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Stress, Behavior, Training and Safety

Adequate preparation can increase orderly behavior in the event of an emergency evacuation. One approach includes development of a training program designed to qualify passengers as "licensed to fly."

by
Mary Edwards, Ph.D

In the event of an aircraft emergency, the behavior of the passengers and crew is a critical factor in determining the extent of occupant survival. Reports of accidents have described a wide range of inappropriate types of behavior ranging from panic, through helpless dependency, to frozen immobility. There are also reports of cool, competent and orderly behavior in which injury and loss of life are minimized. Clearly, the objective of all those concerned with cabin safety is to increase the incidence of this type of behavior when an emergency takes place.

An understanding of the nature of the human response to sudden traumatic events, such as aircraft accidents, will help to indicate the conditions under which inappropriate behavior is likely to occur. It may also suggest ways in which behavior more adaptive to survival may be facilitated.

Stress Relates to Behavior

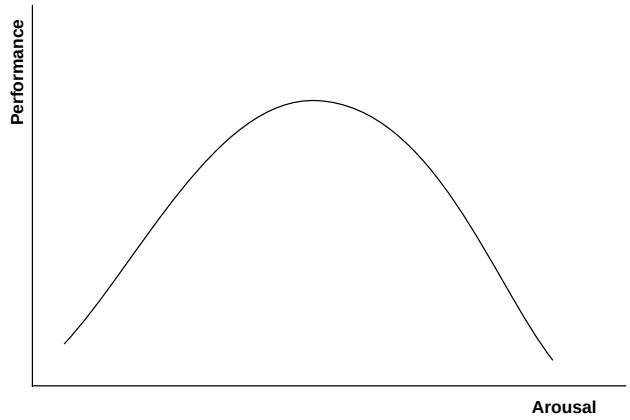
It is generally agreed that an emergency is an intensely stressful situation. The word "stress" is commonly used to refer both to a cause, i.e. some feature of the external world that impinges upon the individual, and to an effect, i.e. the behavior and feelings of people. To avoid confusion, the word "stress" will be used here to refer only to the latter — the response of the individual.

Stress is an emotional response involving subjective feelings, bodily processes and behavior. In an aircraft emergency, stress is normally experienced as fear, though in other contexts it could be anger or joy. The bodily processes associated with fear are the consequence of the activity of the sympathetic nervous system which controls, for example, adrenalin secretion, heart rate, sweat rate and the flow of blood from the digestive tract to the extremities. All this prepares the individual for fight or flight.

The emotional response to danger lies towards the extreme of a continuum of arousal, at the other pole of which is sleep. Arousal can be regarded as a state of activation ranging from sleep and drowsiness, through wakefulness and alertness, to a very high degree of activity associated with intense emotion, such as fear.

A certain level of arousal is essential for any activity to take place. For behavior to be most effective, the arousal must achieve an optimal level (see Figure 1); departures from this level in either direction will produce downgraded performance. A lower level of arousal results in uncoordinated, over-relaxed behavior. As arousal increases beyond the optimal level, skilled behavior disintegrates, becoming increasingly disorganized and uncontrolled. In an emergency, a moderate level of arousal resulting from a mild degree of fear is likely to be beneficial.

The level of arousal that is optimal for effective behavior varies with different tasks. Easy tasks require a higher level of arousal for effective performance and are less susceptible to disruption by additional stress. Difficult



As arousal increases, performance achieves an optimal level. Further increases in arousal result in deterioration of performance.

Figure 1

tasks, by contrast, require a lower level of arousal to produce the best performance. An increase in arousal associated, for example, with fear, leads more readily to disruption of behavior (see figure 2).

Panic

Panic behavior is disordered, uncontrolled, apparently irrational and often self-defeating. For the individual involved, the experience of panic is characterized by intense feelings of life-threatening fear accompanied by an urgent need to flee from the source of the fear.

An emergency such as an aircraft fire can have the effect of increasing arousal to the level at which behavior is severely disrupted. Characteristically, people become hyperactive; behavior is frequently unproductive; and codes of civilized conduct are violated. During high levels of arousal, previously learned behavior styles, both of a technical and social nature, are inhibited. Instead, anti-social and regressive acts, such as pushing, kicking and even trampling other people take place, while at the same time there is an inability to perform such basic tasks as operating door handles.

