

Challenges Faced by Airline Pilots

Robert Chapin

Eastern Michigan University

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Abstract

Unique and unusual challenges common for airline pilots were sought. To determine the frequency of some of those challenges, 185 pilots were surveyed, including 80 airline transport pilots. Among the airline transport pilots, the most frequent challenges were being away from home and being interrupted during procedures. Marital problems were considered rarely or never faced by 86% of the airline pilots. Most said that quarreling among crew members was rarely a problem, but only 17% said that it never happened. Waits of 30 minutes or more at security check points were reported by 10% of airline pilots. Among the commercial and airline pilots, 28% commuted 100 miles (161 km) or more to work, and 12% commuted over 999 miles (1,608 km). Pilots generally lived close to their base airport, experienced some delay at security, and faced challenges with a variety of frequencies. Opportunities seem to exist to further study conflicts among crew members and the health effects of flying.

Challenges Faced by Airline Pilots

Being an airline pilot is often described in terms of job requirements, duties, training, proficiency, salary, and employment opportunities. These aspects paint a rather plain profile that could fit into the vocabulary of any career. Looking beyond the labor statistics, for what it means to be a pilot day-to-day, reveals a lifestyle that inspires people to work in the face of many challenges. Unique and perhaps unusual challenges for pilots revolve around staying rested on long trips, passing medical examinations to remain certificated, and performing simultaneous or unexpected tasks at the helm of an airplane. When combined with the demands of an average career and stress, or problems at home, these added aspects can play a very significant role in the lifestyle of an airline pilot.

Presented here is a review of literature pertaining to those challenges, followed by the results of a survey. The survey attempts to establish the frequency of those challenges and determine if they are relevant to future research. It is expected that certain challenges vary in frequency from rare to common. Therefore, instances of challenges severe enough to interfere with flight duties may be rare among pilots.

Multitasking and task interruption were studied by Loukopoulos, Dismukes, and Barshi (2003). They rode in a Boeing 737 jumpseat on “many” flights and noted observations about flight crew behavior. One of their concerns was the format of checklists pilots used to recite or confirm a series of tasks. A checklist is presented as a sequential work flow, but in practice a pilot may be holding the checklist in one hand while monitoring the other pilot and talking to someone else on the radio. “We saw

no evidence that procedure writers have tried to compensate for this misleading impression by explicitly discussing circumstances in which two or more tasks must be interleaved concurrently” (Loukopoulos et al., 2003, p. 2). Checklists also needed to compensate for the possibility that certain items on the list must be skipped or deferred to suit the circumstances. Finally, a concern that may be an unavoidable characteristic of flying: “Crews are frequently interrupted, especially by other personnel, while they perform procedures. Preflight preparation is rife with interruptions from gate agents, ground personnel, flight attendants, and others” (Loukopoulos et al., 2003, p. 2).

Although relatively unlikely, pilots could also be interrupted to handle passenger misconduct. Typically, flight attendants will talk down or restrain disruptive passengers. However, this type of incident is ultimately reported to the pilots who may choose to divert the airplane to a nearby airport or request law enforcement upon arrival. Connell, Mellone, and Morrison (2000) found that in 1998, there were 152 incidents of passenger misconduct reported and “in almost a quarter of the study incidents, a member of the flight-deck crew was required to leave the cockpit to assist the cabin crew in restraining an unruly passenger” (p. 10). This was a very specific study of interruption frequency.

A much more common challenge for pilots is fatigue. Staying rested may not be as simple as getting to sleep after a long day of flying, and this has been widely studied. It is also tangentially related to many other aspects of flying. Bedell (2003) described a day as a regional airline pilot as beginning when “the hotel wake-up call comes and my alarm clock begins cheeping. It’s 5 a.m.” (para. 1). Despite the early start, his day was largely defined by delays and rushing to catch up to his schedule. This may be a typical routine for some pilots, while others endure the influence of crossing many time zones

during each flight. Caldwell (2004) described the body's circadian rhythm as a "biological propensity towards sleepiness and inactivity at night" (p. 88). Body temperature, blood pressure, melatonin levels, adrenaline levels, growth hormones, and cortisol fluctuated with this rhythm. In a seemingly unrelated study about the prevalence of cancer and other diseases among pilots, Nicholas et al. (2001) started by saying, "The airline pilot works within an environment that consists of circadian dysrhythmia" (p. 821). In other words, pilots have to be awake on the job at times when their bodies cannot fully adjust to the task. Another study about cancer rates by Rafnsson, Hrafnkelsson, and Tulinius (2000) specifically looked at "the possible relation between disturbance of circadian rhythm, jet lag, and risk of cancer" (p. 176). They found a relatively high rate of malignant melanoma among pilots who had flown across five time zones, suggesting jet lag could be a risk factor. However, the small sample size and small number of four melanomas made this finding inconclusive. On another tangent, Butcher (2002) mentioned fatigue as a source of stress to be considered in evaluating the emotional health of pilots.

