Human Factors: Pilot Stress

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More often than not aviation incidents and accidents are attributed to ‘pilot error’. But what causes pilot error? One definite contributing factor is that of stress and a pilot who is stressed is not capable of peak performance. This article is an overview of the sources and effects of stress and provides some coping strategies to reduce its effects.

Various stressors, or causes of stress, exist for pilots. As examples, these may include self doubt in terms of skills, which may be particularly true for student pilots, lack of recognition and lack of promotion and career progress for commercial pilots. Stress may also be introduced by the changes which often occur in the industry which may place demands and expectations onto pilots. These include regulatory changes from governing bodies such as Civil Aviation Safety Authority (CASA), Australian Ultralight Federation (AUF), Australian Sports Rotorcraft Association (ASRA) and the Hang Gliding Federation Australia (HGFA), which ever body is relevant to the pilot's chosen type of flight. Financial stressors also exist so far as high training costs, aircraft hire and low salaries for pilots commencing their careers. These are only a few examples of the many causes of stress experienced by pilots.

The sources of stress may be considered as fitting into five groups. These are: factors which are intrinsic to the task; role-based stress; relationships with subordinates, colleagues and superiors; career development factors and factors related to the organisational structure; and, climate of the workplace and industry. Intrinsic stressors are the ones which are always present to some extent, such as the stress which comes with the knowledge that an error on the path of the pilot may result in fatality, or improper adherence to defined procedures resulting in reprimand. Role-based stress arises from uncertainty in the job role. This type of stress occurs when new changes are difficult to comprehend and implement. For a student pilot beginning to fly, there is a high degree of stress resulting from the pressure to learn all the required knowledge and implement it correctly. The Civil Aviation Regulations and Civil Aviation Orders alone are a handful.
Poor relationships and lack of support among pilots also causes stress. A supportive environment where relationships with other pilots are good makes it easier to cope with problems, whether work or personal related. Where there is hostility in the environment and little support, the resulting tension breeds stress. The organisational structure of a pilot's flying environment may also contribute to levels of stress. Where major decisions are made that effect pilots, without firstly consulting them, tension and stress result. The CASA system of open consultation through the use of Notices of Proposed Rule Making (NPRM) helps to reduce this type of stress by allowing all stakeholders in the industry to voice their opinion. Responding to an NPRM however takes time, particularly where there is a large amount of supporting documentation to read first, which may be stressful in itself.

The final group of stressors is related to the climate of the workplace and industry. This climate is influenced by community perception and attitude. An unpleasant atmosphere adds to the stress of flying. This sort of stress is often propagated by the media. How many times has the statement "You're mad flying those things!" been made about flying ultralight aircraft without any knowledge or foundation rather than that of perception based on a limited experience. People who are not involved in the aviation industry seem to only hear the bad news. It is difficult to convince our spouses, friends and children of the safety of flying after a sensationalised media report of an accident. Each time an aviation accident or incident occurs, it makes it a little more difficult to be a confident pilot, especially after negative community perception.

Having considered a few of the causes of stress, we must ask 'So how does a pilot know when he/she is stressed?', or at least more so than usual. There are a number of symptoms to look for in this regard which may be physical, emotional or behavioral. These include: headaches; nervousness; inability to get rid of bad thoughts; faintness; loss of sexual interest or pleasure; excessive criticism of others; poor memory; pains in the heart/chest; low energy; excessive perspiration; poor or excessive appetite; temper outbursts; lower back pain; feelings of loneliness; fearfulness; suspiciousness; feelings that you are disliked and that everybody is unfriendly; lowered self-esteem; sleep difficulties; trouble concentrating; and nausea. Each of us has these feeling occasionally, however, when there are a number of them consistently present in an individual, they are a fairly good indicator that he/she is stressed.

A person in a prolonged state of stress passes through three stages. Firstly, there is an initial reaction to the stressor, followed by a period of prolonged resistance and finally where the responses are no longer effective and the person is prone to develop illness. When a person is stressed their brain interprets their situation to be physically or emotionally threatening or demanding. Messages are then sent to the autonomic nervous system and the endocrine system of the individual. A hormone called ACTH (adrenocorticotrophic hormone)
is released into the bloodstream which goes to the adrenal glands. The result is an increased output of adrenaline from the adrenal glands into the bloodstream, together with related hormones called corotids. These hormones bring the individual's body to an aroused state and at the same time messages are sent to the heart, lungs and muscles to get them ready for action. The muscles are supplied more richly with blood as it is diverted away from the extremities and the smaller blood vessels constrict which results in higher blood pressure.

The liver also works harder at this time to convert its stored glycogen into glucose which is required by the brain and muscles in increased supply. While all this occurs, the breath rate increases to supply more oxygen to the blood which is also required by the muscles and brain to burn the glucose more efficiently. Vision becomes more sensitive and hearing becomes more acute in this alert state. This explains the feeling we experience when we are in a situation such as avoiding an accident with our heart pounding and heavy breathing. I am sure that a forced landing would elicit this type of response as would any emergency situation.

