## 5-2019

# Women in Aviation: A Workforce Report 

Rebecca K. Lutte<br>University of Nebraska at Omaha, rlutte@unomaha.edu

Follow this and additional works at: https://digitalcommons.unomaha.edu/aviationfacpub
Part of the Aviation Commons
Please take our feedback survey at: https://unomaha.az1.qualtrics.com/jfe/form/
SV_8cchtFmpDyGfBLE

## Recommended Citation

Lutte, Rebecca K., "Women in Aviation: A Workforce Report" (2019). Aviation Institute Faculty Publications. 6.
https://digitalcommons.unomaha.edu/aviationfacpub/6

This Article is brought to you for free and open access by the Aviation Institute at DigitalCommons@UNO. It has been accepted for inclusion in Aviation Institute Faculty Publications by an authorized administrator of DigitalCommons@UNO. For more information, please contact unodigitalcommons@unomaha.edu.



# Women in Aviation: A Workforce Report 

Rebecca K. Lutte, PhD

University of Nebraska at Omaha Aviation Institute

May 2019

## Author

Dr. Rebecca (Becky) K. Lutte
Assistant Professor
University of Nebraska at Omaha Aviation Institute

Acknowledgments:
Contributing researcher:
Dr. Jacqueline Luedtke
Professor
Embry-Riddle Aeronautical University

Research Assistants:
Hannah Knaust, undergraduate student research assistant, University of Nebraska at Omaha, Aviation Institute
Joseph Harris, graduate assistant, University of Nebraska at Omaha

This research is supported by a grant from the NASA Nebraska Space Grant, NNX15AI09H. The research was conducted in cooperation with Women in Aviation International.

## (D) AVIATION INSTITUTE



## Introduction

Aviation industry forecasts reveal the depth of the need for qualified personnel worldwide and the projected growth of the industry. Over the last five years, the industry has experienced average year over year passenger traffic growth of $6.5 \%$, resulting in "unprecedented" financial prosperity for North American airlines (Boeing, 2018a). North American air carriers have accounted for more than half of the global industry prosperity in the last five years (Boeing, 2018a). The growth is attributed to multiple factors including lower air fares, higher standards of living in large emerging markets such as China and India, new airline business models, and growth in travel and tourism (Boeing, 2018a). The trend is expected to continue with a forecast growth rate of $4.7 \%$ average passenger growth over the next twenty years. (Boeing, 2018a). To meet that need, Boeing is forecasting that the number of jet airplanes in the commercial market will nearly double through 2037 (Boeing, 2018a). Growth in general aviation (GA) is also impacting the industry. In 2018, general aviation aircraft shipments experienced an increase of $5 \%$ for piston aircraft, $5.2 \%$ for turboprop aircraft, and a $3.8 \%$ increase in business jets (General Aviation Manufacturers Association [GAMA], 2019). While the overall GA fleet is forecast to remain relatively stable through 2039, growth in turbine and rotorcraft fleets is anticipated while fixed wing piston aircraft are forecast to decline (Federal Aviation Administration [FAA], 2019a). The number of GA hours flown is projected to increase in the same time period (FAA, 2019a). With the anticipated growth in both GA and commercial markets, operations at FAA towers are projected to grow $.9 \%$ a year through 2039 (FAA, 2019a). The FAA also anticipates growth in the area of commercial space operations (space launch activities other than military and civilian government such as NASA) (FAA, 2019a). Such expansion in commercial space flight will result in increased FAA activity in the areas of approval for equipment, training, technicians, inspections and other related activities. As a gauge of the level of current activity in this area, the "FAA currently conducts as many as 400 pre-flight/reentry, flight/reentry, and postflight reentry safety inspections per year" (FAA, 2019a, p. 35). One of the fastest growing market segments in aviation continues to be Unmanned Aircraft Systems (UAS). In the short time since UAS registration went into effect (December 2015), there are over 900,000 registered UAS, compared to just over 212,000 registered active GA aircraft (FAA, 2019a). A highly trained workforce to meet the needs of the expanding industry remains essential. As an example of the growing need, between 2018 and 2037, Boeing forecasts a need for 790,000 new pilots, 754,000 new technicians, and 890,000 new cabin crew (Boeing, 2018b).

