CS-FSTD(A) issue 2

5 juin 2019

DSAC/PN/FOR

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RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET SOLIDAIRE
dgac
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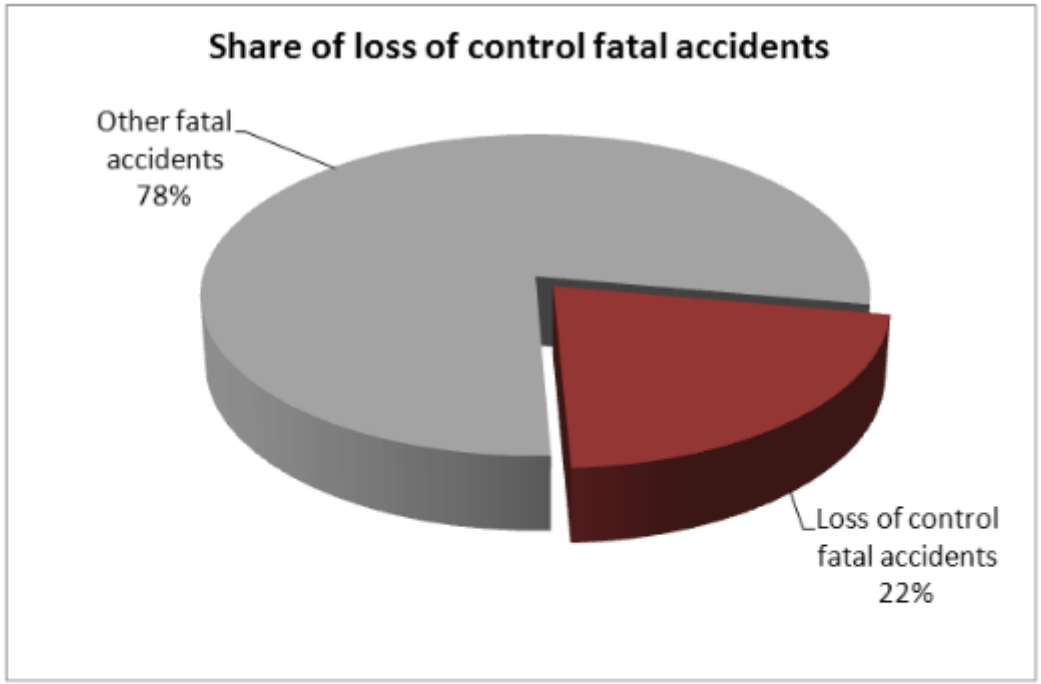
Direction Générale de l'Aviation Civile
Ministère de la Transition écologique et solidaire

Le déclencheur



EU carriers fatal accidents 2002-2011 in Commercial Air Transport (CAT) operations, Aeroplanes with MTOM above 5 700 kg. Source: EASA Safety Analysis.

EXTENSION DU DOMAINE

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NTSB :safety recommendation (A-96-120) after UA585, B737, March 1991:

Recognition and recovery skills learned in a light general aviation-type airplane are not necessarily transferable to the operation of a swept-wing, heavy commercial jet aircraft. [.....]

Require 14 CFR Part 121 and 135 operators to provide training to flightcrews in the recognition of and recovery from unusual attitudes and upset maneuvers, including upsets that occur while the aircraft is being controlled by automatic flight control systems, and unusual attitudes that result from flight control malfunctions and uncommanded flight control surface movements.

EXTENSION DU DOMAINE

FRAN-2012-039
FRAN-2012-040
NETH-2010-007
FRAN-2010-004
FRAN-2010-005
FRAN-2011-009
SPAN-2011-018
SOUF-2010-009
FRAN-2012-021
FRAN-2012-041
FRAN-2012-046
FRAN-2013-023
FRAN-2013-041
NETH-2014-005
FINL-2014-002

OPS ⇔ FCL

- L'AIR OPS a réagi avant l'AIR CREW
- En AIR OPS, la formation UPRT est déjà obligatoire, sur des moyens décrits dans la partie ORO.
- En AIR CREW, la définition des moyens a été publiée en mai 2018, l'obligation de formation en février 2019, avec application de l'ensemble en décembre 2019

MISE EN PLACE

4 Mai 15	• RMT.0581
1er Sept 15	• NPA 2015-13
29 Juin 17	• CRD 2015/13
29 Juin 17	• Opinion 06/2017
3 Mai 18	• ED Decision 2018/006/R

LE CŒUR DE LA NOUVEAUTÉ

— approach-to-stall objective requirements;
— determine whether the FSTDs' capability is appropriate to facilitate UPRT;
— establish a definition of 'FSTD training envelope';
— increase the fidelity of the simulation of the engine and airframe icing effects;
— provide guidance on IOS feedback tools, such as the interpretation of the velocity versus load factor (V-n) and alpha/beta diagrams

LES FSTD IMPACTÉS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
	being conducted.											
d.3	Instrument indications respond			✓	✓				✓	✓		
g.2	For aeroplanes equipped with stick pusher system (e.g. longitudinal control feel system, or equivalent) control forces, displacement, and surface position of the aeroplane correspond to those of the aeroplane being simulated.			✓	✓							A statement of compliance (SOC) is required verifying that the stick pusher system has been modelled, programmed, and validated using the aeroplane manufacturer's design data or other acceptable data source. The SOC must address, at a minimum, the stick pusher activation and cancellation logic as well as system dynamics, control displacement and forces as a result of the stick pusher activation. This requirement applies only to FSTDs that are to be qualified to conduct full stall training tasks. Test required.

