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For Everyone Concerned With The Safety of Flight

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Educating the Educators in Human Factors

While the author believes that not enough attention is given to the discipline of human factors, he outlines a plan that could contribute to increased safety through attention to human factors. The plan indicates who should know what, and it is applicable for a small corporate aviation operation or a major international airline.

—
by

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Do-it-Yourself Approach Inefficient

When we seek to resolve a legal problem, we go to a qualified lawyer for advice. If we are building a house, we employ a qualified architect. And if we are looking for a diagnosis of a medical problem, we consult a physician. Yet, when it comes to solving human factors problems, we have traditionally been content to handle these using a do-it-yourself approach, even though hundreds of lives may depend on the outcome.

This seems strange because three out of four accidents result, as the last event, from less than optimum human performance. Not from being medically unfit or lacking in basic flying skills but often from errors in information processing or decision-making or in behavioral inadequacies. Sometimes these errors or behaviors have been induced from elsewhere, such as poor equipment or procedure design or inadequate training or operating instructions. But whatever the origin, human performance and behavior lies right in the mainstream of human factors.

The cost in human and financial terms, of less than optimum human performance, has now become so great that a do-it-yourself approach to human factors is no longer good enough. The days of blissful ignorance are over. If safety is our objective — and it surely must be if we are to accept our responsibility to the public and the paying customers — then we must ensure a proper level of human factors knowledge throughout our industry, whether we are making, certifying or operating aircraft. In the following

paragraphs, we shall examine the level of knowledge needed and indicate how and where it can be obtained.

Education and Training

Education and training are two aspects of the teaching process. Education is normally used to establish a broad-based set of knowledge, values, attitudes and skill upon which more specific job abilities can be acquired at a later stage. Education can be seen as the precursor of training.

Training is a process aimed at developing specific skills, knowledge or attitudes for a job or part of a job. To attempt to apply training without an adequate background of education is like building a house without first laying the foundation.

When we train in the techniques of flight planning, we do so with the knowledge that the pilot has a background of formal education in mathematics. Similarly, when we provide training in meteorology or aircraft systems, we can safely assume that the student has a background of formal schooling in general science and physics. But when it comes to matters related to human performance and behavior, any training given lacks a background of formal education in the subject, that is, human factors.

Only the simplest form of medication or medical diagnosis would be attempted without using the expertise of a qualified physician — even elementary first aid calls for a special course. We cannot expect to see an adequate

improvement in safety related to human aspects of flying until we are prepared to accept the same standards of knowledge and expertise as we apply to technical and medical matters. The key to progress is education — at all levels. Fortunately, such education and expertise are available today and increasingly, more progressive and enlightened organizations are ensuring that they take it on board.

Human Factors Knowledge Requirements

Everyone in the design, certification and operation of aircraft needs some foundation of human factors knowledge. A simple model will illustrate the appropriate level of expertise for each grade of staff.

Level 1: All Staff

Notices on engines, weather problems or aircraft systems, are likely to be effective because those receiving the message have had a formal background of education upon which to base their comprehension and response. Messages related to human performance and behavior must meet a similar educated response.

This means that all staff should be exposed to a general level of human factors education so as to be fully aware of the scope and significance of this technology and to be more aware of human capabilities and limitations. An important aim is the modification of attitudes. Such a course must provide education for large numbers of staff at low cost. It must be mobile to meet the needs of companies whose staff is dispersed around a network of bases.

