SE 199	CAST Safety Enhancement (SE)	STUDY TOPIC
	TRAINING – ENHANCED CREW RESOURCE MANAGEMENT (CRM) TRAINING	ASA AIRPLANE STATE AWARENESS CICTT RISK AREAS LOC–I

SECTION I: SE OVERVIEW

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, 5 of which focus on air carrier training.

The ASA JSAT's study of 18 LOC accidents and incidents showed that in many situations crew resource management (CRM) was not effective when it was needed most. Additionally, the pilot monitoring (PM) was often unable to clearly communicate the seriousness of the situation to effect a change in the behavior of the pilot flying (PF).

SE Objective

CAST recommends air carriers and other training providers as well as regulators enhance acceptance, utilization and effectiveness of CRM principles on the flight deck by revising curriculum content and delivery. These principles should provide clear, unambiguous roles for the PF and PM in normal and non-normal operations.

Primary Risks Mitigated

Loss of Control-Inflight (LOC–I)

Action	Organization(s)	Strategy	Description	Due Date
[Action 1](#)	FAA AFS	Guidance	Assess and revise Advisory Circular (AC) 120–51 as necessary to place specific emphasis on duties and responsibilities of the pilot monitoring. [Note: FAA AFS elected to address pilot monitoring duties in a revision to AC 120–71 instead of AC 120–51.]	02/28/2017
	Comments: CAST closed this action based on publication of AC 120–71B on January 10, 2017.			
[Action 2](#)	Air Carriers	Training	Assess policies for content and delivery of training programs related to CRM and revise as necessary.	08/31/2017
	Comments: CAST closed this action based on air carrier survey responses.			
[Action 3](#)	Air Carriers	Training	Revise training programs based on the FAA guidance from Action 1 and revised air carrier policies from Action 2.	08/31/2019
	Comments: CAST closed this action based on implementer feedback received to date.			
[Action 4](#)	Air Carriers	Procedures, Training	Develop processes to solicit feedback for evaluating and assessing standard operating procedures, and revise CRM and PM training.	08/31/2019
	Comments: CAST closed this action based on implementer feedback received to date.			

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.

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION II: DETAILED ACTION INFORMATION

Action 1: Issue guidance to emphasize duties and responsibilities of pilot monitoring

Primary Implementer	**FAA Flight Standards Service, Safety Standards (AFS)**
Action Objective	FAA AFS should assess and revise Advisory Circular (AC) 120–51, as necessary, to place specific emphasis on duties and responsibilities of the pilot monitoring (PM). [Note: FAA AFS elected to address PM duties in a revision to AC 120–71 instead of AC 120–51.]
Action Timeline	Flow Time: 42 months
	Due Date: 02/28/2017
Timeline/Flow for Future Adopters	N/A
CAST Lead	FAA AFS

#	Organization(s)	Detailed Steps
1a	FAA AFS	Assess and revise AC 120–51 to place specific emphasis on the duties and responsibilities of the PM, incorporating the following concepts: a. Emphasizing the team concept and the role of each pilot within the team, and in particular, enhancing para. 16 of AC 120–51E to more strongly address the role of PM; b. Command oversight training and recognition of the potential adverse effects of the authority gradient; c. Opportunities and scenarios that require effective communication between flightcrew members regarding the current and predicted state of the airplane; d. Scenarios and situations that provide for the PM to progressively intervene up to the point of taking control of the airplane to prevent an undesired state, including recognition and intervention in the scenario of loss of attitude or energy state awareness by the pilot flying (PF); e. Situations where the flightcrew is required to prioritize tasks in order to maintain situational awareness; f. Encouraging communication when one pilot observes a loss of situational awareness or impending task saturation of the other pilot; g. Specifically addressing the skills required of the PM with detailed curriculums and scenarios that are instructed and evaluated; h. Theoretical and practical applications for the PM to implement a progressive strategy of intervention; and i. Standard operating procedures (SOP) adequately address CRM, CRM training, and the responsibilities and specific duties of the PM.
		FAA AFS determined revising AC 120–71 instead of AC 120–51 was a more appropriate means of issuing guidance for SOPs relating to PM duties. The intent of this action was addressed in AC 120–71B.
1b	FAA AFS	Encourage due diligence by air carriers in addressing the role of PM both in training and operations.
		Complete.

Note: See section III for detailed costs and resources.

SECTION II: DETAILED ACTION INFORMATION

1c	FAA AFS	Report completion and publication of the revised AC to JIMDAT and CAST.
		AC 120–71B was published January 10, 2017.

