Chapter 3

REMEDYING THE GENDER GAP IN A DYNAMIC SPACE SECTOR

This chapter provides a brief overview of employment in the space sector. It also presents one of the first exercises at the international level to produce indicators to evaluate the space sector from a gender perspective. It provides exploratory indicators on government space agencies, higher education institutions and the private sector as well as female tertiary education enrolment and graduation statistics in space-related fields.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

State of employment in the space sector

The space sector is home to highly skilled professionals around the world, mainly technicians, scientists and engineers, with other ancillary professions ever more represented (e.g. business, legal). The gender gap that has been strong in the sector for decades may be narrowing, pushed by corporate actions, but also by the prospects offered by new generations of trained professionals coming into the market. In order to track, compare and evaluate different initiatives, gender participation in the space sector needs to be thoroughly mapped.

The global space sector employed around 1 million persons around the world in 2017. To give orders of magnitude, around 350 000 full-time employees are active in the United States, 200 000 in the Russian Federation and around 60 000 in Europe. These are only estimates, as detailed official statistics are not available for every country.

Space-related employment includes jobs in public administrations with responsibilities for managing space activities and publicly funded research and development programmes (space agencies, space departments in civil and defence-related organisations), the core space manufacturing industry (building rockets, satellites, ground systems), direct suppliers to this industry and the wider space services sector (mainly commercial satellite telecommunications). Not included in this estimate are other major actors that play a direct or indirect role in space programmes, such as universities or military personnel.

Space manufacturing employment has been stable or increasing in most OECD countries over the last ten years (Figure 3.1). Workers tend to be highly qualified. For instance, in Japan almost 50% of the space manufacturing workforce are engaged in R&D activities (SJAC, 2018[1]). In Europe, some 34% of the workforce have university degrees (Eurospace, 2018[2])

The sector is currently undergoing significant reorganisation in different parts of the world. Chinese and Russian government agencies are seeking to consolidate their state-owned enterprises and optimise production and processes (People's Republic of China State Council, 2016[3]; Roscosmos, 2017[4]) while companies in the OECD area are restructuring their space business after multiple mergers and putting in place vertical integration of their activities. Important investments are also being made in new digitalised facilities with less need for manpower.

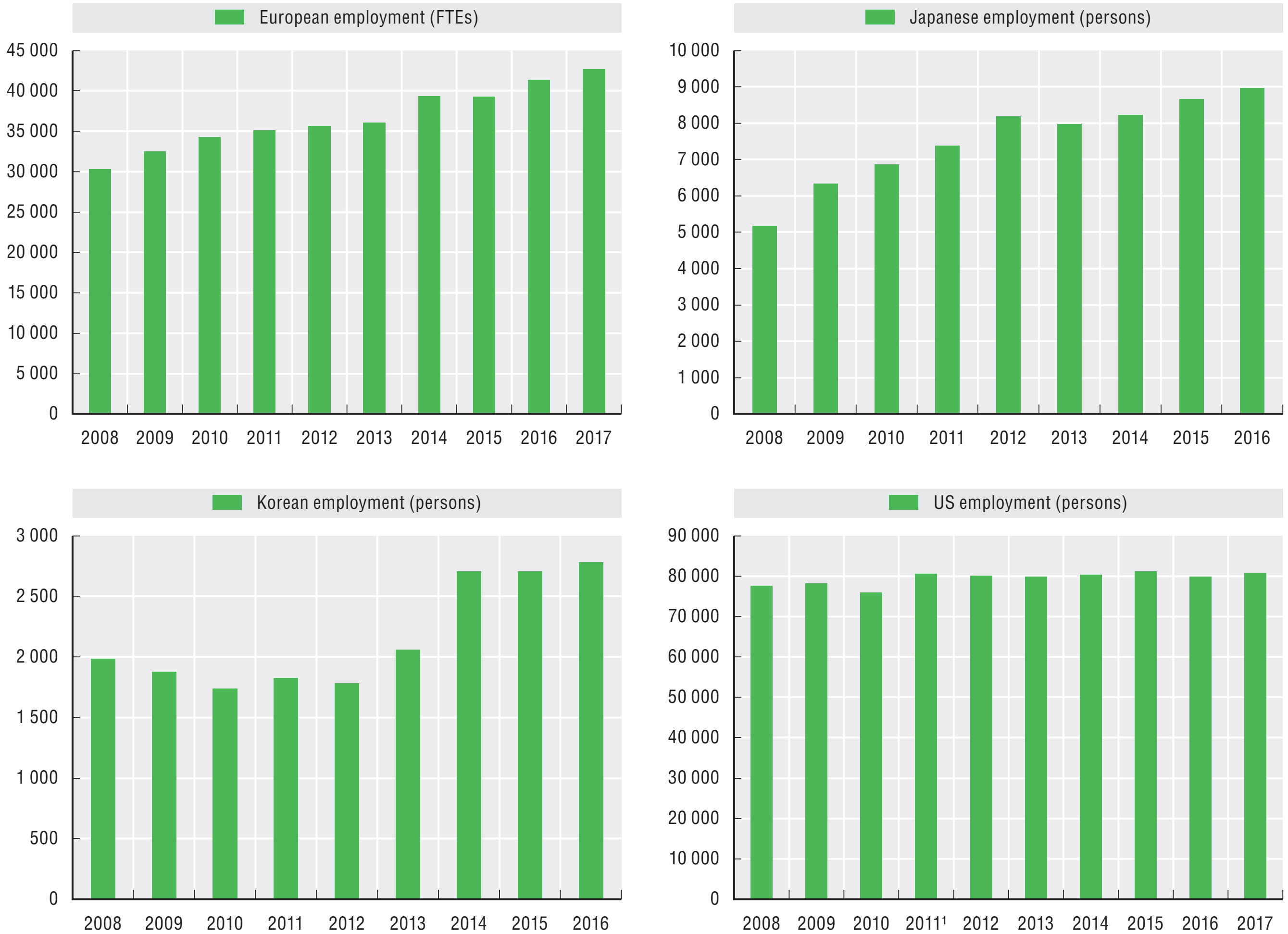
Figure 3.1 shows how space manufacturing employment has evolved in selected countries and regions with space activities in the last ten years. In Europe, space manufacturing employment has grown continuously over the period, reaching almost 43 000 full-time equivalents in 2017 (Eurospace, 2018[2]). In North America, US employment levels have remained stable over the period, with 80 000 people employed in space manufacturing in 2017, whereas the Canadian upstream sector employed almost 5 000 people in 2017 (AIA, 2018[5]; Canadian Space Agency, 2019[6]). In Asia, some 9 000 employees work in space manufacturing in Japan and almost 3 000 in Korea, for both countries a considerable increase since 2008 (SJAC, 2018[1]; KARI, 2017[7]). In the People's Republic of China (hereafter "China"), one of the countries with the largest space programme in the world, data on employment are not easily accessible. According to the Chinese National Bureau of Statistics, some 26 000 people are employed in Chinese space manufacturing in 2016 in state-owned enterprises (Chinese National Bureau of Statistics, 2017[8]). This represents a small change compared to 2008, and probably a much under-evaluated estimate, when considering the number of organisations involved in the extensive Chinese space programme.

