Flight Stress:

Stress, Fatigue, and Performance in Aviation

Dedicated to the memory of Dr. Fred Hyman, aviator

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low bia ces. However, the workload increase represented by an additional y task had no effect upon this baseline salience bias, while noise (which otherwise simulates the effects of anxiety on performance[53]), was associated with a marked increase in salience bias.[83] Among other things, these findings underscore the desirability of discriminating between the performance effects of workload and of psychological stress. Cognitive tunnelling also represents a salience based narrowing of the attentional field, but one in which the bias is defined in psychological rather than perceptual terms. A pilot attempting to reach a decision under stress, for example, may ignore information about alternative hypotheses and select from a more restricted field of options.

Theoretically, both cognitive and perceptual tunnelling ought (at least some of the time) to result in positive benefits -- i.e., by helping pilots or controllers to focus attention upon the particular task at hand without being distracted by extraneous or peripheral matters. Laboratory evidence is consistent with this. Consider, for example, the Stroop test: this is the famous test in which colour terms are presented in type of some different colour -- the word 'red' printed in blue, for example, or 'blue' printed in yellow.[86] Subjects asked to name the colour terms as rapidly as possible normally find that the need to 'tune out' the print colour slows down their responses; under stress, however, responses may if anything speed up, which suggests that stress may help individuals to focus their attention.[84,81]

Narrowing of attention in the operational world. Does 'real world' stress have analogous positive effects outside the benign confines of the laboratory, in complex operational circumstances? There is room for scepticism. Certainly both cognitive and perceptual tunnelling are suggested by accounts of various types of perseveration under stress: pilots, for example, may become fixated on or 'obsessed with' one equipment item, one response possibility, or one thought (see the sidebar by Saint-Exupery), often despite the operational ineffectiveness of the approach. Despite Bacon's speculation (that whatever originally received most attention attracts even more under stress) there seems to be little operational evidence that stress increases attention to previously central tasks, such as controlling the aircraft or communicating with the crew. Indeed, what becomes psychologically salient or central may be features or symbols of the threat. Consider, for instance, the case of the crashed airliner whose crew (as the voice recorder tape reveals) devoted considerable resources to vocalizing their increasing concerns about terrain clearance, but apparently made no

> *Without any warning whatever, half a mile from Salamanca, I was suddenly struck straight in the midriff by the gale off that peak and sent hurtling out to sea... I tried to climb, as soon as I became conscious of my disastrous mistake: throttle wide open, engines running at my maximum, my plane hanging sixty feet over the water, I was unable to budge. I hung on to the controls of my heavy transport plane, my attention monopolized by the physical struggle and my mind occupied by the very simplest thoughts. I made a discovery that horrified me: my hands were numb. My hands were dead. They sent me no message. Probably they had been numb a long time and I had not noticed it. I began to chant a silly litany which went on uninterruptedly. A single thought. A single image. A single phrase tirelessly chanted over and over again: "I shut my hands. I shut my hands. I shut my hands." All of me was condensed into that phrase and for me the white sea, the swirling eddies, the sawtoothed range ceased to exist. There was only "I shut my hands."*
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> -- Antoine de Saint-Exupery (1939), *Wind, Sand, and Stars*

effort to actually arrest their descent, the single critical action that could have saved them.[67] (See also the discussion of 'stress induced inaction' in Chapter 7.)

This example illustrates how easy it is, with a little hindsight and post-hoc guesswork, to generate psychological descriptions of what 'must have' happened in an accident or incident.* Thus, there is never any shortage of (putative) cases of perceptual and cognitive tunnelling in aviation mishaps. The present authors would be the last to condemn such after-the-fact 'psychologizing', which after all virtually amounts to an international sport among aviation psychologists. Nevertheless, it has to be acknowledged that the confident extrapolation of laboratory research to the operational environment of flying is not without its difficulties. Take for example, the crash of an Eastern Airlines L-1011 in the Miami Everglades in 1972, an accident that has become a commonly cited (indeed, a somewhat hackneyed) example of cognitive tunnelling. The crew of the L-1011 focussed a great deal of attention on a nonfunctioning landing gear extension light

*However, the reader might like to try this for the Air Virginia accident described in the sidebar on p. 75 -- a complex multistressor event referred to again later.