Some features of emergency situations appear to trigger the onset of panic. These include:

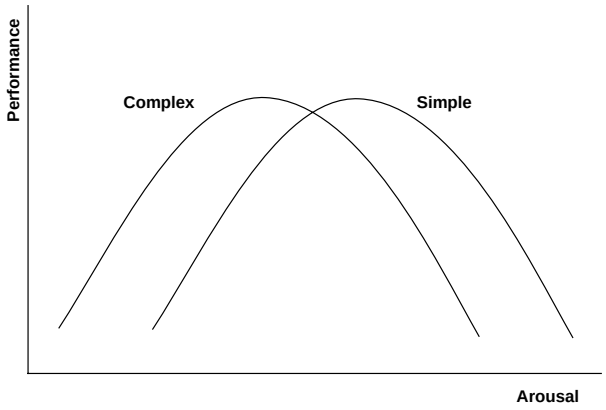
- *The loss of the ability to see.* This might result from failure of the lighting system or from the presence of smoke. Loss of vision seems to be less tolerable than the loss of other sensory inputs. It is also likely to give rise to disorientation with may further disrupt behavior.

- *The perception that the escape route is becoming progressively less acceptable.* Panic is more likely to occur in conditions where there is competition for something in short supply. Where the number of people attempting to escape is perceived to be greater than the capacity of the exits, then the norms which regulate social behavior are likely to be abandoned. Instead, ruthless selfishness becomes the guiding principle.

- *The behavior of other people.* Panic behavior appears to be "infectious." The behavior of some individuals may result in imitation by others. For example, orderly behavior, which is more likely to occur near to an exit, can be disrupted by pushing and jostling by those further from an exit.

Freezing is Counterproductive

High levels of arousal may result in behavior which is the opposite of the hyeractivity observed in panic. This behavior, which is generally considered to occur more likely than panic in aircraft accidents, is characterized by immobility. In contrast to the fight or flight response associated with panic, the individual is "petrified" with fear and appears unable to think, feel or move. "Freezing" is biologically adaptive for animals in some circumstances when, by feigning death, they avoid the attentions of a predator. It may act as a defense mechanism for individuals to protect them from the experience of overwhelming fear. However, in the case of an aircraft accident where survival may depend wholly on quick and purposeful action, the response of freezing is certainly not an adaptive one.



The optimal level of arousal for a complex task is lower that that for a simple task.

Figure 2

Whether hyperactivity or freezing occurs in response to an extremely stress-provoking event is in part related to the past history and the personality structure of the individuals concerned. It is also a function of such situational factors as the behavior of other people, and the extent to which the physical environment permits certain types of behavior to occur. Freezing has been observed in people who are required, under great stress, to carry out an unfamiliar task which requires an original response. The individual does not know what to do, and this inability serves further to increase the level of arousal. The result is that the individual, overwhelmed with intense anxiety, freezes.

There are reports of passengers apparently frozen into immobility who respond when given forceful and simple commands. To this extent, people who respond by freezing may be easier to manage than those who panic.

"Negative Panic" Wastes Time

In emergency situations, some people behave with a lack of urgency which indicates that they are not fully aware of the enormity of their predicament. They may, for example, delay to collect their belongings before attempting to leave the aircraft. The phrase "negative panic" has been used to describe this behavior. However, this phrase has also been used to describe freezing and hence there is some confusion attached to it. The two behavior patterns are in fact quite distinct. Freezing is contingent upon a high level of arousal, whereas the casual behavior often described as negative panic is the consequence of a low level of arousal in which the full extent of the threat has not been fully comprehended. The rarity of aircraft emergencies makes it difficult for people to accept that such an event is really happening.

As people begin to recognize that they are in a serious emergency situation, they are likely to experience feelings of uncertainty and intense anxiety. There is strong motivation to reduce this anxiety by seeking stability in the environment. In the search for certainty, people are highly suggestible. They will thus respond to the commands of others who appear to know what to do, provided that the required behavior is not complex. Whether or not their reactions are appropriate will depend on the percieved competence of those giving the commands.

What Course to Follow?

Clearly, none of these behavior patterns provides the best means of survival in the event of an emergency. The high levels of arousal associated with fear can result in the hyperactivity of panic behavior or the immobility of freezing. At slightly lower levels of arousal, a passenger's dependency on others for direction may be misplaced if those others are not competent leaders; their dependency on previously learned habits may also be misplaced if, for example, they attempt to release an aircraft seat belt in the way that they usually operate an automobile seat belt.

The ideal behavior in an emergency is smooth, competent, orderly and effective. Such behavior is compatible only with the optimal level of arousal. How can we ensure that this behavior will be more likely to occur?

