



U.S. Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, DC 20591

November 4, 2020

The Honorable Roger Wicker
Chairman, Committee on Commerce, Science,
and Transportation
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

This letter is in response to the requirement of Section 334 of the Federal Aviation Administration (FAA) Reauthorization Act of 2018 to submit a report on improving runway safety. The report must:

- review the relative benefits and risks of requiring the use of runway awareness and advisory systems in turbine-powered airplanes with a maximum takeoff weight greater than 19,000 pounds;
- review systems capable of detecting wrong-surface alignment to determine whether the capability exists to detect imminent wrong-surface landings at each airport where such a system is in use;
- describe information gathered from the use of the Airport Surface Surveillance Capability (ASSC) system at San Francisco International Airport (SFO) since July 2017;
- assess available technologies to determine whether it is feasible, cost-effective, and appropriate to install and deploy, at any airport, systems to provide a direct warning capability to flight crews or air traffic controllers, or both, of potential runway incursions; and,
- describe FAA efforts to develop metrics that would allow the FAA to determine whether runway incursions are increasing and to assess the effectiveness of implemented runway safety initiatives.

Consultation with the National Transportation Safety Board (NTSB) is required.

The Federal Aviation Administration's Runway Safety Program is continuously working to reduce the risk of runway safety events. The Runway Safety Program's strategic direction is highlighted in the National Runway Safety Plan 2018-2020. The plan aligns FAA's strategic priorities with established Safety Risk Management principles. The plan defines how the FAA, airports, and industry partners collaborate and use data-driven, risk-based decision-making to enhance the safety of the National Airspace System.

In addition, the current FAA runway safety initiatives are documented in the Runway Incursion Safety Issue: Safety Risk Management Document. This document provides an assessment of the hazards and identifies targeted safety requirements to mitigate the current safety risk.

In response to the requirement of Section 334 of the FAA Reauthorization Act of 2018 the FAA submits the following report on improving runway safety:

1. Review the relative benefits and risks of requiring the use of runway awareness and advisory systems in turbine-powered airplanes with a maximum takeoff weight greater than 19,000 pounds

Runway Awareness and Advisory Systems

Runway awareness and advisory systems are currently authorized in 89 percent of the United States Part 121 Air Carriers and 33 percent of the Part 135 operators. The FAA conducted a sample of the runway awareness and advisory system provides and it was reported that these systems were *in use for more than 1 million taxi operations per month* for aircraft operated by Part 91K, 121, 129, and 135 aircraft operators.

The FAA is continuing to evaluate the relative benefits and risks of requiring the use of runway awareness and advisory systems. When combined with several other active safety recommendations, the FAA predicts a 7 percent decrease in general aviation wrong-surface landings, and a 6 percent decrease in commercial aviation wrong-surface landings. Runway awareness systems, such as those within application (app) based Electronic Flight Bags (EFB), are already in use by nearly all domestic air carriers. Runway advisory systems are more difficult to evaluate, as there are few technological solutions. The available systems are extremely cost-prohibitive, and would have a significant financial impact on domestic air carrier operations and subsequently the flying public. The FAA continues to collaborate with stakeholders and industry partners to determine the benefits and risks of requiring such systems versus other possible solutions.

2. Review systems capable of detecting wrong-surface alignment to determine whether the capability exists to detect imminent wrong-surface landings at each airport where such a system is in use

Systems Capable of Detecting Wrong Surface Alignment

In response to the growing number of reported wrong surface departures, landings and aircraft aligned to wrong surface for landing, the FAA reviewed systems capable of detecting wrong surface alignment. Our review identified three systems, Airport Surface Detection Equipment Model X (ASDE-X), Airport Surface Surveillance Capability (ASSC), and Standard Terminal Automation Replacement System (STARS), that can be used to enhance safety by raising air traffic controller's awareness of wrong surface alignment. We have made improvements to our automated Air Traffic Control (ATC) systems (i.e. STARS and ASDE-X) to raise controller awareness of aircraft misalignments and wrong surface or airport landings. The modifications include the capability to display extended runway centerlines, which will further increase controllers'

situational awareness of aircraft aligned to wrong landing surfaces. In addition, ASDE-X has been enhanced to alert when aircraft are approaching taxiways instead of runways.

