SE 202 CAST Safety Enhancement (SE)
DESIGN – BANK ANGLE PROTECTION

STUDY TOPIC
ASA
AIRPLANE STATE AWARENESS

CICTT RISK AREAS
LOC–I

SECTION I: SE OVERVIEW

SECTION I

Study Topic Overview Summary	CAST chartered the Airplane State Awareness (ASA) Joint Safety Analysis Team (JSAT) in August 2010 and the ASA Joint Safety Implementation Team (JSIT) in 2012 as a follow-on activity to the previous Loss of Control (LOC) JSAT in 2000. Historically, Loss of Control-Inflight (LOC–I) has been, and continues to be, one of the largest categories of commercial aviation fatal accidents. Loss of ASA is a subset of LOC–I accidents and incidents, defined as events in which the flightcrew lost awareness of the airplane's attitude or energy state. Between 2001 and 2010, half of all LOC–I accidents involved loss of ASA. The ASA JSIT recommended, and CAST adopted, 19 ASA SEs, 7 of which focus on airplane design. The ASA JSAT study of 18 LOC accidents and incidents found excessive bank, resulting from flightcrew loss of ASA, played a role in 6 of the accidents.
SE Objective	CAST recommends aircraft manufacturers implement bank angle protection on applicable new fly-by-wire (FBW) transport category aircraft (TCA) programs launched after January 1, 2015. Applicable new FBW TCA programs include— • New type certificate programs, and • Major derivative, amended type certificate programs involving redesign of the FBW flight control system, or conversion from a conventional control system to a FBW control system.
Primary Risks Mitigated	Loss of Control-Inflight (LOC–I)

Action	Organization(s)	Strategy	Description	Due Date
Action 1	Aircraft Manufacturers	Design	Agree to implement bank angle protection in applicable new FBW TCA programs.	08/31/2014
	Comments: CAST closed this action.			
Action 2	Aircraft Manufacturers	Design	Implement bank angle protection in applicable new FBW TCA programs.	12/31/2020
	Comments: CAST closed this action based on manufacturers having already addressed the intent of the SE on new type designs.			

See section II of this SE for detailed action descriptions.

References: The detailed analysis in the ASA JSAT Final Report (June 5, 2015) and the ASA JSIT Final Report (December 31, 2014) is available through CAST.

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SECTION II: DETAILED ACTION INFORMATION

Action 1: Agree to implement bank angle protection in applicable new FBW TCA programs

Primary Implementer	**Aircraft Manufacturers**
Action Objective	Manufacturers should agree to implement bank angle protection on applicable new fly-by-wire (FBW) transport category aircraft (TCA) programs launched after January 1, 2015.
Action Timeline	Flow Time: 12 months o 6 months for Aerospace Industries Association (AIA) to send request letters o 12 months for manufacturers to respond to letter Due Date: 08/31/2014
Timeline/Flow for Future Adopters	N/A
CAST Lead	AIA

#	Organization(s)	Detailed Steps
1a	AIA	Communicate with CAST-represented aircraft manufacturers that are currently producing or are expected to produce FBW TCAs for use in U.S. Title 14, Code of Federal Regulations (14 CFR) part 121 operations, explaining the ASA analysis and the role of bank angle protection in preventing ASA accidents.
	Complete.	
1b	Aircraft Manufacturers	Review the CAST ASA study and recommendations, and respond to AIA, indicating intention to incorporate bank angle protection into applicable new FBW TCA programs launched after January 1, 2015.
	Complete.	
1c	AIA	Track implementation and report progress to JIMDAT and CAST.
	Reported to JIMDAT and CAST in August 2014.	

Notes	All CAST-represented manufacturers of FBW TCA should receive and respond to the CAST communication.

SECTION II

Note: See Section III for detailed costs and resources.

SECTION II: DETAILED ACTION INFORMATION

Action 2: Implement bank angle protection in applicable new FBW TCA programs

Primary Implementer	**Aircraft Manufacturers**
Action Objective	Manufacturers should implement bank angle protection in applicable new fly-by-wire (FBW) transport category aircraft (TCA) programs launched after January 1, 2015.
Action Timeline	Flow Time: 72 months after January 31, 2015 Due Date: 12/31/2020
Timeline/Flow for Future Adopters	TBD when CAST closes this action.
CAST Lead	Aerospace Industries Association (AIA)

#	Organization(s)	Detailed Steps
2a	Aircraft Manufacturers	Implement bank angle protection on applicable new FBW TCA programs launched after January 1, 2015.
	Complete.	
2b	AIA	Track implementation and report progress to CAST.
	Complete based on manufacturers having already addressed the intent of the SE on new type designs.	

Notes	This action assumes completion in conjunction with a new aircraft development effort and, therefore, specific completion timelines are dependent upon new aircraft development program schedules. Programs launched after December 31, 2020, may still incorporate the design feature, but their entry in service is not likely to significantly contribute to the current CAST risk reduction target for 2025; therefore, this SE tracks implementation only until this date.

Note: See Section III for detailed costs and resources.

SECTION III: SUPPLEMENTAL INFORMATION

Source Study	ASA Joint Safety Analysis Team (JSAT) Final Report (June 5, 2014) ASA Joint Safety Implementation Team (JSIT) Final Report (December 31, 2014)
Related Initiatives	CAST SE 40: LOC – Design – Flight Envelope Protection

Total Cost	**$100,000**	*Note: For labor, 1 Full Time Equivalent (FTE) = $250,000*	
Action 1	$100,000	0.2 FTE	
Action 2	N/A		The costs associated with this feature will already be expended in a new FBW airplane program, and most FBW airplanes already incorporate bank angle protection as a basic feature. Therefore, the ASA JSIT anticipates no additional incremental costs to manufacturers to implement this feature in new FBW TCA programs.

	Organization	Resources Needed
Direct Resource Overview – Government	N/A	N/A

	Organization	Resources Needed
Direct Resource Overview – Industry	AIA	• Action 1: 0.1 FTE for communication and tracking.
	Aircraft Manufacturers	• Action 1: 0.1 FTE (~ 60 hours per manufacturer, for communication). *Note: Four manufacturers of Title 14, Code of Federal Regulations (14 CFR) part 25 aircraft operated in U.S. part 121 operations are represented at CAST:* o *Airbus (CAST member),* o *Boeing (CAST member),* o *Bombardier (represented by AIA), and* o *Embraer (represented by AIA).*

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 III

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
1.1	12/05/2019	Action 2 closed based on manufacturers having already addressed the intent of the SE on new type designs.
1.0	09/17/2018	New SE format. Content reorganized and terminology updated. No substantive changes. Action 1 closed at August 2014 CAST meeting
Original	08/01/2013	CAST adopted SE 202.