What are the main causes and effects of fatigue? Caldwell (2004) reviewed 82 articles and found that "pilot fatigue is a significant problem in modern aviation operations, largely because of the unpredictable work hours, long duty periods, circadian disruptions, and insufficient sleep that are commonplace" (p. 85). Pilots commonly cited their workload, flying at night, waking up early, and the weather as other causes of fatigue. Electroencephalograph (EEG) tests showed that pilots experienced "micro-sleeps or vigilance lapses" (Caldwell, 2004, p. 87) when fatigued, especially when cruising long distances at night. Peiris et al. (2005) defined vigilance lapses as "a

complete, temporary loss of responsiveness to a visual stimulus” (p. 1). The American Academy of Sleep Medicine (2001) defined microsleep as “an episode lasting up to 30 seconds during which external stimuli are not perceived.” A common experience of such an episode is the sensation of heavy eyelids with brief moments of unconsciousness. However, these episodes can occur without being aware of it. Caldwell (2004) also reported that fatigue caused by traveling to the east resulted in circadian disruptions that lasted twice as long as when travelling to the west, “because limited layover periods require crew members to attempt sleep at an earlier than normal biological time, which is difficult to accomplish” (p. 89).

There are challenges unique to any type of flight, and long-distance flights across time zones are not necessarily more tiring than short flights. According to Bourgeois-Bougrine, Carbon, Gounelle, Mollard, and Coblenz (2003), “Because of night flights and jet lag, long-haul flights (LHF) have generally received more interest than short-haul flights (SHF) with respect to fatigue” (p. 1072). This survey of French airlines found:

90% of the SHF pilots performed their duty time during the day, while 80% of the LHF pilots performed the whole, or the majority of their duty time between 0 h and 6 h. However, there was no difference between the SHF and LHF with respect to average duty time or average level of fatigue. (Bourgeois-Bougrine et al., 2003, p. 1073)

The most common schedule that made the long-haul pilots feel tired was an international flight with a 22-hour layover (Bourgeois-Bougrine et al., 2003). Consider departing Paris at 9 a.m., arriving in New York at 6 p.m., and then flying the next day at 4 p.m. to arrive in Paris at 9 a.m. Waking up for a 13-hour flight at 4 p.m. is a bit crazy,

and the pilot's trip ends at the start of the third day, totally exhausted. On the other hand, a trip of 16 to 20 flights over the course of four days was the most common cause of fatigue reported by short-haul pilots.

How do pilots stay healthy when fatigue is such a prevalent problem? Primarily, by resting between trips, pilots are able to maintain a healthy lifestyle. As required by 14 C.F.R. § 121.471 (2010), pilots of domestic air carriers are limited to 1,000 hours of commercial flight time in a calendar year. Air taxi pilots are similarly limited to 1,400 hours per year under part 135, and so on. Airline pilots are also required to have a medical examination every 12 months which is a strong motivation to remain healthy.

In a study of pilot health, Nicholas et al. (2001) surveyed 6,533 male airline pilots to determine the rate of cancers and other diseases. Increased rates of melanoma, cataracts, and motor neuron disease were found to be significant. The rate of melanomas was estimated to be 347% of the national rate, and the rate of cataracts between 180% and 303% depending on age. For all other cancers, the rate was below average. For example, there were only four cases of lung cancer in the sample, which was estimated to be 5% of the national rate. Such a large discrepancy raises questions about the validity of the survey method. Could retired pilots respond to the survey? Would a pilot with lung cancer still be considered a pilot if unable to pass a medical examination? Some uncertainty was admitted in the discussion: "Pilots had to be free of detectable disease at the time of beginning their careers and they had to have survived until 1998 to be included in the survey. These are constraints not placed on the [national] population" (Nicholas et al., 2001, p. 825). With that in mind, the phenomenally low number of four brain cancers and ten oral cancers are difficult to believe without a comparable control

group. In their discussion, a link between motor neuron disease and magnetic field exposure was suggested. For the melanomas and cataracts, “Reasons for these reported increases are unclear” (Nicholas et al., 2001, p. 824). Andley, Song, and Mitchell (1999) found “UV-B radiation produces cataracts in animals and has been associated with human cataract formation” (as cited in Nicholas et al., 2001, p. 824).