LES COMPLÉMENTS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
h.2	The FSTD must have a real-time feedback tool that provides the instructor/evaluator with visibility of whenever the FSTD training envelope or aeroplane operating limits have been exceeded. Additionally, and optionally, a recording mechanism may be utilised.			✓	✓							This feedback tool must include the following: (a) FSTD validation envelope: This must be in form of an alpha/beta envelope (or equivalent method) depicting the 'confidence level' of the aerodynamic model. This 'confidence level' depends on the degree of flight validation or on the source of predictive methods. There must be a minimum of a flaps-up and flaps-down envelope available. (b) Flight control inputs: These must enable the instructor/evaluator to assess the pilot's flight control displacements and forces (including fly-by-wire, as appropriate). (c) Aeroplane operational limits: This must display the aeroplane's operational limits during the manoeuvre as applicable for the configuration of the aeroplane. An SOC is required that defines the source data used to construct the FSTD validation envelope. Please refer to AMC12 FSTD(A).300.

LES COMPLÉMENTS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
h.3	Upset scenarios: When equipped with instructor operating station (IOS) selectable dynamic aeroplane upsets, the IOS is to provide guidance on the method used to drive the FSTD into an upset condition, including any malfunction or degradation of the FSTD's functionality, required to initiate the upset. The unrealistic degradation of simulator functionality (such as degrading flight control effectiveness) to drive an aeroplane upset is generally not acceptable unless used purely as a tool for repositioning the FSTD with the pilot out of the loop.			✓	✓							An SOC is required to confirm that each upset prevention and recovery feature programmed at the IOS and the associated training manoeuvre have been evaluated by a suitably qualified pilot. Please refer to AMC9 FSTD(A).300(a)(1).

LES COMPLÉMENTS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
s.2	The aerodynamic model has to incorporate data representing the aeroplane's characteristics covering an angle of attack and sideslip range to support the training tasks.			✓	✓							An SOC is required. Please refer to AMC9 FSTD(A).300(a)(3).
s.3	Applicable only for those FSTDs that are to be qualified for full stall training tasks. The aerodynamic modelling has to support stall-recovery training tasks in the following flight conditions: (a) stall entry at wing level (1g); (b) stall entry into turning flight of at least 25° bank angle (accelerated stall); (c) stall entry into a power-on condition (required only for propeller-driven aeroplanes); and (d) aeroplane configurations of second-segment climb, high-altitude cruise ('near performance limited condition'), and approach or landing.			✓	✓							An SOC is required which describes the aerodynamic-modelling methods, validation, as well and check of the stall characteristics of the FSTD. An additional SOC has also to include a verification that the FSTD has been evaluated by a subject-matter expert pilot acceptable to the competent authority. Please refer to AMC10 FSTD(A).300(e) for clarification on the definition of a 'subject-matter expert pilot'. Please refer to AMC9 FSTD(A).300(a)(4) for clarification on the stall modelling. Please refer to AMC1 FSTD(A).200 for clarification of the 'near performance limited condition'.

LES COMPLÉMENTS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
t.1	Modelling that includes the effects of ~~airframe and engine~~ icing, where appropriate, on the airframe, aerodynamics and the engine(s). Icing-effects simulation models are only required for aeroplanes authorised for operations in icing conditions.			✓	✓				✓	✓		~~Statement of compliance required.~~ Icing models simulate the aerodynamic degradation effects of ice accretion on the aeroplane lifting surfaces, including (if present on the simulated aeroplane) loss of lift, decrease in stall angle of attack, change in pitching moment, decrease in control effectiveness, and changes in control forces in addition to any overall increase in drag. Aeroplane systems (such as the stall protection system and auto flight system) must respond properly to ice accretion, consistent with the simulated aeroplane. Aeroplane original equipment manufacturer (OEM) data or other acceptable analytical methods must be used to develop ice accretion models. Acceptable analytical methods may include wind tunnel analysis and/or engineering analysis of the aerodynamic effects of icing on the aeroplane lifting surfaces coupled with tuning and supplemental subjective assessment by a subject-matter expert pilot knowledgeable of the effect of ice accretion on the handling qualities of the simulated aeroplane. An SOC is required ~~shall~~ describing the effects that provide training in the specific skills ~~required~~ for recognition of icing phenomena and execution of recovery. The SOC must describe the source data and any analytical methods used to develop ice accretion models, including a verification that these effects have been tested. Please refer to AMC13 FSTD(A).300.