Currently, the ASDE-X Taxiway Arrival Prediction is operational in Seattle, Atlanta, Windsor Locks, Philadelphia, Charlotte, Dallas/Fort Worth, Detroit Metro, Houston Intercontinental, Orlando, Saint Louis Lambert, Baltimore-Washington, and Chicago O'Hare.

3. Describe information gathered from the use of the Airport Surface Surveillance Capability system at San Francisco International Airport since July 2017

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Based on runway incursion data FAA worked with SFO and NATCA to further refine ASSC in 2017 by essentially increasing the field of view for controllers and allowing for earlier warnings to the controllers of potential wrong runway events.

Another important data review was conducted after July 2017 when Air Canada flight 739 overflew four aircraft waiting on Taxiway Charlie to depart. As a result of this event, several changes were made at SFO:

- The service volume of ASSC was increased to include the approach to the taxiway. This adaption change allowed the aircraft to remain on the controllers display longer. On the night of the event, the aircraft target had dropped off the air traffic controller's display for the last 12 seconds of the approach.
- Runway construction activities were moved later in the evening, after the majority of arrivals had landed.
- All aircraft must be assigned precision instrument approach procedures during nighttime conditions when a runway is closed.
- SFO ATCT extended the hours for swing shift employees, and changed the allowable start time for mid-shift combining of operational positions.

The data reviewed since instituting all of these changes show that there have not been additional events comparable to Air Canada flight 739. Two similar wrong surface alignments occurred, but were identified and corrected by air traffic control.

In addition, the FAA conducted a Special Focus Runway Safety Action Team meeting in SFO on February 27-28, 2018. The meeting included FAA and industry representatives with the purpose of sharing information gleaned to date about the risks of wrong surface operations nationwide, and in particular, at SFO. The goal was to stress the risk of these operations, find contributing factors as to why these events are happening, and determine what can be done to prevent these incidents.

4. **Assess available technologies to determine whether it is feasible, cost-effective, and appropriate to install and deploy, at any airport, systems to provide a direct warning capability to flight crews or air traffic controllers, or both, of potential runway incursions**

Direct Warning Capability to Flight Crews and/or ATC of Potential Runway Incursions

The FAA has three systems that provide direct warning capability to flight crews and/or ATC of potential runway incursions ASDE-X, Runway Status Lights (RWSL) and ASSC.

ASDE-X is operational at 35 locations and provides direct to controller warning. RWSL is operational at 20 locations and provides direct to pilot warning. ASSC is operational at four locations and provides direct to controller warning.

The FAA plans to add an additional 5 ASSC sites, which would total 44 locations with systems that provide direct warning capability to flight crews and/or ATC of potential runway incursions.

The agency is deploying several groundbreaking initiatives to help prevent wrong-surface landings. We are modifying existing ground radar systems to issue an alert when an aircraft is lined up for a taxiway rather than a runway. This Taxiway Arrival Prediction enhancement is already in place at 10 airports and is being installed at 12 more. The agency expects the system to be running at the nation's 35 busiest commercial airports by mid-2020.

5. **Describe FAA efforts to develop metrics that would allow the FAA to determine whether runway incursions are increasing and to assess the effectiveness of implemented runway safety initiatives.**

FAA Efforts to Track the Effectiveness of Implemented Runway Safety Initiatives

The FAA's efforts to monitor safety risk and develop metrics that would allow the FAA to assess the effectiveness of implemented runway safety initiatives is conducted in the Runway Safety Council. This is a joint government/industry group that develops a focused implementation of integrated, data-driven strategies to reduce the number and severity of runway incursions. The Runway Safety Council reports their progress in these efforts in the National Runway Safety Plan (enclosed).

