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European Union Aviation Safety Agency

Startle and Surprise Effect Management:

The European Regulatory Framework and EASA Research Study

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International Symposium on Pilot Training for Startle and Surprise

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Photo Martina Talacchia, EASA

New Basic Regulation: Regulation (EU) 2018/1139

Startle and Surprise on the Net

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https://www.youtube.com/watch?v=oDpQ2uGLUKU

Fight, Flight or Freeze… or Face?

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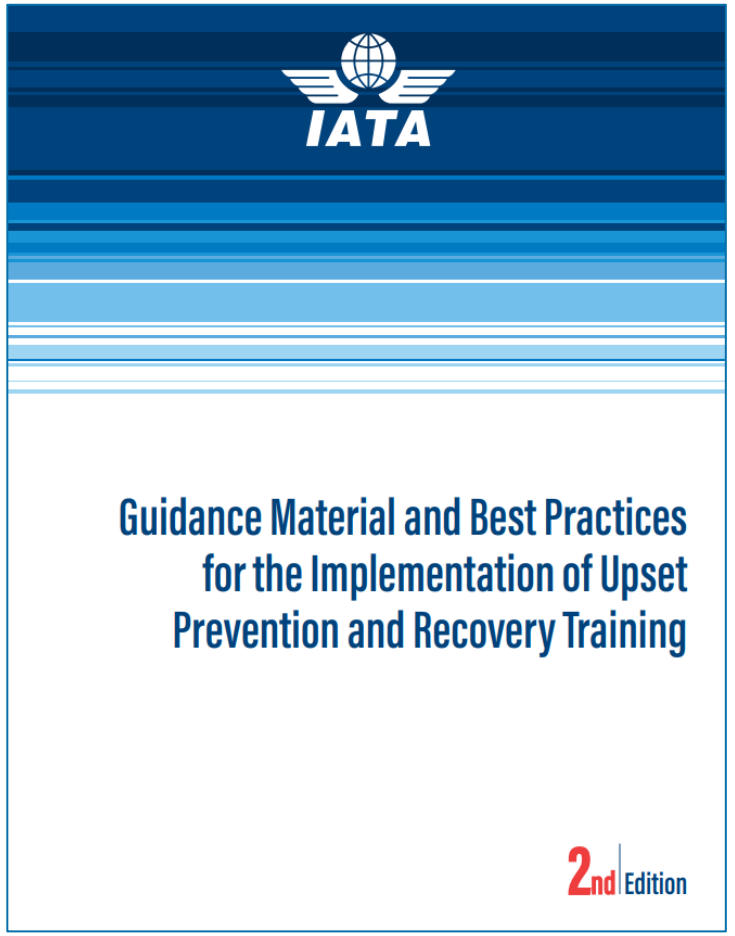
https://www.youtube.com/watch?v=jEHwB1PG_-Q

1. UPRT Framework

AUPRTA Rev 3.0 – February 2017



2018

Reg. (EU) No 1178/2011

1. UPRT Framework

Commission Regulation 1178/2011

GM3 FCL.010 Definition

'Startle' refers to the initial, short-term, involuntary physiological and cognitive reactions to an unexpected event that commence the normal human stress response.

'Surprise' refers to the emotionally based recognition of a difference in what was expected and what is actual.

'Stress (response)' refers to the response to a threatening event that includes physiological, psychological and cognitive effects. These effects may range from positive to negative and can either enhance or decrease performance.

1. UPRT Framework

AMC1 FCL.745.A Advanced UPRT course – aeroplanes

ED Decision 2019/005/R

(d) Flight instruction should include:

(1) exercises to demonstrate:

(i) the relationship between speed, attitude and AoA;

(ii) the effect of g-load on aeroplane performance, including stall events at different attitudes and airspeeds;

(iii) aerodynamic indications of a stall including buffeting, loss of control authority and inability to arrest a descent;

(iv) the physiological effects of different g-loads between -1 and 2.5G; and

(v) surprise and the startle effect

(2) training in techniques to recover from

(i) nose high at various bank angles

(ii) nose low at various bank angles

(iii) spiral dives

(iv) stall events; and

(v) incipient spin; and

(3) training to develop resilience and to employ strategies to mitigate the startle effect.

COURSE COMPETION

(e) The course is considered to have satisfactorily completed if the trainee is **able** to successfully:

(1) apply strategies to mitigate psychological and physical effects;

(2) recognise upset;

(3) apply correct recovery techniques from upset scenarios as specified in point (de)(2).