Rafnsson et al. (2000) surveyed 458 male airline pilots in Iceland to determine the rate of cancers. They found a similar increase in the number of melanomas, however amounting to only five cases among all of the pilots. Other cancers were average or insignificant due to the small sample size. Again, no cause could be established. “The small size of our study does not allow us to separate between the theoretical synergism, or additive effect, of cosmic radiation, disturbed circadian rhythm, and the potential confounding of possible excessive sunbathing” (Rafnsson et al., 2000, p. 178).

Pilots should comprise a very healthy group overall due to the exclusivity created by medical examinations. Persons determined to be unable or unsafe to operate an airplane are actively denied that privilege. It would be interesting to study the rate and reason for medical certificate denials of active pilots to establish a “medical drop out” rate for each cancer or disease. Butcher (2002) tried to establish such a rate for psychological problems and found that 1,232 medical certificates were denied in 1999 due to neuroses. That number came from all denials, not necessarily renewals.

Butcher (2002) was mainly concerned with evaluating the psychological health of pilots, but also discussed several stressors regularly faced by pilots. Before fatigue, he suggested that long flights were the number one source of stress due to cumulative responsibility and risk of equipment failure and adverse weather over time. However,

there was no evidence to show that these same stresses were absent from cumulative short flights. In fact, it could be argued that risks are multiplied by the number of takeoffs and landings rather than cruise time. It may be more accurate to say that fatigue and long duty shifts go hand in hand as sources of stress. Butcher (2002) next reported that “pilots place the periodic check ride among the most stressful situations they encounter on the job” (p. 174). A check ride is essentially a driving test for pilots. After that, he lists quality of crew communications, being away from home, fear of layoffs, preoccupation with labor disputes, and marital problems.

Bourgeois-Bougrine et al. (2003) mentioned some other stressors of interest: Dissension within crewmembers, necessity of performing an additional unplanned leg, interruption during activities, and simultaneous actions. For long-haul pilots, the possibility of adding an unexpected flight scored almost as high on the fatigue survey as lack of sleep. Dissension within crewmembers, as with all of these items, was not studied in terms of frequency or severity, but was included in their study about possible causes of fatigue.

The relevance of these stressors was dubious without knowing their prevalence, so I developed a survey to collect more information. I also wanted to get a better understanding of the challenges involved in commuting to airports for work and going through the security screening process at those airports. The survey included questions about those topics to test the following hypotheses:

Hypothesis #1: Challenges faced by airline pilots that were previously studied as causes of stress or fatigue actually occurred at widely varying rates. Some of them may happen so rarely that they would not significantly contribute to chronic fatigue or stress

in the population overall. Hypothesis #2: Most pilots live within 60 miles (97 km) of their base airport, and some commute hundreds of miles. Hypothesis #3: Pilots are subjected to the same security delays as passengers. This includes waiting in long lines at larger airports.

Method

Participants

On November 2, 2010, I posted a hyperlink in public forums on the World Wide Web to solicit survey responses. Due to varying forum policies and limited time to negotiate with forum staff members, the link appeared on only two websites: www.airliners.net and www.airlinepilotforums.com. These websites were the top Google search results for “aviation forums” and “pilot forums” respectively. All visitors to these websites could use the hyperlink to submit anonymous survey responses until November 8, 2010. Participants were neither required to register with these websites nor required to be referred by these websites directly.

All participants were required to answer the first four survey questions before their answers were saved. The first two questions were age range and type of pilot certificate held. The intent of these questions was to establish the overall experience and qualifications of the survey group, and to discourage non-pilots from responding to the survey. Participants tended to be young, mostly less than 30 years old, which was an expected characteristic of the online forums. Ages are summarized in Table 1.

Of the 186 surveys collected, one was removed from the results because the respondent used the “Other” option to indicate they were not a certificated pilot. The survey group consisted of the 185 remaining respondents. Two of the participants used

the “Other” option to indicate they held a private, commercial, or airline certificate. Those two answers were corrected in the results. The remaining five “Other” answers correctly indicated the participants held a different type of certificate. Certificate types are summarized in Table 2.