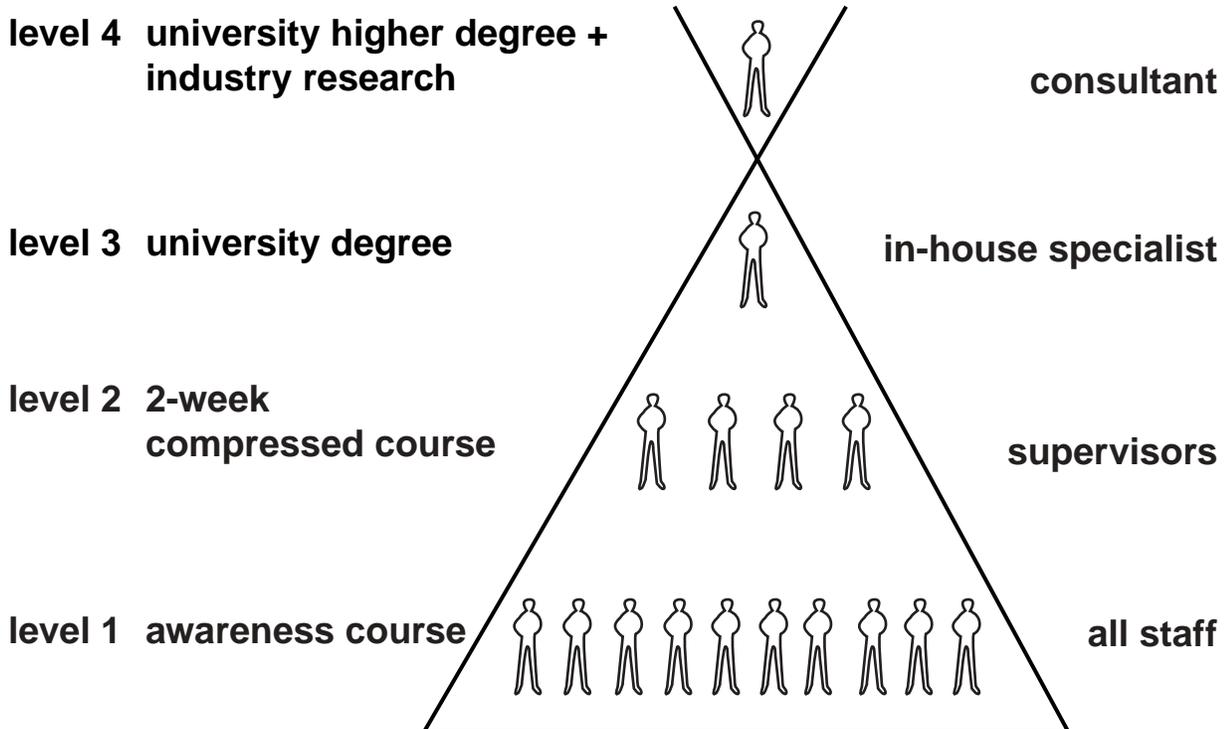


Fig. 1 The company human factors wigwam illustrating the expertise required at different levels in an organization.*

Such a program is available in the 15-unit audio-visual, "KLM Human Factors Awareness Course" (KHUFAC), which is now in use in more than two dozen organizations in 18 countries.

Level 2: Supervisory Staff

Those in supervisory positions, designing procedures and supervising operations are constantly involved in making decisions in which human performance plays a role. Some are concerned with training or checking; others with designing procedures or controlling operational standards. Yet others may be concerned more directly with trying to develop suitable professional attitudes towards safety.

It is essential that such activities are based upon a background of education in human factors. For this purpose, short courses of one to two weeks are available to introduce the supervisor to the technology. He should then see each human problem in a new light, should be able to tackle the most straightforward ones with a greater chance of success and know when and from where to obtain further assistance.

One such course is available from the University of Southern California (USC) in the United States. "Human Factors in Transport Aircraft Operation" (HFTAO), has been offered for some years by Loughborough and Aston Universities in the United Kingdom and can be provided to users (by arrangement with Professor Elwyn Edwards) anywhere in the world. Taking the course to the student can be very useful for busy operators with highly-paid staff. This HFTAO course was attended by participants from 30 countries during its first 10 years.

Level 3: The In-House Specialist

There can be no justification today for any large aviation company or organization not employing one or more degree-qualified human factors specialists on a full-time basis. A close association with flying will be necessary if the specialist is to work effectively and with credibility on operational problems.

This specialist will establish a link with a Level 4 consultant and will thus be able to take advantage of a higher level of expertise, advice on experimental procedures and solutions to problems which have already occurred elsewhere.

Degree courses in ergonomics, engineering or occupational psychology are now available in very many universities; the Human Factors Society has a register of them.

