



DOCUMENT
GSM-G-CPL.021

DOCUMENT TITLE
HUMAN PERFORMANCE AND LIMITATIONS

CHAPTER 17 – STRESS

Version 1.0
September 2012

This is a controlled document. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission, in writing, from the Chief Executive Officer of Flight Training Adelaide.

CONTENTS	PAGE
STRESS.....	3
STRESS AND AVIATION SAFETY.....	4
WORK STRESS	4
PILOT STRESS	5
PSYCHOLOGICAL STRESSORS	5
PHYSIOLOGICAL STRESSORS.....	6
NOISE.....	6
TEMPERATURE	6
VIBRATION.....	6
HUMIDITY.....	7
TURBULENCE	7
HYPOXIA.....	7
HYPOGLYCAEMIA	7
DEHYDRATION	7
SLEEP DEPRIVATION (LACK OF SLEEP).....	7
ILLNESS	7
BEING UNCOMFORTABLE	7
NOT FEELING WELL	7
EYE STRAIN.....	7
FLASHING LIGHTS	7
RECOGNISING YOUR WARNING SIGNS	8
STRESS AND THE ATTENTION RANGE.....	10
PERFORMANCE VS. STRESS CURVE	10
SYMPTOMS OF STRESS	11
PHYSIOLOGICAL OR BODILY SYMPTOMS.....	12
BEHAVIOURAL - OBSERVABLE CHARACTERISTICS	12
PSYCHOLOGICAL	12
DEALING WITH STRESS.....	13
STRESS MANAGEMENT	13
COPING STRATEGIES	14
GENERAL ADAPTATION SYNDROME	14
ALARM.....	15
RESISTANCE	15
EXHAUSTION.....	15
STRESS & AIRLINES.....	15

STRESS

INTRODUCTION

Stress is our physiological and psychological response to the demands confronting us. It is our body and mind preparing us to deal with problems or possibly a crisis.

People usually consider only negative factors to be stressful, but positive influences can also generate stress. Stress is normal. Not all stress is bad! Small amounts of stress can be of benefit as it will provide us with a stimulus to act. It is when stress remains unresolved then problems can occur in the human body. Long-term or unresolved stress can result in changes to our hormone balance, which will affect our health.

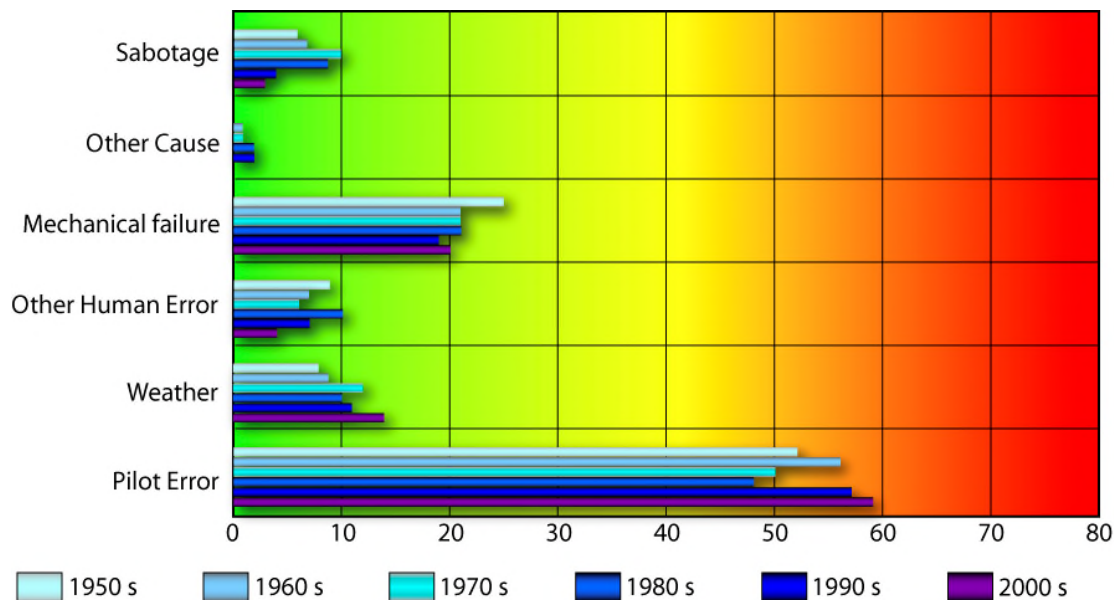


Those things that cause us stress are called **stressors**.



