

## Human Capabilities and Limitations

*Michele Terranova, Ph.D.*

Promoting a safe level of operations in the control room means ensuring that human capabilities and limits are not exceeded. Human operators have certain capabilities and limits for physical functions such as vision and hearing, but also for social, emotional, and cognitive performance. One of the most complex types of limitation to define and measure is human workload. The most accurate measures are multi dimensional and incorporate mental demand, physical demand, time pressures, required effort, performance and stress levels. All of these variables interact to influence controller workload. Day shifts may increase workload because of busy daytime activities such as phone calls. However, the stress levels of night personnel may be higher due to sleep and fatigue issues. Transitional activities and re-sequencing tasks before and after shift changes place additional demands on controllers. Whether a controller actually perceives a situation as heavy in workload is determined by the level of experience and natural differences in work and cognitive processing styles. Stress levels and workload are increased by situations in which a controller's effort has little or no influence on performance. Situations in which controllers feel "out of control" include equipment failures or unpredictability, poor communication, redundant administrative paperwork or ticketing, distracting phone calls, nuisance alarms, lack of familiarity in reacting to infrequent actions or abnormal events, and inefficient user interfaces. The combination of these factors can create higher workload and increase the probability of mistakes at critical times.

