

Effective Training to Improve Pilot Management of Startle during Unexpected Events



Dr Wayne Martin
BAvMan, MAvMgmt, MBus, PhD, FRAeS

Training Objectives

Topics

- The problem
- The nature of startle and surprise



The Problem with Startle and Surprise

Surprise

An unexpected event that violates a pilot's expectations and can affect the mental processes used to respond to the event

(FAA, 2015)



The Problem with Startle and Surprise

Startle

An uncontrollable, automatic muscle reflex, raised heart rate, blood pressure, etc., elicited by exposure to a sudden, intense event that violates a pilot's expectations.

(FAA, 2015)



The Startle Reaction

The usual startle reflex actions include:

Eye blink.

Forward movement of the head.

A characteristic facial expression.

Raising of shoulders and moving them forward.

Motion of the upper arms away from the body.

Bending of the elbows so as to raise the forearms and hands.

Rotation of the forearms inwards so that the palms face each other.

Clenching of the fingers.

Motion of the upper body forward from the hips.

Tightening of the abdominal muscles.

Bending of the knees

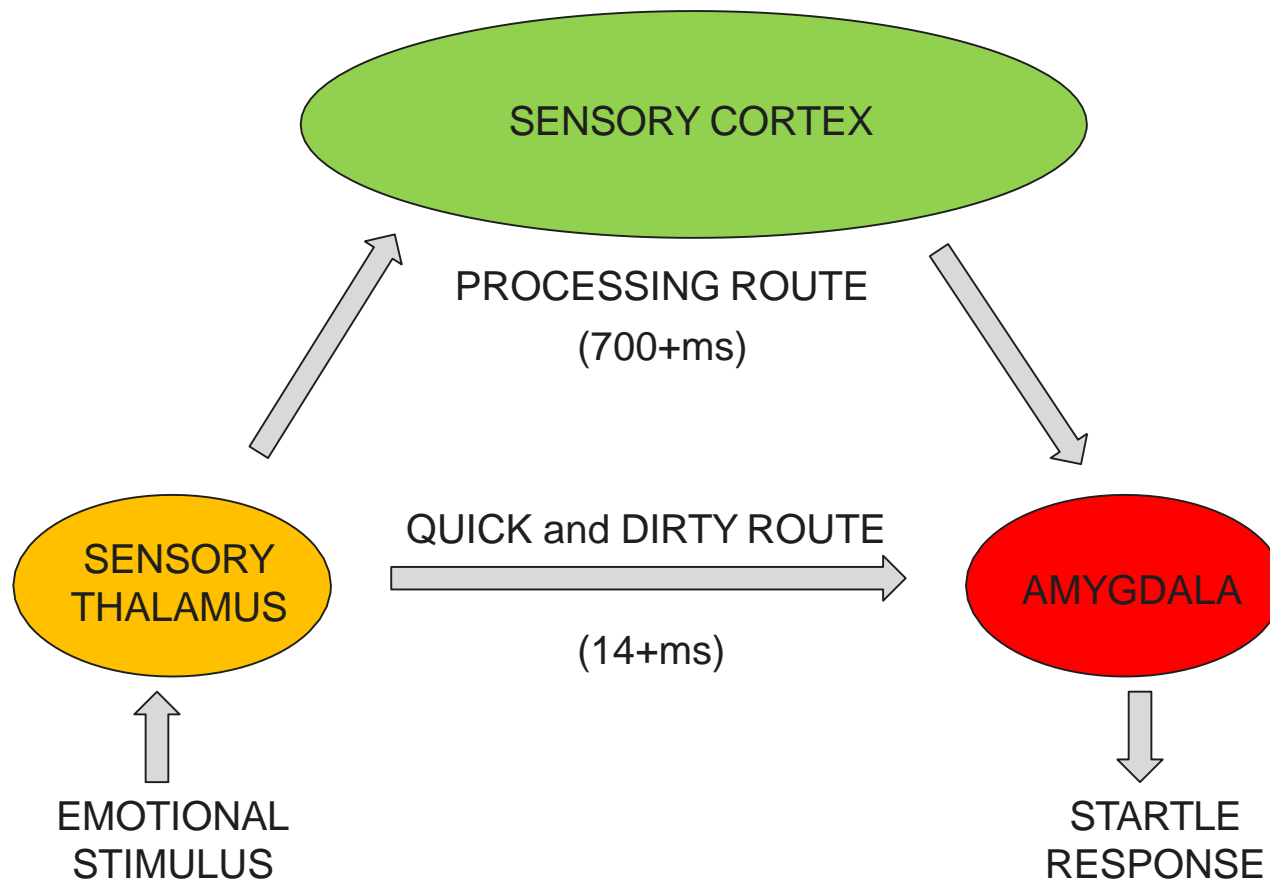
The Startle Reaction



The onset of the startle reflex often begins within 14 msec of the eliciting stimulus, and may have a duration of 0.3 secs for a mild but complete response to approximately 1-1.5 secs for an intense reaction.

