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Review of *The Future of Air Traffic Control: Human Operators and Automation,* by The National Research Council*

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This book is the second of a two-part report on a study of human factors and automation sponsored by the US Department of Transportation. The National Research Council (NRC) convened this panel as a result of the Federal Aviation Administration's (FAA) decision to terminate the Advanced Automation System project (AAS). AAS was an ambitious and aggressive attempt to create a highly automated Air Traffic Control (ATC) system to manage operations in the National Airspace. The report was intended to address Congressional concerns about the potential effects of the level of automation being planned, the safety implications of changing the level of involvement of human operators, and the huge capital investment required.

The first part of the report, *Flight to the Future: Human Factors in Air Traffic Control* (NRC, 1997) provides a comprehensive functional decomposition of the major elements of the ATC system, focusing on the work structure and systemic tasks of the humans and the equipment that comprise the system. The later chapters introduce air traffic management automation concepts and the attendant potential benefits and risks of different automation strategies, which are critical for understanding *The Future of Air Traffic Control*.

This second book covers the automation initiatives in ATC modernization. The various programs in development are detailed from the human-centered automation viewpoint, including assessments of the potential risk involved in implementing them. (Improvements in many of these programs since the report was published make some of this detailed information dated, but the underlying automation approach has remained consistent.) It is in this area of risk assessment that the concept of human-centered automation makes its best case - designing and using automation to build on human strengths and capabilities while managing and compensating for human weaknesses.

This report is critical because it leads one to ask the hard human factors questions beyond what many “experts” presume is the essence of human factors - “color scheme” and “font size” and “display lay-out”: namely, what is the purpose of this function in the system, and what does the system gain *and lose* if that function is automated? That is, will automating this function provide enough benefit to system safety and performance to off-set the risks? Understanding and accepting ahead of time that there will be risks, regardless of the level of automation selected, is fundamental to deciding what the future system will look like.

Not satisfied to merely ask the questions, the NRC panel also presents over a dozen pages of solid recommendations for mitigating the risk of automating air traffic control functions,

emphasizing the human-centered automation approach. This, for me, is the "heart" of this report: clear recommendations for policy decision makers in the FAA to integrate the excellent research being performed by many different organizations into a system that provides for safety and efficiency equally, based on the fundamental precepts of human-centered automation.

There are some truly exciting possibilities attendant to the various ATC modernization initiatives. This report should provide FAA management with a blue-print for making these a reality in the future ATC system.

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* National Research Council. (1998). *The Future of Air Traffic Control: Human Operators and Automation*, C. D. Wickens & J. P. McGee (Eds.), National Academy Press. (ISBN 0-309-05637-3).

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