Aug 16th, 8:00 AM - 10:00 AM

Age Differences in Helicopter Accidents: A Preliminary Investigation

Scott S. Burgess
Embry-Riddle Aeronautical University - Worldwide, burgesco@erau.edu

Robert O. Walton
Embry-Riddle Aeronautical University - Worldwide, waltonr@erau.edu

P. Michael Politano
The Citadel, politanom@citadel.edu

Karina Mesarosova
University of Zilina, km@flightresearch.eu

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[1]Burgess, S.S., [1]Walton, R. O., [2]Politano, P. M., and [3]Mesarosova, K.

[1]Embry-Riddle Aeronautical University – Worldwide; [2]The Citadel; [3]University of Zilina

Abstract

This study utilized the NTSB database from 2006 to 2016 to examine differences in severity of accidents by age for helicopter operations.

There were 1023 cases included in the data (97.1% male and 2.9% female). The average age for helicopter pilots in the database was 47.00 years (*SD*=13.78). The average number of flying hours was 5447.98 (*SD*=6825.90, *sk*=1.982).

An ANOVA was used to examine the effects of age on damage to the aircraft and injury to aircraft occupants. There was not a significant difference in pilot ages across the damage categories of none, minor, substantial, and destroyed, $F(3,1019)=.763$, $p=.515$, with average ages of 46.64, 46.04, 46.86, and 49.58 across the categories.
There was a significant difference in age across injury categories of none, minor, serious, and fatal, $F(3,1019)=7.549$, $p<.001$, with average ages of 45.64, 46.13, 50.74, and 49.91 across the categories.

To examine further the apparent conundrum that injuries went up with age while damage did not, additional analyses were conducted looking particularly at helicopter pilots between 50 and 59 and 60 and 69. For the two groups, there was not a significant difference by age for damage or injury [$F(3,234)=.784$, $p=.504$; $F(3,234)=.745$, $p=.526$, $F(3, 1880=1.395$, $p=.246$, $F(3, 188)=.173$, $p=.915$ respectively].

Discounting reporting anomalies, when proportional damage was examined (for age >60 pilots) 86.45% of aircraft sustained substantial damage; in the same age group, 95.31% of aircraft sustained substantial damage or destroyed resulting in 35.42% of those accidents involving serious injury or loss of life.

Background

As the aviation industry continues to deal with pilot shortages, the helicopter industry (globally) focuses on reducing accidents (USHST, 2014) which has a positive influence on pilot retention. One of the ways to reduce the impact of pilot shortages is to allow older pilots to fly past mandatory retirement age. However, this brings up the question of flight safety, and if older pilots are indeed a risk. Most of the studies and concerns about aging pilots center around acute incapacitation, but age related mental and physical declines are also a consideration. The problem is that everyone ages differently and at different rates. Ultimately, human physiology changes with age and not only effects our physical and mental capacities, but our ability to endure an accident sequence.

This preliminary study examined the differences in severity of accidents by age for helicopter operations in an attempt to determine if helicopter accidents rates increased with age, or did the type of accidents change by age. Literature on aviation accidents was examined but few helicopter accident studies considering age were found. Additionally, recent age related helicopter pilot research centers on human factors elements (experience, ergonomic, physiological, cognitive) rather than accidents and the effects thereof.

Anomalies do exist however in the ability to accurately acquire detail for study in this timeframe as the FAA and NTSB investigations of helicopter accident reporting was not as reliable (Burgess, 2016). Additionally, how damage is reported when there are no fatalities is not standardized and at times unreliable (personal communication).

Literature

While there is very little research regarding helicopter accidents and ages of aircrew, associations may be generalized from results from the greater aviation industry (airplane commuter and general aviation specifically). The closest study in this regard used data from 1983 through 1997 with a total of 21 helicopter accidents involving pilots over 40 years old (Li, Baker, Lamb, Grabowski and Rebok, 2002). Li et al., postulated that age related changes in cognition and experience would affect human factors and vary with age.

Risk can be argued as significant when identifying differences between helicopters and airplanes. In a study by Thomson, Önkal, Avcioğlu, and Goodwin (2004), there is a clear distinction between age and risk for helicopter pilots. Experienced helicopter pilots are more seasoned and older. In an age study on Helicopter Emergency Medical Services pilots, no empirical evidence was identified to ban older EMS pilots (Müller, Prohn, Huster, Nowak, Angerer, & Herbig, 2014).

In extending the review to the greater field of aviation (airplane commuter and general aviation specifically), clear evidence exists that human factors (experience, ergonomic, physiological, cognitive) when age is accounted for, shows some or little relationship to the occurrence of accidents (Byeon, Kim, Jeong, Sim, Kim, Choi, and Kim, 2013; Causse, Dehais, Arexis, and Pastor, 2011; Forde, Albert, Harrison, Neary, Croll, and Callaghan, 2011; Müller et al., 2014; Rebok, Qiang, Baker, and Li, 2009; Truszczyńska, Lewkowicz, Truszczyński, Rąpała, and Wojtkowiak, 2012). None of these studies account for severity of accident as related to the age of the pilot.

Results

An ANOVA was used to examine the effects of age on damage to the aircraft and injury to aircraft occupants. There was not a significant difference in pilot ages across the damage categories of none, minor, substantial, and destroyed, $F(3,1019)=.763$, $p=.515$, with average ages of 46.64, 46.04, 46.86, and 49.58 across the categories. There was a significant difference in age across injury categories of none, minor, serious, and fatal, $F(3,1019)=7.549$, $p<.001$, with average ages of 45.64, 46.13, 50.74, and 49.91 across the categories.

To examine further the apparent conundrum that injuries went up with age while damage did not, additional analyses were conducted looking particularly at helicopter pilots between 50 and 59 and 60 and 69. For the two groups, there was not a significant difference by age for damage or injury [$F(3,234)=.784$, $p=.504$; $F(3,234)=.745$, $p=.526$, $F(3, 1880=1.395$, $p=.246$, $F(3, 188)=.173$, $p=.915$ respectively]. Discounting reporting anomalies, when proportional damage was examined (for age >60 pilots) 86.45% of aircraft sustained substantial damage; in the same age group, 95.31% of aircraft sustained substantial damage or destroyed resulting in 35.42% of those accidents involving serious injury or loss of life.

Conclusions

We do know that helicopter accidents and injuries occur but we do not have a grasp on the effects. This preliminary study attempted to start building the literature on helicopter pilot age related declines and its impact on aviation safety. It is suggested that further studies on the relationships of age to accident rates should be conducted to continue to enhance flight safety, and educate the industry on the effects of an accident sequence to the body at different ages. Additionally, study in this area may inform on experience level and accident rates. An ancillary benefit may help alleviate helicopter pilot shortages.