Prolonged stress, even though not necessarily causing an emergency response as outlined above, caused distress which results in increased production of ACTH and thus adrenaline and cortisol. In the long term, cortisol causes a reduced immune response and adrenaline increases the risk of blood clots and hardening of the arteries. Further, prolonged stress results in the release of fatty substances into the bloodstream which causes fatty deposits to reside in the arteries. This narrows the arteries and causes high blood pressure which may result in weakened artery walls and the heart working harder than it should. The fatty deposits may also cause the formation of blood clots. The combined result is an increased risk of heart disease and stroke. Untreated high blood pressure may also cause kidney failure and continued muscle tension has been associated with rheumatic diseases. The risk of duodenal or stomach ulcers also exists as a result of continued oversecretion of gastric acid and thus the impairment of the stomach lining.

Persistently high blood sugar levels may also cause imbalances in the release of insulin by the pancreas. A high level of insulin release into the bloodstream may lead to hypoglycaemia, or the opposite, where the pancreas can not produce sufficient insulin and the blood sugar levels are too high.

The point to note here is that pathways for permanent physical damage as a result of stress do exist. The notion of stress needs to be taken seriously and treated seriously. Strategies for coping with stress are essential to the well-being of any pilot. Furthermore, reducing stress allows pilots to remain healthy both physically and mentally.
There are a number of different ways to deal with stress. These may be categorised into four general areas: preventing stress producing situations; controlling stress internally; problem oriented responses to situations which are stress producing; and seeking relief from stress and tension. Each of these categories are equally important and required to fully minimise stress. Various strategies exist for these to take place. The strategies include: building a tolerance to stress; emotional management; professional support systems; social support systems; effective communication; prioritising and time management; diet and nutrition; fitness and exercise; relaxation; and, professional assistance. Being tolerant under stress requires an individual under stress to think before he/she acts. Thinking about the following questions prior to action may be used to build tolerance: Clarifying purpose - ‘Why am I doing this?’; clarifying definition - ‘What do you mean when you say…?’; clarifying the source of ideas - ‘Is that your opinion or fact?’; pointing out inconsistencies - ‘Is that the same as before?’; questioning usefulness - ‘Will this help me?’; considering alternatives - ‘What other choices do we have?’; and, summarising - ‘Can we have the main points?’ These questions need to be asked to those who are placing an individual under stress by that individual. The answers may lead to an increased understanding which in turn leads to an increase in tolerance and thus reducing stress. This is particularly true for a pilot who is undertaking training for a licence or rating. A clear understanding of new ideas and ideas that are difficult to understand (and there are plenty of those in aviation) reduces the frustration caused by not understanding and facilitates memory retention. As such, some of the stress of learning for the licence or rating is reduced.

Emotional management is also an essential tool of stress management. Positive thoughts, and seeing the positive side of a situation, although this is sometimes difficult, play a large part in decreasing stress. The attitude that ‘we can always derive benefit from that which has been placed before us’ has a strong positive influence. Stress may also be reduced by support systems, both professional and social. Talking about situations with colleagues, friends and relatives helps to see situations from new perspectives and offers new ways to deal with the stress a situation may provide. A further tool which may be used for stress management is the utilisation of effective communication. This includes active listening, giving and receiving feedback and problem solving.

Prioritising tasks can be a very effective way to minimise stress. People often feel that they will not be able to cope thus fail to achieve. By prioritising tasks and sticking to them one at a time, a joy of accomplishment is felt at the completion of each task. In order to prioritise tasks, three questions should be asked: Can this task be delegated?; What would happen if the tasks was not completed today?; Is this tasks self-imposed or imposed on me by the system, such as an employment condition? Tasks that are self-imposed may be reconsidered to reduce their negative effects.
Diet and nutrition contribute to good health and play an important role in alleviating stress. Dietary deficiency upsets body chemistry and deprivation of essential nutrients causes the body to be less capable of withstanding the effects of stress and more susceptible to breakdowns. Supplemental to a proper diet, fitness and exercise can be of great benefit to the body. Exercise gives the benefits of increased circulation, assistance to the heart, added oxygen to the body, improved digestion, relaxed nerves, balanced emotions, reduced fatigue, strengthened muscles, bones and ligaments, improved figure and complexion, and finally, sharpened mental powers. These benefits create the body required to cope with high stress environments.

Prolonged stress has a physiological pathway which will eventually cause physical harm to an individual, together with psychological effects. A pilot who is suffering from stress is unable to commit fully to the task at hand, that is, flying safely. Each pilot should recognise their limitations, endeavor to minimise stress and utilise coping strategies when they are under stress. In this way, the occurrence of 'pilot error' may be reduced and we can blame the machines for accidents and incidents.
BRAIN
Interprets a situation as stressful

Hypothalamus

Pituitary Gland

ACTH (Hormone)

Adrenal Cortex

Adrenal Medulla

AUTONOMIC NERVOUS SYSTEM
Sympathetic parasympathetic

Direct stimulation of fighting response

Hormones: Adrenaline and Noradrenaline

Hormones: Glucocorticoids including Cortisol and Mineralocorticoids

Main pathways of physiological stress response