Abstract

The existing ‘en-route’ Air Traffic Control (ATC) system has developed through the adaptation of mechanical or electronic devices with no fundamental consideration of the allocation of tasks to the controller or the system. A radically modified interface for En-route Air Traffic Control (ATC) was designed, based on an analysis of the ATC task, allocation of tasks to form a satisfying task for the human operator (particularly conflict resolution), and development of a purely graphic interface with immediate feedback of proposed modifications to the future flight plans of aircraft under control. This system relies on computer-based conflict detection, based on aircraft’s satellite navigation, and primarily data-link communication. It dispenses with the beacon, radar, route and sector structure currently employed, the traditional strip or tabular display of aircraft information, and radar “labels” attached to aircraft on the display.

27 postgraduate students (none native English speakers) were given an overall briefing on ATC, followed by individual familiarisation with the QWERTYUIOP keyboard and 20 training examples of ATC conflicts. They were then presented with traffic corresponding to an entry rate of 250+ aircraft per hour in random direct flight for one-hour nominal duration. 20 students controlled this traffic with no unresolved conflicts. The total of conflicts was 1446 of which 1423 (98.4%) were solved correctly. 23 (0.16%) conflicts involving 7 students were not resolved in time. 99.97% of the 6750 aircraft left the simulated area at the correct position, 99.71% at the correct level, and 98.55% at the correct time. Experienced controllers, after three to four years training, can handle only one quarter of this level of traffic under current traffic constraints, and about one tenth under the direct-routing conditions simulated here.

The Radical interface offers a solution to the contemporary en-route sector capacity problem and a positive control system for the large areas of the world where traditional ATC is not available.

Background

David (1997a) described a demonstration model of a revised ATC interface. This model is described in more technical detail in David (1997b), which contains demonstration versions of the proposed interface on 3.5" disc. The interface was