Chapter 11
Concept Evaluation

ABSTRACT

Various mission adaptive display concepts are evaluated in an operational setting to evaluate the effectiveness of their conceptual design. This is useful so one can highlight possible design problems early. An important aspect of this evaluation presented here is the scenario treatment of an actual mission. Terrain critical conditions, wind shear, and wake turbulence conditions are covered. This section also examines some important features and theories of Operational decision making. Included in the operational decision making model are problem definition, ODM definition, risk continuum, decision analytic structure, mission performance models, triggering events, critical flight maneuver performance aids, and kinematic assessment. A special notice should be given to the operational treatment of a single engine approach and the mission performance aids associated with its critical flight maneuver.

INTRODUCTION

In this book we have covered much new ground. The purpose is to create an environment where the necessary tools and conceptual structures are at once available to the many and diverse design teams that address themselves to the problem of human operation of large scale dynamic systems and to contribute in a meaningful way to operationally viable convergent technology applications. The goal of this book therefore is to introduce to the aviation community the idea of Mission

DOI: 10.4018/978-1-4666-8673-1.ch011

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Adaptive Displays. Mission Adaptive Displays are crew station design features and representations that have the built-in capability to automatically adapt themselves to changing operational conditions so that the operator does not have to sort through reams of information searching for the right information at the right time. Mission Adaptive Displays, using state-of-the-art mission adaptive technologies, will automatically provide this to the crew member in a just-in-time format—the right information at the right time. In this chapter we will briefly review the essential concepts surrounding the Smart Cockpit (Mission Adaptive Displays) and then look at their use in an operational setting.

OPERATIONAL DECISION MAKING

Operational decision making (ODM) and the conceptual structures and theory that support such a decision making process is the single most important aspect supporting the design, development, and implementation of mission adaptive displays and their targeted Mission Performance Aids (MPA). Operational Decision Theory is consistent with the more conventional decision theories and in particular Utility Theory, but extends this theory in important new directions. Thus ODM complies with Utility Theory in all important respects which we will cover briefly.

UTILITY THEORY

Utility Theory is based on the concept that a certain distinguishing characteristic of something that contains desirable properties is referred to as “value.” Value is synonymous with desirability. A desirable attribute is then subjected to a real world consideration of the likelihood that it will manifest. This is typically called probability. The mathematical relationship is straightforward. Value (V) times probability (P) equals utility (U), or

\[ U = V \times P. \]

In conventional decision theory—the idea is straightforward enough—you want to maximize utility. But the reader will notice that for any decision problem encountered using this model, the decision analytic structure is situation specific. However, Operational Decision Theory is significantly different in this regard.
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