This suggests that startle responses are generated significantly before normal cognitive processing.

Emotional Response in the Human Brain



The Startle Reaction

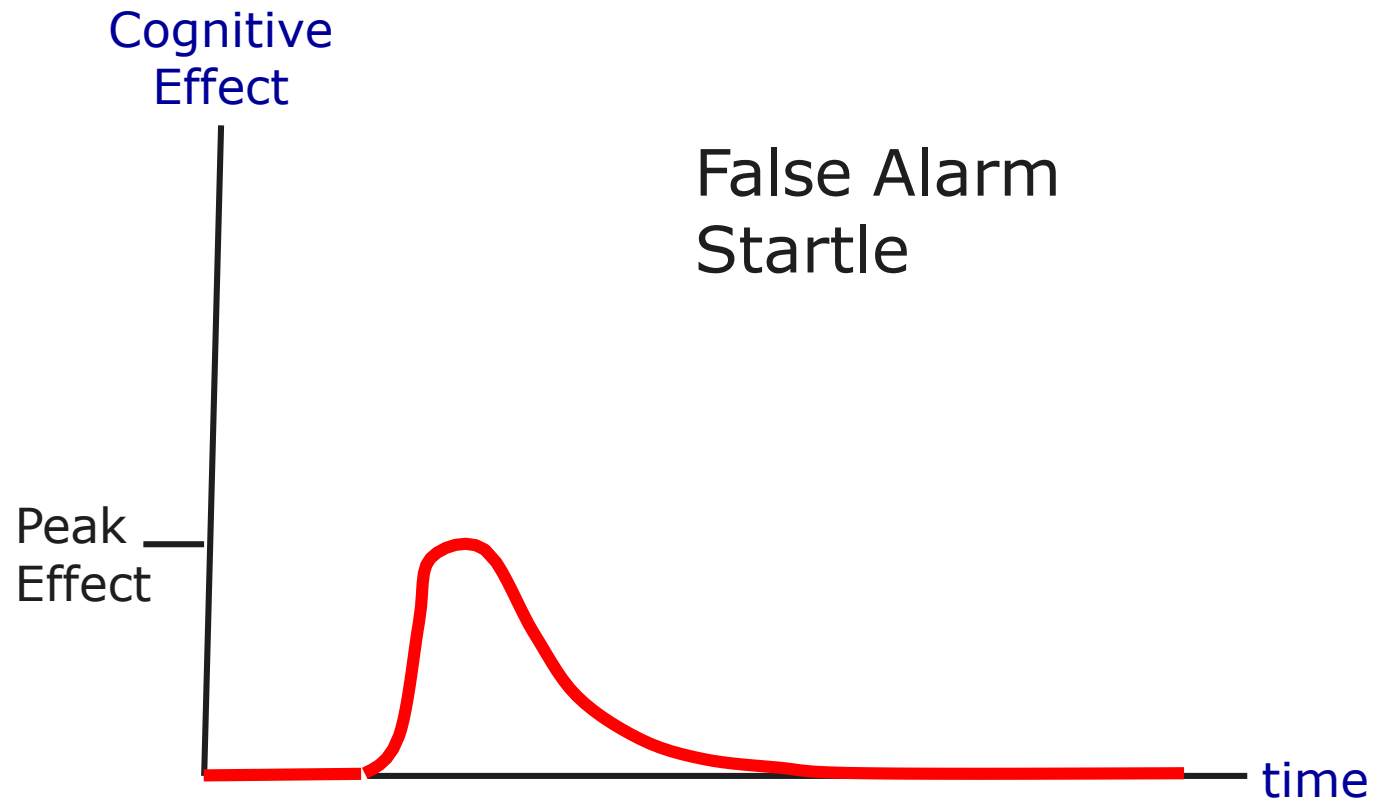


The startle transitions from a simple reflex into a full-blown startle reaction where a perceived or actual threat exists
(Fear-potentiated Startle)

