



**PARE Article**

# Increasing the Participation of Women in Aerospace

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**Based on**

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2nd Yearly Report of  
the PARE project

**Prepared by**



PERSPECTIVES FOR AERONAUTICAL  
RESEARCH IN EUROPE



## INTRODUCTION

To support the 23 Flightpath 2050 goals established by the Advisory Council for Aeronautics Research and Innovation in Europe (ACARE), the PARE project defined 35 complementary PARE objectives. PARE objectives 49 to 58 are addressed in chapter 11 of PARE's 2nd-year report, entitled "Increasing the Participation of Women in Aerospace", which analyses the factors that influence the participation of women in this sector and proposes measures to attract and retain more women.



Some of these factors are: women's interest in the aerospace sector and the women's self-confidence in **STEM (Science, Technology, Engineering and Mathematics)** subjects; the gender stereotypes that women are exposed to in the educational context and the gender imbalance in STEM education; the inequality of employment opportunities, the gender imbalance in STEM jobs, the unequal treatment and labour conditions.

## GENERATING INTEREST IN AEROSPACE AND BUILDING CONFIDENCE

Evidence suggests that women are underrepresented in some areas of work, notably those where some knowledge of STEM subjects is required. Main reasons for this pattern include a lack of encouragement from friends, family and teachers; a lack of awareness, this is, reduced prior knowledge of STEM as a career option; and a lack of young women's self-confidence in STEM roles, which in its turn is partially caused by the societal bias that girls face since childhood. Considering this, it is fundamental **to counter family and societal bias discouraging girls from the interest in vehicles, be it cars or planes (objective 49).**



### KEY FINDINGS

- The European Institute for Gender Equality (EIGE) defends, in a report entitled “Study and work in the EU” (from 2018), that positive STEM experiences and development of “STEM identities” start from an early age, even before children enter formal education, through family relations (e.g. a strong bond with fathers increases women’s likelihood to enter STEM studies) and choices (e.g. providing caring toys such as dolls for girls and exploring toys such as cars and planes for boys);
- Girls and boys also start understanding gender stereotypes or societal bias regarding gender as early as age two and they learn to adjust their behaviour according to internalised gender stereotypes by age four. The assumption that “girls play with dolls and boys play with cars/planes” and other predominant stereotypes with relation to gender and STEM (e.g. “boys are better at math and science than girls” or “science is for men, not for women”) makes it particularly challenging for girls to see STEM as a potential career choice and, on the other hand, may equip boys with easily available and pre-established roles in science and technology;
- To understand why more Europe’s girls and young women aren’t studying STEM, Microsoft commissioned a Europe-focused research in 2017 involving 11.500 school girls (ages 11 to 18) and young women (ages 19 to 30) from 12 European countries. The research concluded that most European girls become interested in STEM between the ages of 11 and 12, but that interest drops off significantly between the ages of 15 and 16 (by the time girls are in high school). On average, 57% of girls rejected the idea that they will never be as good at STEM subjects as boys (expressing in general confidence in their STEM skills) but all of them acknowledged that men and women are treated differently in STEM-related roles and this perceived inequality is putting them off further STEM studies and careers;
- A study commissioned by the European Commission (EC)’s Directorate-General for Mobility and Transport (DG MOVE) identified 10 specific communication good practices and strategies able to be transferable across the full spectrum of transport sectors in the Member States and believed to promote transport jobs effectively to young women and men. These are: 1) Using research to confirm the approach; 2) Taking a strategic approach (a long term plan with specific targets); 3) Going into schools, colleges and universities; 4) Providing opportunities to experience the job; 5) Showcasing real people as role models; 6) Working with men to engage women; 7) Communicating with young people on their terms; 8) Building in careers advice provision to promotional strategies; 9) Using networks & mentoring to support female retention; 10) Using existing resources & networks to increase cost-effectiveness;



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- Policymakers can help fight gender stereotypes and bring behavioural change regarding gender equality through an effective gender mainstreaming, which is a strategy that involves the integration of a gender perspective into the preparation, design, implementation, monitoring and evaluation of policies, regulatory measures and spending programmes.