Women in the aviation workforce are a vital resource for meeting the personnel needs. Before exploring the number of women in aviation, it is interesting to begin with a look at women in the U.S. workforce. The number of women in the workforce in the U.S. has increased over the past several decades (Toossi \& Morisi, 2017). Women made up about $1 / 3$ of the workforce in 1950 compared to $46.9 \%$ of the workforce in 2018 (Toossi \& Morisi, 2017; Bureau of Labor Statistics [BLS], 2018). The gender gap is excepted to continue to narrow (Toossi \& Morisi, 2017). In addition, the women's labor force is projected to become more diverse, "reflecting greater racial and ethnic diversity" in the next ten years (Toossi \& Morisi, 2017, p. 18). It is also interesting to note that the proportion of women ages 25 to 64 in the labor force who hold a Bachelor's degree and higher increased from $11 \%$ in 1970 to $42 \%$ in 2016 (BLS, 2017). By comparison, the number of men ages 25 to 64 in the labor force who hold a Bachelor's degree and higher was slightly more than doubled during the same time frame, reaching just over $36 \%$ in 2016 (BLS, 2017).

Currently there is insufficient data on the number of women in the aviation workforce. While solid information is available on some segments of the industry, through FAA data for example, it remains a challenge to get a baseline of information in many segments in the industry. Data sources such as the Bureau of Labor Statistics and member participation in aviation specific professional groups has been targeted to attempt to fill these gaps. The purpose of this report is to provide a comprehensive study of the number of women in the aviation workforce. When able, data from multiple sources are provided. In addition, the work will provide a baseline so future reports can be developed to establish and monitor trends in the workforce. At a time when the industry is facing unprecedented shortages of qualified personnel, understanding these key gaps in the workforce can lead to strategies to not only expand the workforce but also enhance diversity.

## Methodology

The purpose of the report is to present data on the number of women employed in a variety of aviation occupations. This will provide a better understanding of the gaps in employment to assist in outreach and retention efforts. Data searches were conducted to collect data from publicly available sources. When multiple sources existed, those sources were each presented. The author does not make a determination of the best indicator but instead presents the data sources available. Other sources utilized when publicly available data were not accessible included contacting professional organizations or creating data sets where able (such as the Dr. Luedtke research on aviation faculty). Sources of data are noted in the report.

## Summary of Results

The results of the report reveal that while women are underrepresented in many areas of aviation, the areas with the largest gaps include technical operations and leadership positions. Table 1 provides an overall breakdown of the results of the report. It shows that women make up less than $10 \%$ of pilots, maintenance technicians, and airline executives. While continued outreach to underrepresented groups in all areas of aviation is essential for further developing the aviation workforce, the results reveal areas that require additional emphasis include pilots, maintenance technicians, aerospace engineers, dispatchers, cybersecurity experts, airport managers, air traffic controllers, and a continued focus on the need for women in aviation leadership positions. While there are many excellent outreach programs in aviation, these results can assist in providing additional information on where to focus our outreach efforts as an industry. Increasing the number of women in the field will help meet the needs of industry. In particular, more emphasis is needed to build upon the $3 \%$ women airline executives and $1 \%$ women airline captains. While increasing the number of women on the flight deck is important, it is equally important to increase the number of women in the left seat, and the number of women in board seats.