Employment in the space sector is affected by different trends, some specific to national situations, others more general in the context of changing demographics and a growing digitalisation of the economy:

- Like for most sectors, the number of baby boomers retiring in many large OECD countries and partner economies is creating a slow generation change. This does not automatically translate into a younger workforce in space agencies or companies, but the middle management is currently changing in many organisations around the world, opening up opportunities for younger staff in some cases.
- In parallel, many emerging economies have launched space programmes, drawing in experienced experts, some often having worked abroad, but also younger qualified staff, educated onsite, and/or in large aerospace engineering and scientific universities. For example, the Mohammed Bin Rashid Space Centre in the United Arab Emirates, established in 2005, employs today some 200 people, with an average age of 28. Some 40% of its engineers and scientists are women.

Figure 3.1. Space manufacturing employment in selected OECD countries

2008-17, or latest available year



1. The US Aerospace Industries Association has changed their methodology for data from 2011 onwards.

2. Data on space-related human capital are very fragmented. Official employment statistics on the sector are often poor, lacking in both quality and detail. To some extent, the gaps can be filled by micro-data coming mainly from industry associations' surveys, which usually focus on the space manufacturing industry, while the larger services sector is not included.

- The next production revolution and digitalisation trends will have effects on employment that are yet to be fully captured in the different value chains of the space sector. While it is too early to see any general effects on space manufacturing employment, growing automation may affect future job creation. The announced number of manufacturing jobs created by some of the most recent entrants in the space sector is at this stage quite low (e.g. 200-300 jobs per facility for OneWeb). Other large industry players are adapting their digitalisation strategies all along the different value chains, to improve their processes and reduce costs in a highly competitive international environment. The impacts of automation on employment is currently leading to more research.
- The gender gap, or the under-representation of women in science and engineering occupations and management positions in public and private space organisations and companies, and the persistently low percentage of girls and women pursuing studies in space-related fields of education, has been evident for decades, as in other high-technology fields. Overall, women are still under-represented in all segments of the space sector, from government sector administration and research to private sector manufacturing and services provision, irrespective of fields. There are some differences between the public and private sector, as well as variations across industrial segments. The following sections will study this in more detail, looking at employment in government space organisations, in higher education institutions and the private sector.

Employment in government and higher education organisations

This section focusses on the employment of women in government organisations and higher education organisations in the space sector. The past decade or so has seen some positive changes occurring in many countries.

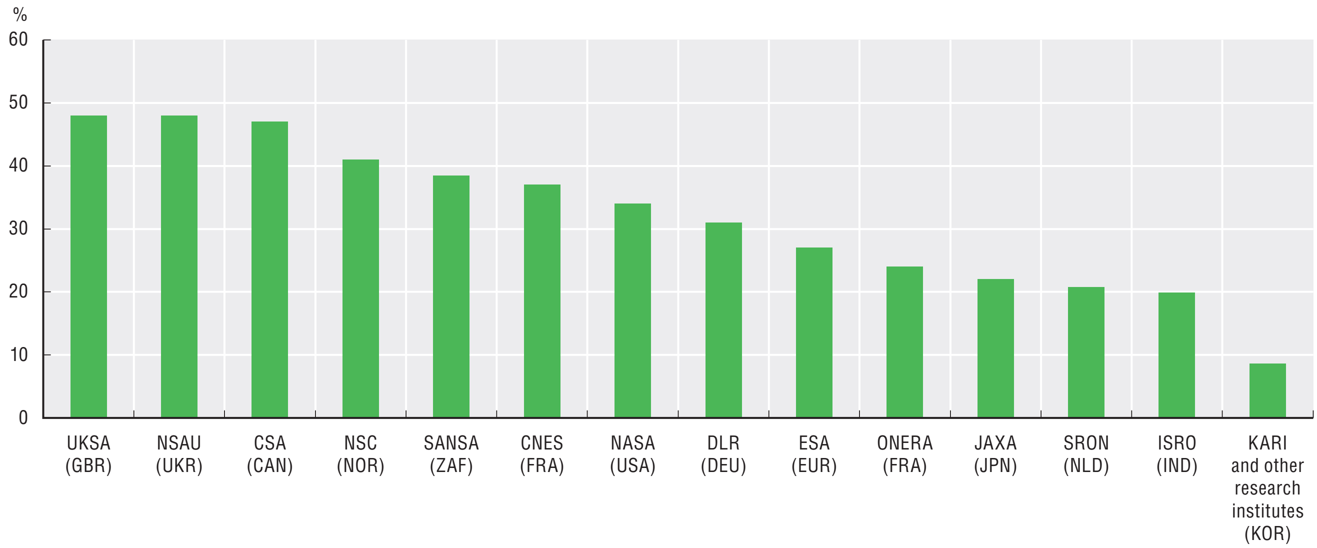
Female employment in government organisations

Female employment rates in government space organisations vary quite significantly according to the work areas of public administrations and across countries. Female employment rates tend to be higher in agencies with a more administrative and project management role, such as the UK Space Agency or the Norwegian Space Centre (NSC) and lower in agencies with large research and manufacturing activities, such as the French Centre national d'études spatiales (CNES) or the National Aeronautics and Space Administration (NASA).

One exception is the National Space Agency in Ukraine, which maintains a high share of women employees (48%) despite including in its statistics not only the agency staff, but also the dependent state-owned manufacturing enterprises, totalling almost 2 000 persons (State Space Agency of Ukraine, 2016[9]). Figure 3.2 gives an overview of the share of female employment in a selection of space agencies and space-related research organisations.