### KEY ACTIONS

To achieve this objective, PARE recommends **making available on-line and accessible to primary schools and parents, children stories and cartoons involving flying that are both entertaining and educational.**

## IMPLEMENTING CHANGES IN THE EDUCATIONAL CONTEXT

In the EU, despite an average of half of the pupils that enter in the primary schools are female and continue studying further into secondary education, in tertiary education/university men are more likely to obtain a degree in a STEM field of studies. Research suggests that there is little no difference in boys' and girls' average ability at STEM subjects, which means that to attract more girls to STEM subjects at schools and universities, the solution is to tackle the stereotypes that they are exposed to from primary and secondary education until university graduation. In practice, it is necessary **to give girls and boys in primary schools the same opportunities to choose their games and entertainment (objective 50) and to encourage more girls to take aeronautical engineering degrees (objective 51).**







### KEY FINDINGS

- As said before, teachers play an important role in influencing girls and young women in studying and pursuing STEM fields. Some measures that have been adopted so far in Europe include:
  - making available on the internet and to primary school's children stories and cartoons where girls drive cars and fly aeroplanes as much as boys do and let them play with vehicle models or ask for them as presents;
  - developing a toolkit for primary and secondary school teachers to fight gender stereotypes and raise awareness about transport professions among young people;
  - have a gender-neutral environment in classes that help young women to participate and feel engaged;
- According to a report made by Deloitte UK, in 2016, almost as many girls and boys sat the General Certificate of Secondary Education (GCSE), a qualification in a specific subject typically taken by school students aged 14 – 16, in STEM subjects. However, 40 per cent fewer girls than boys continue studying STEM subjects in A - level, which is the level that students who pass on the GCSE exam go to. This result corroborates with the findings of the Microsoft research that girl's interest drops between the ages of 15 and 16 and is not a cause of girls' performance in these subjects;
- According to the EIGE "Study and work in the EU" report, in ten years (2004-2015), women's share among STEM graduates in the EU barely changed and instead of slightly improving, has fallen from 23% to 22%. In engineering, manufacturing and construction-related studies, this percentage decreases to almost 16%;
- The article "Girl Power" published in 2018 in the Social Sciences open access journal states that women in engineering majors enter college with the same levels of interest and intent to persist in the major as male peers, but the majority face negative experiences such as male favouritism and differential treatment and sexual harassment from classmates and faculty; that make it difficult to persist and succeed in their majors. Those who have positive via supportive faculty members and peers, research experiences or participation in engineering organizations are more likely to continue taking STEM classes, complete degrees and continue on to post-baccalaureate STEM careers in comparison to those who do not.

### KEY ACTIONS

To achieve these two objectives, PARE recommends (respectively)

1. **Including flight experiments equally accessible to boys and girls** in primary and secondary school programmes and activities;
2. **Reinforcing and accelerating visits to universities and industry, role models of success stories and the same fascinating technologies.**



## IMPROVEMENT OF THE EMPLOYMENT CONTEXT

As the traditional masculine beliefs and values have been rooted in the aviation industry for a long period, despite several efforts made, the percentage of women pursuing a career in the field remains low, particularly in technical positions that require STEM skills. To oppose this, it is necessary:

- **provide women with attractive careers in aeronautics in industry and academia** (objective 52);
- **discourage and prevent the continuation of abuse based on gender** (objective 53);
- **ensure that the protection of the family, maternity and parenthood is effectively implemented** with its legal basis as a minimum (objective 54);
- **give equal recognition of achievements regardless of gender**, taking into account the circumstances (objective 55);
- **see the differences between the genders as an opportunity for a symbiosis of distinct talents that furthers smooth progress** (objective 56);
- **increase the participation of women in aeronautics in the most effective way** (objective 57); and
- **recognise the historic achievements of women, including in aeronautics, in biased or unfavourable circumstances** (objective 58).





