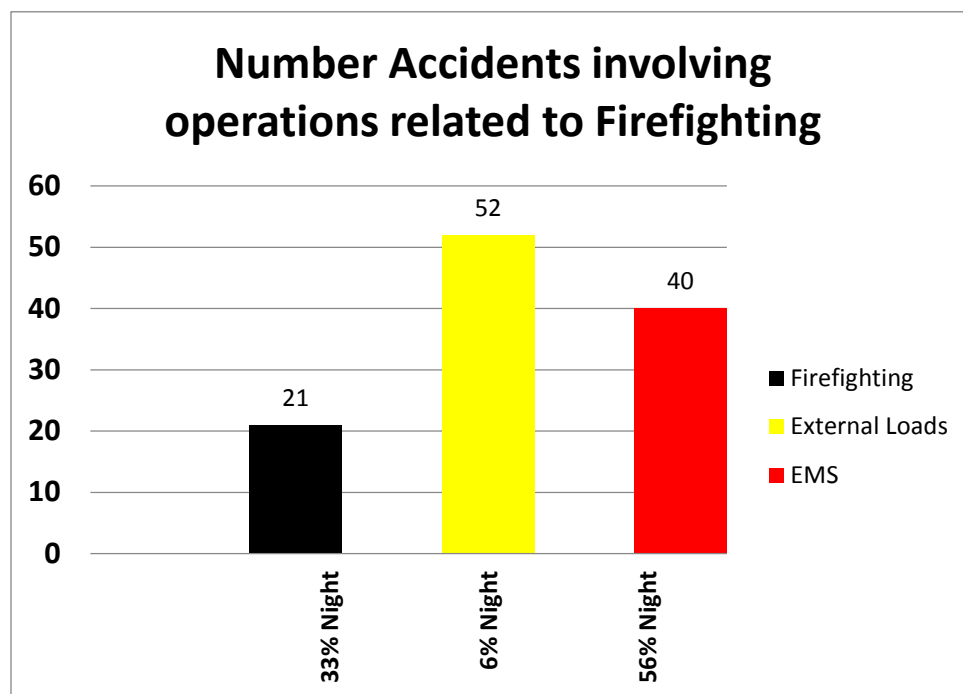


A Review of Data Available Regarding Aerial Firefighting Operations

Data on night aerial firefighting operations are sparse and incomplete. Using the National Transportation Safety Board (NTSB) database, we attempted to extract data on incidents pertaining directly and indirectly to firefighting—such as Emergency Medical Services (EMS) flights and external loads in which aircraft were carrying water, trees, or other materials on a line when an incident occurred.

From 1983 to January 2015, there were 11,969 incidents involving helicopters. Of all of the incidents in the database involving either helicopters or fixed-wing aircraft, there were only:

- 21 incidents that occurred during firefighting trips
- 52 incidents that involved external loads
- 40 incidents that involved EMS calls



Seven of 21 firefighting crashes happened in the dark. All but 3 external load incidents happened during daylight hours. Twenty-three EMS incidents occurred in the dark for an average of 29% for night time incidents. Of the 113 total incidents that could be compared to aerial firefighting, 42 (37.2%) either would have been worse had it been nighttime or were worse because the incidents actually occurred at nighttime.

The most common causes of the 113 incidents were:

- Sudden loss of power without explanation but most likely due to vortex forces
- Power line or communication line strike
- Tail boom strike
- Long line snag
- Pilot loss of situational awareness due to weather, darkness, or distraction

These data suggest that certain risks of night aerial operations could be eliminated by land filling of buckets, so there is no external long line. In addition, reconnaissance to locate towers and lines could be performed during daytime hours.

A 2010 *Helicopter Night Operations Study* was performed comparing aerial U.S. Forest Service (USFS) data to aerial U.S. Army data. There were many criteria that had to be met for missions to be included in the study. The project steering committee directed the group of experts to analyze night and rank missions in order of priority. The highest priority missions were to be those with the greatest potential to produce firefighting benefits. The following missions were selected for further evaluation:

- Water and retardant dropping using a fixed tank with ground fill
- Aerial supervision
- Emergency medical transport (hoist)

Colorado DFPC Center of Excellence for Advanced Aerial Firefighting.

- Aerial ignition with plastic sphere dispenser.

See <http://www.fs.fed.us/sites/default/files/media/2014/17/cr-2013-report-nanfo-ecm7351935.pdf> for the full report.