Figure 3.2. Share of female employment in selected space agencies and research organisations

2017 or most recent year



Note. Data refer to 2014 for CNES. DLR, KARI and ONERA include other research areas than space.

Across all organisations with available data, the share of women in non-administrative or non-clerical occupations, i.e. mostly science and engineering occupations, is significantly lower than the share of total employment. For instance, at the German Aerospace Center (DLR), women account for 32% of total employment and 20% of the "scientific" staff (DLR, 2018[10]). Similarly, while in 2014 women at the CNES accounted for 37% of total staff, 26% of the engineers were women (CNES, 2015[11]). Equally, at NASA, women currently account for some 34% of total employment and 23% of "science and engineering" occupations (NASA, 2018[12]). In some cases, this gap is much smaller. At the South African Space Agency (SANSA), women account for 39% of employment and 37% of engineering and scientist/researcher staff (SANSA, 2018[13]). Table 3.1 summarises some of these findings.

Table 3.1. Share of female employment in different types of occupations, selected space organisations

Latest available year

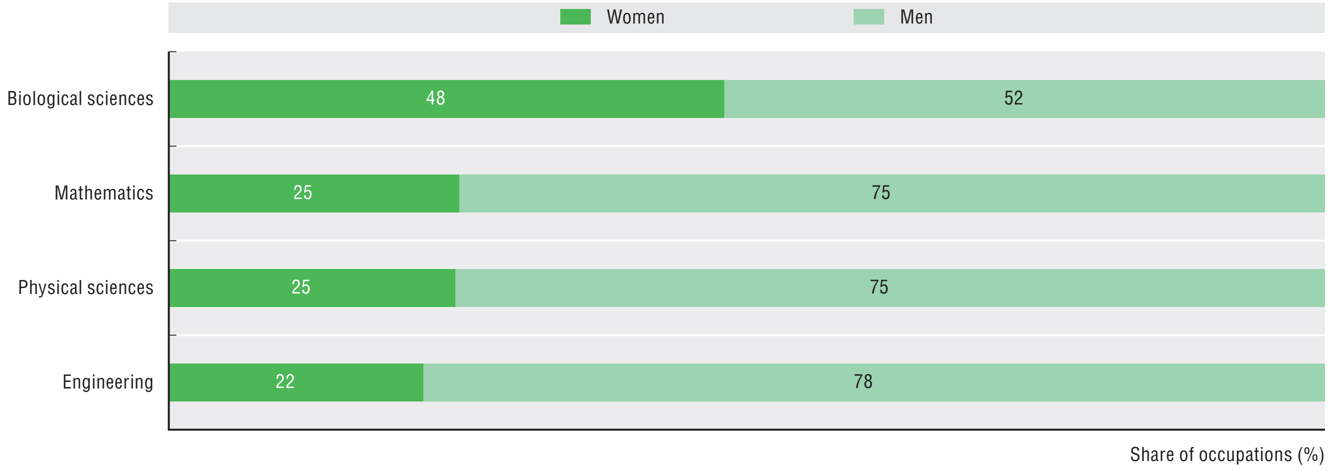
	CSA, CAN (2017)	SANSA, ZAF (2017)	CNES, FRA (2014)	NASA, USA (2017)	DLR, DEU (2017)	ESA (2016)	JAXA, JPN (2015)	ISRO, IND (2017)
Share of total staff	47%	39%	37%	34%	32%	26%	22%	20%
Share of "non-administrative and/ or non-clerical staff"[1]	23% (scientific and professional positions)	37% (engineers and scientists/ researchers)	26% (engineers)	23% (science and engineering occupations)	20% (scientific staff)	21% (executive staff, translators and "off-scale", e.g. directors, staff)	12% (researchers)	16% (science and technology occupations)

Note. 1. This category typically refers to women in science and engineering occupations, but definitions and data availability vary across organisations.

There are also significant differences in women's participation within the science and engineering employment category. At NASA, women account for almost half (48%) of staff in biological sciences, but only 22-25% of the occupations in engineering, physical sciences and mathematics (NASA, 2018[12]), as is shown in Figure 3.3.

Figure 3.3. Occupations in selected science and engineering fields at NASA, by gender

Office of Personnel Management occupational classifications, January 2018



Source: NASA (2018[12]), "Workforce Profile Cube", *Workforce Information Cubes for NASA*, *https://wicn.nssc.nasa.gov/wicn_cubes.html*.

Women also generally hold a lower share of management positions than men in government space organisations. At DLR, women occupy 19% of management positions (DLR, 2018[10]), while at the Canadian Space Agency, this share is 33%. At the European Space Agency (ESA), only 9 % of the top management are women, or some 25 out of 295 positions including division heads and above, the same share as in 2011 (ESA, 2017[14]).

Box 3.1. Women and spaceflight

Human spaceflight, the most emblematic and mediatised of all space activities, is heavily male-dominated. By the end of 2017, 560 people (depending on the definition of spaceflight, see note below Figure 3.4), including 60 women, have flown to space as test pilots, astronauts, cosmonauts, taikonauts (i.e. Chinese astronauts), payload specialists or tourists (WorldSpaceFlight, 2018[15]). This includes 46 women from the United States; four from the Russian Federation/USSR; two each from Canada, China and Japan; and one each from France, Italy, Korea and the United Kingdom, as presented in Figure 3.4. The first woman in space was the USSR cosmonaut Valentina Tereshkova in 1963.

While the United States has sent the greatest number of women into space, this still accounts for only 13% of the total number of US astronauts in orbit, whereas the proportion of women for the Russian Federation/USSR is 3%. Several countries (Canada, China, Italy, Japan, Korea and the