Notes

SECTION II

SE 199 — TRAINING – ENHANCED CREW RESOURCE MANAGEMENT (CRM) TRAINING

SECTION II: DETAILED ACTION INFORMATION

Action 2: Review and revise CRM training policies

Primary Implementer	**Air Carriers**
Action Objective	Air carriers should assess and review policies regarding CRM training for content and delivery of training programs related to CRM and revise as necessary.
Action Timeline	Flow Time: 6 months
	Due Date: 08/31/2017
Timeline/Flow for Future Adopters	TBD
CAST Lead	Airlines for America (A4A)

#	Organization(s)	Detailed Steps
2a	Air Carrier Industry Assns.	Communicate with air carrier members, explaining the analysis undertaken by CAST regarding loss of ASA, the role of CRM and the particular importance of pilot monitoring (PM), and the purpose of the CAST SE.
	Complete.	
2b	Air Carriers	Review CRM policies in light of the revised FAA guidance from Action 1, and revise as necessary to incorporate the following concepts: a. The team concept and the role of each pilot within the team; b. Command oversight training and recognition of the potential adverse effects of the authority gradient; c. Opportunities and scenarios that require effective communication between flightcrew members regarding the current and predicted state of the airplane; d. Scenarios and situations that provide for the PM to progressively intervene up to the point of taking control of the airplane to prevent an undesired state, including recognition and intervention in the scenario of loss of attitude or energy state awareness by the pilot flying (PF); e. Situations where the flightcrew is required to prioritize tasks in order to maintain situational awareness; f. Encouraging communication when one pilot observes a loss of situational awareness or impending task saturation of the other pilot; g. Specifically addressing the skills required of the PM with detailed curriculums and scenarios that are instructed and evaluated; h. Theoretical and practical applications for the PM to implement a progressive strategy of intervention; and i. Standard operating procedures (SOP) adequately address CRM, CRM training and the responsibilities and specific duties of the PM.
	Complete.	
2c	Air Carriers	Air carrier actions are complete when air carriers have revised the CRM policies to align with the guidance from Action 1.
	Complete.	

Note: See section III for detailed costs and resources.

SECTION II: DETAILED ACTION INFORMATION

2d	Air Carrier Industry Assns.	Track implementation for member air carriers and report progress to JIMDAT and CAST.
	Reported to JIMDAT and CAST in August 2017.	

Notes

SECTION II

SECTION II: DETAILED ACTION INFORMATION

SECTION II

Action 3: Revise training programs based on results of Action 1 and Action 2

Primary Implementer	**Air Carriers**
Action Objective	Air carriers should revise training programs based on the FAA guidance from Action 1 and revised air carrier policies from Action 2, to include simulator scenarios, classroom instruction and case studies that require the pilot monitoring (PM) to identify, assess and communicate threats to effectively mitigate/eliminate the hazard, in accordance with the latest version of Advisory Circular (AC) 120–71.

Action Timeline	Flow Time: 24 months (upon completion of Action 2)
	      o 12 months to revise training
	      o 24 months for all pilots to receive training (initial and/or recurrent)
	 Due Date: 08/31/2019
	      o 08/31/2018 to revise training
	      o 08/31/2019 for all pilots to receive training (initial and/or recurrent)

Timeline/Flow for Future Adopters	TBD when CAST closes this action.
CAST Lead	Airlines for America (A4A)

#	Organization(s)	Detailed Steps
3a	Air Carriers	Develop, in cooperation with the pilot labor organizations, revised CRM training programs based on the FAA guidance from Action 1 and air carrier policies from Action 2. These programs will include simulator scenarios, classroom instruction and case studies in accordance with the latest version of AC 120–71 that— a. Develop and train a defined skill set for use in performing PM duties. b. Promote the flightcrew concept and the responsibility of the first officer, when in the role of PM, to be actively involved in the safe conduct of the flight while recognizing and validating the captain's authority over the flight. c. Develop and implement, as necessary, standard operating procedures (SOP) specifying the duties, roles and responsibilities of the PM. d. Develop PM training that addresses specific actions to effect a progressive strategy of intervention, starting by communicating a deviation (inquiry), then suggesting a course of action (advocacy and assertion), and finally directly intervening if necessary to prevent an accident. e. Develop training scenarios (similar to existing pilot incapacitation scenarios) that exercise the progressive strategy of intervention in paragraph d, including scenarios in which the pilot flying (PF) loses attitude or energy state awareness. f. Reinforce clear communication during transfer of controls.
		Complete.
3b	Air Carriers	Implement the revised training in initial and recurrent training programs.
		Complete.
3c	Air Carriers	Air carrier actions are complete when the air carrier has—

SECTION II: DETAILED ACTION INFORMATION

		a. Revised training in accordance with the recommendations of Actions 1 and 2, as necessary. b. Trained all pilots employed by the air carrier (initial or recurrent).
	Complete.	
3d	Air Carrier Industry Assns.	Track implementation of member air carriers, and report progress and completion to JIMDAT and CAST.
	Complete.	

