An Ordered Logit Model of Air Traffic Controllers’ Conflict Risk Judgment

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Though there is considerable agreement among past studies as to the great variability in conflict judgments made by Air Traffic Controllers (ATCos), certain observable control room behaviour speaks in favour of the existence of a common core that is shared by controllers, regarding their perception of conflict risk. The study presented in this paper began with the construction (from real recordings) of traffic scenarios showing two converging aircraft in approach. Three variables characterized these traffic scenarios, quantifying respectively horizontal separation, vertical separation and the momentum of the formation of the judgment (prediction time span). The conditions created by factorial manipulation of three variables led to the design of short scenarios (about 1 min) involving two aircraft upon which 161 controllers gave their judgments about possible occurrence of a separation loss. A first descriptive analysis of the data, conducted in Averty [2005], confirmed the large variability of the experts’ judgments but also clearly indicated the global consistency of the results. The data thus called for a deeper statistical analysis, the results of which will be presented in the article. In a first step, particular models have been constructed for each value of the prediction time span. The comparison of the model’s parameters allows evaluating the influence of the time span on the conflict perception. It appears for example that the horizontal dimension has more “separating power” than the vertical dimension far from the conflict location, but that its relative importance diminishes (along with uncertainty) as the conflict resolves. Individual models are then nonlinearly aggregated into an “integrated model” by maximum likelihood estimation on the whole dataset. Finally, the relevance of this model to individual models is statistically validated, indicating that very little information has been lost in the aggregation process.

Assessing the Impact of Automation on the Air Traffic Controller: The SHAPE Questionnaires

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EUROCONTROL’s “Solutions for Human-Automation Partnerships in European ATM” (SHAPE) project deals with the impact of new automation on the air traffic controller. Within the SHAPE project, a set of questionnaires has been developed which serves to assess the effect of automation on controller workload, situation awareness, teamwork, and trust in the system. This paper outlines the process by which the SHAPE questionnaires were developed and describes the resulting questionnaires with respect to their internal structure, psychometric properties and limitations. Furthermore, the results of initial validation activities are reported.

The Impact of Multi-layered Data-blocks on Controller Performance

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As a consequence of the push to increase National Airspace System capacity, air traffic control displays will not only have to show the increasing number of aircraft, but also all the associated data such as airspeed and altitude. The representation of aircraft data and associated relational information, often superimposed on a map, leads to cluttered displays, which could negatively affect controller performance, especially as aircraft numbers increase. To investigate these issues further, an experiment was conducted that examined the effect of increasing data-block lines on controller performance in an aircraft vectoring task. Data-block design, the primary factor, varied in the number of lines displayed (2-5). In addition, a data-block information priority factor was examined that addressed the frequency of information access
across data-block lines. Results demonstrated that while task load, measured as an increasing number of planes under control, negatively influenced reaction times and task accuracy, the number of lines in a data-block was not statistically significant. However there was a trend towards reduced performance when data-blocks exceeded more than three lines on a base layer. In addition, the data-blocks that contained prioritized information across levels promoted faster reaction times, but at a cost of lower situation awareness. This research demonstrated that the design of data-blocks should consider the balance between reduction in data-block interaction time against the need to allow enough interaction time to build situation awareness.