Table 1
Women in the Aviation Workforce

| $\%$ Women in the Field | Occupation |
| :--- | :--- |
| $<5 \%$ | Maintenance technicians <br> Airline executives (CEO, COO) |
| $5 \%-10 \%$ | Pilots |
| $11 \%-20 \%$ | Aerospace engineers <br> Dispatchers <br> Airport managers <br> Air traffic controllers <br> Aviation higher education leadership <br> Cybersecurity |
| $21 \%-30 \%$ | FAA employees <br> Aviation higher education faculty |
| $31 \%-40 \%$ | TSA screeners <br> NTSB employees <br> NASA employees |
| $>70 \%$ | Travel agents <br> Flight attendants |

## Workforce Areas

## Professional Pilots

## Bureau of Labor Statistics Data

When using the Bureau of Labor Statistics, one should note there are several categories for professional pilot. The overall category, Aircraft Pilots and Flight Engineers (BLS number 532010) includes two occupations, Airline Pilots, Copilots, and Flight Engineers (BLS number 532011) and Commercial Pilots (53-2012). Figure 1 depicts the categories. The BLS definitions for the occupations are included below:

## 53-2010 Aircraft Pilots and Flight Engineers

This broad occupation includes the following two detailed occupations:
53-2011 Airline Pilots, Copilots, and Flight Engineers
53-2012 Commercial Pilots

## 53-2011 Airline Pilots, Copilots, and Flight Engineers

Pilot and navigate the flight of fixed-wing aircraft, usually on scheduled air carrier routes, for the transport of passengers and cargo. Requires Federal Air Transport certificate and rating for specific aircraft type used. Includes regional, national, and international airline pilots and flight instructors of airline pilots. Excludes "Electro- Mechanical and Mechatronics Technologists and Technicians" (17-3024).

Illustrative examples: Airline Captain, Airline Pilot in Command, Charter Pilot (Air Transport Pilot Certificate Required), Charter Pilot (Airline)

## 53-2012 Commercial Pilots

Pilot and navigate the flight of fixed-wing aircraft on nonscheduled air carrier routes, or helicopters. Requires Commercial Pilot certificate. Includes charter pilots with similar certification, and air ambulance and air tour pilots. Excludes regional, national, and international airline pilots. Excludes "Electro-Mechanical and Mechatronics Technologists and Technicians" (17-3024).

Illustrative examples: Aerial Crop Duster, Charter Pilot (Commercial Pilot Certificate Required), Flight Instructor (Commercial Pilots), Helicopter Pilot
(Office of Management and Budget [OMB], 2018, pp. 202-203)

## Aircraft Pilots and Flight Engineers 53-2010

Airline Pilots, Copilots, and Flight Engineers

## 53-2011

## Commercial Pilots

53-2012

Figure 1: BLS Occupational categories: Pilots
Within BLS data, there are numerous sources of data. The most specific data by occupation are the Occupational Employment Statistics (OES) which produce estimates for over 800 occupations, including categories 53-2011 and 53-2012 (BLS, 2019a). The employment data for May 2018 is provided in Table 2. However, the OES does not gather demographic information so a break down by gender is not available for OES data. By comparison, BLS also provides data in the form of the Current Population Survey (CPS). The CPS is a "monthly survey of households conducted by the Bureau of Census for the Bureau of Labor Statistics" (BLS, 2019b). The CPS does break down data by gender but does not provide the detailed category breakdown for categories 53-2011 and 53-2012. The CPS data is available in Table 3.

Table 2
May 2018 Pilots, BLS OES Data (BLS, 2019a)

| Occupation | Employment | Mean annual wage |
| :--- | :---: | :---: |
| Aircraft Pilots and Flight <br> Engineers (532010) | 120,760 | $\$ 169,560$ |
| Airline Pilots, Copilots, <br> and Flight Engineers <br> (532011) | 82,890 | $\$ 96,530$ |
| Commercial Pilots <br> (532012) | 37,870 |  |

Table 3
2018 Pilots, BLS CPS Data (BLS, 2019b)

| Occupation | Total employed | Percent women |
| :--- | :--- | :--- |
| Aircraft Pilots and Flight <br> Engineers | 119,000 | $9 \%$ |

By comparison, the Bureau of Labor Statistics: Women in the Labor Force report presents the following data (Table 4) for 2016 (BLS, 2017, p. 88).

