

# CALLBACK

From NASA's Aviation Safety Reporting System



Issue 535

August 2024



## Physiological Factors IN AVIATION



This month, *CALLBACK* continues its informal survey of ASRS's Human Factors (HFs) with a brief look at physiological incidents in aviation. "Aviation Physiology deals with the physical and mental effects of flight on air crew personnel and passengers."<sup>1</sup> Effects can be subtle or overt, but are almost always detrimental. Well known effects include hypoxia, decompression sickness, and spatial disorientation, while some less recognized are self-imposed stress, sensitivity to noise, and physical fitness.

Humanly speaking, physiological effects are produced by the body's inability to fully adapt to hostile, unnatural environments that aviation can impose. Changes in barometric pressure, considerable variation in temperature, acceleration and high velocities in three dimensions,<sup>1</sup> and rotation around three axes are key elements in generating physiological events. Aircraft systems designed to mitigate harsh environments can play a part. A system-sustained, safe environment may deteriorate to one less tolerable during a system failure, which can then reintroduce original hazards to passengers and crews. Moreover, a failed system, itself, may subject aircraft occupants to its own peculiar hazards. Physiological effects can also affect other HFs, such as confusion, distraction, fatigue, or situational awareness.

This month, we feature reported incidents where a significant physiological effect was experienced. Note the physical and mental effects described, the extent to which operations could have been affected, and any possible mitigations.

### Part 91 – Degrees of Disorientation

This PA-28 private pilot gained some real-time experience and likely discovered valuable personal insight to combat disorientation while in the throes of sensory illusion.

■ *Yesterday's weather presented challenging conditions, even with 10 miles of visibility and clouds ranging from 5,000 to 6,000 feet at times. I was on an IFR flight plan. ... As I ascended to 9,000 feet, I encountered icing issues, making it difficult to maintain my assigned altitude. I deviated by 200 to 300 feet to navigate around clouds. Approaching the mountains, before I encountered thick clouds...ATC requested that I stay at 9,000 feet. Upon entering the clouds, I realized my aircraft was in an unusual attitude, with a 40-degree deviation in...attitude, and airspeed was nearing the yellow*

*zone. My heading was also off by 40 degrees. ... Despite ATC's instructions to turn, I communicated my struggle to maintain control of the plane. I regained visual contact within 30 seconds, and the Controller directed me to maintain the current heading. Concerned about my disorientation and staying on course, I eventually corrected my heading. ... Worried about fuel, I descended earlier than planned.*

*Reflecting on this experience, I am disappointed in my performance and ability to handle flying through actual IMC. Recognizing the need for improvement, I have scheduled additional actual IFR practice with my instructor...to enhance my skills and confidence in challenging conditions.*

### Part 91 – An Ounce of Prevention

A C172 Flight Instructor succinctly provides some sound aviation observations and philosophy on navigation, training, dependency, and disorientation.

■ *I found myself grappling with disorientation as a pilot, leading to a descent of 400 feet. The loss of GPS navigation compounded the challenge, prompting me to execute three successive 360-degree turns in a bid to regain situational awareness. This incident highlighted the imperative for comprehensive pilot training in spatial orientation and underscored the critical role of dependable navigation systems. It serves as a poignant reminder of the ongoing need for continuous skill development to navigate unforeseen challenges during flight.*

### Part 91 – Classic Hypoxia

This Super King Air corporate crew chronicles a system failure, then describes in detail the hypoxia that followed.

From the Captain's report:

■ *We picked the plane up from Maintenance at ZZZ. The aircraft was in for a phase inspection as well as various other maintenance items, including a landing gear overhaul. We departed ZZZ on an IFR filed flight. ... Approximately 15 minutes into the flight, climbing through FL230 for FL240, we noticed a R BLEED FAIL light on the Master Caution Panel. Per manufacturer's Emergency Memory Items Checklist, I reached over to the bleed air panel and switched the right bleed air to the OFF position. At this*

point, I reached for the manufacturer’s Emergency Checklist to verify the condition and actions needed to be taken. ... We notified...Center that we needed to return to the departure airport...and needed to descend to a lower altitude. Center asked if we were an emergency, and I responded, “Not at this time.” We were given a left turn back to ZZZ and a descent to 17,000 feet. As we were in the turn, the L BLEED FAIL light illuminated. ... Adrenaline and stress levels rose rapidly, as a dual bleed air failure is an incredibly rare event and would ultimately mean the loss of cabin pressurization. Mentally, my debate was, “Should I follow the Emergency Checklist and turn off the other bleed air switch, unknowing if this is solely an indication issue, or leave it on, risking the possibility of further complications or compromising other systems?” The checklist instructs you to turn off the system associated with the caution light, but not what to do in the event of dual failure. With both systems off, the cabin immediately felt a loss of pressurization. We both immediately felt intense effects of hypoxia and began using crew masks for oxygen...to relieve some of these effects. We continued a rapid descent until we reached a safer altitude where effects stabilized. We tried [requesting priority], but were having radio troubles with the mask microphones. The microphone switch was selected to OXY when we donned the masks. We removed masks once we both felt like the effects had been reduced. At this point, we were just trying to reach anyone back at ZZZ, so we swapped to Tower frequency back on headsets. Tower instructed us to go...to Approach frequency and get cleared for the ILS in to ZZZ. Once cleared, we landed safely.

