POTENTIAL APPLICATIONS OF ARTIFICIAL INTELLIGENCE TO THE AIR TRAFFIC CONTROL SYSTEM

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These comments concern the potential applications of artificial intelligence (AI) to the Federal Aviation Administration's (FAA) air traffic control (ATC) system. Artificial intelligence and expert systems technology are clearly a "leading edge" in advanced computer science and must be thoroughly examined for possible benefits for the FAA and, by extension, system users.

A logical approach would be to avoid concentrating great amounts of time, money, or energy on exploring generic or high-level abstract concepts but rather to attempt to demonstrate the operational feasibility of simple, straightforward, and/or "intuitively obvious" applications. While this may not be fully satisfying to enthusiastic theorists, exotic theories remain pure fantasy until the soundness of fundamental capabilities can be shown. The following is a listing of areas that the FAA should explore.

Severe Weather Detection/Prediction

The eventual implementation of terminal Doppler weather radar systems is not an invalid assumption. Research into expert system analysis of Doppler radar data has shown that gust front and microburst activity can be automatically detected. Additional work should be done to determine the feasibility of: (a) reducing the data processing time; (b) having a capability to project the above wind shear conditions; and (c) developing a scheme for providing that wind shear data to appropriate control personnel.

Traffic Flow Management

National flow management is largely a data management and non-tactical ATC process, utilizing a relatively stable set of logical cause and effect rules. The pure enormity of the national flow management process, due to the large number of destination points, departure points, congestion points, and shifting (yet inter-related) demand levels, would appear to make an expert system application "intuitively obvious". Given the economic benefits available through a more efficient national flow management process, the FAA should explore this area as soon as possible.

System Maintenance Analysis

The FAA will be capable of collecting and storing great amounts of data pertaining to equipment performance and patterns through the remote maintenance monitoring system (RMMMS). An expert system capability that could aid the system monitoring and maintenance personnel in analyzing the data to reduce the out-of-service time of the project system failures would be of significant benefit to FAA technicians, controllers, and system users. This is another area that should be explored.

Air Traffic Controller Training Aid

An expert system that could monitor controller training problem simulations (radar) and automatically interrupt the simulation when a "system error" occurred, explain why it happened, and provide a reasonable set of control instructions that would have prevented the error, would enhance the productivity of training personnel by providing a "self-study" practice capability for students. It could also enhance training quality by providing opportunities for more practice exercises. If sufficiently sophisticated, this same principle could be applied to teaching efficient control techniques. The benefits here also appear to be "intuitively obvious".

Tactical Air Traffic Control

In order to achieve significant controller productivity gains, a relatively high level of control responsibility will have to be transferred from the controller to the automation system. It would seem that expert system technology will be required to do that. This is certainly a long term activity, but the FAA must begin now to determine the likelihood that such a transfer is possible.

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