SE 229

CAST Safety Enhancement (SE)

TAKEOFF CONFIGURATION WARNING SYSTEM (TCWS) MAINTENANCE AND OPERATIONAL ASSURANCE

STUDY TOPIC
TOMC
TAKEOFF MISCONFIGURATION

CICTT RISK AREAS
LOC–I, RE

SECTION I

SECTION I: SE OVERVIEW

Study Topic Overview Summary	CAST became aware of the risk of zero-flap takeoff attempts through ASIAS and industry presentations at Aviation Safety InfoShare. CAST requested ASIAS perform a directed study, which confirmed several instances of aircraft lining up on the takeoff runway with flaps set to zero. CAST chartered the Takeoff Misconfiguration Joint Safety Analysis and Implementation Team (TOMC JSAIT) to more closely examine the risk and recommend mitigation strategies.
SE Objective	CAST recommends air carriers examine their own safety data to determine if they are at increased risk of takeoff misconfigurations, and if so, consider implementing actions outlined in this SE DIP to decrease the risk. Specifically, aircraft manufacturers and air carriers should ensure air carrier maintenance programs include appropriate actions and procedures to ensure proper operation of the takeoff configuration warning system (TCWS).
Primary Risks Mitigated	Loss of Control-Inflight (LOC–I), Runway Excursion (RE)

Action	Organization(s)	Strategy	Description	Due Date
Action 1	Aircraft Manufacturers	Procedures	Review TCWS designs and maintenance programs to ensure acceptable in-service reliability.	02/28/2018
	Comments: CAST closed this action based on manufacturers reporting they have reviewed the maintenance intervals and in-service reliability of TCWSs and made changes where required. CAST encourages manufacturers that have not performed the review requested in this action to do so.			
Action 2	Air Carriers	Procedures	Review maintenance programs related to the TCWS to ensure acceptable in-service reliability.	02/28/2020
	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 TOMC JSAIT Final Report is available through CAST.

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SECTION II: DETAILED ACTION INFORMATION

Action 1: Review TCWS designs and maintenance programs

Primary Implementer	**Aircraft Manufacturers**
Action Objective	Aircraft manufacturers should review takeoff configuration warning system (TCWS) designs and maintenance programs to ensure acceptable in-service reliability.
Action Timeline	Flow Time: 16 months Due Date: 02/28/2018
Timeline/Flow for Future Adopters	CAST expects a 16-month flow time to be accurate for future implementers based on reports from initial implementation.
CAST Lead	Aerospace Industries Association (AIA)

#	Organization(s)	Detailed Steps
1a	AIA	Communicate with CAST-represented manufacturers, sharing results of the Takeoff Misconfiguration Joint Safety Analysis and Implementation Team (TOMC JSAIT) study and highlighting the importance of the TCWS in preventing takeoff with flaps up. AIA should request manufacturers review their TCWS designs and maintenance programs for the following: a. For those models that have specific maintenance requirements for the TCWS, evaluate that those requirements are appropriate to ensure acceptable in-service system reliabilities are achieved, in accordance with FAA Advisory Circular 25.703–1, dated March 17, 1993. b. Review system architecture for the TCWS and determine which circuit breakers, if pulled, could directly or indirectly disable the TCWS. c. Review master minimum equipment list (MMEL) to ensure no approved items could affect availability of the TCWS, in accordance with FAA Policy Letter 05, Revision 1, dated August 15, 1997.
	Complete.	
1b	Aircraft Manufacturers	Perform the requested reviews and make any necessary recommended revisions to the MMEL, as applicable.
	As of April 2018, a significant number of manufacturers have reported to AIA they meet the intent of this subaction.	
1c	AIA	Track implementation and provide status updates to CAST.
	Reported to CAST in April 2018.	

Notes

Note: See Section III for detailed costs and resources.

Action 2: Review TCWS maintenance programs

Primary Implementer	**Air Carriers**
Action Objective	Air carriers should review their maintenance programs related to the takeoff configuration warning system (TCWS) to ensure acceptable in-service reliability.
Action Timeline	Flow Time: 24 months (from completion of Action 1) Due Date: 02/28/2020
Timeline/Flow for Future Adopters	TBD when this action closes.
CAST Lead	Airlines for America (A4A)

#	Organization(s)	Detailed Steps
2a	Air Carrier Industry Assns.	Communicate with members, providing results of the Takeoff Misconfiguration Joint Safety Analysis and Implementation Team (TOMC JSAIT) study and highlighting the importance of the TCWS in preventing takeoff with flaps up. Associations should request the air carrier members review their maintenance and minimum equipment list (MEL) policies and procedures as follows: a. Ensure their maintenance programs meet the latest manufacturer recommendations for maintenance intervals and procedures on TCWS. b. Review maintenance programs to ensure any circuit breakers pulled during maintenance or troubleshooting that could affect availability of the TCWS are reengaged before release for flight. c. Review MEL to ensure the procedures do not allow flightcrews to disable the TCWS by pulling circuit breakers.
	Complete.	
2b	Air Carriers	Perform the requested reviews and make any necessary recommended revisions to maintenance and MEL policies and procedures, as applicable.
	Complete.	
2c	Air Carrier Industry Assns.	Track implementation and provide status updates to CAST.
	Complete.	

Notes

SECTION II

Note: See Section III for detailed costs and resources.

SECTION III: SUPPLEMENTAL INFORMATION

Source Study	Takeoff Misconfiguration Joint Safety Analysis and Implementation Team (TOMC JSAIT).
Related Initiatives	

Total Cost	**$1,625,000**	*Note: For labor, 1 Full Time Equivalent (FTE) = $250,000*
Action 1	$250,000	1 FTE
Action 2	$1,375,000	5.5 FTE

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

	Organization	Resources Needed
Direct Resource Overview – Industry	Air Carriers	• Action 2: 5.5 FTEs (0.1 FTE per air carrier) to review procedures and information from manufacturers, and additional cost (varies) to modify maintenance procedures, if necessary.
	Aircraft Manufacturers	• Action 1: 1 FTE (0.25 FTE per manufacturer) to perform review and communicate results.

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	04/07/2022	Action 2 closed.
1.0	09/17/2018	New SE format. Content reorganized and terminology updated. No substantive changes.
0.2	04/05/2018	Action 1 closed.
0.1	10/05/2017	Action 1 due date extended from 10/31/2017 to 02/28/2018. Action 2 due date extended from 10/31/2019 to 02/28/2020.
Original	10/06/2016	CAST adopted SE 229.