

## SECTION I: SE OVERVIEW

*Study Topic  
Overview  
Summary*

CAST chartered the Runway Excursion (RE) Joint Safety Analysis and Implementation Team (JSAIT) in 2012 to review the findings and recommendations from 15 industry reports by 11 different organizations and authorities on the issue of RE. From those reports, the team identified 155 contributing factors and 274 recommendations that it eventually consolidated into 45 Standard Problem Statements (SPS) and 75 Intervention Strategies (IS). The RE JSAIT grouped, analyzed, and consolidated the ISs into 7 SEs for industry implementation and 1 research and development (R&D) SE. CAST approved the SEs the RE JSAIT recommended in June 2014.

*SE Objective*

CAST recommends air carriers define, publish, and train proper techniques for stabilized approach, flare, touchdown, and use of available aircraft stopping devices during landing, with emphasis on realistic scenarios that contribute to runway excursions.

*Primary Risks  
Mitigated*

Runway Excursion (RE)

Action	Organization(s)	Strategy	Description	Due Date
<a href="#">Action 1</a>	Air Carriers	Procedures	Define, publish, and train proper techniques for stabilized approach, flare, touchdown, and use of available aircraft stopping devices for landing scenarios with reduced or minimal landing distance margin.	12/31/2018 <sup>1</sup>
<a href="#">Action 2</a>	Air Carriers	Procedures	Define, publish, and train proper techniques for stabilized approach, flare, touchdown, and use of available aircraft stopping devices for landing scenarios in conditions conducive to directional control issues.	12/31/2018

*See section II of this SE for detailed action descriptions.*

**References:** The detailed analysis in the Runway Excursion Joint Safety Analysis and Implementation Team (RE JSAIT) Final Report (February 12, 2015) is available through CAST.

<sup>1</sup> CAST is leaving Actions 1 and 2 open beyond the original due date to gather stakeholder implementation feedback. CAST expects implementers completed this action on the original schedule, so the due date and flow time remains unchanged.



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## SECTION III: SUPPLEMENTAL INFORMATION

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This section contains the following additional information that may be of interest to implementers:

- Source Study
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- Total Cost / Resource Overview

## SECTION IV: REVISION LOG

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This section provides a history of revisions to this SE.



## SECTION II: DETAILED ACTION INFORMATION

## Action 1: Develop procedures to mitigate landing distance margin issues

Primary  
Implementer

Air Carriers

Action Objective

Air carriers should define, publish, and train proper techniques for stabilized approach, flare, touchdown, and use of available aircraft stopping devices for landing scenarios with reduced or minimal landing distance margin.

Action Timeline

Flow Time: 54 months

- 18 months after approval for air carriers to revise policy and training.
- 36 months after completion of policy and training for pilots to receive training.

Due Date: 12/31/2018

Timeline/Flow for  
Future Adopters

TBD when CAST closes this action.

CAST Lead

Airlines for America (A4A)

#	Organization(s)	Detailed Steps
1a	Air Carrier Industry Assns.	<p>Communicate with member air carriers, explaining the analysis undertaken by CAST regarding runway excursions and the factors that result in reduced or minimal landing margins, including but not limited to—</p> <ol style="list-style-type: none"> <li>Wet or contaminated runway conditions, with emphasis on variability and inconsistency of conditions along the length of the runway;</li> <li>The effects of tailwind, including gusts, on aircraft landing distance (due to higher ground speed) and on aircraft handling characteristics during the flare;</li> <li>Runway closures that reduce available landing distance; and</li> <li>Late runway changes to a shorter-than-planned-for runway and timely reassessment of the landing decision.</li> </ol>
1b	Air Carriers	Consult aircraft manufacturer guidance to ensure consistency with their policies and operating procedures as related to the proper use of available aircraft stopping devices (such as arming speedbrakes for auto-deploy, awareness of the circumstances that can by design inhibit auto-deploy of speedbrakes, and timely deployment of reverse thrust before the point where the engine drops to ground idle setting).
1c	Air Carriers	Develop/revise operational procedures for landing on runways with reduced or minimal landing distance margin (as outlined in Step 1a), including processes to identify runways within their sphere of operations that have a higher risk of runway excursions. These processes should use feedback from operational data monitoring programs such as Aviation Safety Action Programs (ASAP), Flight Operational Quality Assurance (FOQA), and ASIAs to measure risk based on industry-developed and accepted RE metrics. Data from the monitoring programs should be fed back into flightcrew training and procedures.
1d	Air Carriers	Develop and implement procedures for stabilized approach, flare, and landing and train to these procedures. These procedures and associated training should be driven from operational data monitoring programs such as ASAP, FOQA, and ASIAs, where such programs are available and mature. The related risk assessment should include all key risk issues that are recognized in contributing to runway excursions. The results of that risk

Note: See Section III for detailed costs and resources.



