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GLOBAL POSITIONING SYSTEM (GPS): HUMAN FACTORS ASPECTS FOR GENERAL AVIATION PILOTS

A thesis presented in partial fulfilment of the requirements for the degree of Master of Science in Psychology at Massey University, Palmerston North, New Zealand

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I certify that the substance of this thesis has not already been submitted for any degrees and is not being currently submitted for any other degrees.

I certify that to the best of my knowledge, any help received in the preparation of this thesis, and all sources used, have been acknowledged in this thesis.

Michael D. Nendick

ABSTRACT

The allied disciplines of psychology and human factors within aviation are well established. Moreover, the benefits that their research efforts have brought to the underlying theoretical and practical application of technology within aviation are well documented. The introduction of the Global Positioning System (GPS) is a new technology in this context that has not yet received much attention in terms of its human factors implications. GPS is a satellite based navigation system, available as a non-standardised "add-on" navigation system for General Aviation (GA) aircraft. While GPS has been established within the military environment for some time it has only recently been made available to the civil aviation market. To date there has been little human factors research conducted on its use by pilots, especially in the GA industry where it has rapidly become an extremely popular navigation aid. This study aimed to utilise the fundamental principles of psychology and human factors to examine GA pilots' use of GPS. Particular reference was made to the equipment design ergonomics, the psychological attitudes and behaviours displayed when using GPS, and the implications GPS has for flight safety. The study sought information to determine whether formal training was required and to suggest the format for such training. A survey of 172 GA pilots using GPS in New Zealand was carried out to investigate five research questions proposed to provide a basis for future research. The results found that GPS was rated highly for its design and ease of use, however specific areas of GPS design needing improvement were identified. GPS was rated in a similar fashion by pilots irrespective of their individual demographic sub-groupings. While the majority of pilots were found to have positive attitudes and behaviours using GPS, some users had developed negative attitudes previously associated with automation such as over-confidence, reliance, and complacency. This had resulted in certain inappropriate behaviours. These included operating without backup means, discarding standard navigation procedures such as maintaining reference to maps and charts, and navigating with GPS before gaining an acceptable level of knowledge and competency with its use. The results appeared to be generalisable to the wider pilot population. The results suggest that formalised training incorporating human factors was required for operators to use GPS to its full potential and to avoid committing errors with possible hazardous consequences.

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