Procedures

After the two demographic questions, the survey contained two more required questions and two optional questions. One of the optional questions involved the topic of runway incursions, the results of which will be reported in a separate paper. Combining the topics into one survey made the research more efficient and helped conceal the context of the questions in a single-blind manner. One forum member commented that they could not figure out the purpose of the survey questions.

Both the third and fourth questions required numeric answers. When asked about the length of their commute to work, participants were limited to answering between 0 and 1,000 miles (1,609 km) inclusive. When forum members commented that their commute exceeded the upper limit of this question, the question text was updated to instruct an answer of 1,000 for anything greater than 999.

The fifth and sixth questions, regarding runway incursions and a list of challenges faced by pilots, were optional. However, participants were not presented with the sixth question until they answered all of the previous questions. Question five was presented in a multiple choice format. Question six was a grid consisting of a list of challenging events on the left side, and the frequency of those events along the top. Participants were required to select one cell in each row of the grid.

HTTP Cookie technology was used to allow participants to return to the survey and change their answers while the survey was open. It also prevented multiple surveys from being submitted in a single web browser. This technology could have been easily bypassed and did not totally mitigate the anonymous nature of the survey.

Results

The average distance that participants lived away from their base airport was 68 miles, $SD = 155$, $Mdn = 20$, $n = 169$. This excluded 16 participants who answered 1,000, indicating they commuted over 999 miles to work. For private pilots, the average decreased to 15 miles, $SD = 16$, $Mdn = 10$, $n = 43$. Commercial pilots averaged 65 miles, $SD = 119$, $Mdn = 17$, $n = 52$ and airline transport pilots 105 miles, $SD = 209$, $Mdn = 25$, $n = 71$. Distance answers are charted in Figure 1.

Nine minutes was the average wait time at security, $SD = 11$, $Mdn = 5$. For non-zero answers, the average was 11 minutes, $SD = 11$, $Mdn = 10$, $n = 143$. For private pilots, the average decreased to five minutes, $SD = 7$, $Mdn = 1$, $n = 43$. Commercial pilots averaged eight minutes, $SD = 8$, $Mdn = 5$, $n = 57$ and airline transport pilots 12 minutes, $SD = 14$, $Mdn = 10$, $n = 80$. Security wait times are charted in Figure 2.

Question six was completed by 150 participants, generating 1,350 data points. Their answers were strongly influenced by qualification, so the results of question six are presented in three separate sets for clarity. Private pilot answers are summarized in Table 3, commercial pilots in Table 4, and airline pilots in Table 5.

Private pilots were more likely to answer “never” experiencing a challenge for each of the nine events. Likewise, commercial pilots scored higher on the “never” option than airline pilots, with the exceptions of “fear of layoffs,” on which they tied near 25%,

“quarreling among crew members” near 18%, and “interruption during procedures” near 10%. Private pilots chose lower frequencies for all events. The survey did not include any questions about how often the participants acted as pilots, so it is impossible to say how the frequency of these events compares to the frequency of flying.

Age was considered as an independent variable, but it did not correlate strongly with the other questions on the survey.

Discussion

The question about distance from a pilot’s base airport was designed to find out what portion of pilots have a traditional commute by driving less than 100 miles (161 km) to work. Thirty-eight participants answered 100 miles (161 km) or more, none of whom were private pilots. This represented 28% of the combined commercial and airline pilots groups. 12% were commuting more than 999 miles (1,608 km), which was surprising. Forum members frequently commented on this question because of the complexity of some situations that involved flying thousands of miles, commuting to multiple airports, or not starting work from a base airport.

After their commute, pilots have to wait in line at the airport. This is a hot topic now. Everyone understands the needs for security and privacy, but one should wonder why there is a need for pilots to stand in long lines at check points? According to this survey, 10% of airline transport pilots are waiting 30 minutes or more to get through security. This seems to be an uncommon but unnecessary challenge for pilots to deal with. The Transportation Security Administration (TSA) recently recognized this problem and is making changes to improve efficiency. “While a nationwide sterile area access system for pilots is being phased in, pilots traveling in uniform on airline business

will see immediate modifications to their checkpoint screening process due to their trusted status” (TSA, 2010, para. 9).