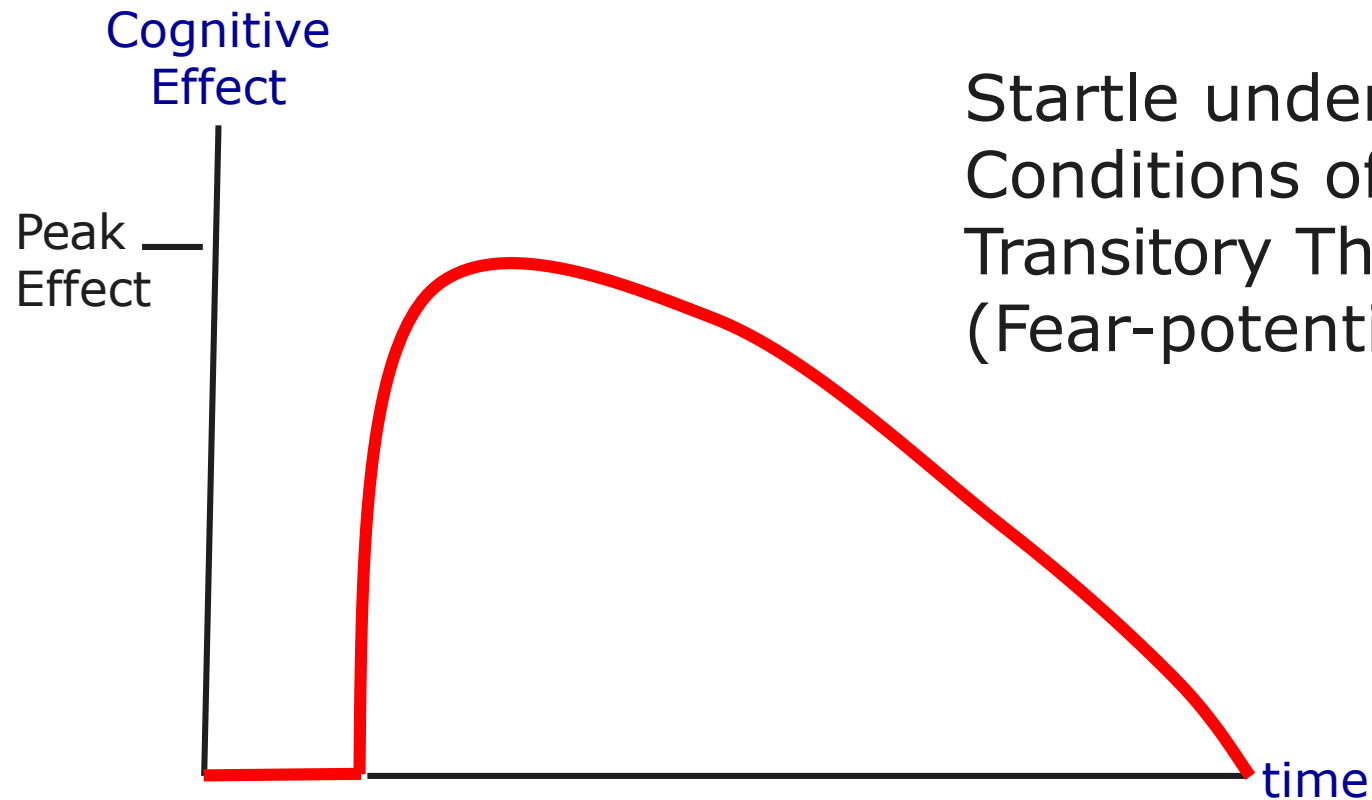
This full-blown reaction involves an arousal of the sympathetic nervous system with activation of various hormonal changes such as adrenalin, commonly associated with the 'flight or fight' response.

This reaction has shown during testing to create severe impediments to information processing for up to 30 seconds.

