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Gender Balance in Aviation

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Women continue to be a minority in STEM related industries today and are grossly under-represented as professional pilots. To exacerbate this disparity, there is a pilot shortage in the United States. Fewer women than men are earning degrees in STEM degree programs, except in the Life Sciences. Universities must foster a gender balance in aviation degree programs by increasing the female student population at the college level to help create a pipeline of female pilots for the aviation industry. Universities and colleges should establish outreach programs that promote and support female STEM awareness as well as establish industry relationships to create collegial partnerships that lead to recruiting female students.

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There is a pilot shortage in the United States and women are the solution to this problem! Colleges and universities should take the initiative to increase the female student population in aviation and STEM related degree programs. By increasing the female student population in STEM degree programs, with emphasis on the aviation and aerospace industries, a gender balance for the pilot career path could occur. Airline pilots today are required to earn a Bachelor's Degree. To address the current pilot shortage, it makes sense to increase the number of female pilots at the collegiate level.

Problem

In the United States, there is a pilot shortage and women are under-represented as airline pilots at 4.2%.

Purpose

This paper will demonstrate that there is not a gender balance in aviation in the United States.

Discussion

STEM refers to the fields of *science, technology, engineering, and mathematics*. There is no standard definition of a STEM occupation as STEM incorporates professional and technical support occupations in the areas of life and physical sciences, computer science and mathematics, and engineering. Less agreement has been made on the inclusion of educators, healthcare professionals, and social scientists in STEM (Beede et al., 2011; U.S. Census Bureau, 2010). At the university level, STEM includes aviation and aerospace related programs.

As depicted in Table 1, fewer women than men are earning degrees in STEM degree programs except in the Life Sciences. The share of STEM degrees is even smaller for women of color. In 2014–2015, women of color earned a small percentage of bachelor's degrees across all STEM fields: Black women at 2.9%, Latinas at 3.6%, and Asian women at 4.8% (National Center for Education Statistics, 2016; 2017).

Women remain a minority of STEM workers in the United States. Women made up less than one-quarter (24%) of those employed in STEM occupations in 2015 (Noonan, 2017). A substantial gender gap in engineering and computer occupations contributes to women's overall underrepresentation in STEM. In 2016, women in the United States represented 25.5% of computer and mathematical occupations, and 14.2% of architecture and engineering occupations (Bureau of Labor Statistics, 2017). For women of color, this gap is even wider. Latinas and Black and Asian women made up slightly less than 10% of working scientists and engineers in the United States in 2015 (National Science Foundation, 2017).

Table 1

United States STEM Statistics (Catalyst, 2018)

Percentage of Degrees Earned by Women in Postsecondary Institutions (2014–2015)			
	Bachelor's	Master's	PhD
Biological and biomedical sciences	59.0%	57.3%	53.3%
Mathematics and statistics	43.0%	40.6%	27.9%
Physical sciences and science technologies	38.5%	37.5%	34.3%
Engineering and engineering technologies	18.7%	25.2%	23.2%
Computer and information sciences and support services	18.0%	30.4%	22.5%
All STEM fields	35.1%	32.7%	34.4%

Women are significantly underrepresented in high-tech occupations. In 2016, women accounted for one-fifth or less of those employed in these jobs, to include: software developers, applications and systems software at 20.0%, computer network architects at 9.7%, and aerospace engineers at 7.8% (Bureau of Labor Statistics, 2017). Even in these high-paying STEM jobs, women earn less than men. In the United States, women in computer, engineering, and science occupations were paid an estimated 79.2% of men’s annual median earnings in 2016 (U.S. Census Bureau, 2017).

While most non-STEM related industries have made significant efforts to attract the female customer in the last few decades, the aviation industry is still lagging. As an example, long gone are the cars that would require the smaller-framed female driver to bring cushions along, however that is not the case with most new aircraft (Goyer, n.d.).

Females are grossly underrepresented in aviation occupations. In fact, the percentage of female pilots in the United States is lower than the meager 7.8% for female aerospace engineers. The statistics for the number of pilots in the United States show an enormous disparity between genders. The percentage of total female pilots (not including certified flight instructors) in the United States (US) is 6.7%. The percentage of female certified flight instructors is 6.5% (Federal Aviation Administration [FAA], 2017). See Tables 2 and 3.