## SECTION II: DETAILED ACTION INFORMATION

assessment should be used to establish training scenarios and frequency in the following areas:

- a. Emphasis on flying a stable approach in accordance with the air carrier's standard operating procedures (SOP), and on executing a go-around when the approach becomes unstable.
- b. Emphasis on transitioning from a stable approach to a stable flare and touchdown within -250 feet to +500 feet of the aiming point markings or, where there are no runway aiming point markings, 750 feet to 1,500 feet from the approach threshold of the runway (as consistent with the current FAA Airline Transport Pilot Practical Test Standards). Training should reinforce that the flightcrew should consider a go-around if the aircraft does not touch down in the defined touchdown zone.
- c. Emphasis on early deployment of available stopping devices (such as speedbrakes/ground spoilers, or reverse thrust to at least the flight idle position) for all landings, and the early use of appropriate levels of wheel braking on the first half of the runway, where friction levels tend to be higher in contaminated conditions.
- d. Specific instruction for the pilot monitoring to verify and call-out deployment of stopping devices after touchdown.
- e. Simulator-based practice for aircraft-specific handling guidelines in gusty tailwind conditions (within approved aircraft-specific limits), to be performed in full flight simulators with capability to support the training.
- f. Simulator-based practice for landing and stopping on wet/contaminated runways, to be performed in full flight simulators with capability to support the training.
- g. Simulator-based practice for operation into runways with higher risk of runway excursion, as identified in Step 1c.
- h. Potential effects of minimum equipment list (MEL) conditions on aircraft stopping performance.
- i. Promotion of awareness and use of the Flight Safety Foundation's (FSF) Runway Excursion Risk Awareness Tool.

1e Air Carriers Air carrier actions are complete when the air carrier has revised its policies, procedures, and training, as necessary, and all pilots have received the training (initial or recurrent).

1f Air Carrier Industry Assns. Track implementation and report progress to JIMDAT and CAST.

## Notes

- CAST is leaving this action open beyond the original due date to gather stakeholder implementation feedback. CAST expects implementers completed this action on the original schedule, so the due date and flow time remains unchanged.
- Assumes no increase to training footprint, only revision and improvement of currently performed landing training.
- Assumes all scenarios are covered in initial training and then specific scenarios are varied in recurrent training, with the goal of training each scenario at least once every 3 years.



## SECTION II: DETAILED ACTION INFORMATION

## Action 2: Develop procedures to mitigate directional control issues

Primary  
Implementer

Air Carriers

Action Objective

Air carriers should define, publish, and train proper techniques for stabilized approach, flare, touchdown, and use of available aircraft stopping devices for landing scenarios in conditions conducive to directional control issues.

Action Timeline

Flow Time: 54 months

- 18 months after approval for air carriers to revise policy and training.
- 36 months after completion of policy and training for pilots to receive training on all scenarios.

Due Date: 12/31/2018

Timeline/Flow for  
Future Adopters

TBD when CAST closes this action.

CAST Lead

Airlines for America (A4A)

#	Organization(s)	Detailed Steps
2a	Air Carrier Industry Assns.	<p>Communicate with member air carriers, explaining the analysis undertaken by CAST regarding runway excursions and the factors that result in directional control issues, including but not limited to—</p> <ol style="list-style-type: none"> <li>Wet or contaminated runway conditions, with emphasis on variability and inconsistency of conditions along the length of the runway and the impact of directional controllability;</li> <li>The effects of crosswind including gusts, on aircraft handling characteristics during the flare, touchdown, and rollout; and</li> <li>System failures (thrust, brakes, nose gearing steering, etc.) or minimum equipment list (MEL) conditions that result in directional asymmetries.</li> </ol>
2b	Air Carriers	<p>Consult aircraft manufacturer guidance to ensure consistency with their policies and operating procedures as related to aircraft performance in crosswinds, including—</p> <ol style="list-style-type: none"> <li>Maximum demonstrated crosswind values;</li> <li>Aircraft-specific flight handling characteristics in gusty crosswind conditions;</li> <li>Aircraft-specific ground handling characteristics on wet/contaminated runways when operating in gusty crosswind conditions;</li> <li>Emphasis on proper use of tiller during ground rollout, including the risk of nose gear steering malfunctions or over control if the tiller is used at high speeds; and</li> <li>Potential effects of MEL conditions on directional control (such as single reverser nonoperational).</li> </ol>
2c	Air Carriers	<p>Develop and implement procedures concerning proper techniques for maintaining directional control in crosswind conditions or in response to an aircraft system failure resulting in a directional asymmetry and train to those procedures. These procedures and associated training should be driven from operational data monitoring programs such as Aviation Safety Action Programs (ASAP), Flight Operational Quality Assurance (FOQA), and ASIAs, where such programs are available and mature. The related risk assessment should</p>

Note: See Section III for detailed costs and resources.