Table 4
2016 Pilots and Flight Engineers, Women in Labor Force Report (BLS, 2017)

| Occupation | Total employed | Percent women |
| :--- | :--- | :--- |
| Aircraft Pilots and Flight <br> Engineers | 141,000 | $5.2 \%$ |

## Federal Aviation Administration Data

One of the most commonly cited sources for pilot statistics is the FAA. Table 5 and Figures 2, 3, and 4 depict FAA data on active airmen certificate holders (FAA, 2019b).

Table 5
2018 Percentage of Women Pilot Certificate Holders (FAA, 2019b)

| Total Pilots | 633,317 |
| :--- | :--- |
| Total Pilots (women) | 46,463 |
| \% Women Total | $7.3 \%$ |
| Student | 167,804 |
| Student (women) | 22,266 |
| \% Women Students | $13.3 \%$ |
| Private | 163,695 |
| Private (women) | 10,255 |
| \% Women Private | $6.3 \%$ |
| Commercial | 99,880 |
| Commercial (women) | 6,556 |
| \% Women Commercial | $6.6 \%$ |
| Airline Transport | 162,145 |
| Airline Transport (women) | 7,136 |
| \% Women ATP | $4.4 \%$ |
| Flight Instructor | 108,564 |
| Flight Instructor (women) | 7,335 |
| \% Women CFI | $6.8 \%$ |



Figure 2: Percentage of airmen certificates held by women (FAA, 2019b)


Figure 3: Comparison of total active airmen certificates held by men and women (FAA, 2019b)


Figure 4: Percentage of active airmen certificates held by women by certificate/rating (FAA, 2019b)

## International Society of Women Airline Pilots Data

An additional source for pilot data includes the International Society of Women Airline Pilots. These numbers represent self-reporting by industry personnel (International Society of Women Airline Pilots [ISWAP], 2019). The ISWAP data is provided in Table 6 and Figure 5.

Table 6
2019 US Airline Women Pilots, ISWAP Data (ISWAP, 2019)

| Total airline pilots | Women airline pilots | Women airline captains |
| :--- | :--- | :--- |
| 92,722 | $4,726(5 \%)$ | $1,376(1 \%)$ |



Figure 5: 2019 US airline women pilots, ISWAP data (ISWAP, 2019)

As an additional indicator of women pilot data, the International Society of Women Airline Pilots also provides a graph (Figure 6) of major airlines with the most female pilots (McCarthy, 2019).

Major Airlines With The Most Female Pilots
Share of female pilots at commercial airlines in 2018


Source: International Society Of
@StatistaCharts Women Airline Pilots via The Telegraph
statistaת

Figure 6: Major airlines with the most female pilots (McCarthy, 2019)

## Remote Pilots

FAA Data

Table 7
2018 Remote Pilots, FAA Data (FAA, 2019b)

| FAA certificate held | Total | Women |
| :--- | :--- | :--- |
| Remote Pilot | 106,321 | $6,188(5.8 \%)$ |

## Airline Management

$94 \%$ of airlines are run by men. (CAPA, 2015)
According to a study by CAPA which reviewed the number of women in leadership positions at global airlines, in 2010, 15 airlines had appointed a woman as CEO or managing director. By 2015, a follow up study showed that number had only increased to 18 (CAPA, 2015).

Women make up only $3 \%$ of CEOs and COOs in the world's top 100 airline groups and $8 \%$ of airline CFOs are women (International Air Transport Association [IATA], 2018).


