Should Charity Air Medical Organizations Require Commercial Certification of Their Pilots?

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Abstract

Objective: Fixed wing medical transportation crashes operating under 14 CFR Part 91 show higher fatal outcomes than nonmedical Part 91 flights. Advanced certification may translate into increased safety, yet we know of no charity air medical transportation requiring such certification. Herein, in a retrospective study, we determined whether commercial certification is associated with a reduced fatality rate compared with the less stringent private pilot certificate and accident causes.

Methods: The National Transportation Safety Board accident database was queried for fatal accidents in single-engine aircraft occurring between 2002 and 2012. Poisson and proportion tests were used in statistical analyses.

Results: For the period spanning 2002-2012, commercial pilots showed a lower fatality rate. Under visual meteorologic conditions, aerodynamic stall was a frequent cause for fatal accidents affecting both airman cohorts equally. For operations in instrument meteorologic conditions, fatal accidents were most commonly attributed to instrument approach deficiency and spatial disorientation. At night, failure to maintain obstacle/terrain clearance was the most prevalent cause of fatal crashes.

Conclusion: Our data suggest that charity air medical transportation organizations should encourage their pilots to acquire commercial certification. Furthermore, our study indicates areas in which general aviation training/currency should be directed to reduce fatal accidents.

Introduction

General aviation (14 Code of Federal Regulations [CFR] Part 91) includes all civilian aviation apart from operations involving paid passenger transport; the latter is covered under 14 CFAR Part 121 and 135. Unfortunately, the fatality rate for general aviation is 82 times higher than that of the airlines.[1] Moreover, fixed wing medical transportation crashes flying under the Part 91 umbrella show even higher fatal outcomes than nonmedical Part 91 flights.[2]

At the present time, we are unaware of any charity air medical transportation organization requiring commercial certification of their pilots. A commercial license requires a higher level of precision in maintaining control of the airplane, especially for takeoffs (control of airspeed) and landings (control of airspeed and precision in touchdown point), the phases of flight that carry the highest risk[3,4] of an aviation accident. Additionally, airmen tested for the commercial license have to demonstrate the ability to land at a specified runway touchdown point (+ 200 feet) after course reversal from a low altitude (1,000 ft above the airport) after a simulated engine failure. In contrast, this task is not required for applicants seeking private pilot certification. Test standards for both commercial and private certification are described in the Federal Aviation Administration (FAA) Practical Test Standards (US Department of Transportation documents FAA-S-8081-12C and FAA-S8081-14B, respectively).

In view of the more stringent requirements for commercial certification, we were interested in determining whether this rating affords an increased level of safety. Although there have been several prior reports on general aviation fatal crashes,[1,3,5] we know of none that have compared fatal accident rates and causes for commercial and private pilot–certified airmen. The majority of studies on general aviation accidents aggregate all 14 CFR Part 91 operations inclusive of pilots holding various licenses as well as trainees with little distinction given to certification.[6-8] Along similar lines, accidents for single and multiple engines are typically grouped[9] despite the fact that the latter carry an increased risk of fatality.[6] Another limitation of earlier studies is that often general causes (eg, pilot error and pilot related)[3,10,11] rather than specific causes are cited. However, it is specific rather than general causes that inform where training should be focused.

In the present investigation, we compared the fatal accident rate for IFR-certified commercial and instrument flight rules-certified private airmen (2002-2011) and determined the accident causes. As of 2012, there were 89,155 and 50,617 IFR-certified commercial and IFR-certified private pilots, respectively (http://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/2012/). We elected to study all accidents across

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the 14 CFR Part 91 spectrum because of the paucity of fatal accidents involving air medical transportation, which would preclude a robust statistical analysis. Hereafter, we refer to these 2 groups of IFR-certified airmen as commercial and private pilots, respectively. We restricted the study to IFR-certified airmen to capture a population engaging in "real-world" flight operations inclusive of degraded visibility. Indeed, notable air medical transportation organizations (eg, Angel Flight, Mercy Flight, and Mercy Medical Airlift) require instrument certification for pilots. We report herein that commercial certification is associated with a reduced risk of fatal accidents. Considering the overall diminished rate of fatal accidents, charity organizations participating in air medical transportation should encourage commercial certification for their airmen.