## SECTION II: DETAILED ACTION INFORMATION

		include all key risk issues that are recognized in contributing to runway excursions. The results of that risk assessment should be used to establish training scenarios and frequency in the following areas: <ol style="list-style-type: none"> <li>Simulator practice (in full flight simulators with capability to support the training) of landing and rollout in gusty crosswinds on a contaminated runway, within air carrier crosswind landing guidelines for contaminated runways; and</li> <li>Simulator practice (in full flight simulators with capability to support the training) of recognition and control of asymmetric thrust reverser deployment.</li> </ol>
2d	Air Carriers	Air carrier actions are complete when the air carrier has revised its policies, procedures, and training, as necessary, and all pilots have received the training (initial or recurrent).
2e	Air Carrier Industry Assns.	Track implementation and report progress to JIMDAT and CAST.
Notes		<ul style="list-style-type: none"> <li>CAST is leaving this action open beyond the original due date to gather stakeholder implementation feedback. CAST expects implementers completed this action on the original schedule, so the due date and flow time remains unchanged.</li> <li>Assumes no increase to training footprint, only revision and improvement of currently performed training.</li> <li>Assumes all scenarios are covered in initial training and then specific scenarios are varied in recurrent training, with the goal of training each scenario at least once every 3 years.</li> </ul>



## SECTION III: SUPPLEMENTAL INFORMATION

**Source Study** Runway Excursion Joint Safety Analysis and Implementation Team (RE JSAIT) Final Report (February 12, 2015)

**Related Initiatives**

- CAST SE 215, Air Carrier Operations and Training – Landing Distance Assessment
- CAST SE 217, Air Carrier Operations and Training – Takeoff Procedures and Training

**Total Cost** **\$2,200,000** Note: For labor, 1 Full Time Equivalent (FTE) = \$250,000

**Action 1** \$1,100,000 4.4 FTE

**Action 2** \$1,100,000 4.4 FTE

	Organization	Resources Needed
<b>Direct Resource Overview – Government</b>	N/A	N/A

	Organization	Resources Needed
<b>Direct Resource Overview – Industry</b>	Air Carriers	<ul style="list-style-type: none"> <li>• Action 1: 3.3 FTE (assumes 0.06 FTE at each carrier to perform review of and make revisions to policies and training and identification of training for high risk runways).</li> <li>• Action 2: 3.3 FTE (assumes 0.06 FTE at each carrier to perform review of and make revisions to policies and training and identification/qualification training for high-risk runways).</li> </ul>
	Air Carrier Industry Assns.	<ul style="list-style-type: none"> <li>• Action 1: 0.3 FTE (assumes 0.1 FTE at each organization for support and communication).</li> <li>• Action 2: 0.2 FTE (assumes ~0.05–0.1 FTE at each organization for support and communication).</li> </ul> <p><i>Note: 55 air carriers are represented by three CAST-member air carrier industry associations:</i></p> <ul style="list-style-type: none"> <li>○ Airlines for America (A4A),</li> <li>○ Regional Airline Association (RAA), and</li> <li>○ National Air Carrier Association (NACA).</li> </ul>
	Aircraft Manufacturers	<ul style="list-style-type: none"> <li>• Action 1: 0.8 FTE (assume 0.2 FTE at each manufacturer to support air carrier policy development).</li> <li>• Action 2: 0.8 FTE (assume 0.2 FTE at each manufacturer to support air carrier policy development).</li> </ul> <p><i>Note: Four manufacturers of part 25 aircraft operated in U.S. part 121 operations are represented at CAST:</i></p> <ul style="list-style-type: none"> <li>○ Airbus (CAST member),</li> <li>○ Boeing (CAST member),</li> <li>○ Bombardier (represented by Aerospace Industries Association (AIA)), and</li> <li>○ Embraer (represented by AIA).</li> </ul>



## SECTION III: SUPPLEMENTAL INFORMATION

*Indirect  
Resource  
Overview*

The organizations identified in this section are not expected to incur direct costs associated with implementing this SE, but they may incur indirect costs within their normal line of work.

Organization	Description
FAA AFS	Inspector resources required for normal review and acceptance or approval, as applicable, of air carrier manuals.





## SECTION IV: REVISION LOG

*Major revisions (whole numbers) represent CAST-approved changes to SE language. Minor revisions (decimals) represent minor changes to target dates or completion notes that do not affect implementer actions.*

Revision	Date	Description
1.3	08/15/2019	Administrative revision to Actions 1 and 2 due dates; flow time not affected.
1.2	06/06/2019	Actions 1 and 2 due dates extended.
1.1	02/06/2019	Action 1 due date extended. Action 2 due date extended.
1.0	09/17/2018	New SE format. Content reorganized and terminology updated. No substantive changes.
Original	06/05/2014	CAST adopted SE 216.