Speaking of uncommon challenges, it is surprising that only 17% of airline pilots said they never experienced “quarreling among crew members.” The other 83% have encountered this, even if it was a rare event. This suggests a good opportunity exists to study the severity and circumstances of what is happening in those situations.

The remaining data points need to speak for themselves for the sake of keeping this analysis brief. Hypothesis #1 was found to be true in this survey. There is a varying frequency of stressors such as marital problems, which more than half of the participants said were never an issue for them. Hypotheses #2 and #3 were also true, though a substantial portion of airline pilots are commuting great distances. This survey successfully produced results from a large number of pilots who were very helpful.

From simple lack of sleep, to dealing with an intoxicated passenger, airline pilots must face a variety of challenges on a daily basis. In addition to frequent circadian disruption and task deferral on the job, there is a lot of time spent away from home. After a long trip, a pilot leaves their base airport and still has to travel to get home, perhaps to face even more challenges. Some of the health effects of flying are not well studied, but most pilots continue to exceed the standards of health and ability. Most importantly, aviation continues to inspire research and new solutions so that pilots can face these challenges safely and successfully.

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Table 1

Age of Participants

Age	Count
18-29	102
30-39	45
40-49	21
50-59	12
60-69	4
70+	1

Table 2

Qualification of Participants

Certificate Type	Count
Private Pilot	43
Commercial Pilot	57
Airline Transport Pilot	80
Other	5

Table 3

Frequency of Challenges Faced by Private Pilots

Challenge	Daily	Weekly	Monthly	Annually	Rarely	Never	Unsure
Long haul flights.			3	2	3	23	1
Extra leg that was unplanned.			4	5	7	15	1
Check rides.			3	17	6	5	1
Being away from home overnight.		2	2	2	6	19	1
Fear of layoffs.				1	4	26	1
Preoccupation with labor dispute.					4	27	1
Marital problems.				2	2	27	1
Quarreling among crew members.				1	7	22	2
Interruption during procedures.	1	2	7	2	8	11	1

Table 4

Frequency of Challenges Faced by Commercial Pilots

Challenge	Daily	Weekly	Monthly	Annually	Rarely	Never	Unsure
Long haul flights.	1	4	4	2	15	19	
Extra leg that was unplanned.	5	13	8	6	7	6	
Check rides.			7	37	1		
Being away from home overnight.	9	17	4	1	8	6	
Fear of layoffs.	10	1	4	4	13	11	2
Preoccupation with labor dispute.	4	2	2	3	16	16	2
Marital problems.	2		2	2	7	30	2
Quarreling among crew members.	4	1	8	4	19	9	
Interruption during procedures.	12	11	8	2	6	5	1

Table 5

Frequency of Challenges Faced by Airline Transport Pilots

Challenge	Daily	Weekly	Monthly	Annually	Rarely	Never	Unsure
Long haul flights.	7	22	12	4	9	15	
Extra leg that was unplanned.	2	14	16	9	27	1	
Check rides.		1	1	66	1		
Being away from home overnight.	15	43	5		6		
Fear of layoffs.	5	1	5	8	31	17	2
Preoccupation with labor dispute.	9	4	6	2	30	17	1
Marital problems.		3	3	4	23	36	
Quarreling among crew members.		5	3	9	40	12	
Interruption during procedures.	26	16	7	1	13	6	