Figure 7: Women in aviation executive roles at world's top 100 airline groups (IATA, 2018)

## Maintenance Technician

## Bureau of Labor Statistics Data

Aircraft Mechanics and Service Technicians (49-3011): Diagnose, adjust, repair, or overhaul aircraft engines and assemblies, such as hydraulic and pneumatic systems. Excludes "Avionics Technicians" (49-2091). Illustrative examples: Aircraft Engine Specialist, Airframe Mechanic, Flight Test Mechanic, Helicopter Engine Mechanic (OMB, 2018, p. 174)

Table 8
2018 Mechanics and Service Technicians, BLS CPS data (BLS, 2019b)

| Occupation | Total employed | Percent women |
| :--- | :--- | :--- |
| Aircraft mechanics and <br> service technicians | 164,000 | $3.6 \%$ |

## FAA Data

Table 9
Mechanic, FAA Data (FAA, 2019b)

| FAA certificate held | Total | Women |
| :--- | :--- | :--- |
| Mechanic | 292,002 | $7,133(2.4 \%)$ |

## Aerospace Engineers

## Bureau of Labor Statistics Data

Aerospace Engineers (17-2011): Perform engineering duties in designing, constructing, and testing aircraft, missiles, and spacecraft. May conduct basic and applied research to evaluate adaptability of materials and equipment to aircraft design and manufacture. May recommend improvements in testing equipment and techniques. Illustrative examples: Aeronautical Engineer, Aircraft Design Engineer, Flight Test Engineer (OMB, 2018, p. 54)

Table 10
2018 Aerospace Engineers, BLS CPS Data (BLS, 2019b)

| Occupation | Total employed | Percent women |
| :--- | :--- | :--- |
| Aerospace Engineers | 147,000 | $13.4 \%$ |

As a point of comparison, the Bureau of Labor Statistics, Women in the Labor Force report lists the percentage of women Aerospace Engineers in 2016 at $7.8 \%$ women (BLS, 2017, p. 68)

## Travel Agents

## Bureau of Labor Statistics Data

Travel Agents (41-3041): Plan and sell transportation and accommodations for customers. Determine destination, modes of transportation, travel dates, costs, and accommodations required. May also describe, plan, and arrange itineraries and sell tour packages. May assist in resolving clients' travel problems. Illustrative examples: Corporate Travel Expert, Travel Service Consultant (OMB, 2018, p. 139)

Table 11
2018 Travel Agents, BLS CPS Data (BLS, 2019b)

| Occupation | Total employed | Percent women |
| :--- | :--- | :--- |
| Travel Agents | 79,000 | $85.5 \%$ |

As a point of comparison, the Bureau of Labor Statistics, Women in the Labor Force report lists the percentage of women travel agents in 2016 at $84.7 \%$ women (BLS, 2017, p. 77).

## Air Traffic Controllers

FAA fact sheet for March 2019 lists the number of air traffic controllers as over 14,000 (FAA, 2019c).
$16.7 \%$ of FAA air traffic controllers are women. (P. Wilson, President Professional Women's Controllers, personal communication, April 5, 2019)

## Dispatchers

## FAA Data

Table 12
2018 Dispatcher, FAA Data (FAA, 2019b)

| FAA certificate held | Total | Percent women |
| :--- | :--- | :--- |
| Dispatcher | 21,465 | $4,086(19 \%)$ |

## Flight Attendants

## Bureau of Labor Statistics Data

Flight Attendants (53-2031): Monitor safety of the aircraft cabin. Provide services to airline passengers, explain safety information, serve food and beverages, and respond to emergency incidents. Illustrative examples: Airline Flight Attendant, Airplane Flight Attendant (OMB, 2018, p. 203)

Table 13
2018 Flight Attendant, BLS CPS data (BLS, 2019b)

| Occupation | Total employed | Percent women |
| :--- | :--- | :--- |
| Flight Attendant | 104,000 | $74.9 \%$ |

FAA Data

Table 14
2018 Flight Attendant, FAA Data (FAA, 2019b)

| FAA certificate held | Total | Percent women |
| :--- | :--- | :--- |
| Flight Attendant | 231,355 | $183,519(79 \%)$ |

## Transportation Security Screeners

The Bureau of Labor Statistics, Women in the Labor Force report lists the number of women transportation security screeners at 16,0000 out of $40,000(40 \%)$ for 2016 (BLS, 2017, p. 133). The BLS CPS lists the 2018 total employment number of transportation security screeners at 41,000 (no gender breakdown is provided) (BLS, 2019b).