The Runway Safety Council has chartered the Surface Safety Group to track status and effectiveness of implemented runway safety initiatives detailed in the Runway Incursion Safety Issue Safety Risk Management Document version 1.2, Dated July 3, 2018 (enclosed).

While not all initiatives can be directly measured for effectiveness, an example of a runway safety initiative with direct effectiveness measures is the Runway Incursion Mitigation Program. This program uses airport infrastructure projects to enhance areas that have had multiple runway incursions and implement current safety standards. Currently, there are 28 completed projects.

6. Consultation with NTSB

The NTSB participates in the Runway Safety Council, which coordinates the National level runway safety initiatives and their effectiveness.

The FAA consulted in the NTSB Board Meeting on the July 2017 taxiway overflight involving Air Canada Flight 759 at the San Francisco International Airport in, California (SFO). The FAA also consulted and participated in the NTSB Forum “Runway Incursion Safety Issues, Prevention and Mitigation” held in September 2017.

Based on the findings of the investigation into the July 2017 taxiway overflight involving Air Canada at SFO, the NTSB made six recommendations to the FAA. The recommendations are:

Work with air carriers conducting operations under Title 14 Code of Federal Regulations Part 121 to (1) assess all charted visual approaches with a required backup frequency to determine the flight management system autotuning capability within an air carrier’s fleet, (2) identify those approaches that require an unusual or abnormal manual frequency input, and (3) either develop an autotune solution or ensure that the manual tune entry has sufficient salience on approach charts. (A-18-23)

Establish a group of human factors experts to review existing methods for presenting flight operations information to pilots, including flight releases and general aviation flight planning services (preflight) and aircraft communication addressing and reporting system messages and other in-flight information; create and publish guidance on best practices to organize, prioritize, and present this information in a manner that optimizes pilot review and retention of relevant information; and work with air carriers and service providers to implement solutions that are aligned with the guidance. (A-18-24)

Establish a requirement for airplanes landing at primary airports within Class B and Class C airspace to be equipped with a system that alerts pilots when an airplane is not aligned with a runway surface. (A-18-25)

Collaborate with aircraft and avionics manufacturers and software developers to develop the technology for a cockpit system that provides an alert to pilots when an airplane is not aligned with the intended runway surface, and, once such technology is available, establish

a requirement for the technology to be installed on airplanes landing at primary airports within Class B and Class C airspace. (A-18-26)

Modify airport surface detection equipment (ASDE) systems (ASDE-3, ASDE-X, and airport surface surveillance capability) at those locations where the system could detect potential taxiway landings and provide alerts to air traffic controllers about potential collision risks. (A-18-27)

Conduct human factors research to determine how to make a closed runway more conspicuous to pilots when at least one parallel runway remains in use, and implement a method to more effectively signal a runway closure to pilots during ground and flight operations at night. (A-18-28)

These recommendations are all related to human factors and technology improvements.

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These recommendations are all related to human factors and technology improvements.

Finally, this report was shared with NTSB.

We have sent identical letters to Chairman Wicker, Chairman DeFazio, and Ranking Member Graves.

Sincerely,

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Steve Dickson
Administrator

Enclosures

National Runway Safety Plan 2018-2020, update November 29, 2018
Runway Incursion Safety Issue Safety Risk Management Document version 1.2, Dated July 3, 2018



U.S. Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, DC 20591

November 4, 2020

The Honorable Sam Graves
Committee on Transportation and Infrastructure
House of Representatives
Washington, DC 20515

Dear Ranking Member Graves:

This letter is in response to the requirement of Section 334 of the Federal Aviation Administration (FAA) Reauthorization Act of 2018 to submit a report on improving runway safety. The report must:

