



Interagency Aviation Lessons Learned



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Subject: Human Factors – Startle Effect – Expect the Unexpected

Area of Focus: Flight Safety

Distribution: All Aviation Operations

Discussion: Last summer, a contracted Bell 407 helicopter was involved in an accident while transporting firefighting personnel from a fire to their home base ([NTSB #WPR 24LA265](#)). During the mishap flight, the pilot misinterpreted an uncommanded activation of the Measured Gas Temperature (MGT) gauge test and consequently conducted an autorotation into a cornfield, resulting in substantial damage to the aircraft and minor injuries to some of the crew.

The MGT test activation results in a full-scale deflection toward the maximum temperature limit and activation of the temperature warning lights. Other engine instruments remained in the normal operating range during the uncommanded test event.

Numerous factors often come to light when conducting an accident investigation. In some cases, pilot skill and knowledge may not have been sufficiently developed to prepare for an emergency, but in some instances, an initial inappropriate reaction to a perceived emergency culminated into a chain of events that led to disaster.

Humans are subject to a “startle response” when they are faced with emergency situations which may delay action or initiate an inappropriate action in response to the emergency¹. The startle response (also known as limbic hijack) is the physical and mental response to a sudden, unexpected stimulus². Startle can negatively impact pilot performance by causing confusion, delaying appropriate actions, or leading to inappropriate responses. It can also narrow vision and reduce situational awareness.

This effect temporarily disrupts a pilot’s focus, which can be dangerous during critical phases of flight. When startled, a pilot may also experience a momentary lapse in decision-making. This brief period of confusion can turn an otherwise manageable situation into a crisis.

¹ <https://www.safety.af.mil/Divisions/Human-Performance-Division/HFACS>

² <https://www.flightsafetyaustralia.com/2015/08/without-warning-the-startle-factor/>

Unexpected events, especially those occurring close to the ground, require rapid, appropriate action. As a pilot, you should take time to review “what if” scenarios in your head and practice what you would do should a certain event take you by surprise. Mental drills like this, in a non-stressful environment, will help you develop a pre-planned course of action and test your mastery of your abnormal and emergency checklists.

Flight simulation is another great tool for planning and preparing yourself to handle unexpected events. You can experience an engine failure after takeoff or practice your reaction to a primary or multi-function flight display failure. A simulator can also give you practice with electrical failures, control-system failures, and more. Some programs even allow you to set up random failures during a flight and let you experience them as you would in real-world flying. One of the biggest benefits of flight simulation is the ability to experience both sudden and subtle failures, become familiar with their early indications, and practice handling those emergencies to ensure a safe outcome.

The discipline of planning for both positive and adverse outcomes is one of the most essential elements of being a pilot. This includes training, regular practice, and the discipline to strive for proficiency and perfection on every flight. It includes understanding your aircraft’s systems, how they work, how they fail, and how those failures could affect other systems or controls. It also includes incorporating crew resource management (CRM). A pilot with good CRM skills is one who has strong situational awareness of the aircraft and its flight path, and the range of resources that can assist.³

Occasionally, our perception of events fails to match reality. In aviation, it’s vital that we take the necessary time and adhere to three vital standards when flying an aircraft:

1. MAINTAIN AIRCRAFT CONTROL
2. PROPERLY ASSESS THE SITUATION
3. TAKE APPROPRIATE ACTION

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³ <https://www.faa.gov/newsroom/startle-response-safety-briefing>