### KEY FINDINGS

- In Europe, women make up 41% of aviation employees, but this percentage is deceptive because it reveals little of the skill distribution between the sexes or the extent of female presence in senior roles. For example, even though there is a high share of female cabin crew (a position that doesn't require STEM education), it is estimated that only around 4-5% of the world's commercial airline pilots are female. The same goes to technical positions that skew towards men;
- The gender gap in starting salary between men and women who have STEM qualifications and go on to take jobs in those spheres is smaller than in any other subject's studies. It is partly related to the fact that many women take time out from work for family reasons and may only take on a part-time job when they eventually return to work, which in general is paid less per hour than full-time work. Moreover, part-time work is not equally spread between women and men, since in the EU in 2017, 32% of women in employment worked part-time, compared with 9% of men;
- Women feel more supported in environments which recognize their range of skills they have, provide opportunities for progression and take a firm line on sexist behaviour. Concerning on-the-job treatment and preventing abuse, there are three main factors to take into consideration:
  1. Women mentoring programs: women mentors can support in efforts to make the industry and job functions more transparent, giving entrants a realistic depiction of how the industry works and what it is like in the work environment;
  2. Women job satisfaction determinants: on-the-job treatment should also consider women's determinants for job satisfaction and design their jobs ensuring these factors;
  3. Women networking: establishing networks of women to share experiences and promote opportunities are perceived to be an important element of improving working conditions.
- The protection of the family and children is a fundamental value of society that the law tries to ensure in all situations including employment. Instead of dismissing someone using collateral arguments, a change of type of work or a different assignment can make more compatible company priorities and family needs, by adjusting schedules or timetables;

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- The recognition of professional achievements must be objective and fair, using the same criteria applied in the same way, regardless of gender, age or belief. However, fairness also means equal opportunities, and while applying the same final criteria, all should have the same opportunities to attain those objectives. The adjustment of working conditions or schedules or responsibilities to account for special individual circumstances of women or other groups is not a favour, but rather having an even playing field inside the company as the company would like to have in the market versus its competitors, promoting a loyal division of tasks within the organization;
- Women were present in aviation activities since the first flights. However, until the 70s their presence was, with rare exceptions, mainly as passengers on-board of male-piloted vehicles. Biased opinion persisted over decades, determining a large delay in pioneer women penetrating in male-dominated aviation professions. Examples of women that had remarkable successes in aviation despite modest recognition: Amelia Earhart, Hanna Reich, Jaqueline Cochran and Jaqueline Auriol. These notable exceptions were the effect of a combination of factors: outstanding qualities, the encouragement of a political system using women images for propaganda objectives, powerful support from families and luck;
- Women and men can have different sensibilities, distinct approaches to the same problem and complementary abilities that can be of benefit to the balanced and efficient performance of many tasks. Greater participation of women in aeronautics is not only an enlargement of the workforce in numbers, but it is also an enrichment in quality and talent, which are the foundations of inventiveness and competitiveness, on which depend the continuing European leadership in an ever more competitive world with new challenges.





## KEY ACTIONS

To achieve these two objectives, PARE recommends (respectively)

1. **Making all aspects of job recruitment**, from the announcements to the interview to the benefits, **gender-equal, and try to compensate for eventual gender differences**;
2. **Taking gender abuse as seriously** as gross incompetence or major financial misconduct as concerns the consequences and leave no doubts on anyone's mind about this policy;
3. **Taking family, maternity and parenthood in consideration in the assignment of tasks and giving a suitable working environment**;
4. **Avoiding direct and reverse discrimination or bias** by judging and rewarding achievements in an even, transparent and fair way, that is not seen as gender bias;
5. **Assigning positions and tasks using the best talents and skills available in both genders** to promote creativity and efficiency;
6. **Considering the greater numbers of women in aeronautics not just as a numerical enlargement of the workforce but also as a broadening of the talent available**;
7. **Considering the lives of outstanding women, including aviators and astronauts**, not only from a biographical point of view but also recognising the challenges they had to overcome to realise their achievements.

For more information about these topics, you can access the [full chapter here](#).