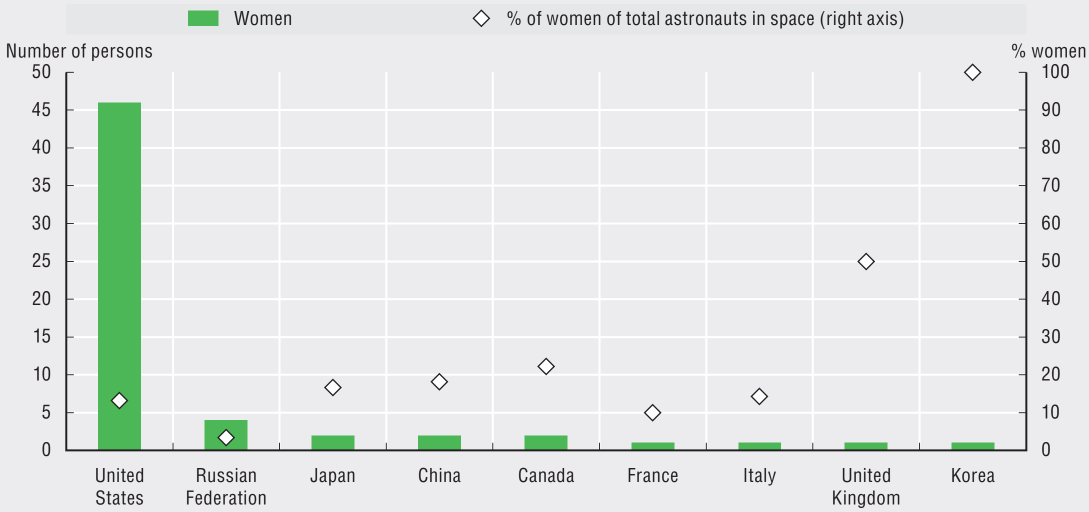
Box 3.1. Women and spaceflight *(cont.)*

United Kingdom) have a higher proportion of women. Both Korea and the United Kingdom sent a woman as their first citizen into space (Yi So-yeon, flying on Soyuz mission TMA-11 in 2008, and Helen Sharman, travelling to the Mir space station in 1991).

The number of women space travellers has increased steadily over the last decades. The two last NASA astronaut candidate classes in 2013 and 2017 had a 50-50 gender distribution (NASA, 2017[16]).

Figure 3.4. Women in space

Number and share of women astronauts by country, as of April 2018



Note: This list includes persons who have crossed the von Karman line at 100 kilometres altitude.

Source: Adapted from WorldSpaceFlight (2018[15]), *Astronaut/Cosmonaut Statistics*, *https://www.worldspaceflight.com/bios/stats1.php*.

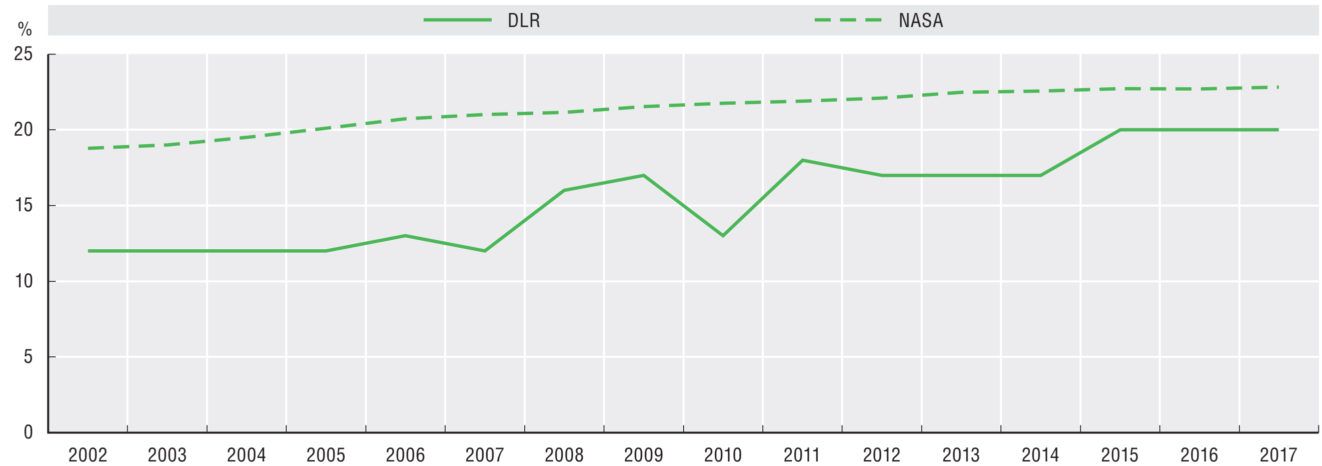
Most of the organisations studied in this section have seen an increase in the share of female employment in the last decade and, where data are available, in the share of women science and engineering staff. At NASA, the share of women in science and engineering occupations increased by four percentage points, from 19% to 23%, between 2002 and 2018, but growth was faster at the beginning of the period (NASA, 2017[17]). Meanwhile, the share of women working as scientists at the DLR increased from 12% to 20% during the same period (DLR, 2018[10]), as illustrated in Figure 3.5.

Employment of women in higher education institutions in space-related fields

This section looks at women employed in higher education institutions engaged in teaching, holding an academic rank, and/or engaged in R&D activities as researchers or technicians in space-related fields of education, such as aerospace engineering, geosciences or astronomy. Country examples are included from France, Korea and the United States, which are some of the few countries with readily available data on this topic.

As already observed in the previous section on government space organisations, women are under-represented among the academic staff and researchers, but with great variation across disciplines and countries. In Korea, higher education institutions and individual university departments report employment and gender data in the annual Korean *Space Industry Survey*. The institutions are divided into two categories: "space" (e.g. aerospace engineering and IT systems, astronomy and space sciences) and "space-related" (departments of physics, mechanical engineering, electric engineering, etc.) In 2016, women in the "space" institutions and departments accounted for some 9% of the academic staff in the reporting institutions (KARI, 2017[7]). Only 6 out of 127 professors (5%) were women, but the share among postdoctoral fellows was much higher (37%, 7 out of 19), which could indicate future higher female participation in the sector.