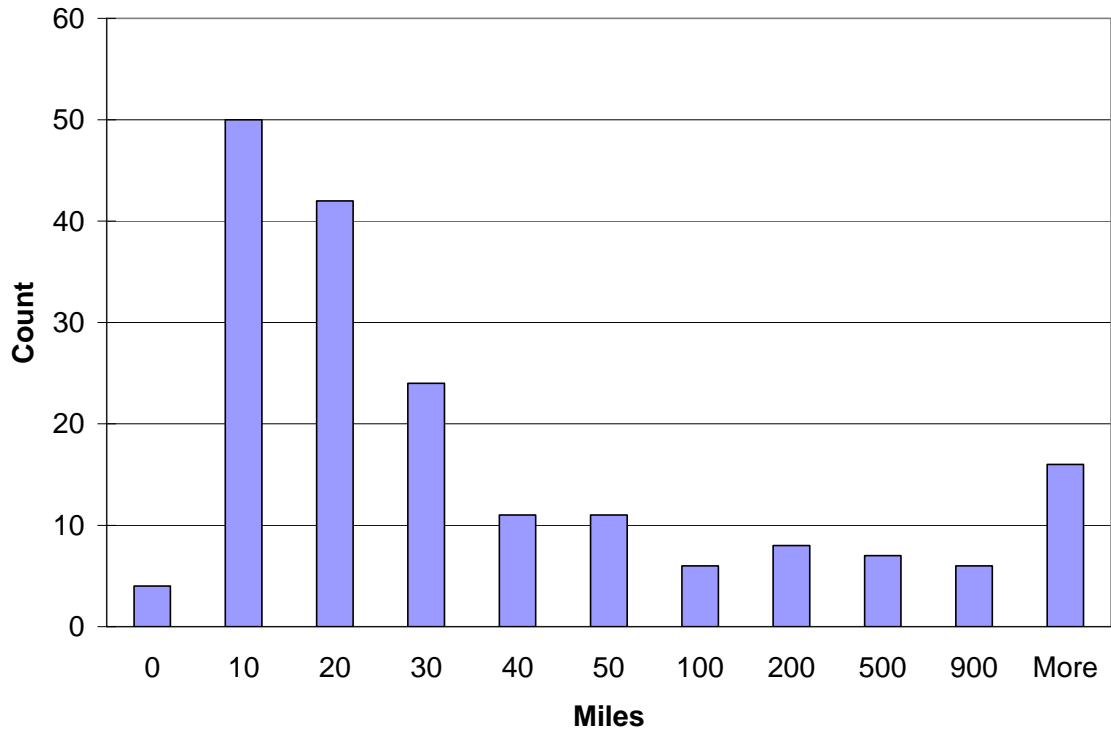


Figure 1. Histogram of distance from base airport.

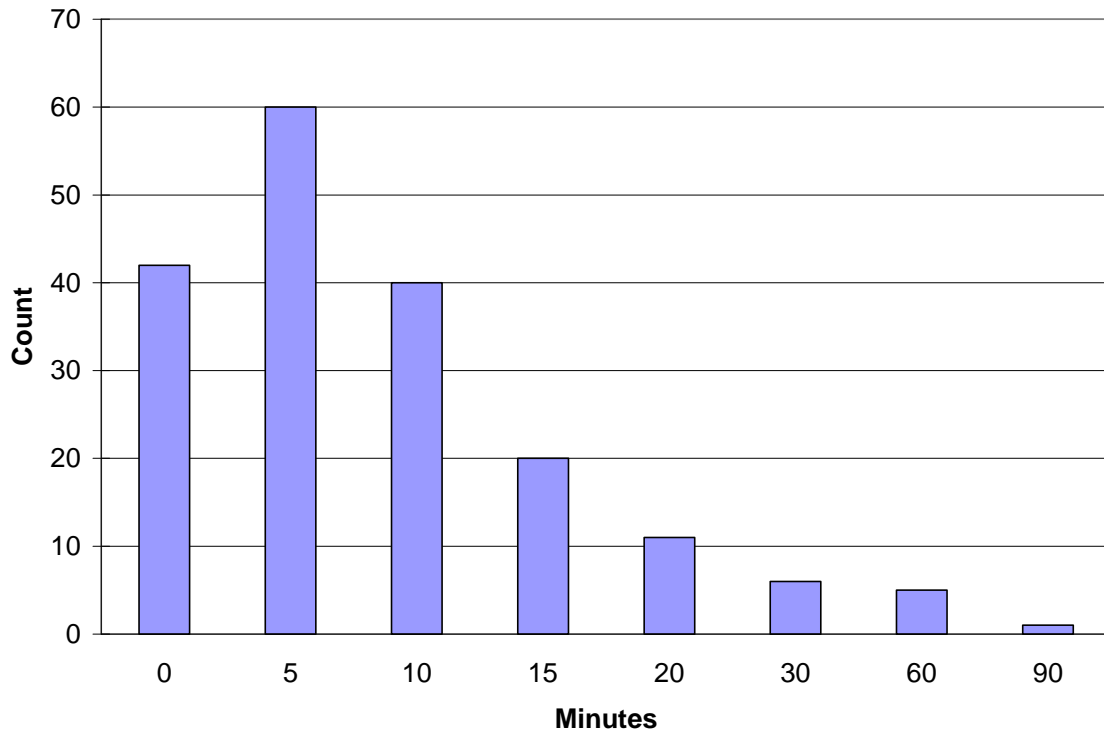


Figure 2. Histogram of time waiting for security.