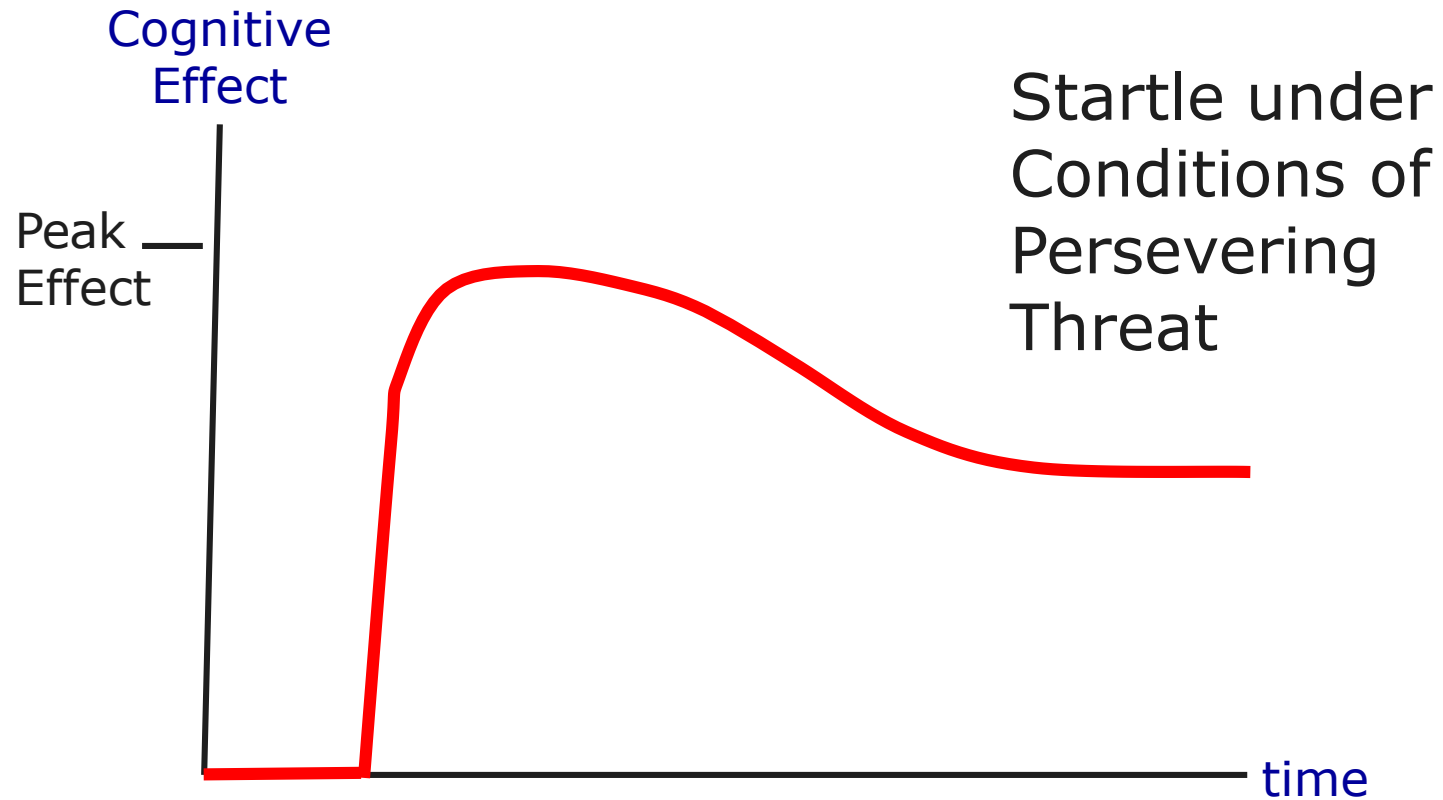
The Startle Reaction



The Startle Reaction



The Startle Reaction

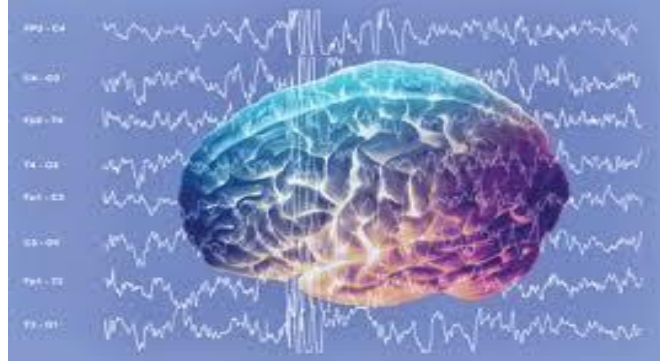


Dynamic Mortality Salience

Mortality Salience is:

‘the enhanced awareness that people engaged in dangerous tasks have of the likelihood of personal injury or death’

In the context of an aircraft emergency, this realisation presents itself as an appraisal that a situation is life threatening or potentially ‘harmful’, which could enhance a **‘fear-potentiated’ startle**



Cognitive Effects of Startle

- Research has shown significant impairment in information processing for up to 30 seconds
- Information processing tasks such as attention, perception, situational awareness, problem solving and decision making can be markedly impacted.
- Communication is often disorganised and incoherent for some time.
- Psychomotor impairment often occurs but generally lasts for only 5-10 seconds.

The Problem with Startle and Surprise



Colgan Air – Buffalo 2009



The Problem with Startle and Surprise



Turkish Airlines – Amsterdam 2009



The Problem with Startle and Surprise



Air France – Atlantic Ocean 2009



The Startle Reaction



People startle especially readily and violently when they are in states in which there is some alteration in usual attentional mechanisms: when attention is intently focussed on some task, when deeply engaged in introspective thought, when intensely monitoring the environment, and when drowsy or falling asleep





Questions?