**The Application of Mindfulness to Flight Training**

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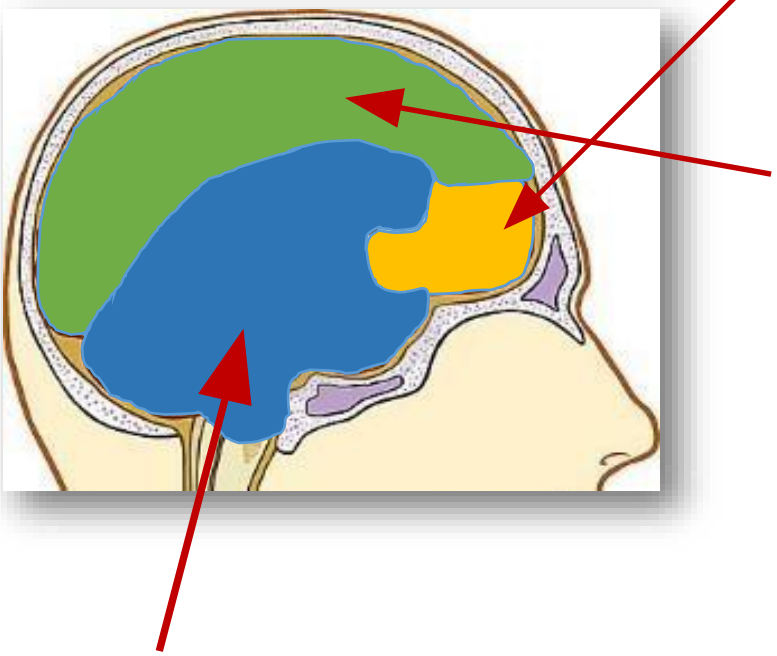
Whether in training or in their daily jobs, pilots continue to exhibit behaviour which is at odds with their training and their experience; put another way: they don't do what they're supposed to. Whilst there may be several reasons for this, I would suggest that it is (very often) down to a failure properly to manage their *emotional* reactions to situations.

Why might that be? What is going on inside the brain? For our purposes, we can divide it into three areas.

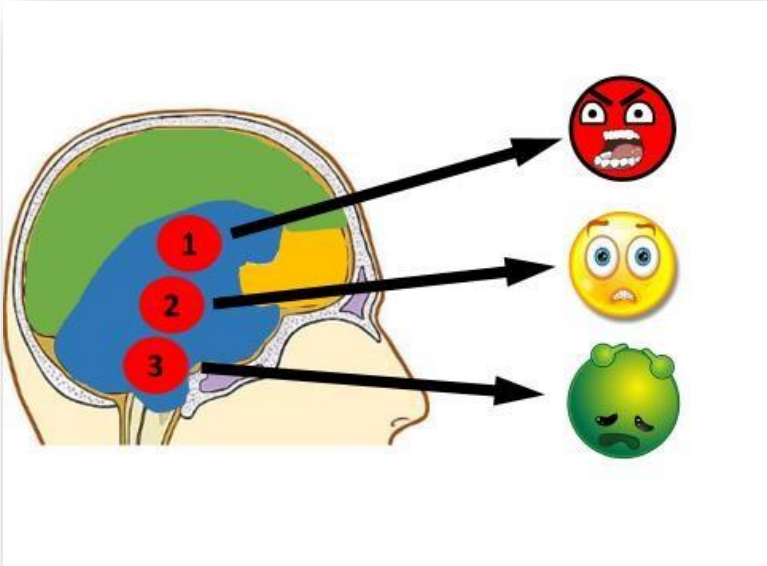


This is the input (pre-frontal area), where all information about the world is gathered via the senses, and through which instructors impart their knowledge.

That knowledge is stored here: this is the 'human brain' (the neo-cortex). This is peculiar to human beings as a species; this is where we plan - where we imagine. We can observe the facts of a situation and create a solution (which may never have existed before) so it provides an enormous evolutionary advantage. When we perceive things as they are, create a solution and act on the plan – in other words, when the *human* brain determines our actions – we tend to get it right.

The rest constitutes the 'chimp brain' (which includes the cerebellum, the limbic system and the amygdala). This is our survival mechanism; it keeps our animal bodies alive. In that capacity, it is also our stress responder. Which makes sense: if our primitive, animal selves were placed in a stressful situation – say, a sabre-toothed tiger running towards us – it's no good trying to observe the situation and create a plan. We need a faster acting response: "Teeth! Argh! Run!" And, thus, we survive.

