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FORMAL PAPERS

Special Issue Editorial

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As a reader of this journal, you probably have direct interest in aviation and the most recent psychological theories and breakthroughs that affect all aspects of flight. As you turn to the present issue you may well ask, Isn't mental workload last year's concern? Hasn't it been superseded by the newer concept, situation awareness? The purpose of this brief introduction is to address this issue and to indicate where workload still fits into the picture of operator assessment.

The study of workload has a long history, but it was not until a 1977 NATO-sponsored workshop and subsequent book entitled *Mental Workload: Its Theory and Measurement* (Moray, 1979), that the concept became a common term used by psychologists and engineers. Since then, research has focused predominantly on determining the factors that influence workload, and concurrently, on methods and techniques for measuring it (e.g., Williges & Wierwille, 1979; for reviews, see Hancock & Meshkati, 1988; Moray, 1988). The impact of this research is evidenced by the FAA's recent adoption of rules to base crew-complement certification on workload factors (Speyer, Fort, Fouillot, & Blomberg, 1987; see FAR 25.1523 on Minimum Flight Crew Certification, Appendix D, FAA, 1994). Of course, workload is a mediational construct that cannot be evaluated or observed directly. Workload assessment methods therefore rely on indirect reflections such as the analysis of objective performance measures, physiological indices, and subjective ratings.

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Recently there have been three large-scale reviews of workload research as related to aviation systems (Corwin et al., 1989; Eggemeier et al., 1990; Lysaght et al., 1989). Although each review has a different emphasis and thus reaches different conclusions, there is general agreement on the need for continuing research into pilot workload.

This recommendation might seem discouraging after so much effort has already been directed to the study of pilot workload (Vidulich, 1991). But readers should be reminded that understanding the cost of performing mental operations (i.e., workload) still remains critical to the design and operation of complex human–machine systems. In support of this notion, we cite two obvious justifications for continuing research into pilot workload. First, because the workload experienced by pilots is in large part determined by the systems, procedures, and environments with which they interact, we must continue to evaluate how pilot workload is affected as these elements evolve and transform. In essence, each time we add a new system, effect a new procedure, or expand the environment within which an aircraft operates, we are creating a new human–machine system for which pilot workload must be assessed. Take, for example, the case of automation. As we increase aircraft automation, we may increase or decrease pilot workload depending on the particular way in which the automation is implemented (Kantowitz, 1994; Wiener, 1985; Wiener & Curry, 1980). Yet without further understanding of how pilots interact with automated systems, cockpit system designers will have little information on which to base their implementation decisions (Sarter & Woods, 1994).

The second justification is reflected in the recent paradigm shift in pilot workload research. This shift reflects a growing awareness of the importance of understanding strategic pilot behavior to workload assessment and prediction and the equal importance of workload assessment to understanding strategic pilot behavior (e.g., see Hart, 1989; Hart & Wickens, 1990). Whereas in the past, aviation researchers have been concerned with understanding *load,* we now realize the importance of understanding *work*—that is, the study of how pilots actively manage their time, energy, and available resources in specific contexts (Hart, 1989). For example, altitude deviations continue to be as prevalent as they are dangerous, primarily because pilots are distracted or preoccupied with other tasks during the altitude change (Palmer, Hutchins, Ritter, & vanCleemput, 1993). Understanding and modeling the mechanisms and causes of this nonoptimal task management remains a critical challenge to the aviation psychology community (Funk, 1991). To this end, future aviation workload research will likely focus less on measurements per se and more on developing a better understanding of the pilots and situations to which workload measurements are applied (see Flach, 1994). Similarly, it is important that we also develop theories of strategic behavior and workload management that apply to teams of pilots (crews; Huey &

Is there still room for workload in our panoply of pilot-assessment procedures? Indeed, yes. The articles in this issue represent a diverse range of contemporary investigations that attest to this belief. We hope they further serve to support the continued application of workload research to the operational issues and concerns of the aviation community.

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