Cabin Crew Training Offers Dual Benefits

The aim of cabin crew training is two-fold. First of all, personnel must be competent in the performance of all the activities associated with emergencies. This includes the technical knowledge of what to do and when to do it, as well as the practical skills of carrying out these activities effectively and efficiently. Second, cabin crew training must ensure that cabin attendants can cope effectively with the stress-provoking conditions prevailing in an emergency.

It is known that increased arousal has a greater effect on complex tasks than on simpler ones and that, when faced with a new task in conditions of stress, people are apt to respond by freezing. However, as skills develop, previously complex tasks become simpler; thorough training will reduce the possibility that regression to earlier, maladaptive, forms of behavior will occur; and the novelty in the situation will have been removed by the familiarity which develops with practice. In addition, the introduction into the training syllabus of stress inoculation programs will ensure that the emergency loses much of its stress-provoking character and becomes instead the stimulus for the exercise of a highly-practiced skill.

However, an emergency situation may arise with which even highly trained and competent cabin attendants are unable to cope. Cabin attendants are few in number in relation to the passengers in an aircraft. Thus, cabin crewmembers may not always be in a position to exercise their skills for the welfare of all their passengers. Consequently, passengers may have to depend on their own abilities if they are to increase their chances of survival in an emergency

Passenger Education Can Help

The U.S. Department of Transportation (DOT) has stated that "The accepted practice of both the U.S. Federal Aviation Administration (FAA) and the airline industry

is that briefing concerning emergency actions should not create passenger apprehension or inspire unwarranted actions by passengers. The emergency procedures for passengers are, therefore, relatively passive (i.e. follow instructions given for their individual protection) while trained crew members implement procedures and deploy any required equipment necessary to assure the continued safe flight and landing of the airplane and the safety of the passengers."(1) Understandably, airlines are unenthusiastic about placing excessive emphasis upon the possibility of what is, in fact, an extremely rare event. Cabin crew members are trained to provide a relaxed and comfortable ambience. Passengers concur in this, and display considerable resistance to hearing oral safety briefings or to studying safety briefing cards.

This situation is one in which there is a general reluctance to draw attention to the possibility of danger until there is no alternative. However, studies of human behavior in emergency situations, such as fires in buildings, have shown that the likelihood of panic is increased when restrictions are placed on the information provided to the public (2).

There is also the fear that passengers, as a consequence of insufficient information, might act in ways which are unsafe. The DOT may be quoted again: "Recent occurrences of unwarranted passenger-initiated emergency evacuations have caused concern that preflight briefings may in some cases motivate some people to act independently and unnecessarily."(1)

While this type of response on the part of passengers is not one to be encouraged, it could be argued that such behavior is the consequence of both inadequate passenger education and also a lack of confidence in the professional cabin crew.

There is, however, evidence that adequate preparation for an emergency can increase the incidence of survival. An accident involving a McDonnell Douglas DC-10, in which seagulls ingested into an engine caused it to disintegrate, showed the beneficial effects of training in survival. The takeoff was rejected and fire broke out on the right wing. There were no fatalities and only two serious injuries amoung the 128 passengers who evacuated the aircraft in less that one minute. All these passengers were airline employees and all but one had been trained for an emergency (3). Some people who habitually reviewed the potential means of escape from an aircraft in the event of an emergency were able to act speedily to ensure their own survival and also to help others (4).

The major objective of passenger education is to reduce the stress caused by emergencies by preparing the passengers in advance to cope with danger. Knowing what is happening and knowing what to do have a major influence on successful coping. A further advantage of educating passengers is that rules are less likely to be violated when the reasons for them are understood.

Good Program Begins With a Syllabus

The first step in the construction of any program of education is the compilation of a syllabus. The air transport industry should prepare, and make quite explicit, a "Syllabus for Passengers" which would be far more comprehensive that the present statutory briefings.

Passenger education and training must encompass more than the topic of emergency evacuation of an aircraft. Two major areas are involved.

- Passengers themselves create hazards in the aircraft. Rather than consisting of "do this" and "don't do that," passenger education should involve an explanation of why these prohibitions and exhortations are necessary for the safety of all those on board. For example, it should be made clear that the smoking prohibition in the toilet compartment results from an issue of safety, not from the possibility of complaints about the odor of tobacco. Rules concerning dangerous goods on board, intoxication and baggage restrictions should be included in the syllabus. The advantages of wearing a seat belt during cruise should be explained.

- The nature of the possible hazards which may be encountered in the course of a flight should be described. In addition to emergency landings on land or water, these include decompression, turbulence and inflight fire. The countermeasures to cope with these hazards, including the use of emergency equipment, should be detailed.