However, in or modern world (which is mercifully devoid of sabre-toothed tigers) allowing the chimp brain to dictate our actions will very often lead to 'unhelpful behaviour'. Unhelpful behaviour is simply where we behave differently to how we, deep down, *want* to behave. If we say afterwards "I don't understand why I did that", or "I don't know what I was thinking", chances are you weren't thinking; at least not in the sense of engaging the cognitive faculties in the human brain. Indeed, *whenever* 'unhelpful' behaviour is manifest there is a very good chance that it is because the *chimp* brain is dictating our actions.




When placed under stress, the chimp brain acts to protect us; it does so by generating little, primitive thoughts which, in turn, generate *emotions.*

These might be:

**1**: How dare they? This is unfair!
leading to **anger**

**2**: This is going to be awful!
leading to **anxiety** or **fear**

**3**: Why bother? I'll just fail again…
leading to **depression**

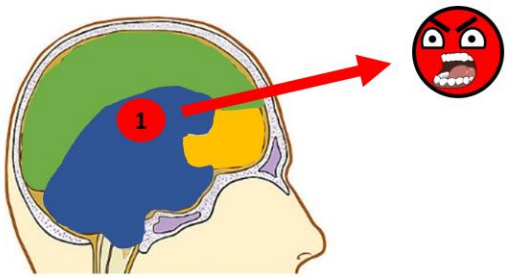
Anger, fear, depression: the only currencies in which the chimp brain deals.

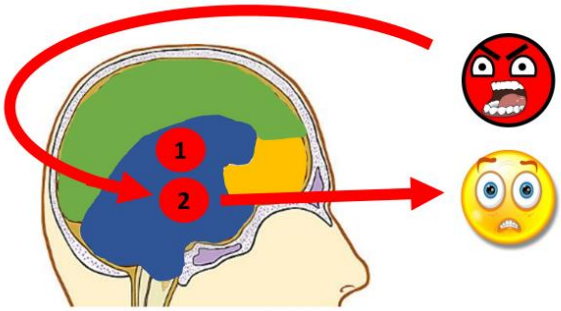
Now, in cavemen these are great. They are powerful triggers for protective action, because we will either attack the threat, run away from the threat, or stay at the back of the cave and hope the situation changes. But in modern humans – who have created world using our cognitive, imaginative human brains - *acting* in response to anger, fear or depression will produce unhelpful behaviour.

Okay. No problem, though, right? Just keep the thinking in the human brain and you will be fine. Don't respond emotionally, don't *be emotional*; just *think*, for goodness' sake, and you'll get it right….

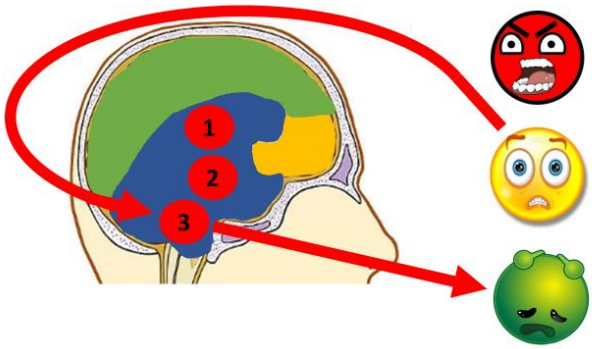
The issue there is twofold: one, emotions are natural and automatic responses to stress; and two, we get trapped in a 'feedback' situation.

Let's examine an example from training. A trainee is flying a manual approach and the aircraft drifts above the glideslope. This is an error; the error will trigger stress and there will be an emotional response – in high-achieving, motivated individuals this will typically be anger; anger at themselves. Now, in a heightened emotional state our ability to perceive *reality* is compromised, because the chimp brain (in an effort to protect the body) will default to assuming a worst-case scenario. The trainee does *not* perceive 'the aircraft has deviated above the glideslope'; he or she perceives instead "I'm getting this all wrong!". The effect of that perception is to increase the amount of stress he or she is experiencing, producing a further emotional reaction, this time of anxiety.



It's an example of the 'chimp brain loop'; stress gives rise to emotion – emotion ultimately begets stress. And now, in this anxious and angry state, our trainee still doesn't truly perceive reality but, instead, perceives "I'm failing at this"; maybe, even, "I am a failure". Another trip around the loop, more stress, and a further emotional reaction. If he's really good, our trainee can have all three going at once: anger, fear *and* depression.

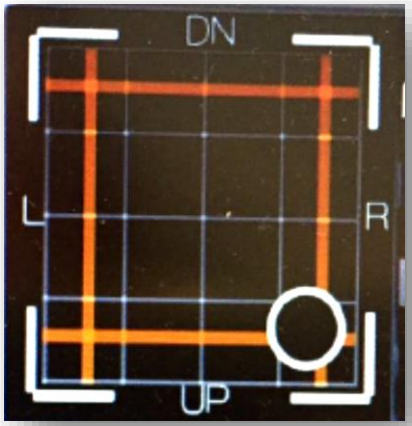



Thus, because the chimp brain is so highly active at this time, accessing the knowledge which his instructor has imparted to his *human* brain becomes very difficult.