Figure 3.5. Share of women in science and engineering fields at DLR and NASA

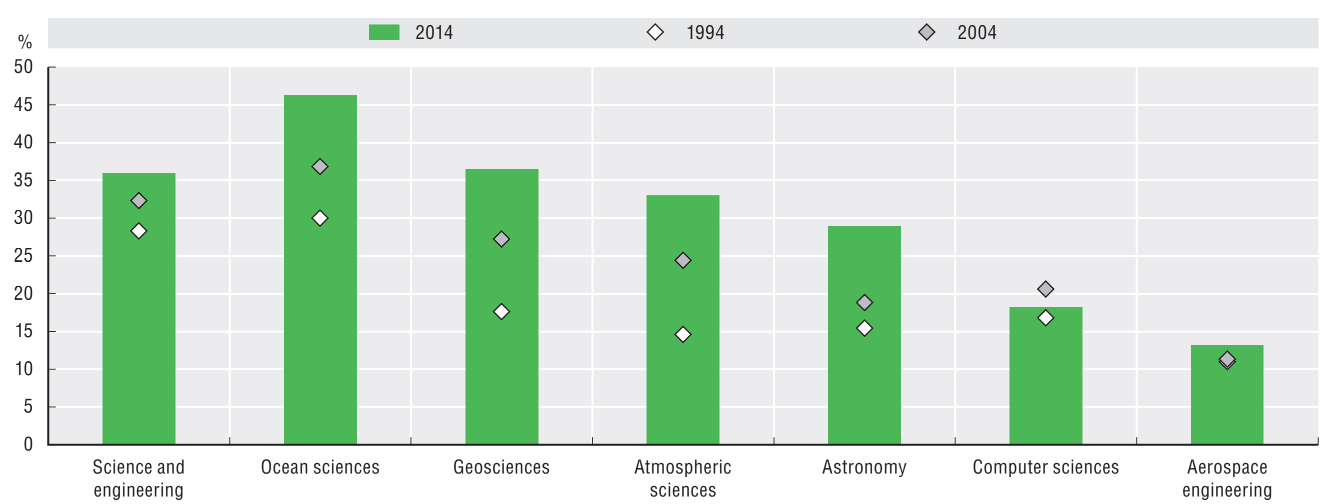


Note: DLR's and NASA's occupation categories are not directly comparable. DLR's activities also include other research areas than space.

In France, space-related academic research is carried out both at universities and engineering schools. One of the most important research actors is the CNRS (National Centre for Scientific Research), whose Institute for Earth Sciences and Astronomy (Institut national des sciences de l'univers, INSU) employs more than 2 000 people at different universities and laboratories across France (CNRS, 2018[18]). In 2016, women accounted for 34% of INSU's permanent research personnel, 29.6% of researchers (*chercheuses*) and 37% of technicians (*ingénieures* and *techniciennes*) (CNRS, 2018[18]). This is a small improvement compared with 2009 (the earliest comparable year following a reorganisation of the CNRS institutes), with women accounting for almost 33% of the research staff, 27.5% of researchers and 36% of technicians (CNRS, 2010[19]).

The United States has highly granular data on specific fields of education and several decades of time series on the share of women in postdoctoral fellowships in academic institutions. Figure 3.6 shows how several space-related fields of education are increasingly populated by women scientists. In 2014, women accounted for more than a third of postdoctoral fellows in ocean sciences (46%), geosciences (37%) and atmospheric sciences (33%), a significant growth since 1994. In contrast, women accounted for only 13% of fellows in aerospace engineering in 2014, a 2 percentage point increase since 1994, and 17% in computer sciences, the same share as in 1994 and a decrease compared with 2004 (US National Science Foundation, 2017[20]).

Figure 3.6. Female share of postdoctoral fellowships by field, United States



Source: US National Science Foundation (2017[20]) *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017, http://www.nsf.gov/statistics/wmpd/* and equivalent reports for previous years.

Gender diversity in the space industry

In the private sector, gender disparity levels vary significantly across different space industry segments. There is a big gender gap in space manufacturing, whereas downstream applications and services tend to have a higher share of women employees.

Available data for selected OECD countries show that female employment in space (and/or aerospace) manufacturing hovers around 20% in Europe and the United States, with a lower rate of employment in science and engineering occupations (e.g. science and engineering professionals and technicians). Meanwhile, in the Russian Federation, the female employment rate in the space manufacturing sector ("rocket and space industry") in 2016 was 46% (Roscosmos, 2017[4]). Similarly, as already noted above, 48% women were employed in the space sector in Ukraine in 2016, including government-owned enterprises and the space agency, (State Space Agency of Ukraine, 2016[9]).

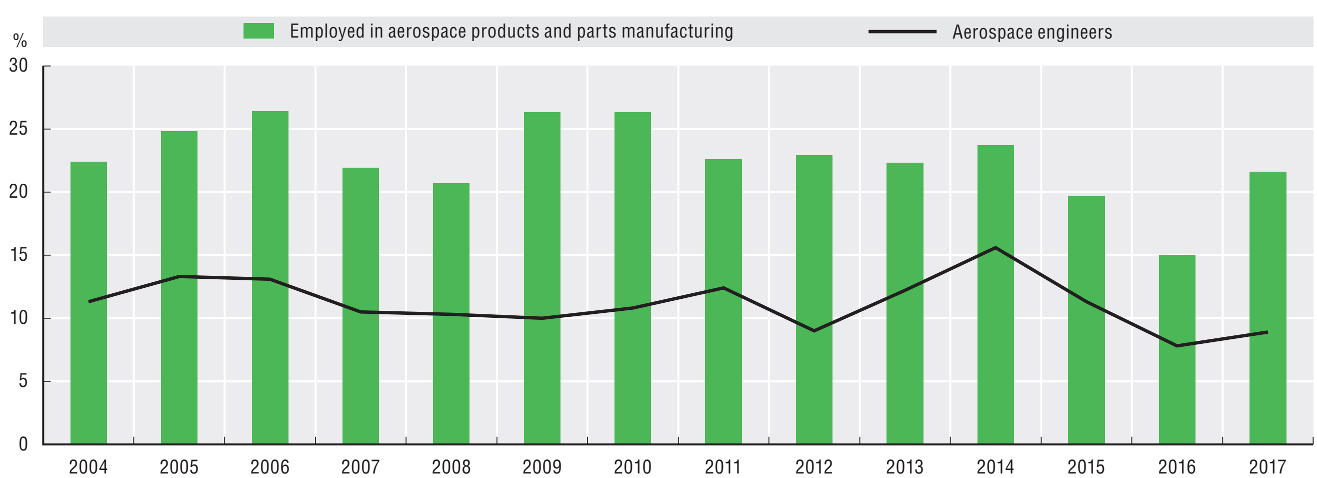
The latest data for Europe for 2016 show that women accounted for 21% of employment in space manufacturing, and 15% of highly educated staff (four to five years and more of tertiary education (Eurospace, 2017[21]). There has been little or no evolution since 2012 (Eurospace, 2013[22]).