The next step is to devise the most effective method of teaching syllabus information to passengers. Quite sophisticated techniques of communication are now employed in various media, and some of these could be used for passenger education. In addition to formal knowledge, practical skills are necessary for the fully-trained passenger. "Hands on" facilities for the operation of door handles and oxygen masks, for example, should be provided for passengers to experience the use of these facilities.

The final component of such a training program would, of course, be an assessment of the progress of the trainee. Successful completion of the course would confer a "licence to fly" as a passenger.

The objections to such a systematic approach are not difficult to predict. Time and cost play a substantial part. The image of commercial aviation as a safe and enjoyable method of travel would not be enhanced by an emphasis upon preparation for disaster. Any one airline might well be reluctant to launch such a program and risk losing customers to competitors. Arguments concerning individual freedoms might be advanced.

Will such objections prevail? The long-term outlook is difficult to assess. Lifeboat drills aboard passenger ships have long been established and accepted. The public might be inclined to revise current attitudes towards risks in the air, much as popular opinion has changed dramatically with respect to smoking, to some dietary habits, and to the need for environmental conservation. ♦

[This article is based upon the forthcoming book The Aircraft Cabin *by Dr. Edwards and Professor Elwyn Edwards to be published by Gower Publishing Company Brookfield Vt., U.S., and Aldershot, U.K. — Ed.]*

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Mary Edwards, Ph.D., graduated with honors in psychology with philosophy from the University of Bristol, U.K. She taught courses in business psychology and held an appointment as psychologist within a government program for occupational rehabilitation. Following research into organizational structure and function, she was awarded a Ph.D. from Loughborough University of Technology.

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In 1985 Edwards was joined by her husband, Professor Elwyn Edwards, in establishing their consulting company, Human Technologies.

Industry Proposal Addresses Service Carts

New design standards in the works may improve in-flight safety for cabin personnel who operate food-and-beverage service carts.

by
Jeanne M. Elliott

The Society of Automotive Engineers (SAE) and its technical committee on cabin safety provisions is currently completing a new Aerospace Recommended Practice (ARP) on "Safety Considerations of Food and Beverage Service Carts."

Such ARPs provide guidance to designers, manufacturers, suppliers and operators on the design and operation of cabin interior and flight deck emergency equipment and other systems related to crew member and occupant safety and survival.

In a related effort during 1986, the committee issued an ARP on "Galley Installations" which provided industry guidance on galley design as it concerns overall safety, particularly to flight attendants in affording minimum

risk exposure and associated injuries due to: 1) routine use of galley installations and related equipment; 2) galley components becoming dislodged under routine or abnormal operating conditions and under survivable impact conditions; and 3) malfunctions of, or defects in, galleys or associated equipment.

With SAE's Aerospace Council approval, the service cart standard should be available by the summer of 1990.

The incentive to address the subject of food-and-beverage service carts in an industry standard was prompted by data that was compiled concerning flight attendant occupational injuries directly related to poor cart design or inadequate cart maintenance procedures. From the cart-related injury reports gathered, the most common injury was found to be musculoskeletal sprain/strain with the back being the most frequently affected part of the body. Many of these injuries resulted from overexertion in maneuvering service carts in flight.

Additionally, further concern with respect to service carts and their potential for producing on-the-job injuries was expressed by flight attendant unions through their filing of a petition to the U.S. Federal Aviation Administration (FAA) requesting rulemaking to provide regulations governing cart design and maintenance. The petition sought an industry-wide regulation that would limit the force needed to move a service cart, require periodic maintenance and testing, and limit hand flexion and extension during brake operation.

The current ARP being completed provides criteria for the design of service carts so as to enhance the safety of cabin personnel as well as passengers of transport category aircraft.

Some important aspects of the standard call attention to pushing/pulling forces of a fully-loaded service cart, low center of gravity to facilitate cart stability, maneuverability under specific operations in flight, and positive retention systems.

The criteria contained in the proposed standard should provide valuable guidance in the future design and operation of food-and-beverage service carts, particularly in consideration of their daily use by flight attendants for inflight service. ♦

About The Author

Jeanne M. Elliott has been involved with the aviation industry for more than 25 years in varying capacities relative to cabin safety, crew member training, inflight supervision, in-cabin inspection/surveillance, and program development and management.

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Elliott has written on occupant/crew member safety and protection in publications distributed worldwide. She participates with industry organizations dedicated to cabin safety and occupant survival and is affiliated with a major international air carrier.

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