That's an example from training; what about at work? What about a pilot who, say, encounters an upset?

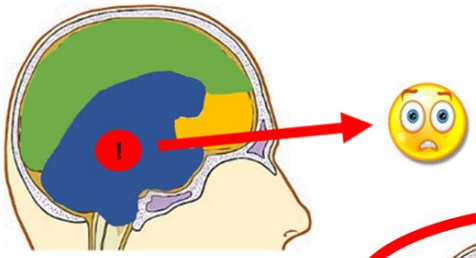
On 1st June, 2009, Air France 447 came down over the Atlantic on its way home from Rio with the loss of all lives aboard. As is always the case, a lot went wrong in that accident, but we will focus here on one particular aspect.


The primary flight display at the moment of the upset shows the aircraft in a high-altitude stall; the wings have lost lift, the nose has dropped and the aircraft has rolled sharply to the left. Now, every pilot is taught and so (in theory) every pilot knows that the correct behaviour (as determined by our cognitive, human brains) is to *push forward* on the stick – decrease the angle of attack; restore the wings to flight.

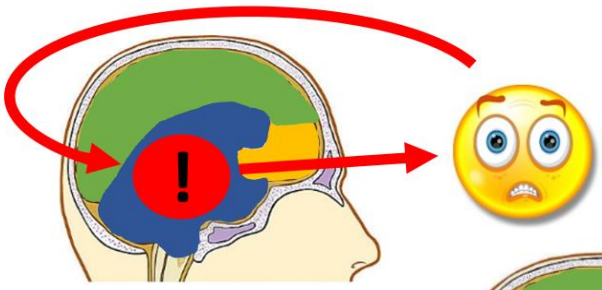



However, the Airbus' sidestick position indicator shows that, in fact, the pilot did the opposite; pulled the stick all the way aft and all the way over to the right. This is archetypal unhelpful behaviour: not simply a failure to do the right thing, but *actively* doing the wrong thing.

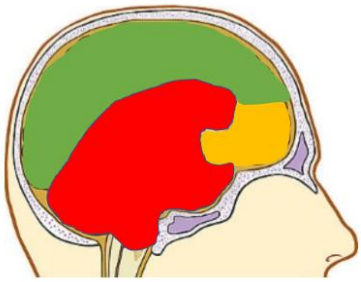
Tragically, we will never know what went through that pilot's mind; but I believe we may (with no disrespect intended) speculate; I *suspect* this what happens for most pilots involved in an upset.



In a state of relative calm, the upset, seemingly coming from nowhere, will cause a sudden injection of stress giving rise to an acute burst of anxiety – this is the 'startle factor'. The chimp brain commands immediate action – 'do *something*, NOW!' – and so the pilot, on reflex, pulls on the stick. Nothing happens. But in this heightened emotional state, the perception is altered from what's really going on to something like "this is all going wrong".



That perception serves only to increase his stress and anxiety – now he's in shock. Lacking the ability to *think* of an alternative, he pulls harder on the stick – and still nothing happens. Now the perception is "I've lost control of the aircraft!" - perhaps even the first inkling of the thought "we are all going to die!" – and thus the chimp brain is utterly overwhelmed with stress and anxiety; a state of fear.



For that pilot in that moment, the chimp brain is the *only active part* of his brain.

A senior training colleague of mine once said (somewhat condescendingly) to me that "the pilot should have known that the Airbus offers no alpha floor protection in either alternate or direct law. He'd have survived". Personally, I think he *did* know. But in that state, he had no hope of accessing the knowledge. And that unhelpful behaviour of pulling on the stick was not a momentary action; he *held* the stick hard against the stops whilst the aircraft *fell* 32,000 feet before impacting the surface of the Atlantic Ocean.

We need to recognise – and encourage our trainers to recognise – the importance of emotions. They should not be dismissed as 'touchy-feely stuff', nor supressed, but recognised as natural, identified and *managed*. They are powerful things that can bring down aircraft.

So, what's to be done?

