

## **6.0 SUMMARY AND DISCUSSION**

The foundation for analyzing data from the CDB was based on the justification presented in Section 4, which supported traditional statistical analyses. Aggregating data from 1976-1988 (excluding 1986) provided a more extensive data set and improved the reliability of the analyses.

### **6.1 Conclusions Based Upon Flight Time Analyses**

When the accident rate for each medical certificate class of pilots was examined as a function of age (Figures 5-1, 5-7, and 5-8, for Classes I, II, and III, respectively), a decrease in accident rate was found for the younger pilots, followed by a leveling off for older pilots.

The data of Figure 5-2, which display the accident rates of Class I pilots with more than 2,000 total flight hours, show that the more recent flight time a pilot had, the less likely the pilot would be in an accident. Indeed, recent flight time was the dominant factor affecting accident rates. Further, for Class I pilots with more than 2,000 total flight hours, no effect of total flight time on accident rates was found.

The data of Figures 5-1, 5-2, 5-3, 5-5, and 5-6, represent progressive attempts to home in on groups of pilots that are most typical of Part 121 pilots. With the exception of the data of Figure 5-6, for which no effect of age was found, all the data indicated a modest decrease in accident rate with age, with a leveling off for older pilots.

When the rates of Class III pilots aged 50 to 70, with more than 500 total flight hours, and with more than 50 recent flight hours were examined as a function of age, year by year, no effect for age was found (Figure 5-10).

### **6.2 Conclusions Based Upon the Quasi-Longitudinal Analyses**

Accident rates of Class I and of Class III pilots with high recent flight time were examined from a longitudinal perspective, i.e., various cohorts were followed for a 10 year period. Again, accident rates initially decreased with age and then leveled off (Figures 5-11, 5-12, 5-13, and 5-14).

### **6.3 Conclusions Relevant to the Age 60 Rule**

The Age 60 rule applies to pilots employed by scheduled air carriers. Lacking the ability to directly determine the flight hours of that specific group of pilots,

the accident rates of reasonably comparable groups were examined, i.e., Class I pilots with at least 2,000 total flight hours and at least 700 recent flight hours, and pilots with more than 700 recent flight hours who had ATP certificate and who were employed by a major airline. For the former group, accident rates decreased with age, leveling off for older pilots (Figure 5-5), and for the latter group no effect was found due to age, probably because of lack of statistical power, i.e., the sample size was too small.

In an attempt to examine accident rates for the age range 50-70 and to minimize the possible confound of older pilots of scheduled carriers having fewer takeoffs and landings per flight hour (which would mask an increase in accident rate), experienced Class III pilots with high recent flight time were examined. For Class III pilots with at least 500 total flight hours and at least 50 recent flight hours, age had no effect on accident rate (Figure 5-10).

Our analyses provided no support for the hypothesis that the pilots of scheduled air carriers had increased accident rates as they neared the age of 60. Most of the analyses indicated a slight downward trend with age, but those results must be treated cautiously because of the number of potentially confounding factors. The data did provide indirect evidence that any changes in takeoffs and landings per flight hour with age had little effect on accident rate, because such an effect would only occur for Part 121 pilots exercising seniority. Yet the data for all the various groups of pilots were remarkably consistent in showing a modest decrease in accident rate with age, a trend shared by the data of Figure 5-5. That is, the same modest effect of age appeared in all the data and was not solely due to changes in takeoffs per flight hour as the pilot aged. On the other hand, substantial changes in membership of the groups of pilots from year to year made interpretation of the modest decrease in accident rate with age problematic. It was as easy to conclude that the FAA's system improved the composition of the groups over time as it was to conclude that pilots' performance improved with age.

In all of our analyses, we saw no hint of an increase in accident rate for pilots of scheduled air carriers as they neared their 60th birthday. There were no data available on scheduled air carrier pilots beyond age 60. To what age could retirement for those pilots be safely put off? This question must be answered very conservatively because of the possibility of catastrophic results.

Statisticians distinguish between "planned" and "post-hoc" tests. Planned tests are formulated before collecting the data while post-hoc tests are formulated after looking at the data. Statistical controls are applied to the latter test to counteract their being biased in favor of finding statistical significance. In the analyses discussed below, the statistical tests were treated as planned tests to maximize the probability of finding even hints of an increase in accident rate with age for pilots near age 60. It is quite likely that any trend detected is spurious, but we were being conservative.

Because we were concerned with accident rates for pilots after age 60, we were forced to look at the data for Medical Class II and III pilots.

Examining the data for all Medical Class II pilots (see Figure 5-7), the accident rate for group 60-64 did not differ from that of group 55-59 ( $F(1)=2.99$ ,  $p>.05$ ), but was lower than that of group 65-69 ( $F(1)=8.41$ ,  $p<.01$  if planned;  $F(7)=1.20$ , not significant if post-hoc).

For all Class III pilots, (see Figure 5-8), the accident rate for group 60-64 did not differ from that of 50-59 ( $F(1)=2.7$ ,  $p>.05$ ) but was lower than that of group 65-69 ( $F(1)=5.9$ ,  $p<.05$  if planned;  $F(7)=0.84$ , not significant if post-hoc).

For Class III pilots with more than 500 total flight hours and more than 50 recent flight hours (see Figure 5-9), the accident rate for group 60-64 did not differ from that of group 55-59 ( $F(1)=0.75$ ,  $p>.05$ ) or from that of group 65-69 ( $F(1)=2.01$ ,  $p>.05$ ).

Finally, looking year-by-year at the accident rates of Class III pilots with more than 500 total flight hours and more than 50 recent flight hours (see Figure 5-10), there was an increase in accident rate for the years 63 through 69 (linear trend,  $F(1)=5.93$ ,  $p<.05$  if planned; not significant if post-hoc).

Taken together, these analyses give a hint, and a hint only, of an increase in accident rate for Class III pilots older than 63 years of age. This suggests that one could cautiously increase the retirement age to age 63.