- review the relative benefits and risks of requiring the use of runway awareness and advisory systems in turbine-powered airplanes with a maximum takeoff weight greater than 19,000 pounds;
- review systems capable of detecting wrong-surface alignment to determine whether the capability exists to detect imminent wrong-surface landings at each airport where such a system is in use;
- describe information gathered from the use of the Airport Surface Surveillance Capability (ASSC) system at San Francisco International Airport (SFO) since July 2017;
- assess available technologies to determine whether it is feasible, cost-effective, and appropriate to install and deploy, at any airport, systems to provide a direct warning capability to flight crews or air traffic controllers, or both, of potential runway incursions; and,
- describe FAA efforts to develop metrics that would allow the FAA to determine whether runway incursions are increasing and to assess the effectiveness of implemented runway safety initiatives.

Consultation with the National Transportation Safety Board (NTSB) is required.

The Federal Aviation Administration's Runway Safety Program is continuously working to reduce the risk of runway safety events. The Runway Safety Program's strategic direction is highlighted in the National Runway Safety Plan 2018-2020. The plan aligns FAA's strategic priorities with established Safety Risk Management principles. The plan defines how the FAA, airports, and industry partners collaborate and use data-driven, risk-based decision-making to enhance the safety of the National Airspace System.

In addition, the current FAA runway safety initiatives are documented in the Runway Incursion Safety Issue: Safety Risk Management Document. This document provides an assessment of the hazards and identifies targeted safety requirements to mitigate the current safety risk.

In response to the requirement of Section 334 of the FAA Reauthorization Act of 2018 the FAA submits the following report on improving runway safety:

1. Review the relative benefits and risks of requiring the use of runway awareness and advisory systems in turbine-powered airplanes with a maximum takeoff weight greater than 19,000 pounds

Runway Awareness and Advisory Systems

Runway awareness and advisory systems are currently authorized in 89 percent of the United States Part 121 Air Carriers and 33 percent of the Part 135 operators. FAA conducted a sample of the runway awareness and advisory system provides and it was reported that these systems were *in use for more than 1 million taxi operations per month* for aircraft operated by Part 91K, 121, 129, and 135 aircraft operators.

The FAA is continuing to evaluate the relative benefits and risks of requiring the use of runway awareness and advisory systems. When combined with several other active safety recommendations, the FAA predicts a 7 percent decrease in general aviation wrong-surface landings, and a 6 percent decrease in commercial aviation wrong-surface landings. Runway awareness systems, such as those within application (app) based Electronic Flight Bags (EFB), are already in use by nearly all domestic air carriers. Runway advisory systems are more difficult to evaluate, as there are few technological solutions. The available systems are extremely cost-prohibitive, and would have a significant financial impact on domestic air carrier operations and subsequently the flying public. The FAA continues to collaborate with stakeholders and industry partners to determine the benefits and risks of requiring such systems versus other possible solutions.

2. Review systems capable of detecting wrong-surface alignment to determine whether the capability exists to detect imminent wrong-surface landings at each airport where such a system is in use

Systems Capable of Detecting Wrong Surface Alignment

In response to the growing number of reported wrong surface departures, landings and aircraft aligned to wrong surface for landing, the FAA reviewed systems capable of detecting wrong surface alignment. Our review identified three systems, Airport Surface Detection Equipment Model X (ASDE-X), Airport Surface Surveillance Capability (ASSC), and Standard Terminal Automation Replacement System (STARS), that can be used to enhance safety by raising air traffic controller's awareness of wrong surface alignment. We have made improvements to our automated Air Traffic Control (ATC) systems (i.e. STARS and ASDE-X) to raise controller awareness of aircraft misalignments and wrong surface or airport landings. The modifications include the capability to display extended runway centerlines, which will further increase controllers'

situational awareness of aircraft aligned to wrong landing surfaces. In addition, ASDE-X has been enhanced to alert when aircraft are approaching taxiways instead of runways.