STRESS AND AVIATION SAFETY

Aviation accident research shows that a high proportion of accidents are caused by poor flight crew team functioning.



The management of human resources on the flight deck has an important relationship with safety. When one or more crew members are under stress, the efficiency of crew operations will be below optimum levels. Individuals under stress do not work well as a team.

WORK STRESS

A recent survey in Britain found that, on a scale of one to ten, the stress rating of some jobs ranked as shown below: The ranking will vary widely between countries because of differing social structures and values. Being a pilot used to rank moderately high on the scale, but with improvements in aircraft reliability and changes to the social structure of many countries, other professions are now regarded as more stressful than being a pilot.

- 1) Prison officer
- 2) Police
- 3) Social work
- 4) Teaching
- 5) Ambulance service
- 6) Nursing
- 7) Medicine
- 8) Fire fighting
- 9) Dentistry
- 10) Mining

We all operate under varying levels of stress and we all handle stress differently. How well a person handles stress varies, and depends on a number of factors, including:

- Our personality – are we generally relaxed or less at ease
- Our general health
- Do we have a happy personal life – in work, family and socially
- Are we healthy?
- Are we well rested, or fatigued?
- Are we prepared for life's tasks?
- Our intelligence and aptitude for work

PILOT STRESS

Flight crews are responsible for maintaining the very highest standards of safety and this responsibility brings about inevitable stress.

Work schedules (in particular, 'back of the clock' schedules), together with the endless checks of performance (line checks, simulator checks, medical examinations) add to stress, which can overflow into our domestic lives. Rarely are signs of stress restricted purely to one area of life – work or home.



PSYCHOLOGICAL STRESSORS

Surveys have identified the following **psychological** stressors that may apply to pilots:

- 1) **Control:** Disruption of domestic routine; events or processes over which the pilot has no control.
- 2) **Scheduling and Rostering:** Un-predictability of flying, and the social and family complications caused by rosters.
- 3) **Anxiety of ratings and checks:** Constant scrutiny, ongoing programme of rating renewals, new type endorsements, change and updating of knowledge, simulator and health checks.
- 4) **Home/Work Interface:** Home stressors can have an impact on the pilot at work.
- 5) **Career and Achievement:** Career uncertainty, blocked career pathways, organisational change and redundancy policies.

- 6) **Insufficient Flying:** Lack of practice can lead to lack of confidence and anxiety.
- 7) **Responsibility and Decision-Making:** These were sometimes identified as positive stressors, e.g. a promotion or a welcomed challenge.
- 8) **Interpersonal Problems:** With cabin crew; cockpit crew or other airline employees.
- 9) **Managerial and Organisational Issues:** Lack of Management support; morale & organisation climate; management style.
- 10) **Fatigue and Flying Patterns:** Matching of sleeping patterns with preparing for and recovering from flying; length of flying patterns.

PHYSIOLOGICAL STRESSORS

These commonly include (but not limited to):

NOISE

- May help maintain arousal during periods of boredom and fatigue, but too much noise will have an adverse effect.
- Cockpit warnings should attract attention but not startle. Excess noise can reduce speech intelligibility in cockpits, particularly in GA aircraft.
- Noise has a similar effect to heat – our attention is narrowed and restricted. Fatigue often results from sustained noise exposure.

TEMPERATURE

- Above 30°C, heart rate and blood pressure both increase.
- Above 32°C is regarded as being too hot for an operating environment.
- Attention becomes narrowed and restricted with high temperatures.
- Below 15°C we experience discomfort.
- Below 10°C for a sustained period will result in incapacitation.
- Too much sun can be a stressor.

VIBRATION

- Affects visual and psychomotor performance.
- Depends on frequency and amplitude – 2 Hz can be calming (rocking a baby), but discomfort progressively increases with an increase in frequency.
- Problems include; breathing, body pain, backache, headache, eye strain.

HUMIDITY

- 40 - 60% is most comfortable at normal temperatures (around 20°).
- In passenger aircraft, it can fall to around 5 - 15%.
- Low humidity dries mucous membranes, causing problems in the nose and eyes.

TURBULENCE

In strong turbulence we will experience difficulty in carrying out cockpit duties in an efficient and timely manner.

HYPOXIA

Already discussed

HYPOGLYCAEMIA

Already discussed

DEHYDRATION

Already discussed

SLEEP DEPRIVATION (LACK OF SLEEP)

To be covered later

ILLNESS

Already discussed

BEING UNCOMFORTABLE

Uncomfortable seats, clothing, etc.