Table 15
2017 Transportation Security Screeners, Women in Labor Force Report (BLS, 2017)

| Occupation | Total | Percent women |
| :--- | :--- | :--- |
| Transportation Security <br> Screeners | 40,000 | $16,000(40 \%)$ |

## Airport Management

To obtain data on airport managers, the American Association of Airport Executives (AAAE) was contacted. The organization is the largest professional organization for airport executives (American Association of Airport Executives, 2019). A request was made for the number of women who hold the Accredited Airport Executive (A.A.E.) designation, a defining credential for airport managers.

Table 16
2018 Airport Managers, AAAE Data

|  | Total | Women |
| :--- | :--- | :--- |
| Active Accredited Airport <br> Executives (A.A.E.) | 469 | $78(16.6 \%)$ |

2018 (A. Calliari, personal communication, January 29, 2018)

## Aviation Higher Education

Women Postsecondary Faculty and Administrators
The target population for this component of the study was all full-time aviation faculty who are employed at postsecondary aviation programs. The definition of full-time aviation faculty included fully-appointed faculty who teach non-engineering related aviation subjects. Excluded from this study were adjuncts, visiting faculty and flight instructors. Data was gathered from the 2018 University Aviation Association (UAA) Collegiate Aviation Guide (University Aviation Association [UAA], 2018). Both UAA and non-UAA member schools were investigated, with data obtained through the UAA Guide or by direct contact with the universities. Of the 818 fulltime aviation faculty members employed at 67 universities/colleges with aviation programs, 170 ( $20.8 \%$ ) were female; of the 197 faculty who were identified as being in academic leadership positions, $38(19.3 \%)$ were women. Table 17 shows results for female full-time aviation faculty as well as female aviation administrators as of 2018. As a point of comparison, in 2010 women were $8.1 \%$ of aviation faculty and $11.9 \%$ of aviation academic leadership positions (Chair, Dean, Director) (Ison, 2010).

Table 17
2018 UAA Member Institutions’ Aviation Department Employment (Luedtke, 2019)

|  | Total | Women |
| :--- | :--- | :--- |
| Full time aviation faculty | 818 | $170(20.8 \%)$ |
| Aviation academic leadership <br> positions | 197 | $38(19.3 \%)$ |

## Aviation Government Organizations

The following data was collected from the Office of Personnel Management (Office of Personnel Management [OPM], 2019). The numbers represent total employment at the organization.

Table 18
2018 Aviation Government Organizations Employment (OPM, 2019)

|  | Total | Women |  |
| :--- | :--- | :--- | :--- |
| FAA employees | 44,895 | 10,539 | $(23.4 \%)$ |
| NTSB employees | 400 | 157 | $(39.2 \%)$ |
| TSA employees | 62,692 | 25,416 | $(40.5 \%)$ |
| NASA employees | 17,183 | 5,867 | $(34.1 \%)$ |

## Cybersecurity

The global cybersecurity workforce consists of $11 \%$ women.
Women number 4\% of the leadership positions in global cybersecurity. (Leadership positions are defined as C-level such as CEO, COO, CIO, Executive management, Directors)
(Frost \& Sullivan, 2017)

American Association of Airport Executives. (2019). About AAAE. Retrieved from https://www.aaae.org/aaae/AAAEMBR/About/AAAEMemberResponsive/About_AAAE/About AAAE.aspx?hkey=17fa23bc-bfe6-4589-9c8b-c362c1e7c303