From the First Officer’s report:

■ Some of the effects I was experiencing were: numb/tingling fingers, hyperventilation, incredibly slow reaction time, lack of basic motor skills, visual impairment, and at one point...the beginning of a greyout. Eventually the oxygen mask and the lower/safe altitude seemed to reduce the effects, and I could feel my body stabilizing.

## Part 121 – Peculiar and Systemic

A B737 NextGen Captain experienced an unusual system failure that produced significant physiological symptoms. Fortunately, few were affected and resolution was achieved quickly. Results could have been far more serious.

■ We were a ferry flight with no flight attendants. While holding in position on the runway...we heard a loud bang followed by the sound of escaping gas. We notified ATC that we had a maintenance issue and needed to cancel our takeoff. ATC instructed us to taxi clear. I cleared the runway and set the parking brake. We investigated the situation and

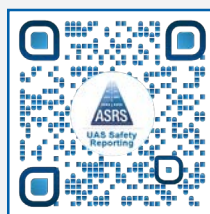
discovered that the flight deck halon fire extinguisher was discharging into the flight deck. We removed the extinguisher to try and shut it off. We were unable, and then moved it to a first-class seat. During this time, approximately 5 minutes, we were breathing halon gas. We informed ATC we needed to return to the gate. Once at the gate, Maintenance discovered there was a leak at the neck of the extinguisher handle and the bottle. We were both experiencing headaches and light-headedness and went to the local clinic. The Company doctor examined us and advised that we remove ourselves from the schedule for a minimum of 48 hours. I will be re-examined by the Company doctor to determine my return-to-work status.... The health effects were significant.

## Part 121 – Blight Noise

A B737 MAX Captain identified a distracting physiological effect that became a hazard at night in IMC. A fix is suggested and a plea for mitigation is made.

■ After being cleared direct to ZZZZZ on the arrival and to cross it at 11,000 feet, we encountered a high pitch tone that had been building up after departing ZZZ [Airport]. Due to the high pitch tone encounter and late crossing restriction clearance, we arrived at the fix a little high. I contacted Maintenance the next day to find out the origin of the tone. It appears there could be a safety issue with the ground crew plug-ins on the MAX. Due to the height of the external jack, some ground crews use the nose gear access. Instead of pulling the cord near the base of the plug, it’s pulled from several feet away, which breaks the tip of the plug off in the access. This creates a build-up in static noise, eventually becoming a high pitch tone. This causes a major distraction to crews due to the level of noise, making it difficult to communicate between crews and ATC. The aircraft malfunction caused physiological distraction due to the high-pitched tone. I recommend training for the ground crew regarding the plug removal technique and the potential for a safety issue.

1. Introduction to Aviation Physiology, FAA Civil Aerospace Medical Institute, Mike Monroney Aeronautical Center, Oklahoma City, OK 73125, [https://www.faa.gov/sites/faa.gov/files/2022-11/Intro\\_Aviation\\_Physiology.pdf](https://www.faa.gov/sites/faa.gov/files/2022-11/Intro_Aviation_Physiology.pdf)



### NASA ASRS UAS Safety Reporting

Anyone involved in UAS operations can file a NASA ASRS report to describe close calls, hazards, violations, and safety related incidents.

ASRS Alerts Issued in June 2024	
Subject of Alert	No. of Alerts
Aircraft or Aircraft Equipment	5
Airport Facility or Procedure	9
ATC Equipment or Procedure	4
<b>TOTAL</b>	<b>18</b>

535  
A Monthly Safety  
Newsletter from  
**The NASA  
Aviation Safety  
Reporting System**  
P.O. Box 189  
Moffett Field, CA  
94035-0189  
<https://asrs.arc.nasa.gov>

June 2024 Report Intake	
Air Carrier/Air Taxi Pilots	5,666
General Aviation Pilots	1,964
Flight Attendants	1,806
Military/Other	846
Controllers	370
Mechanics	343
Dispatchers	222
<b>TOTAL</b>	<b>11,217</b>