

September 7, 2021

The Honorable Steve Dickson
Administrator
Federal Aviation Administration

The attached letter from the NTSB Chairman provides information about the NTSB's August 10, 2021, report *Preventing Turbulence-Related Injuries in Air Carrier Operations Conducted Under Title 14 Code of Federal Regulations Part 121*, NTSB/SS-21/01. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, A-21-25 through -42; Reiterated Recommendations A-17-21 and -22, A-17-26; Classified and Reiterated Recommendation A-17-25). We encourage you to submit your response to ExecutiveSecretariat@nts.gov. If your reply exceeds 20 megabytes, including attachments, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.



Executive Secretariat-CRB
Office of the Managing Director
National Transportation Safety Board
490 L'Enfant Plaza SW
Washington, DC 20594
Email: ExecutiveSecretariat@nts.gov



Office of the Chair

National Transportation Safety Board

Washington, DC 20594

September 7, 2021

The Honorable Steve Dickson
Administrator
Federal Aviation Administration
Washington, DC 20591

Dear Administrator Dickson:

This letter provides information about the National Transportation Safety Board's (NTSB) August 10, 2021, report *Preventing Turbulence-Related Injuries in Air Carrier Operations Conducted Under Title 14 Code of Federal Regulations Part 121*, NTSB/SS-21/01. The details of this safety research and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

As a result of this research, we identified the following safety issues:

- Insufficient submission and dissemination of turbulence observations.
- A lack of shared awareness of turbulence risks.
- The need for mitigation of common turbulence-related injury circumstances.
- The need for updated turbulence guidance.

Accordingly, the NTSB makes the following safety recommendations to the Federal Aviation Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Work with stakeholders to standardize the distribution of pilot weather reports (PIREPs) across and within air traffic control facilities to ensure they are disseminated to only those facilities and air traffic controller positions for which each PIREP applies. (A-21-25) (See section 4.1.1.)
- As a condition of enhanced weather information system approval, require Title 14 *Code of Federal Regulations* Part 121 air carriers to disseminate all turbulence observations to the National Airspace System as pilot weather reports, as well as reports of smooth ride conditions. (A-21-26) (See section 4.1.1.)
- Determine how to harmonize current and future eddy dissipation rate algorithm performance in operational environments and publish the results of this determination. (A-21-27) (See section 4.1.2.)

- Incorporate the automatic dependent surveillance-broadcast weather capability in the next version of the automatic dependent surveillance-broadcast technical standard order. (A-21-28) (See section 4.1.2.)
- After the automatic dependent surveillance-broadcast (ADS-B) technical standard order is revised as recommended in Safety Recommendation A-21-28, require that aircraft flown in Title 14 *Code of Federal Regulations* Part 121 air carrier operations be retrofitted with automatic dependent surveillance-broadcast weather capable ADS-B equipment. (A-21-29) (See section 4.1.2.)
- Require automatic dependent surveillance-broadcast weather (ADS-B Wx)-equipped aircraft to broadcast ADS-B Wx information when operating in airspace requiring automatic dependent surveillance-broadcast capability as defined by Title 14 *Code of Federal Regulations* 91.225. (A-21-30) (See section 4.1.2.)
- In collaboration with the National Weather Service, modify airmen's meteorological information (AIRMET) advisory issuing practices to include graphical AIRMET advisories with higher granularity, taking into account the effect it would have on all National Airspace System users. (A-21-31) (See section 4.2.1.)
- Distribute graphical airmen's meteorological information advisories, significant meteorological information advisories, and center weather advisories to air traffic controllers as controller-selectable layers on current and future controller radar displays in air route traffic control centers and terminal radar approach control facilities. (A-21-32) (See section 4.2.1.)
- Work with local safety councils to develop training on the use of the advisories developed for Safety Recommendation A-21-32. (A-21-33) (See section 4.2.1.)
- In collaboration with the National Weather Service, operationalize a turbulence nowcast, such as the graphical turbulence guidance nowcast. (A-21-34) (See section 4.2.2.)
- Develop air traffic control guidelines for use of the turbulence nowcast operationalized in accordance with Safety Recommendations A-21-34 and A-21-44. (A-21-35) (See section 4.2.2.)
- Incorporate total lightning and hail information as selectable layers on air traffic controller radar displays in air route traffic control centers and terminal radar approach control facilities. (A-21-36) (See section 4.2.3.)
- After the action in Safety Recommendation A-21-36 is completed, provide training to air traffic controllers on the use of the controller-selectable total lightning and hail information. (A-21-37) (See section 4.2.3.)