Boeing. (2018a). Commercial market outlook 2018-2037. Retrieved from https://www.boeing.com/commercial/market/commercial-market-outlook/

Boeing. (2018b). 2018 Boeing pilot \& technician outlook. Retrieved from https://www.boeing.com/commercial/market/pilot-technician-outlook/2018-pilot-outlook/

Bureau of Labor Statistics. (2017). Women in the labor force: A databook (Report 1071). Retrieved from https://www.bls.gov/opub/reports/womens-databook/2017/home.htm

Bureau of Labor Statistics. (2018). Household data annual averages: Employment status of the civilian noninstitutional population by age, sex, and race. Retrieved from https://www.bls.gov/cps/cpsaat03.pdf

Bureau of Labor Statistics. (2019a). Occupational employment statistics. Retrieved from https://www.bls.gov/oes/home.htm

Bureau of Labor Statistics. (2019b). Labor force statistics from the current population survey (modified January 18, 2019). Retrieved from https://www.bls.gov/cps/

CAPA. (April 9, 2015). Why don't women run airlines? Part 1: 94\% or airlines are run by men. Retrieved from https://centreforaviation.com/analysis/reports/why-dont-women-run-airlines-part-1-94-of-airlines-are-led-by-men-217930

Federal Aviation Administration. (2019a). FAA aerospace forecast: Fiscal years 2019-2039. Retrieved from https://www.faa.gov/data research/aviation/aerospace_forecasts/media/FY201939 FAA_Aerospace Forecast.pdf

Federal Aviation Administration. (2019b). U.S. civil airmen statistics. [Fact sheet]. Retrieved from https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

Federal Aviation Administration. (2019c). Facts about the FAA and air traffic controllers. Retrieved from https://www.faa.gov/news/fact sheets/news story.cfm?newsId=23315

Frost \& Sullivan Company. (2017). The 2017 global information security workforce study: Women in cybersecurity. Retrieved from https://iamcybersafe.org/wpcontent/uploads/2017/03/WomensReport.pdf

General Aviation Manufacturers Association. (2019). 2018 Annual report. Retrieved from https://gama.aero/wp-content/uploads/GAMA-2018-Annual-Report-FINAL.pdf

International Air Transport Association. (2018). IATA economics' chart of the week: International women's day 2018 - aviation has further to go. Retrieved from
https://www.iata.org/publications/economics/Reports/chart-of-the-week/chart-of-the-week-09-mar-2018.pdf

International Society of Women Airline Pilots. (2019). Current numbers worldwide women airline pilots. Retrieved from
https://www.iswap.org/content.aspx?page id=22\&club id=658242\&module_id=264598
Ison, D. C. (2010). The future of women in aviation: Trends in participation in postsecondary aviation education. Journal of Aviation/Aerospace Education \& Research, 19(3). Retrieved from http://commons.erau.edu/jaaer/vol19/iss3/8

Luedtke, J. (2019). Women in aviation higher education. [White paper].
McCarthy, N. (April, 19, 2018). Major airlines with the most female pilots. Retrieved from https://www.statista.com/chart/13582/the-airlines-with-the-most-female-pilots/

Office of Management and Budget. (2018). Standard occupational classification manual. Retrieved from https://www.bls.gov/soc/2018/soc 2018_manual.pdf

Office of Personnel Management. (2019). Federal workforce data: September 2018 quarter. Retrieved from https://www.fedscope.opm.gov/

Toossi, M. \& Morisi, T. (July, 2017). Women in the workforce before, during, and after the great recession. Retrieved from https://www.bls.gov/spotlight/2017/women-in-the-workforce-before-during-and-after-the-great-recession/pdf/women-in-the-workforce-before-during-and-after-the-great-recession.pdf

University Aviation Association. (2018). Collegiate aviation guide (7 $7^{\text {th }}$ ed.). Memphis, TN: UAA.

