

Of Course We Fly Unmanned—We’re Women!

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Striving to achieve a diverse and inclusive workplace has become a major goal for many organisations around the world. We recognise that not only is it the right thing to do, but that it is proven to achieve better outcomes in terms of innovation, creativity, science, and even financial success [1]. However, sometimes the task of change can feel overwhelming and amorphous—what steps do we need to take to reach this goal? Within the disciplines of drone technology and drone science, let us start with the first rung on the ladder: gender-neutral language.

The term “drone” may be seen as somewhat colloquial to a scientific and defence community, describing a whole taxonomy of vehicles that may range from large military weapons to children’s toys [2]. Historically, the scientific and defence fields have enjoyed using acronyms, and so for decades autonomous robots have been referred to as Unmanned Aerial (or airborne) Vehicles or Unmanned Aerial Systems—shortened to UAV or UAS, respectively. These terms (UAV/UAS) perhaps feel more scientific than “drones”, because they lend a technicality to the description of the machine that conjures a vision of something more sophisticated than a toy, whilst also having a different purpose to a machine that performs military strikes. Regardless of the reason, these acronyms have proliferated through the scientific literature in recent years as drone methodologies have mainstreamed within the natural sciences. As authors of this editorial and co-editors of this She Maps Special Issue within the journal “Drones”, we have also uncritically used these gendered terms in our communications in the past [3–8]. We wish to avoid unpacking the politics and gendered history of the term “unmanned” in UAV/UAS, but it is worth noting that its genesis probably arose from the military origins of drones, where the majority of drone pilots have been men, at least until very recently (e.g., the first woman American air force global hawk drone pilot was enlisted in 2017). We also wish to acknowledge the body of work that points to drone warfare itself being deeply “gendered” (e.g., see [9]). Of course, the drone allows the pilot to become physically distanced from acts of war, including killing. So, in “unmanning” the aircraft, the military may view the drone as a means of “feminising” warfare, emasculating male pilots from “warrior” roles on the frontline [9]. This highlights the importance of critically situating linguistics within scientific writing and choosing terminologies thoughtfully.

In acknowledging the complex gendered context of “unmanned”, and regardless of the historical evolution of the terms UAV and UAS, we highlight that “unmanned” is neither gender-neutral nor gender-inclusive. Grammatically, “unmanned” is a heterological word, which neither describes itself, nor is correct in describing those who pilot drones. We also recognise that, as drone pilots, we often are required to adopt other gendered terminologies that have evolved out of military histories; for example, “notices to airmen” (sic; NOTAM). The institutional basis of gendered terminology through aviation authorities is a systemic problem that flows through to government and industry due to its use in legislation and



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rules, and ultimately academia. Furthermore, the institutions around aviation are largely male-dominated, so in those countries that have not adopted non-gendered terminology, there are few women to drive change. Despite this, in 2020, the Institute for Women Of Aviation Worldwide (iWOAW) launched a petition to help eliminate gendered terminology in aviation (<https://bit.ly/3q5XXeH> (accessed on 10 February 2021)). They provide the example that the United States Federal Aviation Administration (FAA) website has more than 40,000 references to “airman” or “airmen”.

Whilst we cannot exert control over these external terminologies that govern our operations, we do have the capacity to change the terms used within our scientific writing, and so we suggest that the time has come to change our practices. Women are not men, nor are we a subset of man, and perfectly good alternatives to the word “unmanned” have been in use for many years (see for example the style guide adopted by NASA [10]). We can now make the appropriate moves to adopt these alternative, gender-neutral terms within our scientific community.

Throughout this She Maps Special Issue, you will see that many authors have opted to replace “unmanned” with “unoccupied”. This achieves the dual purpose of a gender-neutral term, whilst recognising that drone operations remain human-driven. Further, there is no need to change the acronym to adopt this terminology—this is helpful when searching for keywords in the literature. “Uncrewed” is another alternative, however this does not acknowledge that drone operations still rely on a remote human pilot for control. International organisations and in some countries (e.g., Australia), the official term Remotely Piloted Aircraft Systems (RPAS) is used to acknowledge the importance of the remote pilot. Others might prefer to use the universally recognised term “drone” in place of UAV/UAS. Of course, the word “drone” is not gender-free either—referencing a male honeybee (which itself is rather interesting when considering the etymology of the word drone as applied to flying vehicles). However, we suggest that it offers a simpler alternative to the more technical “UAV/UAS” terminology and in some settings may help in communicating science to broader audiences.

Moving forward we ask all who have an interest in diversity and inclusion to adopt one of the gender-neutral options suggested above. Continued use of the term “unmanned” means that we are accepting the male normative yet, this language of oppression continues to disadvantage women [11]. As the simple act of replacing “unmanned” with “unoccupied” does not hurt anyone, there should be no reason not to change.

If you would like to challenge yourself to climb to the second rung of the inclusivity ladder, we encourage you to read and cite the articles within our Special Issue, and to strive to continue to cite more authors who are women. Women are the lead authors for every publication herein, and despite the highly rigorous science that all have conducted, research shows that they are less likely to be cited than papers led by men [12]. This of course affects their reputation and career progression, and further acts to stymie our attempts to build a diverse and inclusive workforce. This is also important in the context of Huang et al.’s work [13], which showed that gender disparities in scientific citations arise more from poorer career progression in researchers who are women compared to those who are men. Finally, “visibility” is key to attaining equality in gender representation across science [14], and through citations, authors who are women gain visibility, and with that comes enhanced opportunities for career progression.

In recognition of that, we use this editorial to actively cite and make visible the work of the authors who are women publishing in our Special Issues. Regardless of your specific interest area within drone science/technology, we are sure that there is at least one paper of interest to you. Between the She Maps Special Issues in the journals *Drones* and *Remote Sensing*, papers cover the diverse topics of reef habitat mapping [15,16], monitoring animals [17–20], agriculture [21], alpine ecosystems [22], education [23], 3D modelling [24,25], forested environments [26,27], algal monitoring [28], salt marshes [29], and water quality [30].

The science and technology of UAS/UAV/RPAS/drones can and should be inclusive. Gender does not determine your ability to operate a drone. Encouraging this diversity enables innovation and different ideas to emerge, yet discouraging women from participating in drone sciences because of terminology is a disservice to our discipline. To counter this, we hope to see you taking action and advocating alongside us as we climb the ladder towards a more diverse and inclusive workforce of the future.

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