Level 4: Human Factors Consultant

The highest level in the wigwam model is the consultant. Even the smallest organization can establish a link with

such a source of expertise, as the consultant is not on the permanent payroll. This level of expert is able to analyse problems and can offer advice free from any internal organizational pressures.

Extensive contacts in the industry will be maintained and these will be available for use in providing a consulting service. In addition to this experience and industry contact, the consultant will hold a higher degree (master's or doctorate) in one of the relevant psychology-based human factors areas.

Documentation

All courses must be backed by proper literature. In the last couple of years, books specifically devoted to aviation human factors have become available. These provide a sound back-up as course documentation, and also provide for independent study for those unable to attend a course. They should be readily available in all operations departments and familiar to all pilots.

Where Do We Stand Today?

There has surely been some progress in creating an awareness of human factors, but this has often been "too little and too late." In accident investigation, the U.S. National Transportation Safety Board (NTSB) has established a special Human Factors Division with properly qualified staff. In Australia, the accident investigation authority has fully implemented, at all levels, the structure of human factors expertise shown in Fig. 1, including the supply of the textbooks relevant to all investigators. This structure is also nearing completion in some Australian airlines — Australia is consistently near the top of the air safety league.

Airlines in the rest of the world generally show less progress. However, an airline does not have to be large to be dedicated to a progressive approach to safety, as illustrated by the national airline of Finland, Finnair, which has fully implemented the Fig. 1 structure of human factors expertise and has made the relevant textbooks available to staff.

One of the obstacles to progress has been the lack of a requirement for any knowledge of the technology of human factors in ICAO Annex 1, which provides criteria for pilot licensing. It is understandable that many operators will allocate funds primarily where activity is mandatory — particularly with the economies enforced by deregulation. International Civil Aviation Organization (ICAO) Annex 1, para 2.6.1.2 spelled out 13 knowledge requirements for the issue of an airline transport pilot license and these even included some knowledge of aircraft maintenance.

Yet in spite of the central and critical role of the performance of the human component in the safe operation of aircraft, no knowledge was required concerning the crew member's own performance and behavior. This omission was untenable and

ICAO has now recognized the deficiency, though there is further scope for development of the requirement. ICAO requirements provide the foundation upon which all countries in the world build their own national regulations. Proper action here was very long overdue.

An obvious place for educational activity is in the flying schools, yet few are prepared to go beyond the current ICAO requirements. One exception is the progressive Civil Air Training Academy in Cessnock, Australia. Another is the State Flying School in the Netherlands. Even the new Flying College in Prestwick, Scotland, lists 935 hours of ground instruction in its pilot syllabus, yet not one hour is listed as specifically devoted to the technology of human factors. Until such time as all operators are staffed with crew members who have received the required level of human factors education, it will remain the responsibility of the operator to ensure that the education is received.

Greater awareness of the significance of human performance in maintaining flight safety has led to the development of a number of training exercises, such as LOFT, and various flight deck resource management or captaincy development programs. Like all training programs, however, these should be applied by those who have already received a sound educational background in human factors. The educational facilities for this vital contribution to flight safety are available. We need only the motivation to go forward and use them. ♦

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About The Author

Capt. Frank H. Hawkins developed and applied his interest in human factors during 30 years as a line captain and research/development pilot for KLM airline. He participated in the design of flight decks for all KLM aircraft from the Viscount to the Boeing 747.

Hawkins perceived a lack of knowledge in the human factors area that often led to tragedy. His interest in this area led to the development of courses in human factors, including the KLM Human Factors Awareness Course.

He is a member of the Human Factors Society and a Liveryman of the Guild of Air Pilots.

His book, "Human Factors in Flight," published in 1987, explores the area of human factors in an easy-to-read style and is aimed at pilots, operators, regulators and designers of aircraft. While aimed at flight decks and operational aspects, the cabin and passenger well-being is also addressed.

European Corporate Aviation Safety Seminar

Intercontinental Hotel
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"Safe Aircraft Operation In A Congested Air Traffic System"

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