LES COMPLÉMENTS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
t.2	Modelling that includes the effects of icing, where appropriate, on the airframe, aerodynamics and the engine(s). Icing-effects simulation models are only required for those aeroplanes authorised for operations in icing conditions.								✓	✓		An SOC is required describing the effects that provide training in the specific skills for recognition of icing phenomena and execution of recovery.

LES COMPLÉMENTS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
d.1	Motion effects programming shall include: (1) effects of runway rumble, oleo deflections, ground speed, uneven runway, centre line lights and taxiway characteristics; (2) buffets on the ground due to spoiler/speed brake extension and thrust reversal; (3) bumps associated with the landing gear; (4) buffet during extension and retraction of landing gear; (5) buffet in the air due to flap and spoiler/speed brake extension; (6) approach-to-stall buffet and stall buffet (where applicable);	✓	✓	✓	✓							For level ~~A~~ FFSs: effects may be of a generic nature sufficient to accomplish the required tasks. For level B, C and D FFSs: if there are known flight conditions where buffet is the first indication of the stall, or where no stall buffet occurs, this characteristic should be included in the model.

LES COMPLÉMENTS

FFS niveau C, CG, D, DG

FLIGHT SIMULATION TRAINING DEVICE STANDARDS		FFS LEVEL				FTD LEVEL		FNPT LEVEL			BITD	COMPLIANCE
		A	B	C	D	1	2	I	II	MCC		
b.1	Sound of precipitation, rain removal equipment and other significant aeroplane noises perceptible to the pilot during normal and abnormal operations and the sound of a crash when the FSTD is landed in excess of limitations.			✓	✓							A statement of compliance is required. Sounds have to be directionally representative. For FSTDs that are to be qualified for full stall training tasks, sounds associated with stall buffet have to be replicated, if significant in the aeroplane.

IMPACT TESTS OBJECTIFS

2.a.10	stick pusher
2.c.8 (a) ou (b)	stall
3.g.5	buffet
2.i.1	icing

Le cas échéant, les tests modifiés en conséquence de la modification de la boucle de vol

Auxquels s'ajoutent quelques compléments pour les tests subjectifs

NOUVEAUX AMC : LE 9

AMC 9 Guidance on upset, stall (including in icing conditions), and qualification of FSTDs

- SME : subject matter expert
- Manœuvres UPRT
- Continuité de l'enveloppe de vol
- Modèles de décrochage, buffet
- Développement des tests QTG : décrochage, approche du décrochage, givrage moteur et cellule,

NOUVEAUX AMC : LE 10

AMC 10 Guidance on high angle of attack/stall model evaluation

- Conditions complémentaires pour les FFS utilisés en décrochage complet
- Guide de l'évaluation subjective

NOUVEAUX AMC : LE 11

AMC 11 Guidance on high angle of attack/stall model evaluation, and approach to stall for previously qualified FSTDs

- Allègements lorsque les données ne sont pas disponible pour un type avion
- Utilisation du foot print, validé par un SME (profil minimum)

NOUVEAUX AMC : LE 12

AMC 12 Guidance on upset prevention and recovery training (UPRT) for the FSTD Standards table

- Les nouvelles fonctionnalités de l'IOS :
- Afficher et enregistrer pour débriefing
  - FSTD validation envelope
  - Flight control inputs
  - Aeroplane operational limits

Avec un GM complémentaire

NOUVEAUX AMC : LE 13

AMC 13 Guidance material for engine and airframe icing evaluation provisions

- Détails du contenu des SOC
- Détails des requis des tests objectifs

RÉSUMÉ FFS

Enveloppe de travail, essais en vol

3 domaines : décrochage, givrage, position inusuelles

Nouveaux SOC, nouveaux tests objectifs, nouveaux tests subjectifs

Validation à toutes les étapes par SME

Provisions simulateurs existants

Exigences IOS

RÉSUMÉ FTD

It was not intended to add additional requirements for FTD in the context of WP1 (CRD)

Quelques impacts sur la numérotation des paragraphes

RÉSUMÉ FNPT

The additional flight condition: high-altitude cruise (near performance limited condition) is required.

The approach-to-stall entry in turning flight is to check the effect on the stall speed.

Quelques impacts sur la numérotation des paragraphes

TRANSITION LENTE

ED Decision 2018/006/R + ED Decision 2019/005/R

➔ 20 décembre 2019

Nombre de certificat de qualification niveaux C, CG, D, DG : 73

Nombre de FFS issue 2 : 2

Nombre d'évaluations spéciales issue 2 programmées : 14

Attention à la capacité d'évaluation!!

RAISON DE PLUS …

… pour fournir dès qu'un projet se précise :

Le maximum de description:

- Le choix Stall / Approach to stall
- Origine des données utilisées
- SOC
- Nombre de tests QTG impactés
- SME (développement et évaluation)

Nota :

A compter du 20 décembre 2019, toutes les évaluations initiales (tout type de FSTD) se feront avec le CS FSTD (A) issue 2.

Avant cette date, ce choix est laissé à l'appréciation de l'opérateur.

Questions ?