- Based on National Transportation Safety Board data on turbulence-related Title 14 *Code of Federal Regulations* Part 121 accidents, include in the revisions to Advisory Circular 120-88A, “Preventing Injuries Caused by Turbulence,” in Safety Recommendation A-21-42 the phases of flight and associated altitudes at which flight attendants should be secured in their seats during Part 121 air carrier operations, including in particular the descent phase of flight. (A-21-38) (See section 4.3.1.)
- Conduct a study of how aircraft accelerations vary along the length of the aircraft during turbulence encounters, including differences among aircraft types operated by Title 14 *Code of Federal Regulations* Part 121 air carriers, and publish the study findings. (A-21-39) (See section 4.3.2.)
- Conduct a study to determine the factors that affect caregivers’ decisions about the use of child restraint systems (CRSs) when traveling on a Title 14 *Code of Federal Regulations* Part 121 air carrier airplane with children under the age of 2 and to understand the challenges associated with using CRSs; publish the study findings. (A-21-40) (See section 4.3.3.)
- After the action in Safety Recommendation A-21-40 is completed, use the study findings to direct the Federal Aviation Administration’s efforts to increase child restraint system usage. (A-21-41) (See section 4.3.3.)
- Revise Advisory Circular 120-88A, “Preventing Injuries Caused by Turbulence,” to reflect current best practices and the findings of this research report, such as new turbulence forecasting and warning technologies; training methods; in-flight communications between pilots and flight attendants, procedures, and available information for predicting turbulence; and altitudes at which flight attendants should be secured in their seats. (A-21-42) (See section 4.4.)

In addition, the NTSB reiterates the following recommendations to the Federal Aviation Administration:

- Provide air traffic controllers with automated pilot weather report (PIREP) data-collection tools that incorporate design elements to prevent input errors, increase quantity, and improve the timeliness of PIREPs disseminated to the National Airspace System. (A-17-21) (See section 4.1.1.)
- Incorporate automation technology that captures data elements from air traffic controllers’ displays, including aircraft type, time, location, and altitude, to automatically populate these data into a pilot weather report (PIREP)-collection and -dissemination tool that will enable controllers to enter the remaining PIREP elements and disseminate PIREPs through a common exchange model directly to the National Airspace System. (A-17-22) (See section 4.1.1.)

- Provide a reliable means of electronically accepting pilot weather reports directly from all users who are eligible to submit reports, and ensure that the system has the capacity to accept and make available all such reports to the National Airspace System. (A-17-26) (See section 4.1.1.)

In the same report, we also classified and reiterated one previously issued safety recommendation:

- Encourage industry safety efforts, such as the Commercial Aviation Safety Team and the General Aviation Joint Steering Committee, to identify, develop, and implement incentives for 14 *Code of Federal Regulations* Part 121, 135, and 91K operators and the general aviation community to freely share pilot weather reports (PIREPs), including braking action or runway condition reports filed as PIREPs, to the National Airspace System to enhance flight safety. (A-17-25, classified “Open—Unacceptable Response” in section 4.1.1)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (Safety Recommendations A-21-25 through -42). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e-mail us at the same address for instructions. Please do not submit both an electronic copy and a hard copy of the same response.

Sincerely,

[Original Signed]

Jennifer Homendy
Chair

September 7, 2021

Mr. John D. Murphy
Chief Operating Officer
National Weather Service

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to provide assistance to victims and their family members affected by major transportation disasters.

The attached letter from the NTSB Chairman provides information about the NTSB's our August 10, 2021, report *Preventing Turbulence-Related Injuries in Air Carrier Operations Conducted Under Title 14 Code of Federal Regulations Part 121*, NTSB/SS-21/01. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, A-21-43 and -44). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply exceeds 20 megabytes, including attachments, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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Office of the Chair

National Transportation Safety Board

Washington, DC 20594

September 7, 2021

Mr. John D. Murphy
Chief Operating Officer
National Weather Service
1325 East-West Highway
SSMC 2
Room 15300
Silver Spring, MD 20910

Dear Mr. Murphy:

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to assist victims and their family members affected by major transportation disasters.

We are providing the following information to urge the National Weather Service to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our August 10, 2021, report *Preventing Turbulence-Related Injuries in Air Carrier Operations Conducted Under Title 14 Code of Federal Regulations Part 121*, NTSB/SS-21/01. The details of this safety research and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

As a result of this research, we identified the following safety issues:

- Insufficient submission and dissemination of turbulence observations.
- A lack of shared awareness of turbulence risks.
- The need for mitigation of common turbulence-related injury circumstances.
- The need for updated turbulence guidance.