NOT FEELING WELL

EYE STRAIN

FLASHING LIGHTS

(e.g. strobes)

Stress may be **acute** (short-term), building up in a few hours or days, but being resolved fairly quickly. Or it may be **chronic**, (longer-term) affecting the person for months or years.

RECOGNISING YOUR WARNING SIGNS

A common source of stress is always racing against time - a condition called chronic overload. To minimise this as a source of stress, you must first learn to recognise your personal warning signs and then take timely action to reduce its effects.

Do you



- Experience physical discomfort, perspiring, dry mouth, nervous twitching, increased heart rate
- Experience unreasonable behaviour; mood changes, unnecessary anger, rude or impatient behaviour, do you rush your speech or complete other people's sentences?
- Show inappropriate or unreliable behaviour such as laughing or singing at inappropriate times, not showing up, rapid changes of emotion, hurry when you eat, shirk responsibilities?
- Have little time for relaxation, intimacy, or enjoying your environment?
- Experience inappropriate thought processes, poor concentration, an inability to set priorities
- Experience deep and continuing fatigue?

The above list is not a full and comprehensive list. If you have recently begun to experience some of the above characteristics, you may well be suffering from chronic overload.

One way of assessing the level of stress due to changes in your life is to use the list developed by two Americans, Holmes and Rahe, called the Survey of Recent Experiences.

This list allows you to score the various changes, if any, that have occurred in your life in the past twelve months, and add them together to arrive at a numerical total. The accuracy of the list has been well authenticated. Notice that any change - not just a change for the worse - has an effect.

CHAPTER 17 STRESS



HUMAN PERFORMANCE AND LIMITATIONS

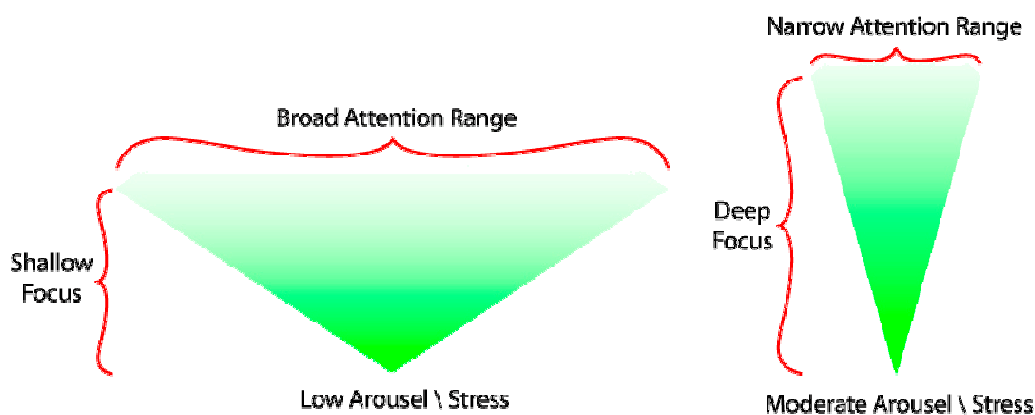
Holmes Rahe Life events Stress Profile	
Life Change Units	Life Event
100	Death of spouse
73	Divorce
65	Marital separation
63	Jail term
63	Death of close family member
53	Personal injury or illness
50	Marriage
47	Lost your job
45	Marital reconciliation
45	Retirement
44	Change in health of family member
40	Pregnancy
39	Sex difficulties
39	Gain of new family member
39	Business difficulties
38	Change in financial state
37	Death of close friend
36	Change to different line of work
35	Change in number of arguments with spouse or partner
31	Mortgage or loan over \$30,000
30	Foreclosure of mortgage or loan
29	Change in responsibilities at work
29	Son or daughter leaving home
29	Trouble with in-laws or partner's family
28	Outstanding personal achievement
26	Spouse or partner begins or stops work
26	You begin or end work
25	Change in living conditions
24	Revision of personal habits
23	Trouble with boss or conditions
20	Change in residence
20	Change in school or teaching institution
19	Change in recreational activities
19	Change in church activities
18	Change in social activities
17	Mortgage or loan less than \$30,000
16	Change in sleeping habits
15	Change in number of family social events
15	Change in eating habits
13	Vacation
12	Christmas
11	Minor violations of the law
Total Life Change Units	

Score of 300 + : At risk of illness.
Score of 150 - 299 + : Risk of illness is moderate.
Score 150 - : A slight risk of illness.

