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Discrete Information Object Analysis of Primary Flight Display Clutter

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## Introduction

Glass cockpits, digital display systems used to display critical flight information and status of aircraft systems, are ubiquitous in modern aircraft and continually are improving in capabilities. However, there comes a point where the data displayed, despite being designed to increase pilot performance and safety, serve as a detriment to situational awareness.

Traditional flight deck designs made use of several instruments, distributed from the center of the instrument panel in a somewhat relative order of importance, forcing pilots to develop a scan pattern to seek requisite information. Glass cockpit systems display much of that same information in a smaller area, minimizing scanning but increasing complexity.

Both the manner in which the data is presented visually and the type and amount of information can serve as distractors from the task of flying an aircraft. This effect is termed *clutter*, and is defined as the “unintended effect of imagery display that obscures or confuses other information, or that may not be relevant to the task at hand.” (Kaber et al., 2008, p. 1008). Pilot perceptions of clutter vary with flight experience, introducing unique considerations in the flight training environment, given the experience difference between instructors and students.

## Methodology

The author reviewed literature on types and effects of clutter in aircraft displays. The purpose of the review was to assess extant research on display clutter and to develop recommendations to incorporate context into the model.

The literature review began with a database search for combinations of the terms “aviation,” “aircraft,” “clutter,” “perception,” and “gestalt.” The researcher used subjective judgment to emphasize sources from scholarly journals describing clutter in aircraft with digital flight displays.

## Training Implications

The training environment introduces a possible disparity in crew perceptions of flight displays given the experience gap between student and instructor. Kaufmann and Kaber (2010) found pilots who can better “divide their attention across a display are less prone to experience clutter in the display than those who must switch attention from one area of the display to another in order to gather needed information” (p. 74). Pilots also vary in the size of the display area in which they can divide their attention.

When coupled with the concept of clutter, it may be that experienced pilots are perceiving more of the display as a single source of information, rather than seeking data from multiple sources on the PFD.

An analysis of the information objects used by flight students and instructors may provide greater insight into how and when different portions of a flight display are used by each. Furthermore, it may indicate portions of the display perceived differently by pilots as useful or cluttered. Awareness of these factors can lead to development of better flight displays, displays with different software de-clutter options, improved training techniques, or alternate instrument scanning techniques.

## Future Research

Future research can analyze perceived clutter in specific displays and scenarios and aid in designing new means to present information to pilots.

Despite subjectivity in individual perception, information objects can be modeled. A hierarchical tree may aid designers and researchers in determining which sources may be perceived by users as a whole, and at what level. Elements will require some form of weight to account for proximity and context, as items not appearing in physical or temporal proximity are unlikely to be perceived by a pilot as a whole.