandemic. This created volatility and uncertainty for travelers, airlines and others around the world. In response, the CTI team mobilized its modeling and analysis team to conduct new research to help inform future policy decisions and safety protocols based on data-driven findings.

Boeing conducted ground-breaking computational fluid dynamics analysis of particle movement onboard an airplane. This allowed Boeing to compare particle movement inside the cabin with a common indoor environment. The research showed passengers sitting next to one another on an airplane is the equivalent of maintaining a physical distance of greater than 7 feet in terms of viral particle mass exposure. The research findings helped inform decisions regarding mandatory mask requirements and passenger capacity onboard airplanes.

More recently, the CTI team conducted an analysis of passenger screening methods to further minimize disease translocation in an effort to help safely expand international travel. With the development of the Boeing Screening Air Travelers for Entry (SAFE) model, the analysis shows screening protocols offer an alternative to mandatory quarantines. The findings can help global regulators evaluate screening and testing protocols that encourage safe travel and minimize quarantine requirements. The work is ongoing as researchers now model scenarios with vaccinated travelers. As data on new COVID-19 variants becomes available, it will also be incorporated.

Both of these research efforts were conceptualized, initiated, and completed in direct response to emerging challenges during the pandemic.

New Research and Information

To address new safety threats and challenges posed by the pandemic, the Boeing team needed to closely monitor the evolving COVID-19 research published in medical and scientific journals. In parallel to conducting Boeing research, the CTI team was always monitoring and evaluating research on COVID-19 with a focus on aerosol transmission, fomite transmission, and air travel case studies.

For example, the team monitored the published research regarding passenger-to-passenger transmissions on flights. In total, the team found less than 60 suspected cases with over 2.1 billion passengers traveling in 2020. Although this didn't account for underreporting, the information proved valuable to establishing the transmission risks associated with air travel. Reviewing this peer-reviewed published research helped validate Boeing's internal analysis that showed the risk of contracting COVID-19 remains extremely low due to the multi-layers of protection inside the airplane and throughout the air travel journey.

Additionally, the CTI team published a peer-reviewed article quantifying the low risk estimated using these aforementioned publications.

The CTI team also conducted deep-dives into published research surrounding airflow and viral transmission. In fact, Boeing's new research established that the underlying Wells-Riley model used in several studies did not accurately account for the cabin design and airflow system in helping minimize the risk of disease transmission on airplanes. That's because applying the Wells-Riley well-mixed assumption to the airplane cabin does not address the direction of flow, or the spatial gradient of concentrations. This finding is now being shared with the broader research community in a research article that has recently been accepted for publication in a peer-reviewed journal.

In addition, the CTI researchers also actively reached out to the authors of COVID-19 research to learn more about newly published papers and share Boeing's internal research. This proved valuable because it created a forum for researchers to share findings and collaborate. However, it was also an example of the complexity of fighting a new virus. As a result of this open dialogue and knowledge sharing across research communities, Boeing was continuously incorporating new findings and data into its ongoing research and analysis.

Conclusion

By the very nature of the pandemic, there was always volatility, uncertainty, complexity and ambiguity. Throughout this process, the CTI team understood the virus would continue to pose new risks and problems. It was critical that Boeing consistently evolved its research to pivot to areas of critical need focused on passenger safety. Although there was uncertainty, the CTI team was always ready to quickly respond because the core mission never changed: make air travel safer.

ORGANIZATIONAL BEST PRACTICES AND TEAM LEADERSHIP (Value: 35 pts)

Please respond to the following prompts

- 15 pts: Describe the innovative tools and systems used by your team
- 10 pts: Define how you developed, led and managed people
- 10 pts: How did you leverage skills and technologies of your suppliers?

(12 pt. Times Roman)

Tools and Systems to Achieve Program Excellence

One of the primary and consistent themes throughout the CTI has been to keep practices simple yet enable cross-functional alignment and responsiveness. The CTI team developed a number of innovative practices to ensure the initiative's success. Many of them have now become best practices for replication in other parts of the company.

While adaptability was paramount given the dynamic environment of COVID-19, a stable operating rhythm was critical to keeping this multi-functional team in sync to prioritize near-term action. The team held daily tactical leadership meetings to report and align on near-term priorities. There were weekly strategic discussions and decision-making, along with deep dive discussions on new research and technologies. This structure enabled efficient discussions with leaders and experts, and helped avoid time-consuming ad-hoc meetings. As part of this operating rhythm, the team also reserved direct access to the Executive Council with weekly progress updates and an opportunity for feedback and direction at the highest level of the company. This ensured top to bottom alignment and quick resolution of issues and roadblocks.

Another key objective was to operate with openness and transparency. This led to the development of an external website to share in-depth research papers. The team leveraged white papers to document research methods and findings to share with the industry. These were published to the website for external use. Additionally, there was a need to share this research in various engagements including conferences, customer meetings, and other forums. The team developed a library of standard material that could be tailored to different audiences, as well as a robust change process to ensure alignment and consistent updates to the material.

Develop People and Transfer Knowledge

To execute with excellence, the CTI incorporated the best engineering practices of aerospace engineering with a rapid response to the dynamic, ever-changing environment. This initiative provided an opportunity for a different approach to leadership roles and created development opportunities for many on the team. The program broke down the traditional thinking on hierarchy and levels of management by providing leadership opportunities to people who had the knowledge and capability, irrespective of titles. Team members were also enabled and empowered to connect directly with internal and external leadership, customers, governments, and other stakeholders.

Since infectious disease-modeling and public health are not part of Boeing's core business, the CTI team relied on external collaboration and assembled an advisory board with experts from multiple universities and research institutions. While the team developed the various models and analyses, these experts provided the CTI team with information, assumptions, and peer reviews.

The team has utilized Boeing's Design Practices process as a formal method to capture, maintain and share knowledge, as well as record lessons learned. This captured best practices in responding to a pandemic including subjects such as pathogen analysis, customer operations support, cabin air, surface disinfection, and air disinfection.

Customer Engagement

Customer and industry engagement were a critical and multi-faceted element of the program. Understanding the focus areas of our customers and the greater industry helped define the initiative's direction. The CTI team engaged with customers early and often through each of the discovery phases of the research. These engagements led to further discussions with others with the airlines, as well as connections to medical advisory groups and briefings on other industry activities. As the research findings were shared more broadly, the network expanded outside the aviation industry.

Technical research and recommendations were shared with operators through the MoM process, which transitioned to the more typical Service Letter process in December 2020. The CTI team also held monthly customer symposiums, across time zones, to share research and the program's progress with operators. As the focus shifted from the Clean Airplane Program to the modeling efforts and findings, the audience at these symposiums expanded to include other roles within the airlines (Government Affairs, Operations, etc.), airports, and international government representatives. In addition to these wider audience forums, the CTI team held many one-on-one discussions with individual customers at all levels to answer detailed questions about their aircraft.

The CTI team also engaged closely and regularly with industry organizations such as the International Coordinating Council of Aerospace Industries Associations (ICCAIA), IATA, and CAPSCA at the

technical level to review and compare industry modeling approaches, assumptions, and results. The team aided in the development of the ICAO Council Aviation Recovery Taskforce (CART) documents. To share the research as broadly as possible, the team participated in media interviews and briefings, as well as industry panel discussions and speaking engagements hosted by IATA, Airline Passenger Experience Association (APEX), Society of Automotive Engineers (SAE), American Institute of Aeronautics and Astronautics (AIAA), and many others. The initiative also provided graphics and key information to airline customers, translated into multiple languages, as well as direct communications in regions around the world. This material was useful as many customers utilized the information to develop their own marketing material.