Accordingly, the NTSB makes the following safety recommendations to the National Weather Service. Additional information regarding these recommendations can be found in the noted sections of the report.

- Work with the Federal Aviation Administration to modify airmen's meteorological information (AIRMET) advisory issuing practices to include graphical AIRMET advisories with higher granularity, taking into account the effect it would have on all National Airspace System users. (A-21-43) (See section 4.2.1.)
- Work with the Federal Aviation Administration to operationalize a turbulence nowcast, such as the graphical turbulence guidance nowcast. (A-21-44) (See section 4.2.2.)

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Sincerely,

[Original Signed]

Jennifer Homendy
Chair

September 7, 2021

Mr. Nicholas E. Calio
President and CEO
Airlines for America

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to provide assistance to victims and their family members affected by major transportation disasters.

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Office of the Chair

National Transportation Safety Board

Washington, DC 20594

September 7, 2021

Mr. Nicholas E. Calio
President and CEO
Airlines for America
1275 Pennsylvania Ave. NW
Suite 1300
Washington, DC 20004

Dear Mr. Calio:

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to assist victims and their family members affected by major transportation disasters.

We are providing the following information to urge Airlines for America to act on the safety recommendation in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our August 10, 2021, report *Preventing Turbulence-Related Injuries in Air Carrier Operations Conducted Under Title 14 Code of Federal Regulations Part 121*, NTSB/SS-21/01. The details of this safety research and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

As a result of this research, we identified the following safety issues:

- Insufficient submission and dissemination of turbulence observations.
- A lack of shared awareness of turbulence risks.
- The need for mitigation of common turbulence-related injury circumstances.
- The need for updated turbulence guidance.

Accordingly, the NTSB makes the following safety recommendation to Airlines for America. Additional information regarding this recommendation can be found in the noted section of the report.

- Coordinate with your member airlines to develop and implement a program to increase child restraint system (CRS) usage in airplanes; this effort should include collecting data to determine the program's effectiveness at increasing CRS usage. (A-21-45) (See section 4.3.3.)

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation A-21-45). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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Sincerely,

[Original Signed]

Jennifer Homendy
Chair

September 7, 2021

Mr. George Novak
President and CEO
National Air Carrier Association

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to provide assistance to victims and their family members affected by major transportation disasters.

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Office of the Chair

National Transportation Safety Board

Washington, DC 20594

September 7, 2021

Mr. George Novak
President and CEO
National Air Carrier Association
1735 N. Lynn Street
Suite 105
Arlington, VA 22209

Dear Mr. Novak:

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We are providing the following information to urge the National Air Carrier Association to act on the safety recommendation in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

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- The need for updated turbulence guidance.

Accordingly, the NTSB makes the following safety recommendation to the National Air Carrier Association. Additional information regarding this recommendation can be found in the noted section of the report.

- Coordinate with your member airlines to develop and implement a program to increase child restraint system (CRS) usage in airplanes; this effort should include collecting data to determine the program's effectiveness at increasing CRS usage. (A-21-45) (See section 4.3.3.)

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation A-21-45). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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Sincerely,

[Original Signed]

Jennifer Homendy
Chair

September 7, 2021

Ms. Faye Malarkey Black
President and CEO
Regional Airline Association

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to provide assistance to victims and their family members affected by major transportation disasters.

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Office of the Chair

National Transportation Safety Board

Washington, DC 20594

September 7, 2021

Ms. Faye Malarkey Black
President and CEO
Regional Airline Association
1201 15th Street NW
Suite 430
Washington, DC 20005

Dear Ms. Black:

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We are providing the following information to urge the Regional Airline Association to act on the safety recommendation in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

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- Coordinate with your member airlines to develop and implement a program to increase child restraint system (CRS) usage in airplanes; this effort should include collecting data to determine the program's effectiveness at increasing CRS usage. (A-21-45) (See section 4.3.3.)

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation A-21-45). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e-mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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Sincerely,

[Original Signed]

Jennifer Homendy
Chair

Safety Recommendation Reiteration List

SR Number	Reiteration Number	Report Number	Report Date	Accident Description	Accident City	Accident State	Accident Date
A-21-040	1	AIR-25-04	7/10/2025	In-Flight Separation of Left Mid Exit Door Plug	Portland	OR	1/5/2024

Safety Recommendation Reiteration List

SR Number	Reiteration Number	Report Number	Report Date	Accident Description	Accident City	Accident State	Accident Date
A-21-041	1	AIR-25-04	7/10/2025	In-Flight Separation of Left Mid Exit Door Plug	Portland	OR	1/5/2024

Safety Recommendation Reiteration List

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