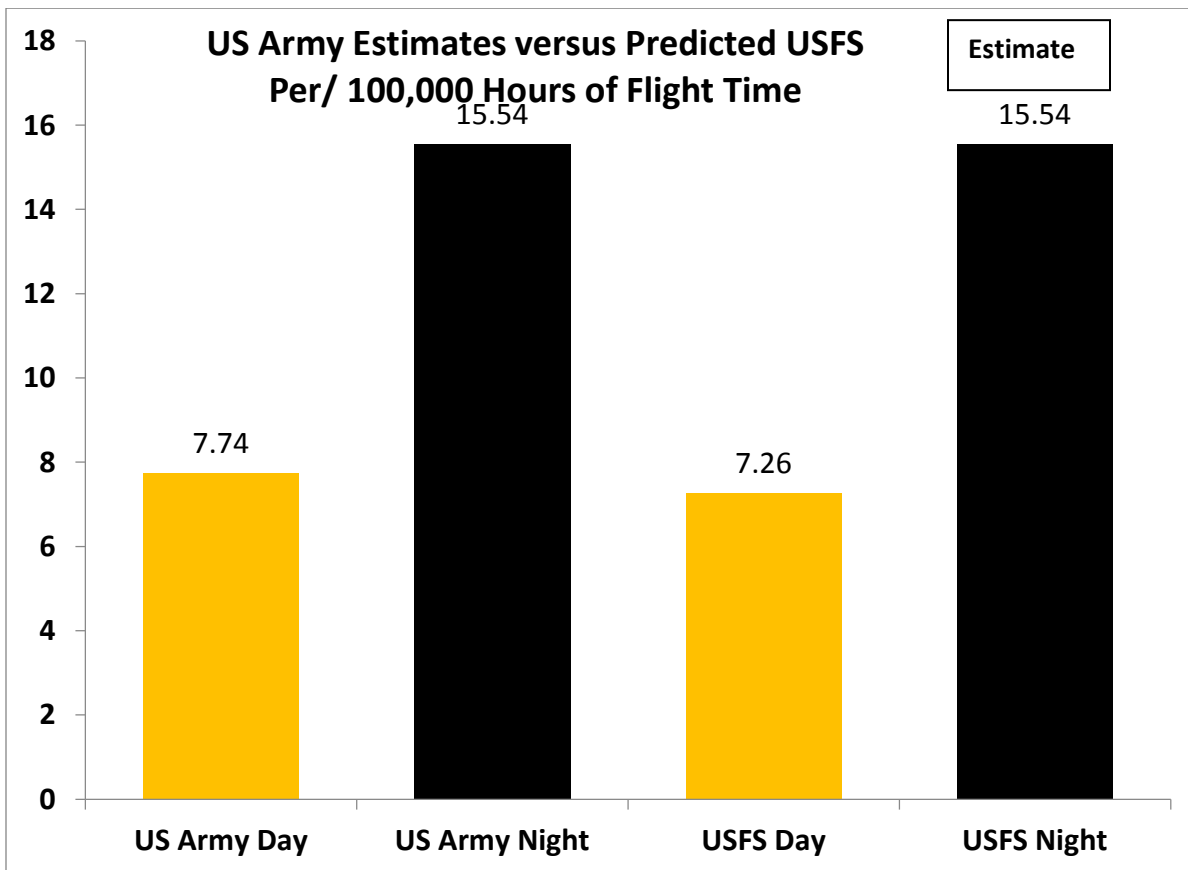
The following discussion provides a context to understand the scope and scale of the USFS helicopter program and its comparison to the U.S. Army aviation program. The U.S. Army statistics for aviation Class A–C flight accidents averaged over the period of 2000–2009 was 9.53 accidents per 100,000 hours of flight time. All U.S. Army helicopters are equipped and qualified for night flight operations. Hence, the accident statistics apply to the entire fleet. Helicopter Night Operations Study – 8/24/2010 Page 2

Twenty-eight percent of all U.S. Army accidents occurred while the pilots were using night-aided equipment, such as night vision goggles. The 10-year average of U.S. Army aviation Class A–C accidents involving night-aided operations is 15.54 accidents per 100,000 hours, which is twice the day operations rate of 7.74 per 100,000. U.S. Army night-aided flight makes up 17 percent of all U.S. Army flight hours.

The USFS contracts for 99 percent of its helicopter flight hours, for an average of 39,924 flight hours per year. The USFS accident rate from 2000–2009 was 7.26 per 100,000 hours of flight time. This accident rate is solely based on daytime flight operations. This equates to one accident per 13,775 hours, or 2.89 accidents per year.

The USFS can project the following night-flight accident rate based on the U.S. Army statistics, with the assumption that five helicopters will be utilized for night operations:

- Total flight time per year for five aircraft equals 500 hours, or 100 hours per aircraft
- Total daytime flight hours for five aircraft equals 413 hours (82.60 percent), or 82.6 hours per aircraft
- Night-aided flight hours for five aircraft equals 87 hours (17.4 percent), or 17.4 hours per aircraft
- Night-aided accidents per 100,000 hours equals 15.54 hours, or one accident per 6,435 hours



Conclusion: Based on NTSB data, the risk of night operations is not substantially higher. Estimations based on U.S. Army aerial operations suggests that the rate of accidents at night are twice that of daytime operations. However, generalization from U.S. Army operations to USFS operations has definite limitations.

- Controlled studies need to be performed to test the safety and efficacy of night aerial firefighting operations.