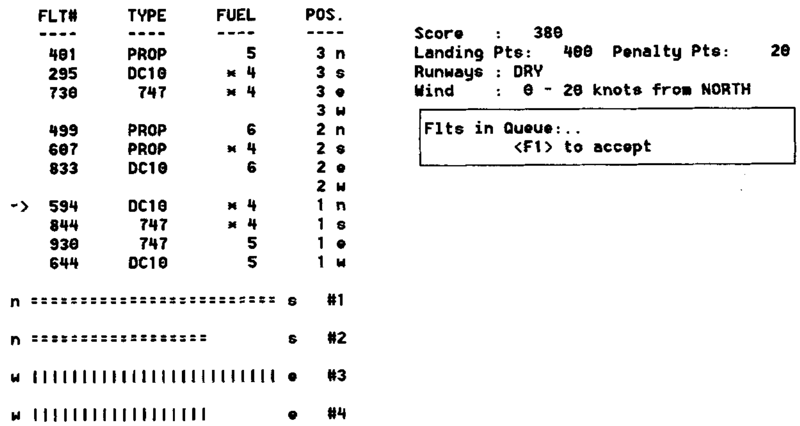

Figure 1. The main screen of the Kanfer–Ackerman Air Traffic Controller Task.

ous researchers studying strategy use in the KA–ATC task have focused on the first subtask (e.g., John & Lallement, 1997; Lee & Anderson, 1997; Lee, Anderson, & Matessa, 1995), this article focuses on the third subtask. In particular, the focus is on the strategy decision of landing a selected plane on the short or long runways when both are open.

This runway-allocation decision is a strategic decision that involves a general tradeoff of physical and cognitive resources. There are several advantages to selecting the long runway. First, the long runways are always legal for all plane types. Thus, the probability of making an error is lower. Second, the current wind speed and runway conditions need not be consulted before landing the plane (although wind direction must always be consulted). Third, the rules for landing a plane on the runways need not be retrieved. Fourth, the long runways are closer to the hold positions than the short runways and so require fewer keystrokes. The advantage of using the short runway (when it is legal) is that it keeps the long runway open for the planes that can only land on the long runway under the current wind speed and runway conditions. Because the planes require 15 s to land on a runway and only one plane can be landed on a runway at a time, participants must maximize the use of both runways to maximize the total number of planes landed. In other words, the long runway is a scarce resource that should be used sparingly.

We analyzed data from three studies involving the KA–ATC task with the general goal of investigating individual differences in strategy adaptivity in a complex task. The first two studies were conducted by Ackerman, and the data were taken from the Kanfer–Ackerman CD–ROM Database (Ackerman & Kanfer, 1994). The first study (Study 1, PA–ATC on the CD) contains previously unreported data, and the second study (Study 2, ATC–SPR on the CD) contains data reported in Ackerman (1988). Because these two studies did not manipulate strategy success rates, the analyses of these studies focused on microlevel strategy adaptivity. The third study reports data from a new experiment that manipulated strategy success rates and thus focused on global-level strategy adaptivity. The analysis of all three studies addresses four basic questions: (a) Are people generally adaptive in their strategy use in the complex KA–ATC task?; (b) If they are, do people vary systematically in their adaptivity?; (c) Do those systematic differences relate to overall task performance?; and (d) What cognitive abilities are associated with strategy adaptivity?

Studies

Study 1 (Ackerman, 1994): Strategy Adaptivity While Learning a Complex Task

Method

Participants. The participants of Ackerman's Study 1 were 57 University of Minnesota undergraduates taking part for course credit and money.

Procedure. Participants were given a total of 27 10-min trials. After every three trials, they were given several ability tests. Nine trials were completed in a day.

Dependent measures. The data on the CD–ROM consisted of the following: (a) KA–ATC task computer protocols that were used to infer keystroke rates, strategy use, number of planes landed, and number of planes crashed and (b) scores from 22 ability tests that were centered around six factors (perceptual speed, movement speed, memory, verbal, reasoning, and psychomotor factors). The tests are listed in Appendix A. See Ackerman (1988) for a more complete description of these ability tests.

The primary strategy measure of interest that we used in our reanalysis of Ackerman's data is OpShort, which is the proportion of times that a participant opted to land a plane on the short runway of all the times that a plane was landed and both runways were open. This ratio is computed only for DC–10s—747s can never land on the short runway, PROPs can always land on the short runway, and 727s provide too few failure opportunities to evaluate individual differences in adaptivity.[3]

Results and Discussion

Overall adaptivity. We focused on the strategy decision of deciding whether to use the short or long runway when both are open, as measured by OpShort. To examine whether participants were adaptive in their OpShort use at the microlevel, we analyzed the OpShort data as a function of whether the previous attempt to land that plane type on the short runway had been successful (i.e., had not resulted in an error). If participants were adaptive, then they should have reduced their tendency to use the short runway when that landing attempt had resulted in an error previously, and they should have increased their tendency to use the short runway for that plane type when that action was previously successful.

[3] In a few cases, there were sufficient numbers to evaluate OpShort adaptivity with 727s, and the results were always very similar to those found with DC–10s.