2. CRM Training Framework

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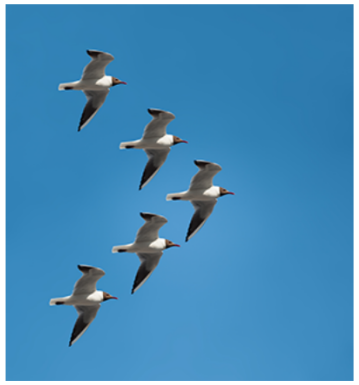
21 DEC 2017

CRM Training Implementation

Publication type: Safety Promotion | **Publication Date:** 01/12/2017 | **Safety Promotion Publication Type:** Crew Resource Management
Safety Promotion Product Type: Commercial Air Transport



The purpose of this document is to share recommended practices and information on Crew Resource Management (CRM) and promote the development of CRM training for both Air Operators having CRM training responsibilities, and Competent Authorities having oversight responsibilities.

The EASA Safety Risk Management process has identified CRM as one of the most important safety factor in the domain of Commercial Air Transport (CAT) Aeroplane operations.

Downloads

https://www.easa.europa.eu/document-library/general-publications/crm-training-implementation

2. CRM Training Framework

Commission Regulation 965/2012
Decision 2015/022/R

AMC1 ORO.FC.115 Crew resource management (CRM) training
CRM TRAINING — MULTI-PILOT OPERATIONS

(f) Training elements

(…) The operator should ensure that the following aspects are addressed:

(3) Resilience development
(i) Mental flexibility

(ii) Performance adaptation
Flight crew should be trained to:

(A) mitigate frozen behaviours, overreactions and inappropriate hesitation;

(B) adjust actions to current conditions.

(4) Surprise and startle effect
CRM training should address unexpected, unusual and stressful situations. The training should cover:

(i) surprises and startle effects; and

(ii) management of abnormal and emergency situations, including:

(A) the development and maintenance of the capacity to manage crew resources;

(B) the acquisition and maintenance of adequate automatic behavioural responses; and

(C) recognising the loss and re-building situation awareness and control.

Resilience

A system is resilient if it can adjust its functioning prior to, during, or following events - changes and disturbances,
but also, opportunities - and thereby sustain required operations under both expected and unexpected conditions.

EASA definition

CAT 4/2019

PILOT TRAINING

How to Develop Resilience?

Training in resilience development, an element of CRM, has been required by EASA air operations regulations since 2016. **Mario Pierobon** talked with training leaders about approaches to managing risk and challenging flight events.

Resilience development in crew resource management (CRM) training should cover mental flexibility and performance adaptation, according to EASA air operations regulations (ORO.FC.115).

Flight crews are required to be trained to understand that mental flexibility is necessary to recognise critical changes, to reflect on their judgement and adjust it to the unique situation, to avoid fixed prejudices and over-reliance on standard solutions, and to remain open to changing situations and perceptions.

In regard to performance adaptation, flight crews should be trained to mitigate frozen behaviours, overreactions and inappropriate hesitation, and to adjust actions to current conditions.

be developed during a CRM course but can be described and techniques can be presented; but it is up to the individual to personally train and develop it," he said.

"Psychologists Ivan Robertson and Cary Cooper – who have worked on resilience – affirm that there are four main defining elements: confidence, social support, adaptability and purposefulness," said Gitte Furdal Damm of consultancy About Human Factors.

"Confidence is about being able to reflect on vour own mistakes and learn

Above
"During training and checking events we need to put more emphasis on the things that go well ... and reinforce the related behaviours." - *Thomas Fakoussa*
Image credit: Shutterstock.

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- Life Balance
- Stress resistance
- Competence
- Confidence (Trust)
- Anticipation
- Monitoring
- Briefings, call outs, action control, etc.
- Communication
- Teamwork
- Role allocation
- Proper gradient

The Holmes-Raye Stress Inventory

LIFE EVENT	MEAN VALUE
1. Death of spouse	100
2. Divorce	73
3. Marital Separation from mate	65
4. Detention in jail or other institution	63
5. Death of a close family member	63
6. Major personal injury or illness	53
7. Marriage	50
8. Being fired at work	47
9. Marital reconciliation with mate	45
10. Retirement from work	45
11. Major change in the health or behavior of a family member	44
12. Pregnancy	40
13. Sexual Difficulties	39
14. Gaining a new family member (i.e. ... birth, adoption, older adult moving in, etc.)	39
15. Major business readjustment	39
40. Major change in eating habits (a lot more or less food intake, or very different meal hours or surroundings)	15
41. Vacation	13
42. Major holidays	12
43. Minor violations of the law (traffic tickets, jaywalking, disturbing the peace, etc.)	11

What Happened to You During the Previous Year?