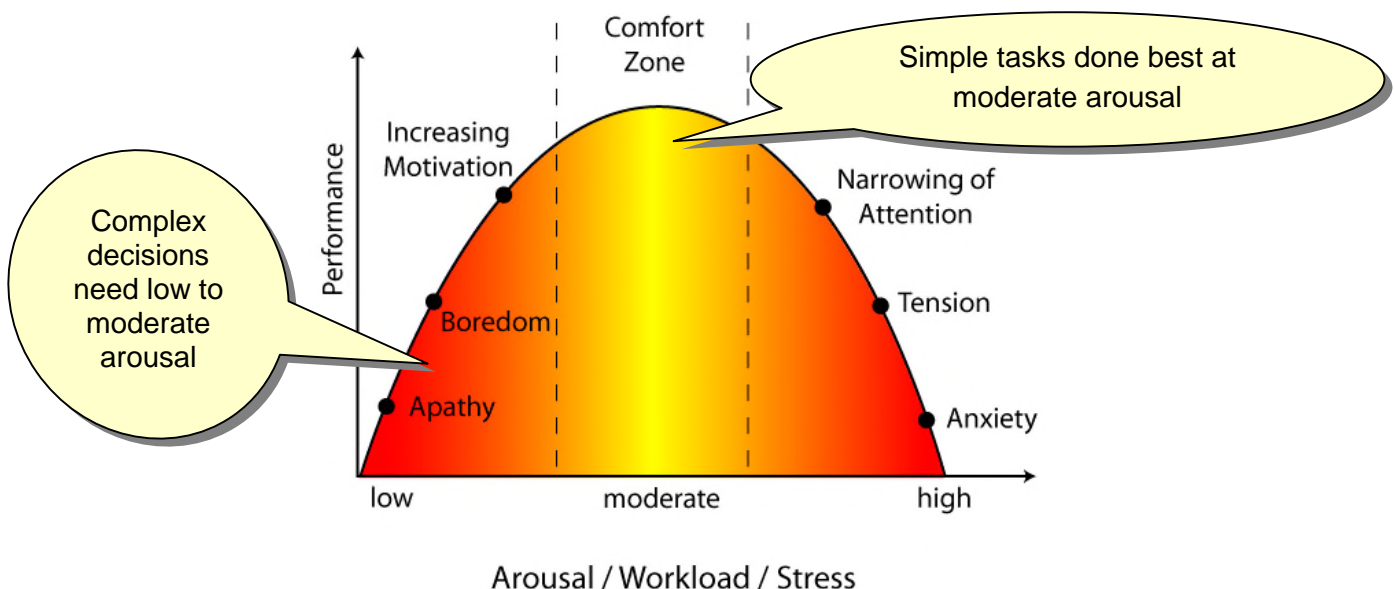
STRESS AND THE ATTENTION RANGE

Stress or arousal can influence our attention range, but it will affect individuals' attention ranges differently. Arousing levels of stress will narrow the attention range, but the focus on the problem will intensify and the rate of information processing will increase. During low stress situations, the attention range will widen, but the focus and rate of information processing will become shallower.

At very high levels of stress, both focus and attention will suffer.