Notes	• Assumes amended training does not add time to current flightcrew training footprint; rather, current training is revised and improved. • Assumes revised concepts will be included in initial and/or recurrent training. • Assumes training revisions will occur as part of normal air carrier training program update cycle.

SECTION II: DETAILED ACTION INFORMATION

Action 4: Develop processes to solicit feedback for evaluating SOPs, and revise CRM/PM training

Primary Implementer	**Air Carriers**
Action Objective	Air carriers should develop processes to solicit feedback for evaluating and assessing standard operating procedures (SOP) and revised CRM and pilot monitoring (PM) training.
Action Timeline	Flow Time: 24 months (upon completion of Action 2)
	Due Date: 08/31/2019
Timeline/Flow for Future Adopters	TBD when CAST closes this action.
CAST Lead	Airlines for America (A4A)

#	Organization(s)	Detailed Steps
4a	Air Carriers	Develop in coordination with labor organizations a process to solicit ongoing feedback from line pilots, flight standards organizations, and training department instructors and revise CRM training accordingly, to include the following elements: a. A process for reviewing and analyzing narrative data reports (for example, Aviation Safety Action Program (ASAP)) to gain insight into CRM and pilot flying (PF)/PM issues in scenarios involving potential loss of ASA; and b. A process for revising CRM training as necessary, based on review of data reports.
	Complete.	
4b	Air Carriers	Air carrier actions are complete when the air carrier has implemented a process for soliciting feedback and revising training, as necessary.
	Complete.	
4c	Air Carrier Industry Assns.	Track implementation of member air carriers, and report progress and completion to JIMDAT and CAST.
	Complete.	
Notes		

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 11, CFIT – CRM Training • FAA AC 120–51, Crew Resource Management Training • FAA AC 120–71, Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers • Flight Safety Foundation (FSF) Active Pilot Monitoring Working Group

Total Cost	**$11,400,000**	*Note: For labor, 1 Full Time Equivalent (FTE) = $250,000*
Action 1	$300,000	1.2 FTE
Action 2	$600,000	2.4 FTE
Action 3	$7,000,000	28.0 FTE
Action 4	$3,500,000	14.0 FTE

	Organization	Resources Needed

Direct Resource Overview – Government	FAA AFS	• Action 1:
		  o 1.0 FTE to revise guidance.
		  o 0.2 FTE for administrative support in issuing guidance and communicating to air carriers.
		• Action 3: Inspector resources required for normal review and approval of airline training programs as part of duties performed.

	Organization	Resources Needed

Direct Resource Overview – Industry	Air Carrier Industry Assns.	• Action 2: 0.2 FTE (assumes ~0.05–0.1 FTE per association to coordinate with air carriers).
		
		Note: 55 air carriers are represented by three CAST-member air carrier industry associations:
		  o *Airlines for America (A4A),*
		  o *Regional Airline Association (RAA), and*
		  o *National Air Carrier Association (NACA).*

	Air Carriers	• Action 2: 2.2 FTE (assumes 55 air carriers @ 0.04 FTE per carrier to perform the review). • Action 3: 27.5 FTE (assumes 0.5 FTE per air carrier). • Action 4: 13.75 FTE (assumes 0.25 FTE per air carrier to set up program).

	Labor Organizations	• Action 3: 0.5 FTE (assumes 0.25 FTE per organization for support).
		• Action 4: 0.25 FTE for coordination and communication.
		
		Note: Two pilot labor organizations are represented at CAST:
		  o *Air Line Pilots Association (ALPA), and*
		  o *Coalition of Air Line Pilots Associations (CAPA).*

SECTION III

CAST Safety Enhancement (SE)

SE 199

TRAINING – ENHANCED CREW RESOURCE MANAGEMENT (CRM) TRAINING

STUDY TOPIC
ASA
AIRPLANE STATE AWARENESS

CICTT RISK AREAS
LOC–I

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
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
1.2	04/07/2022	Action 3 closed. Action 4 closed.
1.1	05/07/2019	Administrative revision to show Action 1 was completed through issuing AC 120–71B instead of revising AC 120–51; other actions revised accordingly.
1.0	09/17/2018	New SE format. Content reorganized and terminology updated. No substantive changes.
0.4	10/05/2017	Action 2 closed.
0.3	02/02/2017	Action 1 closed.
0.2	06/02/2016	Action 1 due date extended from 06/30/2016 to 02/28/2017. Action 2 due date extended from 12/31/2016 to 08/31/2017. Action 3 due date extended from 12/31/2018 to 08/31/2019. Action 4 due date extended from 12/31/2018 to 08/31/2019.
0.1	12/04/2014	
Original	08/01/2013	CAST adopted SE 199.

SECTION IV