Aerospace workforce statistics in North America show similar findings. Figure 3.7 shows that in 2017 women accounted for 22% of the aerospace manufacturing workforce (data not available for space manufacturing), while women's share of the total number of aerospace engineers was much lower, at 9% (US Bureau of Labor Statistics, 2018[23]; US Bureau of Labor Statistics, 2017[24]). Women's share of employment in US aerospace manufacturing has evolved very little since the early 2000s. The share of women aerospace engineers has also remained stable, although slightly declining in the last years (US Bureau of Labor Statistics, 2017[24]). As an illustration, at Space Exploration Technologies (SpaceX), the female employment rate is 14%, according to a Silicon Valley compensation survey (PayScale, 2018[25]).

In Canada, women accounted for about 20% of the workforce in aerospace manufacturing and 12% of aerospace engineers in 2016 (Statistics Canada, 2018[26]).

Figure 3.7. Female employment rates in US aerospace manufacturing

Share of total employment



Sources: US Bureau of Labor Statistics (2018[23]), "Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity", *Labor Force Statistics from the Current Population Survey*, *https://www.bls.gov/cps/cpsaat18.htm, US Bureau of Labour Statistics* (2017[24]), "Women in the labor force: A databook", Bureau of Labor Statistics, *https://www.bls.gov/opub/reports/womens-databook/2017/home.htm.*

In the services and geosciences-oriented downstream segments, female participation tends to be higher. In Korea, women's share of employment is higher in downstream industries than in space manufacturing. Women accounted for 20% of employment in earth observation and 16% in both telecom and satellite navigation in 2016, compared to 5% in satellite production (KARI, 2017[7]). Recent data from the European earth observation sector indicate that some 33% of employees are women (EARSC, 2017[27]).

It should be noted that the growing importance of information and communication technologies (ICT) for data processing and analysis may negatively impact female employment in this segment, as ICT remains a male-dominated field in the OECD. For example, in 2015 women accounted for 19-20% of tertiary ICT graduates in the OECD (median and average values) (OECD, 2017$_{[28]}$).

Preparing the next space workforce

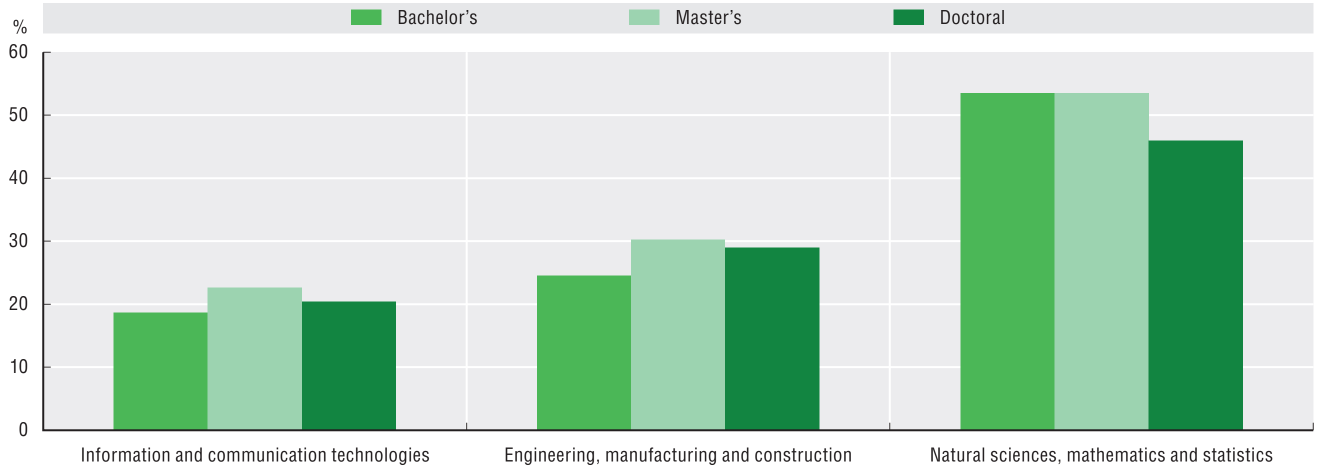
This section looks at female tertiary education enrolment and graduation statistics in space-related fields of education such as aerospace engineering, earth sciences and astronomy. Tertiary education data are key to understanding and predicting short- and medium-term employment trends and to evaluating the effect of school and university-level policy initiatives to address the space sector gender gap.

Before looking specifically at space-relevant fields of education, it is useful to get a general overview of the distribution of women graduates in some of the broader science and technology fields that are of relevance in the OECD.

Figure 3.8 shows the OECD average for the distribution of women tertiary graduates in ICT; engineering, manufacturing and construction; and natural sciences, mathematics and statistics in 2015, and how this share evolves according to the levels of education. In natural sciences, mathematics and statistics, women accounted for more than 50% of bachelor's and master's graduates, and 46% of doctoral graduates (OECD, 2017$_{[28]}$). In ICT, women accounted for 19% of bachelor's, 23% of master's and 20% of doctoral graduates. In engineering, manufacturing and construction, women accounted for 25% of bachelor's, 30% of master's and 29% of doctoral graduates (OECD, 2017$_{[28]}$). While the share of women is considerably lower in engineering and ICT than in natural sciences, the share remains stable when moving higher up the educational ladder, i.e. master's and, in particular, doctoral graduates.

Figure 3.8. OECD average distribution of women graduates in selected fields of tertiary education, 2015

Share of women graduates in bachelor's, master's and doctoral or equivalent degrees (ISCED 2011 Levels 6, 7 and 8)



Note: OECD averages calculated without data from Greece. No data for Japan in information and communication technologies. No data for the Netherlands for doctoral graduates.

