INTRODUCTION

Flight crews must make decisions and take action when systems fail or emergencies arise during flight. These situations may involve high levels of risk, information uncertainty, and time pressure, factors that contribute to stress. Full-mission flight simulation studies have shown that crews differ in how effectively they cope in these circumstances, judged by operational errors and crew coordination. The present study analyzed the problem solving and decision making strategies used by crews in a 6-leg full-mission flight over 5-1/2 days. The flight included a number of abnormal events that required decisions during high workload periods. Transcripts of videotapes were analyzed to describe decision making strategies. Crew performance (errors and coordination) was judged on-line and from videotapes by check airman.

RESULTS

Based on a median split of crew performance errors, analyses to date indicate a difference in general strategy between airplane crews who make more or less errors. Higher performing crews showed greater situational awareness—they responded quickly to cues and interpreted them appropriately. They requested more decision-relevant information and took into account flight phase requirements. Lower performing crews showed poorer situational awareness, planning, constraint sensitivity, and coordination. The major difference between higher and lower performing crews was that poorer crews made quick decisions and then collected information to confirm their decision. CONCLUSION

Differences in overall crew performance were associated with differences in situational awareness, information management, and decision strategy. Captain personality profiles were associated with these differences, a finding with implications for crew selection and training.

DEPARTMENT OF THE AIR FORCE

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CREW DECISION MAKING UNDER STRESS. J. Organiz. NASA-Ames Research Center, Moffett Field, CA 94035

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AIRCRAFT REACTIONS TO COCKPIT AUTOMATION. E. L. Wieser. University of Miami, Coral Gables, FL 33124

The modern, highly automated transport cockpit has brought a new era of highly efficient flight. But it has also introduced new problems of situational awareness, remoteness from the basic airplane, and concerns about possible loss of manual flying proficiency. This paper will discuss the "good/new/bad" news of cockpit automation.


The use of cockpit avionics to guide flight control is not always an option (e.g., low-level nocturnal flight). Under such circumstances the pilot must use out-the-window information for control and navigation. Thus it is important to determine the basis of visually guided flight for several reasons: 1) to guide the design and construction of the visual displays used in training simulators; 2) to allow modeling of visibility restrictions brought about by weather, cockpit constraints, or distortions introduced by sensor systems; and 3) to aid in the development of displays that will enhance the pilot's ability to extract information from the visual scene. The authors are actively pursuing these questions. We have ongoing studies using both low-cost, lower fidelity flight simulators, and state-of-the-art helicopter simulation research facilities. Research results will be presented on: 1) the important visual scene information used in attitude and course control, 2) the utility of monocular, stereo, and hyperspectral cues for the control of flight; 3) perceptual effects due to the differences between normal and abnormal daytime vision, and that made available by various night vision devices (e.g., light-intensifying goggles and infra-red sensor displays); and 4) the utility of advanced contact displays in which instrument information is made part of the visual scene, as on a "scene-linked" head-up display (e.g., displaying altimeter information on a virtual billboard located on the ground).

USING AND DESIGNING PROCEDURES: LESSONS LEARNED FROM AVIATION. A. Decker. San Jose State University Foundation, San Jose, CA 95106.

Procedures drive almost every task and sub-task on the flight deck of a commercial airliner. Failure to conform to Standard Operating Procedures (SOP) is frequently listed as the cause of violations, incidents, and accidents. Moreover, according to a study of 93 commercial aviation accidents, the leading crew-caused factor in aviation accidents was "pitot deviation from basic operational procedures" (Lautman and Gallimore, 1988). However, in most cases procedures and checklists are designed piecemeal, rather than based on a broad philosophy and on policies for operations. A framework of philosophy, policies, procedures and their relationship to the actual practices on the flight-deck is suggested. Initial results of an ongoing field-study to investigate the usefulness of these concepts will be reported.


This panel will consist of five presentations on human factor (operator) issues in military aircraft accidents, focusing on immediate and future concerns. The U.S. Army will discuss the underlying causes of aircraft accidents during Desert Shield/Storm in comparison to the non-combat environment. The U.S. Navy will review the trends and causes of Naval aviation accidents and the effect on current training. The U.S. Air Force will present the problems that face the military services in the future, and the Canadian Forces will discuss their proposed system to collect and analyze human error data from aircraft accidents. The Royal Air Force will discuss recent studies concerning emergency egress equipment.