Because the management of emotional reactions is essentially what psychotherapists do when treating conditions like clinical depression or generalised anxiety disorder, it stands to reason that we can use the techniques of psychotherapy to manage emotional reactions in flight training. A relatively new psychotherapeutic technique (used principally to treat anxiety) is 'mindfulness'. Mindfulness involves practising, both formally and informally, this:

**Paying attention, on purpose, to things as they really are – without judgment – in the here and now.**

The examples above demonstrate that such a skill is useful – and it can be learned, and it can be practised. Now, formal mindful practice is, essentially, secularised Buddhist meditation; and here's where we potentially encounter a problem, as those who advocate meditation often also advocate 'mind-body oneness', 'spiritual wellbeing', 'universal energy lines', etc. Hence, cynical and technically-minded individuals in the pilot community readily dismiss mindfulness along with all sorts of other things for which there is little empirical evidence. For the record, I do not believe in ley-lines, divination, the spirit or visitations from extra-terrestrials; I *do* believe in physics, biology and the electro-chemical activity of the brain; and these last we can *practise* managing.

A formal, mindful, meditative practice might take the form of a 'body scan'; this is where, rather than allowing our minds to cast forward to the future to worry or back to the past to dwell, we instead focus our attention on, say, our feet. How do they feel? Not 'do they feel good or bad?' but, simply, what *are* the physical sensations currently being experienced in my feet? Or we may choose to focus on our breathing: how does it *feel* to breathe? Where are those sensations located? Can I maintain my awareness where I have chosen for the *full cycle* of one inbreath and one outbreath?

(Let me re-iterate: I am not in the business of enhancing anyone's spiritual well-being - though I welcome that as a side-effect. I am simply talking about practising focussing our attention on the 'here and now'; wherever I go, what I have with me 'here and now' will, ordinarily, be my feet and my breathing, so it makes sense to practise with them)

*In*formal practice is the same idea, but applied to everyday tasks – the ones that need doing anyway. The next time you are, for example, brushing your teeth, you can do so whilst your mind is many hours or many miles away. But, instead, just see if you can bring your awareness to the physical sensations associated with the brushing of the teeth: heat, cold, tingling, pressure, no sensation at all. And if I struggle to maintain my awareness in that place for very long, that's okay; that's normal. This is why it needs practice. Should my mind wander during the practice, *that's* okay; that's normal. And if I notice I am having an emotional reaction to the thing about which I am thinking?

**That's okay; that's normal**

Thus, we develop the ability to notice what the mind is doing, *accept* it, and then *choose*, gently, to bring our awareness, without judgement, to the here and now. Note the difference between doing that and metaphorically jumping up and down and shouting "concentrate!" or "relax!". This is as ineffective as shouting "don't have an emotional reaction!".

Mindfulness is, equally, not a substitute for any other skill or competency which a pilot requires. But, at some point in the future, a pilot **will** encounter an upset, and, when they do, they **will** experience the sudden stress and anxiety; *the startle factor is inevitable*. But what if, in addition to their technical ability to recover from the upset, that pilot has also practised their *non*-technical ability to notice and manage what their mind is doing? At the moment when the chimp brain is about to be overwhelmed with fear, perhaps that pilot will say to himself:

> "I am having an emotional reaction: that's okay; that's normal.
> However, I will now see if I can choose to put that, temporarily, to one side, and bring my attention to what's happening here and now."

And just that mental action has the effect of breaking the chimp brain loop; it gives us a moment of pause, during which the stress and anxiety abate just enough to allow the human brain to become active and do what it does best: perceive the facts and come up with a solution.

Similarly, trainees **will** make errors and when they do they **will** experience stress and the concomitant emotional reaction. But instructors could develop their ability to notice:

> "I am having an emotional reaction. I am worrying about my upcoming test; I am dwelling on how badly this has gone in the past; That's okay; that's normal.
> But I'm going to see if I can't just put that to one side and focus, for now, on *this* present moment"

Again, the stress and emotion momentarily abate, and the human brain, with its recently acquired store of knowledge, becomes accessible.

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Once upon a time, there were barber-surgeons; cutting hair or amputating limbs, it was one profession, based on an ability to use a blade. Now we think of barbers and surgeons as very different professions, requiring quite different skillsets. A similar thing is happening, I believe, to the profession of 'airline pilot': it is become its *own* profession, distinct from other forms of being a pilot. Of course, in the same way that 'blade skill' is as necessary for a surgeon as for a barber, so technical skill – the old 'stick and rudder' – is still important for airline pilots. But perhaps more important are the *non-technical* competencies; the human factors skills which we need not just to assess but to train. Given that psychotherapists have been dealing with the human condition since at least the days of Sigmund Freud, it stands to reason that we might look to that realm for training tools and techniques – such as mindfulness, cognitive behavioural therapy, even trauma counselling – to enhance and develop human factors competencies which make up the skillset of the truly professional *airline* pilot.

Because, after all, whilst the modern airliner is a technical marvel, it is still flesh-and-blood, emotional animals that we put at the controls.