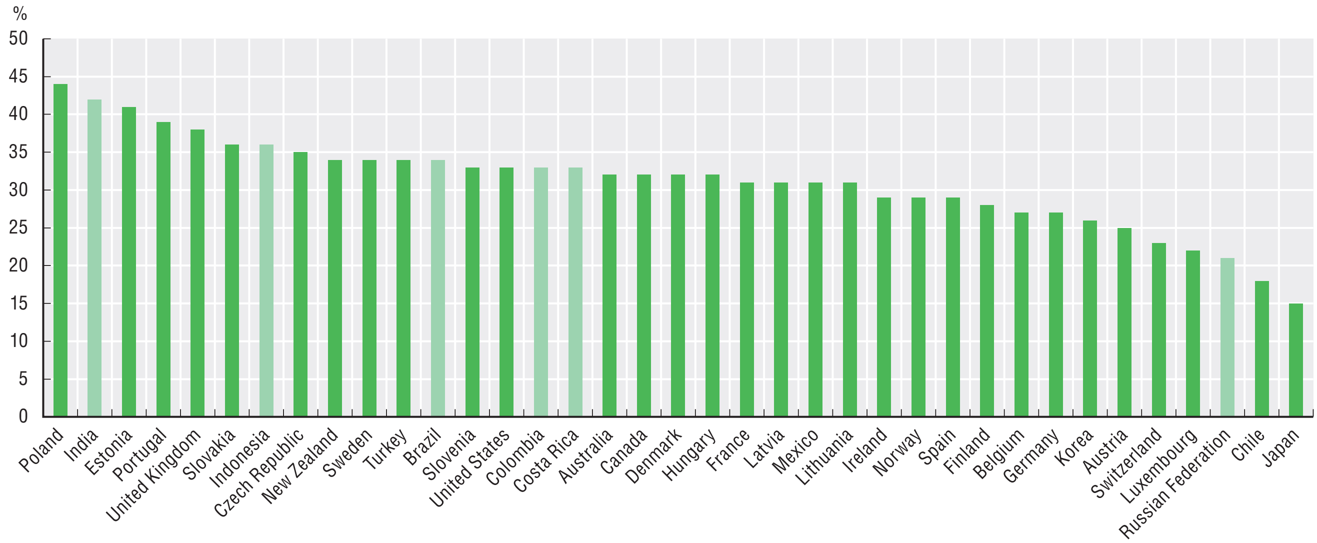
Source: OECD (2017$_{[28]}$), *Education at a Glance 2017: OECD Indicators*, *http://dx.doi.org/10.1787/eag-2017-en*.

These averages hide considerable country differences. Figure 3.9 shows the distribution of women graduates in science, technology, engineering and mathematics (STEM) in 2015 for OECD countries and selected partner economies for total tertiary education (bachelor's, master's and doctoral graduates). In three countries (Poland, India and Estonia) women accounted for more than 40% of STEM graduates, while in two countries (Chile and Japan), they accounted for less than 20% of STEM graduates (OECD, 2017$_{[28]}$).

Examples from Korea and the United States provide some country insights about the number and share of women entrants and graduates in space-related tertiary fields of education.

Figure 3.9. Distribution of women graduates in science, technology, engineering and mathematics, OECD countries and selected partner economies

Share of women tertiary graduates in 2015, total tertiary education (ISCED 2011 Levels 5-8)



Note: OECD averages calculated without data from Greece, Israel, Italy and the Netherlands. No data for Japan in information and communication technologies.

Source: OECD (2017[28]), *Education at a Glance 2017: OECD Indicators*, *http://dx.doi.org/10.1787/eag-2017-en*.

In Korea, data from the national *Space Industry Survey* record the number of enrolled male and female students in "space" fields of education, mainly aerospace engineering and space science and "space-related" fields in participating institutions (KARI, 2017[7]). In 2016, women accounted for 17% of both doctoral and master's students in "space" fields of education in Korea (KARI, 2017[7]). Graduation data from the United States equally show relatively low female participation rates in aerospace engineering and astronomy, but there are some interesting long-term trends (Figure 3.10). On the one hand, the share of women doctoral graduates increased in all the studied space-relevant education fields in the two decades between 1994 and 2014, indeed, in aerospace engineering, the share of women doctoral graduates tripled, from 5% to 16% (US National Science Foundation, 2017[20]). In ocean sciences, there is now a majority of women among both master's and doctoral graduates.

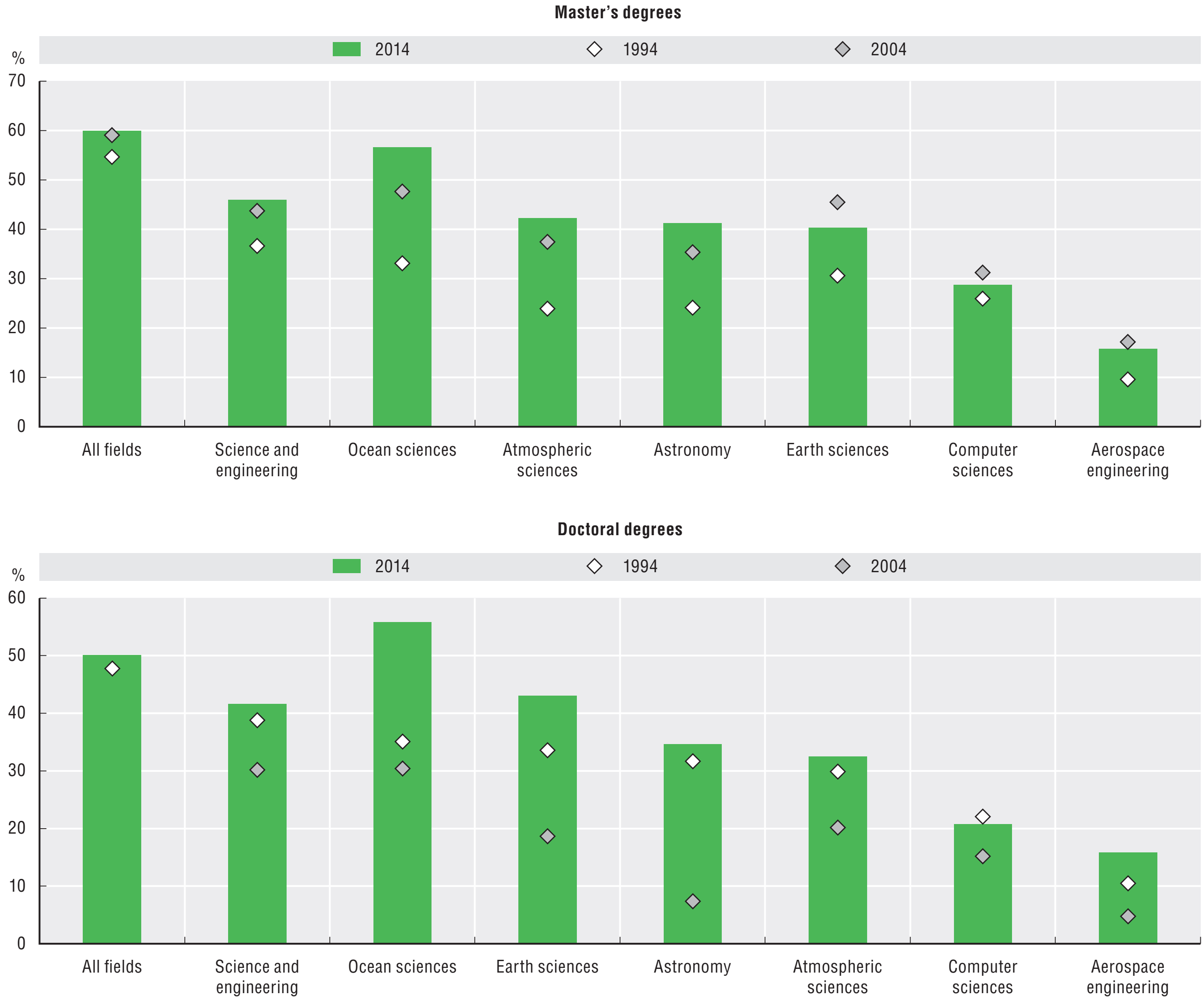
On the other hand, the rapid growth in the share of women master's graduates in aerospace engineering between 1994 and 2004 has flattened in the last decade and accounted for 16% of all graduates in 2014, well below the average for science and engineering as a whole. In computer sciences, women accounted for 29% of master's graduates and 21% of doctoral graduates in 2014, a small decrease compared with 2004, and only a small increase compared with 1994 (26% and 19%, respectively) (US National Science Foundation, 2017[20]).