What Does Your Score Mean?

150 points or less | a relatively low amount of life change and a low susceptibility to stress-induced health breakdown

150 to 300 points | 50% chance of health breakdown in the next 2 years

300 points or more | 80% chance of health breakdown in the next 2 years, according to the Holmes-Rahe statistical prediction model

https://www.stress.org/holmes-rahe-stress-inventory

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Teamwork

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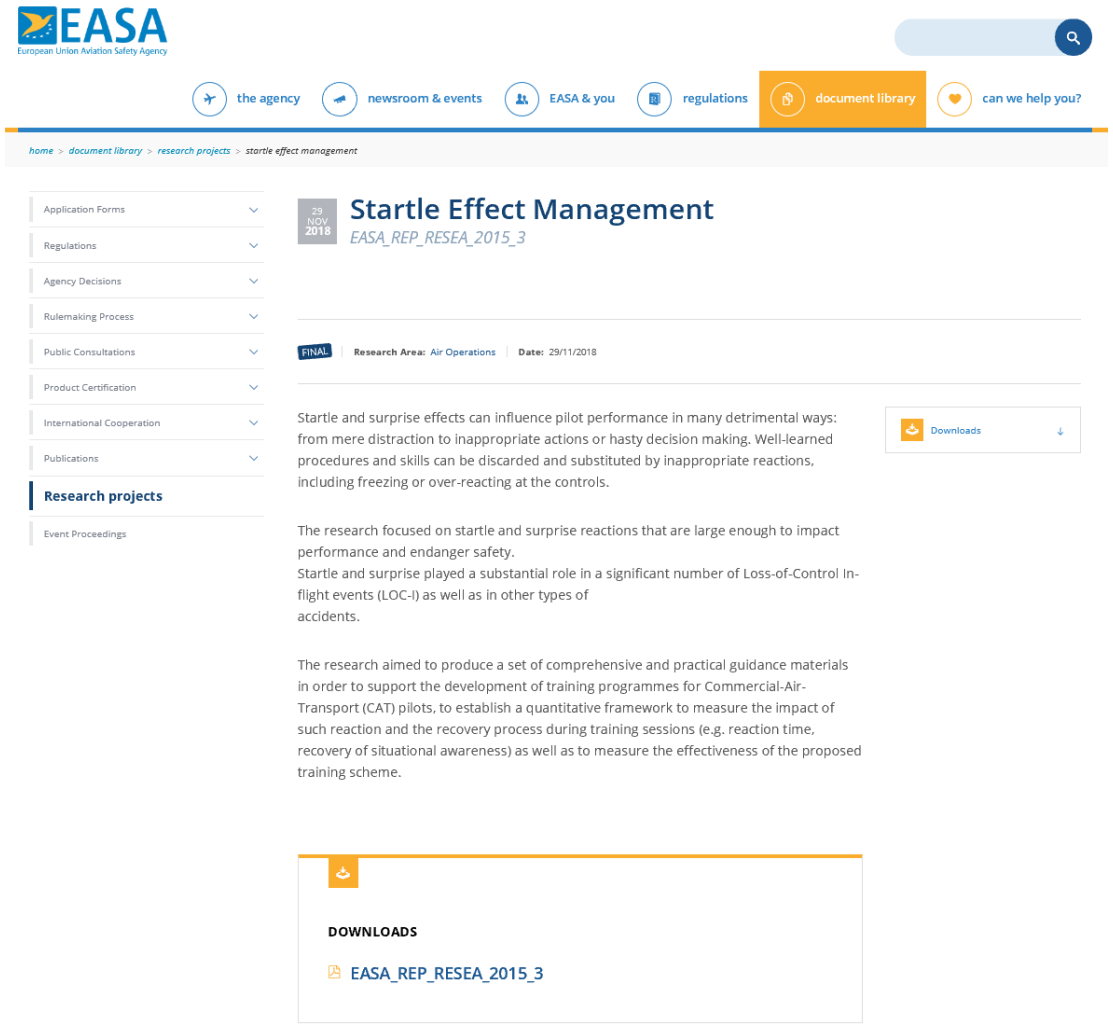
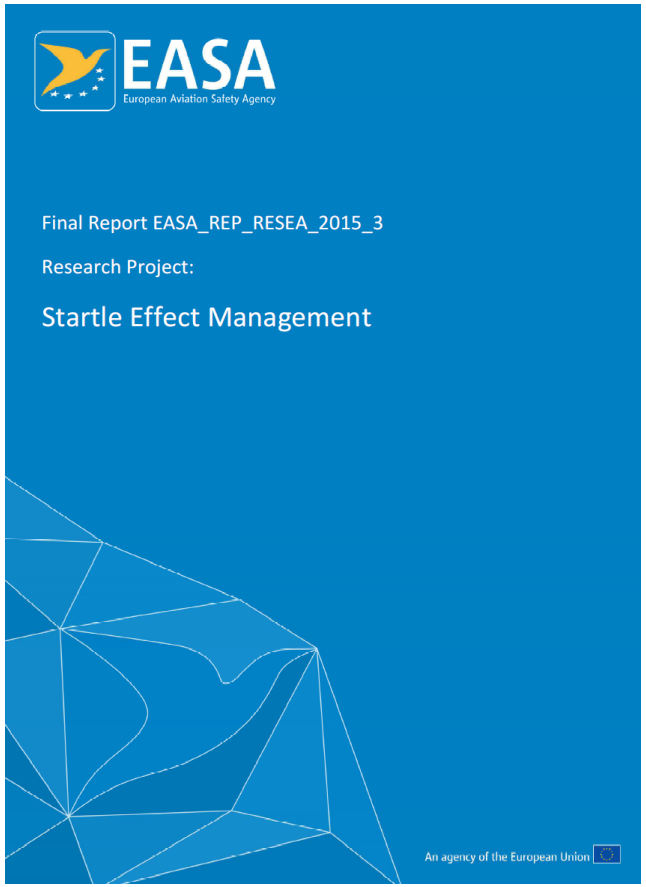
Aerotimes News Hub, Interview with Cap. Emmanuelle Savani, the First Right Wingman of the Frecce Tricolori, 17th August 2019