Currently, the ASDE-X Taxiway Arrival Prediction is operational in Seattle, Atlanta, Windsor Locks, Philadelphia, Charlotte, Dallas/Fort Worth, Detroit Metro, Houston Intercontinental, Orlando, Saint Louis Lambert, Baltimore-Washington, and Chicago O'Hare.

3. Describe information gathered from the use of the Airport Surface Surveillance Capability system at San Francisco International Airport since July 2017

Information Gathered in SFO since July 2017

The FAA has been consistently gathering surface safety data that informs our safety actions for all airports including San Francisco International Airport (SFO). Since July 2017 our SFO data includes information gathered from the use of the Airport Surface Surveillance Capability system (ASSC). The ASSC system displays current position of all aircraft on the airport surface and approaching the airport to air traffic controllers. In addition, the ASSC system provides an alert to air traffic controllers when a potential conflict is predicted. The surface safety data and information from ASSC have informed several actions taken at SFO to mitigate the safety risks identified from wrong surface landing events. The actions taken at SFO are detailed below.

Based on runway incursion data FAA worked with SFO and NATCA to further refine ASSC in 2017 by essentially increasing the field of view for controllers and allowing for earlier warnings to the controllers of potential wrong runway events.

Another important data review was conducted after July 2017 when Air Canada flight 739 overflew four aircraft waiting on Taxiway Charlie to depart. As a result of this event, several changes were made at SFO:

- The service volume of ASSC was increased to include the approach to the taxiway. This adaption change allowed the aircraft to remain on the controllers display longer. On the night of the event, the aircraft target had dropped off the air traffic controller's display for the last 12 seconds of the approach.
- Runway construction activities were moved later in the evening, after the majority of arrivals had landed.
- All aircraft must be assigned precision instrument approach procedures during nighttime conditions when a runway is closed.
- SFO ATCT extended the hours for swing shift employees, and changed the allowable start time for mid-shift combining of operational positions.

The data reviewed since instituting all of these changes show that there have not been additional events comparable to Air Canada flight 739. Two similar wrong surface alignments occurred, but were identified and corrected by air traffic control.

In addition, the FAA conducted a Special Focus Runway Safety Action Team meeting in SFO on February 27-28, 2018. The meeting included FAA and industry representatives with the purpose of sharing information gleaned to date about the risks of wrong surface operations nationwide, and in particular, at SFO. The goal was to stress the risk of these operations, find contributing factors as to why these events are happening, and determine what can be done to prevent these incidents.

4. **Assess available technologies to determine whether it is feasible, cost-effective, and appropriate to install and deploy, at any airport, systems to provide a direct warning capability to flight crews or air traffic controllers, or both, of potential runway incursions**

Direct Warning Capability to Flight Crews and/or ATC of Potential Runway Incursions

The FAA has three systems that provide direct warning capability to flight crews and/or ATC of potential runway incursions ASDE-X, Runway Status Lights (RWSL) and ASSC.

ASDE-X is operational at 35 locations and provides direct to controller warning. RWSL is operational at 20 locations and provides direct to pilot warning. ASSC is operational at four locations and provides direct to controller warning.

The FAA plans to add an additional 5 ASSC sites, which would total 44 locations with systems that provide direct warning capability to flight crews and/or ATC of potential runway incursions.

The agency is deploying several groundbreaking initiatives to help prevent wrong-surface landings. We are modifying existing ground radar systems to issue an alert when an aircraft is lined up for a taxiway rather than a runway. This Taxiway Arrival Prediction enhancement is already in place at 10 airports and is being installed at 12 more. The agency expects the system to be running at the nation's 35 busiest commercial airports by mid-2020.

5. **Describe FAA efforts to develop metrics that would allow the FAA to determine whether runway incursions are increasing and to assess the effectiveness of implemented runway safety initiatives.**

FAA Efforts to Track the Effectiveness of Implemented Runway Safety Initiatives

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