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16. Abstract <p>Introduction. This study investigates the safety of flight operations conducted by sport pilots, who operate light sport aircraft without the requirement for a current FAA medical certificate. The research addresses the growing interest in this aviation community, as regulatory changes, such as the Modernization of Special Airworthiness Certification (MOSAIC) proposal, may lead to increased sport pilot activity. The lack of comprehensive data on sport pilots poses challenges, and this study aims to provide critical insights.</p> <p>Methods. Using a retrospective cohort study spanning a decade, the study focused on 2,585 sport pilots and matched them with 2,585 private pilots holding active third-class medical certificates. The principal outcome measure was aircraft accidents, analyzed using the National Transportation Safety Board (NTSB) dataset.</p> <p>Results. Results revealed that sport pilots face a higher risk of accidents compared to private pilots, even after adjusting for age differences. The private pilot group had a higher percentage of fatal accidents, likely due to the type of aircraft flown. Further analysis of probable accident causes indicated elevated risks for personnel-caused and aircraft-caused accidents among sport pilots. Challenges in attributing accidents to medically-related errors were observed, highlighting the complexity of identifying such factors within accident investigations.</p> <p>Discussion. This study provides valuable insights into the safety dynamics of sport pilots, emphasizing the need for enhanced data collection and safety oversight as the aviation community undergoes regulatory changes. Understanding the safety profiles of sport pilots is essential for policymakers and stakeholders seeking to balance accessibility and safety in recreational flying. With the potential increase in sport pilot activity under MOSAIC, the study's findings are timely and relevant for aviation safety.</p>			
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Exploring the Safety of Sport Pilots

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Introduction

There has been much interest in the aviation community regarding the safety of flight operations that do not require the pilot to possess a current FAA medical certificate. Sport pilot is a class of flight operations limited to light sport aircraft that does not require a medical certificate. The sport pilot rules were implemented in 2004 and the median time since last FAA exam is approximately 10 years for those pilots who had one initially. This interval is sufficiently long enough that any safety issues related to the absence of a medical certification may be detectable. However, there is little information available regarding the safety of sport pilot operations. This is due in part to the lack of sufficient information to support a safety study. That is, most pilots can switch to sport pilot operations without any evidence of having done so, and the only information available for these pilots becomes available after an accident. It is not possible for AAM to know how many sport pilots are currently flying from year to year.

Studying the sport pilot population in aviation is of great importance as it provides critical insights into the evolving landscape of recreational flying. This demographic represents a diverse group of aviation enthusiasts, often characterized by their passion for flying and a desire to make aviation more accessible to a wider audience. Understanding more about the dynamics of this aviation community fosters the development of services tailored to their unique requirements, ultimately enhancing the overall safety of aviation for all participants. FAA rulemaking is currently addressing sport pilot operations under the Modernization of Special Airworthiness Certification (MOSAIC) proposal, focused on streamlining and improving the airworthiness certification process for small aircraft, with the goal of enhancing safety and encouraging innovation. Thus, under the new proposal, criteria for light sport aircraft will be greatly expanded and will lead to much greater sport pilot activity.

However, while the MOSAIC proposal will benefit pilots in many ways, this could come at a cost to reduced safety standards. The FAA already lacks sufficient data on all pilots flying under LSA requirements until a pilot has an accident. Under the MOSIAC proposal, the FAA could face even greater challenges in maintaining effective safety oversight. Therefore, the goal of this study is to provide a better picture of sport pilot safety than what is currently available.

Methods

There is a subset of sport pilots who hold a sport pilot license as their highest level of certificate in the Airman Registry. Given the absence of comprehensive data concerning the entirety of active sport pilots, we performed a retrospective cohort study spanning the most recent decade. This study centered around sport pilots, who constituted the exposed group for our investigation. To ensure a meaningful comparison, we adopted a 1:1 matching ratio with a comparison group of private pilots holding active third-class medical certificates. These private pilots, certified within the Aircraft Registry simultaneously with the sport pilot group, provided a suitable basis for our analysis.

Consequently, our study encompassed two primary groups:

1. Sport pilots whose highest certification level remained "Sport Pilot," bearing certificate issuance dates between 2012 and 2021.
2. A matched random sample of private pilots, holding the "Private" certification level as their highest certificate during this timeframe, whose records indicated no prior sport pilot certification in the Airman Registry. These individuals maintained active third-class medical certificates at the time of their private pilot certificate issuance, which occurred within the same month and year as the date of issuance (DOI) within the sport pilot group.

Our primary focus was the determination of aircraft accidents as our principal outcome measure. To achieve this, we utilized the National Transportation Safety Board (NTSB) dataset, provided by the Office of Accident Investigation and Prevention. This dataset was then matched with our study dataset. Subsequently, both study cohorts were tracked forward in time until the beginning of 2023 to facilitate a comparison of aircraft accident proportions and associated risk factors. Each group had to have their DOI and, if applicable, their medical certificate BEFORE their NTSB accident to count as an outcome. The NTSB's official website served as our primary source for accessing comprehensive information contained within accident investigation reports.

Results

There were 2,585 sport pilots in our study, matched with 2,585 active third-class private pilots during the same time period. Of the sport pilot group, 499 had a previous medical certificate while the remaining 2,086 never held a medical certificate. The baseline average and median age of the sport pilot group was 48 and 50, respectively, compared with the active third-class private pilot group's baseline mean and median age of 37 and 35.

