PERCEPTUAL AND PERFORMANCE CONSEQUENCES OF FLIGHT IN VIRTUAL WORLDS

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Head-mounted, virtual world technologies were developed in the 1960s. Comeau and Bryan (1961) reported on a head-slaved video control system. In 1968, Sutherland discussed a head-slaved, graphics based virtual world that was later demonstrated by Vickers (1970). Operational systems for military aircraft were quickly developed and tested (Johnson and Foster, 1977).

As part of second generation technology efforts, new display media and computer graphics systems have been developed (Fisher, McGreevey, Humphries, and Robinett, 1986). With this new technology effort has come more systematic studies of the performance consequences resulting from conducting teleoperations in aeronautical settings.

There are two primary purposes for head-mounted systems in aeronautical settings. One is for helmet-mounted sights and teleoperated (head-slaved) weapons systems. Bennett, Johnson, Perrone, and Phatak (1988) evaluated head tracking performance during passive and controlled flight. In that study, comparisons were also made of head tracking performance in sterile and relatively complex virtual worlds. That study confirmed the robustness of head tracking performance across a wide variety of visual scenes.

A second use of virtual world displays is for aircraft control. Aircraft controllability using head-mounted, panel-mounted or simulated out-the-window scenes has been systematically examined (Bennett, O'Donnell, and Johnson, 1988; O'Donnell, Johnson, and Bennett, 1988). Those studies reported the range of rotorcraft flight tasks in which head-mounted virtual worlds provided some advantages.

Two studies will be reported that examine the perceptual/performance effects of virtual worlds. The first examines head tracking performance with roll-stabilized versus non-roll stabilized virtual worlds. The purpose of the study was to (a) examine display strategies used in current display systems and (b) study the adaptability of observers to estimated glide slope angles using head-slaved versus head-stabilized imagery. The purpose of this study was to examine the usefulness of wide field-of-regards during final approaches to a runway.