

# Human performance in a moving environment

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Alexander H. Wertheim  
TNO Human Factors Research Institute  
Soesterberg  
The Netherlands

## Abstract

The present paper provides a review of research and theories concerning the question of how and why working in a moving environment may affect performance. It is argued that performance decrements can be expected to occur as a result of general factors or as a result of specific impairments of particular human skills. General effects occur when environmental motion, simulated or real, reduces motivation (due to motion sickness), creates balance problems, or increases fatigue (due to increased energy requirements). Specific effects of moving environments on task performance may only be expected through bio-mechanical influences on particular skills like perception (interference with oculomotor control) or motor skills (like manual tracking). There is no evidence for direct effects of motion on purely cognitive skills.

## Introduction

With the current fast rate of technological developments, the use of simulators, fixed or moving base, to simulate a moving environment, is rapidly increasing. They are used often for training to carry out tasks and work in moving environments, such as aircraft, road vehicles, ships etc. This has created many challenges for human factors researchers, who are often asked to investigate such questions as the validity of the simulators, the efficiency of training procedures, etc. It is surprising, however, that much of the research carried out with simulators assumes that we know how work is actually carried out in a moving environment. This is not always the case. Many investigators are only dimly aware of research on how movement affects performance. To help them fill this gap, the present paper presents a review of what is currently known about the nature of human performance in moving environments (both in simulators and in real environments).

We may classify effects of movement on performance in two categories: general and specific. General effects refer to any task, any performance, carried out in a moving environment. They may be of a motivational nature (motion sickness), of a bio-mechanical nature (interference with task performance because of a loss of balance), or of an energetical nature (motion induced fatigue caused by the continuous muscular effort to maintain balance). Specific effects, on the other hand, refer to interference with specific human abilities (e.g. cognition, perception etc.). General and specific effects will be reviewed separately in the present paper.