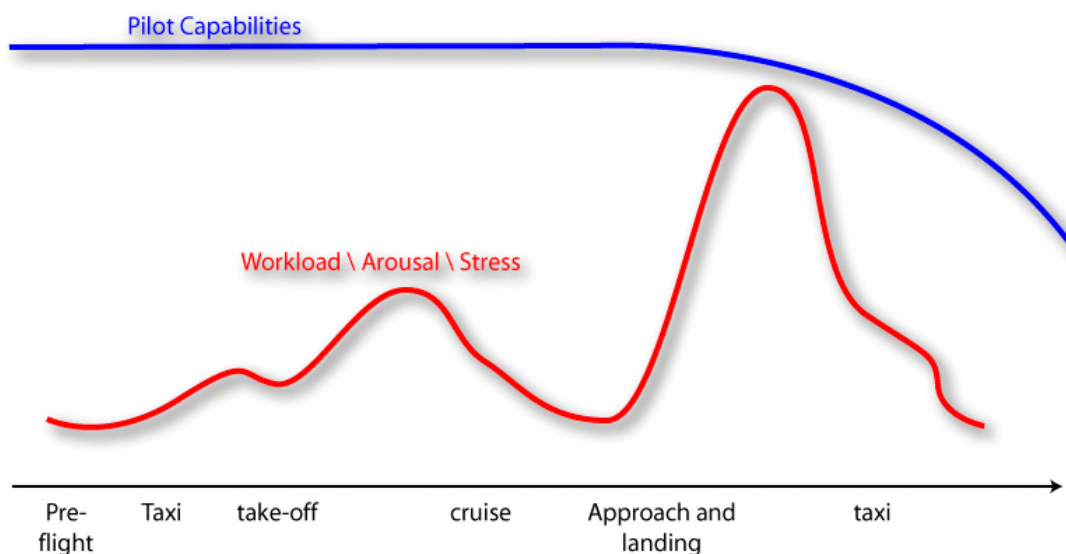
PERFORMANCE VS. STRESS CURVE



This graph implies that for any given task there is a range of stimulation or demand that will yield the best result. The implication is of course that too little stimulation will result in low

levels of arousal and possibly boredom, resulting in low levels of performance. Excessive stimulation, which may be seen in work-overload or high levels of complex task demand (possibly leading to panic), will also result in performance below optimum levels. Neither of these two extremes is desirable.

- **Complex tasks requiring a calm approach are best performed at low to moderate levels of arousal.** (e.g. a test or examination)
- **Simple, repetitive, energetic tasks can be performed at higher arousal.**



The above graph compares the level of our capabilities during a long-haul flight. As the flight progresses, our capabilities will deteriorate, due mainly to fatigue. However, the most critical phase of flight is always the approach and landing, (particularly at a busy international airport) where the workload, our level of arousal and therefore stress levels increase dramatically)

SYMPTOMS OF STRESS

It has been well established that stress reactions are often a normal response to particularly critical situations, such as a flight deck crisis, or life events, such as a child becoming seriously ill. Every individual is likely to have their own characteristic and consistent response pattern to stressful events. It is convenient to classify stress symptoms into three major categories:

PHYSIOLOGICAL OR BODILY SYMPTOMS

tightness in chest	nausea
sweating	indigestion
butterflies in the stomach	ulcers
light-headedness	blood pressure
increased heartbeat	heart disease
dryness of mouth	asthma
diarrhoea	sleeping disorders
feeling tense all over	neurosis
headaches	allergies
legs like jelly	colds
over-breathing	influenza
skin tingling	tense neck and shoulders
nausea	

BEHAVIOURAL - OBSERVABLE CHARACTERISTICS

- difficulty getting to sleep
- wanting to avoid people
- difficulty in speaking
- increased frequency of urinating
- impulsiveness
- becoming withdrawn and very quiet
- laughing too much
- increase in drinking or smoking

PSYCHOLOGICAL

Cognitive (or 'thinking')

Lack of confidence
 Lack of concentration
 Forgetfulness
 Prioritising
 Decision making difficulties
 Difficulty in switching off
 Irritability

Subjective (or 'emotional')

Anxiety
 Aggression
 Depression
 Fatigue
 Apathy
 Moodiness
 Tension

DEALING WITH STRESS

We are all affected by stress. How we respond to the stress, how we cope with it, reduce it and learn to avoid it is, however, critical in determining whether we are debilitated by stress or whether we manage and control it.

We all have a highly individual response to stress - the same situation will usually lead to very different responses in different people. One of the most important learning points for any flight team is to recognise signs of stress in themselves and to appreciate how it affects their performance and behaviour.

To effectively deal with stress we need to:

- a) identify the sources stress
- b) get rid of the source of stress (a 'fight' response)
- c) remove ourselves from the source of stress(a 'flight' response)

As an example, if we are experiencing unacceptable levels of stress from a noisy cockpit, we may be able to cure this with a better headset.

If we are experiencing stress from domestic unhappiness where, for example, your wife/husband is unsatisfied with your flight rosters, it may be necessary to seek changes to the roster (or divorce your spouse; a facetious but valid alternative).

STRESS MANAGEMENT

There are various stress management techniques. Because of the individual nature of stress, they will be of varying benefit to each of us

Health and Fitness Programmes:	Energetic exercise often reduces tension and anxiety in many individuals.
Relaxation Techniques:	Meditation, self-hypnosis, yoga etc may help.
Religious Practices:	Many people find support and comfort in their religion.
Counselling:	A supportive colleague, friend or professional counsellor can alter perception of the situation and reduce stress, or show the need for behavioural change. Just talking about your problems often helps.

COPING STRATEGIES

Coping requires adjustment to the situation or changing the situation.

Action coping:

Action taken to remove the problem or to remove yourself from the problem. eg. Change job, divorce etc. Sometimes called '*Escapism*.'