Overall, 153 (2.96%) of the 5,170 pilots had an accident listed in NTSB from 2012-2022. 113 were from our sport pilot group compared with 40 accidents from our private pilot group, giving an overall accident proportion of 4.37% and 1.55%, respectively ($p < 0.001$). Breaking down the percentage of accidents within the sport pilot group, the accident proportion of those who previously held a medical certificate was 3.81% compared with 4.51% from those sport pilots who never held a medical certificate. While the crude risk of having an accident was 2.9 times (95% CI 2.0-4.2) higher in the sport pilot group compared with the private pilot group, older age was obviously a known confounder in the sport pilot group. Therefore, when controlling for age at DOI, the accident risk was 1.8 times (95% CI 1.2-2.7) higher in the sport pilot group compared with the private pilot group.

Group	Injury				
	None	Minor	Serious	Fatal	Total
Private	21	5	3	11	40
	52.50%	12.50%	7.50%	27.50%	26.14%
Sport	44	26	22	21	113
	38.94%	23.01%	19.47%	18.58%	73.86%
Total	65	31	25	32	153
	42.48%	20.26%	16.34%	20.92%	100%

The private pilot group had a higher percentage of fatal accidents than the sport pilot group, but it also had a higher percentage of no-injury accidents as well (Table 1).

When examining the probable cause(s) listed for each accident on the NTSB report, the trend of higher accident risk in the sport pilot group when controlling for age remained for most findings, even if the outcome groups were small (Table 2).

Table 2: Risk comparisons between Sport Pilots and Private Pilots for different probable causes of accidents

Probable Cause of Accident	Risk Comparison (Sport Pilots vs Private Pilots)*	95% CI*
Personnel-Related	1.84 times higher	1.09-3.12
Aircraft-Related	2.80 times higher	1.55-5.05
Environment-Related	2.55 times higher	0.91-7.14
Unknown Cause	1.43 times higher	0.43-4.78

+Risk Ratios and 95% CIs from final logistic regression matched on certificate date of issuance
*Adjusted for age

Finally, when we limited the findings to the NTSB-defined causes and attributable factors for medically-related errors in accidents, there were 7 accidents with at least one medical factor listed. Two accidents were from private pilots, one was a sport pilot with a previous medical certificate, and the other four were sport pilots with no medical certificate. The NTSB only listed the defining event as a “Medical Event” in one of these accident reports, which was from a fatal crash of a sport pilot with no previous medical certificate.

Discussion

This report addresses a critical area of interest within the aviation community: the safety of flight operations conducted without the requirement for pilots to hold a current FAA medical certificate, specifically focusing on sport pilots. These pilots operate light sport aircraft and have been exempt from the medical certification requirement since the introduction of the sport pilot rules in 2004. However, a notable challenge is the lack of comprehensive data on sport pilots, with relevant information from this group only becoming available after an accident. This study aims to bridge this knowledge gap and provide insights into sport pilot safety, particularly as the FAA is considering regulatory changes under the Modernization of Special Airworthiness Certification (MOSAIC) proposal.

The study methodology employed a retrospective cohort design, spanning the most recent decade, with sport pilots as the primary focus. It was important to match the two groups on their DOI so they could have the same exposure time for equal chance of accidents, although it’s impossible to know who was actually using their certificates to fly during this time. The difficulty in analyzing sport pilots is that no flight-time exposure data exist for the entire group, so the only method to compare this group with another is through risk ratios. In addition, we used the 2012-2021 study group to obtain more recent and relevant accident risks, giving these pilots anywhere from 1-11 years of follow-up time.

The results revealed significant differences in accident proportions between the two groups, with sport pilots experiencing a higher risk of accidents. The risk of accidents remained elevated even after controlling for age differences, underscoring the importance of understanding the specific safety dynamics within the Sport Pilot community. The private pilot group had a higher percentage of fatal

accidents than the sport pilot group, most likely due to the type of aircrafts flown, although researching the airplane types was outside the scope of this project.

Further analysis delved into the probable causes of accidents, confirming elevated risks in multiple categories for sport pilots compared to private pilots. In summary, this analysis highlights that sport pilots generally face a significantly higher risk of being involved in personnel-caused and aircraft-caused accidents compared to private pilots. The difference in risk for environment-caused accidents is less certain due to the wide confidence interval. Additionally, sport pilots have a moderately higher risk of unknown-caused accidents, although there is some degree of uncertainty associated with this estimate as well. These findings provide valuable insights into the previously unknown comparative safety profiles of sport pilots and private pilots across different types of accidents. This study also highlights the challenges in the NTSB attributing accidents to medically-related errors, understanding the complexity of identifying such factors within accident investigations and reports.

We feel confident that the sport pilot study group is representative of the future sport pilot population since more pilots will enter the aviation population through the sport pilot licensure route. The sport pilot license route is much less expensive than the private pilot route, and only requires 20 hours of flight time to obtain a license. If MOSAIC increases LSA criteria to include the aircraft recreational pilots want to fly, then there will be strong motivation for pilots to move towards the sport pilot certificate route.

In conclusion, this study sheds light on the safety landscape of sport pilots and underscores the need for enhanced data collection and safety oversight. While regulatory changes such as the MOSAIC proposal aim to streamline aviation processes, they may also introduce challenges in maintaining safety standards. These findings serve as a valuable resource for policymakers and aviation stakeholders as they seek to strike a balance between accessibility and safety in recreational flying.