

## SECTION I: SE OVERVIEW

<i>Study Topic Overview Summary</i>	FAA and industry stakeholders asked the ASIAS program to proactively conduct studies in 2010 and 2012 to identify new or increased risks associated with area navigation (RNAV) departure procedures and optimized descent profile Standard Terminal Arrival Route (STAR) procedures before the potential risks result in an accident. ASIAS forwarded the study results to CAST in 2012, and CAST chartered the RNAV/STAR Joint Safety Analysis and Implementation Team (JSAT) to examine the findings and develop risk mitigations. The RNAV JSAT found most pilot reports indicate lateral deviations on RNAV departure procedures before the first fix as a result of not having the flight management system programmed correctly for the departure runway, and altitude deviations (missed crossing restrictions) on STARs, particularly on optimized descent profile procedures.
<i>SE Objective</i>	To reduce deviations from the intended path, CAST recommends the FAA, air carriers, and manufacturers implement procedural and standards improvements to consistently execute departure or arrival procedures as published.

<i>Primary Risks Mitigated</i>	Airprox/TCAS <sup>1</sup> Alert/Loss of Separation/Near Midair Collisions/Midair Collisions (MAC)
------------------------------------	---

Action	Organization(s)	Strategy	Description	Due Date
<a href="#">Action 1</a>	FAA, Aircraft Manufacturers	Policy	Develop aircraft, operator, and procedure design criteria for aircraft performance on arrival and departure procedures.	10/31/2016
<i>Comments: CAST closed this action based on the publication of FAA Order 8260.58A.</i>				
<a href="#">Action 2</a>	FAA, Aircraft Manufacturers	Standards	Support development of aircraft and avionics standards to improve path conformance and reduce pilot automation errors on STARs and RNAV departures for new aircraft and new equipment.	02/28/2016
<i>Comments: CAST closed this action based on the publication of RTCA DO-236C Chg. 1 and DO-283B.</i>				

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

*References:* The detailed analysis in the RNAV Departures and STAR<sup>2</sup> Operations Joint Safety Analysis and Implementation Team (RNAV/STAR JSAT) Final Report (February 12, 2015) is available through CAST.

<sup>1</sup> Traffic alert and collision avoidance system

<sup>2</sup> Standard Terminal Arrival Route



## TABLE OF CONTENTS

## SECTION II: DETAILED ACTION INFORMATION

PAGE 3

*SE 214 consists of two actions, which this section lays out in detail.*

- **Action 1 (FAA, Aircraft Manufacturers).....**.....PAGE 3  
Develop design criteria for aircraft performance on arrival and departure procedures
- **Action 2 (FAA, Aircraft Manufacturers, RTCA SC-227).....**.....PAGE 4  
Develop standards to improve STARs and RNAV departures for new aircraft/equipment

## SECTION III: SUPPLEMENTAL INFORMATION

PAGE 5

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

- Source Study
- Related Initiatives
- Total Cost / Resource Overview

## SECTION IV: REVISION LOG

PAGE 6

*This section provides a history of revisions to this SE.*

## SECTION II: DETAILED ACTION INFORMATION

## Action 1: Develop design criteria for aircraft performance on arrival and departure procedures

Primary  
Implementer

FAA, Aircraft Manufacturers

Action Objective

The FAA and aircraft manufacturers should develop aircraft, operator, and procedure design criteria for aircraft performance on arrival and departure procedures under the expected range of operational conditions.

Action Timeline

Flow Time: 32 months

Due Date: 10/31/2016

Timeline/Flow for  
Future Adopters

N/A

CAST Lead

FAA Flight Standards Service, Safety Standards (AFS)

#	Organization(s)	Detailed Steps
1a	Aircraft Manufacturers	Define aircraft qualification criteria and operating guidance to reflect the in-flight performance of aircraft, including autoflight and navigation system performance, on arrivals and departures. <i>FAA Order 8260.58A published March 14, 2016.</i>
1b	FAA AFS	Modify procedure design criteria from an enhanced aircraft performance evaluation module considering the full range of performance for flying arrivals and departures and integrate the use of this module into the Performance-Based Navigation (PBN) procedure design processes. <i>Complete.</i>

Notes

- Preliminary work has already been initiated through the Performance-Based Aviation Rulemaking Committee (PARC) Vertical Navigation (VNAV) action team. There will be future costs to implement updated design criteria.
- Milestones:
  - Completion of development of aircraft qualification criteria and operating guidelines for aerodynamic performance.
  - Completion of development of aircraft qualification criteria and operating guidelines for autoflight and navigation system performance.
  - Dissemination and application of new procedure design criteria and tools in procedure design processes.