3. Research Study *EASA_REP_RESA_2015_3*





Same Report

Various Scenarios (List Extract)

(3) Sudden A/C upset of 30 degrees nose up and 60 degrees of bank.	• CAPT is PF • Reposition to FL100 • Clean aircraft and speed 250 kts. • IMC
(4) Birdstrike after Take-off 24 followed by one stalling engine and one engine with high vibration (indication)	• CAPT is PF • Average aircraft weight: B737: ZFW 58t and fuel 8t B747: ZFW 235t and fuel 85t • Cloudbase at 700' • Visibility 5000m • Wind 330/15 • Recoverable stall @100'
(End) Automatic approach 36R with lightning strike and frozen MCP	• CAPT is PF • On intercept heading • CAT III weather • Showers in the vicinity • Wind 330/15 • -RA • Lightning strike @ 1900'

The Technique

- Inspired by sport psychology and military mental training
- Objectives
  - Controlling physiological and psychological reactions (‘amygdala hijack’)
  - Integration with UPRT practices at KLM
  - ‘Mental Upset’ recovery acronym same as Aircraft Upset recovery acronym:
    - **U**nload
    - **R**oll
    - **P**ower

The Technique

1. **Unload** - Control arousal, avoid cognitive tunnelling, keep the Flight Crew on the same page
   - Take physical distance
   - Breath
   - Relax muscles
     Squeeze the upper legs and release tension in arms and shoulders
   - Check and calm down the colleague if necessary

The Technique

2. Roll - Start up the cognitive processes, collect information, avoid jumping to conclusions

- What do I (we) see, hear, feel, and smell?
- Verbalise and complement observations
- Give meaning to the situation
- Assess threats, time and ways to control

The Technique

3. Power - Look ahead, restore and adjust

- Project the situation into the future
- Critical questions to correct possible errors and adjust course of action
  - Missing information?
  - Conflicting / contradictory information?
  - Assumptions correct?
  - Need to reassess?