Table 2

Estimated Active Pilot Certificates Held by Category and Age Group of Holder

Age Group	Type of Pilot Certificates							Flight Instructor 2/	Remote Pilot 2/
	Total	Student	Sport	Recreational	Private 1/	Commercial 1/	Airline Transport 1/	CFI 3/	
Total	584,361	128,501	5,889	178	174,517	112,056	163,220	104,382	20,362
14-15	259	259	0	0	0	0	0	0	0
16-19	16,491	12,697	16	3	3,482	293	0	56	214
20-24	57,599	31,808	112	28	14,815	10,058	778	3,637	1,388
25-29	64,176	26,837	201	30	13,698	17,703	5,707	8,101	2,397
30-34	55,351	17,693	239	12	13,167	12,011	12,229	11,884	2,761
35-39	50,246	12,314	234	10	12,342	8,997	16,349	11,919	2,564
40-44	44,770	6,212	292	9	12,577	7,513	18,167	10,691	2,217
45-49	49,254	5,571	427	11	13,322	7,417	22,506	11,642	2,143
50-54	56,377	4,962	676	11	16,929	8,214	25,585	10,614	2,094
55-59	59,558	4,069	933	19	20,822	8,966	24,749	9,733	1,746
60-64	52,066	2,847	993	15	21,015	9,275	17,921	8,703	1,425
65-69	36,580	1,798	807	14	15,516	8,598	9,847	7,572	893
70-74	23,543	954	560	9	9,758	6,762	5,500	5,499	376
75-79	11,018	328	266	3	4,382	3,574	2,465	2,683	118
80 and over	7,073	152	133	4	2,692	2,675	1,417	1,648	26

1. Data current as of December 31, 2016 (FAA, 2017)
2. Includes pilots with an airplane and/or a helicopter and/or a glider and/or a gyroplane certificate. Pilots with multiple ratings will be reported under highest rating. For example a pilot with a private helicopter and commercial airplane certificates will be reported in the commercial category.
3. Not included in total active pilots
4. Certified Flight Instructor

As depicted in Table 3, Female Airline Transport Pilots (ATP) in the U.S. = 4.2 %; Female Commercial Pilots = 5.4%; and Female Student Pilots = 12.4%. Out of 163,220 airline pilots in the United States, only 6,888 of them are female pilots. However, Table 3 lists all airline pilots, and 19,229 of them are age 65 or over, which means they cannot fly for an airline due to age restrictions. Airline pilots in the United States have mandatory retirement at age 65. So the female percentage of ATPs from ages 21-64 equates to 4.6%. Also included in the total number of airline airplane pilots are helicopter, glider, and gyroplane pilots.

Table 3

Estimated Active Women Pilot Certificates Held By Category And Age Group of Holder

Age Group	Type of Pilot Certificates							Flight Instructor 2/	Remote Pilot 2/
	Total	Student	Sport	Recreational	Private 1/	Commercial 1/	Airline Transport 1/	CFI 3/	
Total	39,187	15,971	223	15	10,009	6,081	6,888	6,848	793
14-15	48	48	0	0	0	0	0	0	0
16-19	2,382	1,955	2	0	396	29	0	9	10
20-24	6,852	4,449	18	5	1,508	819	53	350	67
25-29	6,075	3,266	21	5	1,164	1,229	390	688	132
30-34	4,493	1,974	14	0	927	820	758	931	107
35-39	3,658	1,373	7	1	723	558	996	979	98
40-44	2,731	683	6	0	595	423	1,024	852	61
45-49	2,684	606	13	0	634	339	1,092	836	80
50-54	2,794	584	25	0	776	356	1,053	670	95
55-59	2,775	486	48	1	1,028	407	805	563	74
60-64	2,240	304	31	0	1,026	418	461	451	44
65-69	1,295	143	16	1	634	350	151	269	19
70-74	718	69	15	1	387	186	60	143	4
75-79	278	22	5	1	148	79	23	66	2
80 and over	164	9	2	0	63	68	22	41	0

1. Data current as of December 31, 2016 (FAA, 2017)
2. Includes pilots with an airplane and/or a helicopter and/or a glider and/or a gyroplane certificate. Pilots with multiple ratings will be reported under highest rating. For example a pilot with a private helicopter and commercial airplane certificates will be reported in the commercial category.
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Conclusions

Women continue to be a minority in STEM related industries and are grossly under-represented as professional pilots. Fewer women than men are earning degrees in STEM programs except in the Life Sciences. Universities must foster a gender balance in aviation degree programs by increasing the female student population at the college level to help create a pipeline of female pilots for the aviation industry.

Recommendations

Airline pilots today are required to earn a bachelor’s degree. To address the current pilot shortage, it makes sense to increase the number of female pilots at the collegiate level. In order to increase the female student population, outreach programs are suggested with the intent of increasing female enrollment in STEM education. Examples of outreach programs are *mentoring programs* which pair up alumni with current female students or *ambassador programs* which pair up current female students with accepted female students before they matriculate.

Colleges need to do a better job in advertising STEM degree programs to junior high and high school students so connecting with guidance counselors would be a good start. Hosting summer camps and workshops for STEM students such as *Introduce a Girl to Flying Workshop* would reach the 6-8th grade demographic. Universities should also work with organizations like the Women in Aviation International. This organization hosts a yearly conference that promotes females in aviation-related STEM fields.

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