Methods

The study did not constitute research involving human subjects regulated under 45 CFR Part 46 (as per the US Department of Health and Human Services [http://www.hhs.gov/ohrp/policy/checklists/decisioncharts.html]) because the research did not involve obtaining information from living individuals. The National Transportation Safety Board (NTSB) accident database (www.ntsb.gov/aviationquery) was queried for fatal accidents occurring in aircraft with a single, reciprocating engine occurring between January 2002 and December 2012 and operating under 14 CFR Part 91 (general aviation). Amateur-built aircraft were excluded from the study.

Records were imported into a custom database designed using FileMaker Pro v11 software (Filemaker Inc, Santa Clara, CA). We then searched our database for fatal accidents involving private or commercial pilots both with instrument certification. Fatal accidents in the following categories were deleted from our analyses: instructional flights, aerobatics, noncertificated pilots, glider and banner tows, aerial observation, skydiving, flight tests, suicides, and injury involving a pilot or passenger located external to the involved aircraft. Fatal accident causes cited in our study were determined as per the NTSB. In cases in which 2 certificated pilots were occupying the front seats in an aircraft with dual controls, we assumed that the pilot in the left seat was the one controlling the aircraft. For temporal studies, we used 2011 as the most recent cutoff year because the typical fatal general aviation investigation takes approximately 390 days from assignment to release of probable cause.[12] We defined night as per the NTSB report.

Annual aviation certification data (ie, commercial and private pilots) were obtained from the publicly available FAA website (http://www.faa.gov/data-_research/aviation_data_statistics/civil_airmen_-statistics/"year"/). Annual flight hours for the general aviation fleet composed of fixed wing single-engine piston aircraft were obtained from the FAA (http://www.faa.gov/data_research/aviation_data_statistics/general_aviation/).

Statistics

A generalized linear model with Poisson response was fitted to year and commercial/private certification in order to compare accident rates. Proportion tests were used to compare whether there were significant differences in fatal accident causes between commercial and private pilots. A Wilcoxon rank sum test with continuity correction was used to test for statistical significance in distance flown and aircraft weight.

Results

Comparison of Fatal Accidents for Commercial and Private Aviators

We first asked whether the higher pilot certification is associated with increased safety. To our knowledge, there are limited data that support this notion. Accordingly, we compared fatal accident rates for commercial and private pilots across a span of 10 years. The analysis included fatal accidents in all weather conditions. The data were corrected for annual variations in the population of private and commercial pilots. In querying the NTSB database for fatal accidents in single-engine (reciprocating)-powered aircraft over the time period of 2002-2012 flown by commercial and private pilots, we identified 176 and 297 accidents, respectively. Note that herein the terms commercial and private pilots refer to airmen who also hold instrument certification. For the 2 years spanning 2002-2003, the fatal accident rate (Fig. 1) for private pilots was more than double (3.9 and 1.6 accidents per 100,000 pilots per million flight hours) that of commercial airmen. The higher fatal accident rate for private pilots was maintained through the 2008-2009 period, but the difference diminished for the most recent period (2010-2011). Using a generalized linear model with a Poisson response, an analysis of all time periods combined indicated that commercial pilots had a lower fatality rate than private airmen ($P < 3.78 \times 10^{-8}$).

We entertained the possibility that the higher accident rate for the private pilots was a result of not including accidents by commercial airmen flying under the 14 CFR Part 135 rule. A query of the NTSB database with identical criteria but now inclusive for accidents operating under 14 CFR Part 135 led to an additional 25 accidents over the 10-year period. However, even with the inclusion of these accidents, we still observed a higher accident rate for private airmen (Poisson generalized linear model, $P = 1.24 \times 10^{-5}$). Rerunning the Poisson response but adjusting solely for the pilot populations also showed a statistically significant difference ($P < 2 \times 10^{-16}$) for fatal accidents between the 2 aviator cohorts.

Causes of Fatal Accidents

We determined the causes of fatal accidents for both commercial and private-certified airmen. Under visual meteorologic conditions (Fig. 2), aerodynamic stall was 1 of the most common causes for fatal accidents affecting both cohorts equally (22%). This was a somewhat surprising finding considering that airmen evaluated for commercial certification must