## SECTION II: DETAILED ACTION INFORMATION

## Action 2: Develop standards to improve STARs and RNAV departures for new aircraft/equipment

Primary Implementer **FAA, Aircraft Manufacturers**

Action Objective The FAA and aircraft manufacturers should support development of aircraft and avionics standards to improve path conformance and reduce pilot automation errors on Standard Terminal Arrival Routes (STAR) and area navigation (RNAV) departures for new aircraft and new equipment.

Action Timeline Flow Time: 24 months

Due Date: 02/28/2016

Timeline/Flow for Future Adopters N/A

CAST Lead **FAA Aircraft Certification Service (AIR)**

#	Organization(s)	Detailed Steps
2a	RTCA Special Committee SC-227	Revise DO 283, Minimum Operational Performance Standards for Required Navigation Performance for Area Navigation, and DO 236, Minimum Aviation System Performance Standards (MASPS) Required Navigation Performance for Area Navigation. <i>RTCA DO-236C Chg. 1 published September 23, 2014, and DO-283B published December 15, 2015.</i>
2b	Aircraft Manufacturers	Standardize against FAA baseline performance standards derived from SC-227 for vertical navigation systems in new aircraft and new equipment. <i>Complete.</i>

Notes

## SECTION III: SUPPLEMENTAL INFORMATION

**Source Study** RNAV Departures and STAR Operations Joint Safety Analysis and Implementation Team (RNAV/STAR JSAIT) Final Report (February 12, 2015)

**Related Initiatives**

- Performance-Based Aviation Rulemaking Committee (PARC) Operational Use of Flight Path Management Systems
- Obstacles to Performance-Based Navigation (PBN) Implementation
- RTCA Special Committee 227, Standards of Navigation Performance

**Total Cost** **\$1,460,000** *Note: For labor, 1 Full Time Equivalent (FTE) = \$250,000*

Action 1 \$1,460,000

Action 2 N/A

	Organization	Resources Needed
<i>Direct Resource Overview – Government</i>	FAA AFS	<ul style="list-style-type: none"> <li>• Action 1: 2 FTE for validation of current aircraft performance and modification of procedure design tool over 3 years (initial development is already funded).</li> </ul>
	FAA ATO	<ul style="list-style-type: none"> <li>• Action 1: 3 FTE.</li> </ul>

	Organization	Resources Needed
<i>Direct Resource Overview – Industry</i>	Air Carrier Industry Assns.	<ul style="list-style-type: none"> <li>• Action 1: 0.15 FTE (assumes 0.05 FTE at each air carrier association for coordination/collaboration).</li> <li>• Action 1: 0.7 FTE (assumes 0.1 FTE for each of 4 aircraft manufacturers and 0.1 for each of 3 avionics manufacturers).</li> </ul> <p><i>Notes:</i>  <i>Four manufacturers of Title 14, Code of Federal Regulations (14 CFR) part 25 aircraft operated in the United States are represented at CAST:</i> <ul style="list-style-type: none"> <li>○ <i>Airbus (CAST member),</i></li> <li>○ <i>Boeing (CAST member),</i></li> <li>○ <i>Bombardier (represented by Aerospace Industries of America (AIA)), and</i></li> <li>○ <i>Embraer (represented by AIA).</i></li> </ul> <i>Three avionics manufacturers represented on CAST by AIA are assumed to provide input.</i></p>
	Aircraft Manufacturers	

**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
	N/A	N/A



## 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
1.0	09/17/2018	New SE format. Content reorganized and terminology updated. No substantive changes.
0.2	10/06/2016	Action 1 closed. Action 2 closed at April 2016 CAST meeting.
0.1	12/03/2015	Action 1 due date extended from 12/31/2015 to 10/31/2016.
Original	02/06/2014	CAST adopted SE 214.