Reducing the gender gap in the space sector is increasingly seen as an opportunity to bring in new talents and innovators. It has been a priority at government, agency and company level for more than a decade, with long-established diversity policies and equal opportunity offices in several space agencies (e.g. NASA Diversity and Equal Opportunities Strategic Implementation Plan (NASA, 2016[29]), the 2002 ESA Equal Opportunities and Diversity Policy (ESA, 2005[30]). In the private sector, companies such as Airbus, Thales and Safran are increasingly proactive and have set recruitment targets for women for the next five years (33% of new recruits at Airbus and 40% of all new recruitments and 30% of managers by 2023) (Dubertrand, 2017[31]).

This issue is also receiving increasing high-level political attention. In 2017, UNOOSA and UN Women arranged Space for Women, a three-day expert workshop, in connection with the UN COPUOS thematic priority "capacity-building for the 21th century" for the implementation of UNISPACE +50. The main topics of discussion were STEM education and gender, women's involvement in the space sector, with a particular focus on developing countries, and the role of space technologies in fulfilling the Sustainable Development Goal on gender equality (UNOOSA, 2017[32]).

Figure 3.10. Women graduates in space-related fields of education, United States

Share of master's and doctoral degrees awarded to women



Source: US National Science Foundation (2017[20]) *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017, http://www.nsf.gov/statistics/wmpd/* and equivalent reports from previous years.

Public and private space organisations tend to concentrate their efforts in the following broad areas of action, separately, or in accordance with existing government frameworks on gender equality and STEM education.

- Increase awareness and engage decision-makers at a high political level (conferences, workshops)
- Address gender bias at an early age and inspire girls in primary and secondary education (e.g. present role models and stimulate interest; educate teachers)
- Attract women to space-related higher education (e.g. make available dedicated scholarships and grants; provide guidance and mentoring)
- Promote gender equality in a professional setting (e.g. recruitment objectives at entry level and for management positions; prevent gender bias; mentoring schemes and networks; work-life balance schemes)
- Promote gender equality in entrepreneurship and innovation activities.

Selected initiatives are summarised in Table 3.2.

Table 3.2. Selected policy instruments and organisations promoting gender equality

Policy objective/audience	Initiatives	Selected activities and organisations
Increase awareness and engage decision-makers at a high political level	High-level conferences and workshops	Space For Women (UNOOSA/UN Women); 3G IDEA (International Astronautical Federation)
	Gender and diversity awards	Diversity Excellence Award (International Astronautical Federation)
Address gender bias early and inspire girls in primary and secondary education	Female role models in school visits, printed and online material	Gender mainstreaming in communications materials and publications (NASA); *Space Girls Space Women* photo exhibition and website (ESA); #ENSEMBLE photo exhibition (Airbus); Women@NASA website (NASA); NASA/Lego NASA women figurines, NASA/American Girl astronaut doll
	Teacher training	BEST (Beginning Engineering Science Technology Educators) with emphasis on underserved / underrepresented student populations (NASA); European Space Education Resource Office (ESA)
	Facility tours	Speed networking events between local school girls and women engineers (Thales UK); ELLES du FUTUR (Airbus and Toulouse school district); Girls Day (DLR), visits to Le Bourget with mentors (Elles bougent)
	Partnerships with youth organisations	NASA and Boys and Girls Clubs of America Partnerships; NASA/Girl Scouts Partnerships
	Girl camps	Summer Institute in Science, Technology, Engineering and Research (SISTER) (NASA Goddard)
	Social media content for girls	NASA Hidden Figures Tour on Google Expeditions app (NASA); NASA Boys and Girls (virtual mentoring through Skype or Google chat by NASA employees); Aspire2Inspire (career information website, NASA)
Attract women to space-related higher education	Scholarships	Scholarships (Women in Aerospace Foundation); Amelia Earhart fellowships for women aerospace doctoral degrees (Zonta International Foundation)
	Mentorships, networks	Brooke Owens Fellowship; career mentor directory for aeronatics and space (Elles bougent), Women in Aerospace
	Dedicated internships	Integrated Recruiting Internships (NASA); diversity objectives for scholarships (NASA); Brooke Owens Fellowship
Promote gender equality in a professional setting	Addressing gender bias in managers and employees	Gender bias training sessions (NASA; JAXA ; etc.) Increasing female participation on interview panels (ESA)
	Recruitment and career progression policies	Career mentoring schemes (JAXA, NASA, DLR) career re-entry schemes (JAXA, DLR)
	Work-life balance schemes	Child care facilities (DLR, ESA, JAXA, NASA) Child care and long-term care leave (JAXA, DLR, ESA) Teleworking (JAXA, DLR, NASA) Flexitime (JAXA, DLR, NASA) Career re-entry procedures (JAXA, DLR)
	Professional networks	Women in Aerospace, Elles bougent
Promote gender equality in entrepreneurship and innovation	Research funding targets	JAXA (double the competitive research funding obtained by women researchers)
	Scientific output targets	JAXA (increase the number of submitted articles and patents by 1.5 times)
	Public procurement policies	Special attention given to women-owned small businesses in the procurement of R&D and other products/services (US federal agency procurement policy, including NASA)

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