Cognitive coping:

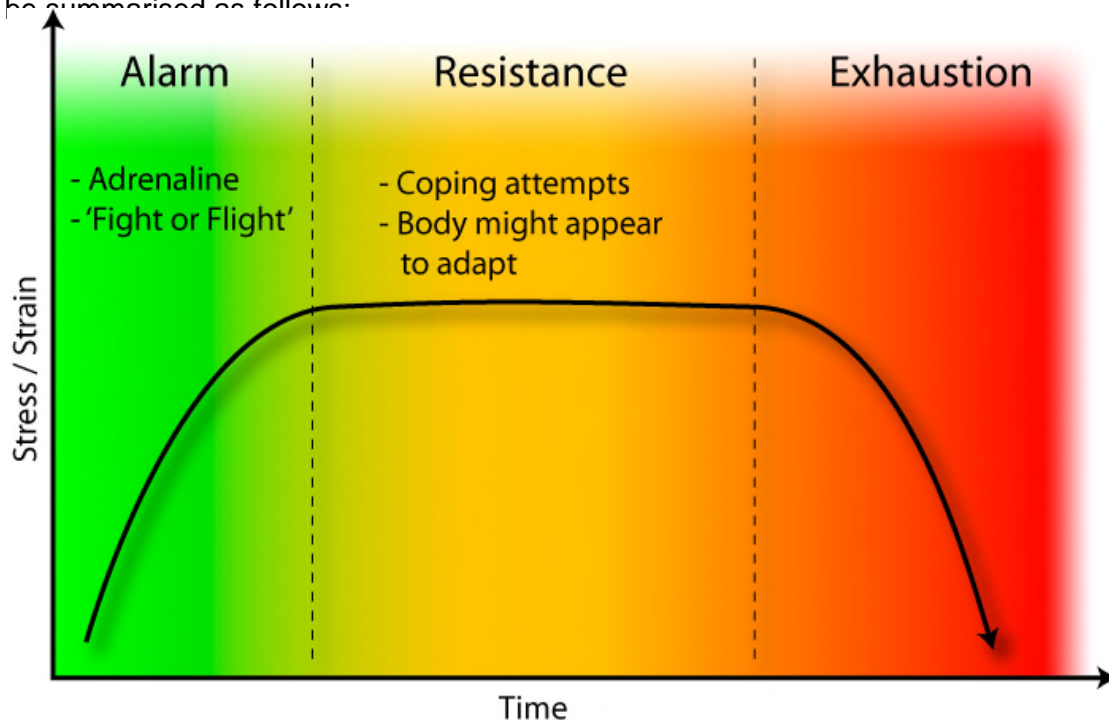
Reducing the emotional or physiological effect of an unchangeable situation. Achieving intellectual or emotional detachment from a situation. (e.g. achieving a situation where you just do not care any more – you have decided to live with the situation. Sometimes this may not be conscious. (eg. repression or denial)

Symptom directed coping:

Tranquillisers, tobacco, alcohol, tea, and coffee. Physical exercise, meditation (To remove symptoms). Not generally recommended – the problem will still be there after the drugs or alcohol wears off.

GENERAL ADAPTATION SYNDROME

The General Adaptation Syndrome (GAS) suggests that there are three stages in the progress of one's adaptation to stress. **Alarm**, **Resistance** and **Exhaustion**. These stages can be summarised as follows:



ALARM

When the threat or stressor is identified, the body's stress response is a state of alarm. During this stage adrenaline will be produced in order to bring about the fight or flight response.

RESISTANCE

If the stressor persists, it becomes necessary to attempt some means of coping with the stress. Although the body begins to try to adapt to the strains or demands of the environment, the body cannot keep this up indefinitely, so its resources are gradually depleted.

EXHAUSTION

In the final stage in the GAS model, all the body's resources are eventually depleted and the body is unable to maintain normal function. At this point the initial autonomic nervous system symptoms may reappear (sweating, raised heart rate etc.). If stage three is extended, long term damage may result as the capacity of glands, especially the adrenal gland, and the immune system is exhausted and function is impaired.

The result can manifest itself in illnesses such as ulcers, depression or even cardiovascular problems, along with other mental issues.

Note: We are not saying that stress must be avoided. On the contrary, most of us get pleasure from doing some task well, especially if it challenges our capabilities

STRESS & AIRLINES

Piloting is a stressful occupation and airlines recognise this and the fact that stress contributes to poor performance. More and more companies are developing company strategies for dealing with stress. Each airline will have stress management programs for staff and staff should always seek assistance if they feel it necessary. Fatigue and Circadian Rhythms