Evaluation

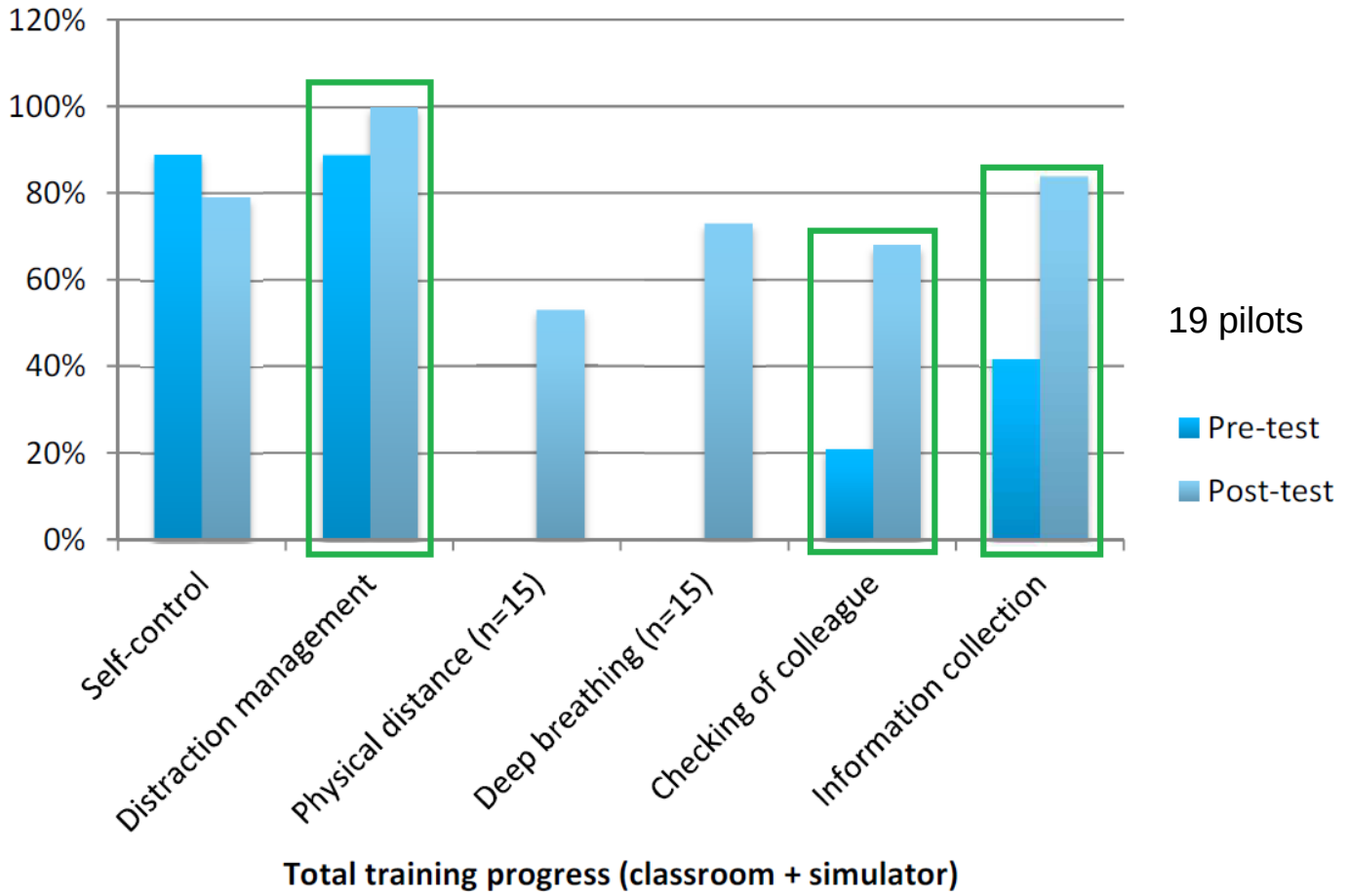


Figure 11 Total Training Observations

Source of Inspiration but Not Official Guidance

Disclaimer

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Disclaimer Extract

Scenario Types *(EASA_REP_RESA_2015_3)*

Surprise category:	Description:	Examples:
S (Self)	Surprise concerning the pilots' individual perception or behaviour	- spatial disorientation/ visual illusions - surprise at own actions
H (Human Interaction)	Surprise concerning the interaction with other people in the aviation system	communication/ actions of: - other pilot - ATC - cabin crew - passengers (e.g. hijack, illness)
A (Aircraft)	Surprise concerning the aircraft's sudden behaviour	- automation surprise - aircraft upset - sudden controllability issues
P (Procedures)	Surprise concerning the use of procedures, resulting in an ambiguous situation	- multiple failures - conflict between procedures - unwanted outcome of procedures
E (Environment)	Surprise concerning elements in the environment outside of the aircraft, posing a direct threat to safety	- GPWS warnings/ terrain - change of runway conditions/ wind/ visibility - airport work in progress - birds - TCAS warnings/ other aircraft

More Scenarios (List Extract)

Exercise	Conditions
(00) Automatic ILS 27 approach with stby bus failure	• CAPT is PF • On intercept heading • Cloudbase at AMS at 300' • Visibility 1200m • 45 minutes of fuel
(0 + 1) Explosive decompression with engine severe damage	• FO is PF • Flight at FL350 • Location in TMA of AMS • IMC • Random traffic TCAS traffic on display
(2) VOR approach 36C AMS with simulated surprise	• FO (pilot in RHS) is PF • Cloudbase at 700' • Visibility 5000m • Approach programmed in FMS with the extra waypoint before point D


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Thank you for your attention!

Questions?

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