



The State of Women in the Israeli Space Ecosystem Data, global comparison and insights

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Conducted by Inbal Orpaz and Avi Blasberger



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Introduction

Women in space exploration have made significant progress in recent years. Christina Koch has been assigned as Mission Specialist I for NASA's Artemis II mission, and she will be the first woman to participate in a lunar mission. In May 2023, Rayyanah Barnawi became the first Saudi female astronaut to take part in Axiom Mission 2 as a mission specialist. Women have been pivotal since the early days of spaceflight, as highlighted in the film "Hidden Figures".

Despite these achievements, women remain a minority in the space ecosystem. According to our findings, women constitute **25% or less of the space industry** workforce in Israel. The gender gap begins as early as high school and widens further in spacerelated companies, particularly startups.

This study examines the status of women in the Israeli space ecosystem, compares it with countries having established space ecosystems, and concludes with recommendations.

NASAs first six women astronauts pose with a mockup of a personal rescue enclosure (PRE) or "rescue ball" in the crew systems laboratory at the Johnson Space Center @ NASA CC0 Images

Study Framework Overview

Goals

This study examines the representation of women in the Israeli space ecosystem, identifying points where involvement decreases from an early age. Our aim is to understand these patterns and explore improvement opportunities.

Methodology

We employed a data-driven, quantitative approach using various sources including national databases and industry reports. Interviews with industry leaders enriched our analysis and conclusions part.

Structure

The research includes analysis of Israel's space ecosystem from schools to startups, a global comparison, and discussion part offering practical suggestions.

Challenges

Gathering data was challenging due to limited information and the vague definition of "space industry." We addressed this by directly reaching out to a broad array of companies.

Timeline

Timeline: Started in Q1 2023 and finished in Q2 2024, the project was slightly delayed due to the conflict in our region.

> Dr. Mae C. Jemison, First African-American Woman in Space @ NASA CCO Images

Main Findings

Women are a minority in the Israeli space industry - 25% or less of the space workforce The gender disparity in the space sector originates at an early age, with girls less frequently pursuing STEM subjects

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A significant issue is the underrepresentation of women in executive and leadership roles within space ecosystem Gender disparity in the Israeli space ecosystem is similar to the Israeli tech sector and to other space ecosystems in developed countries

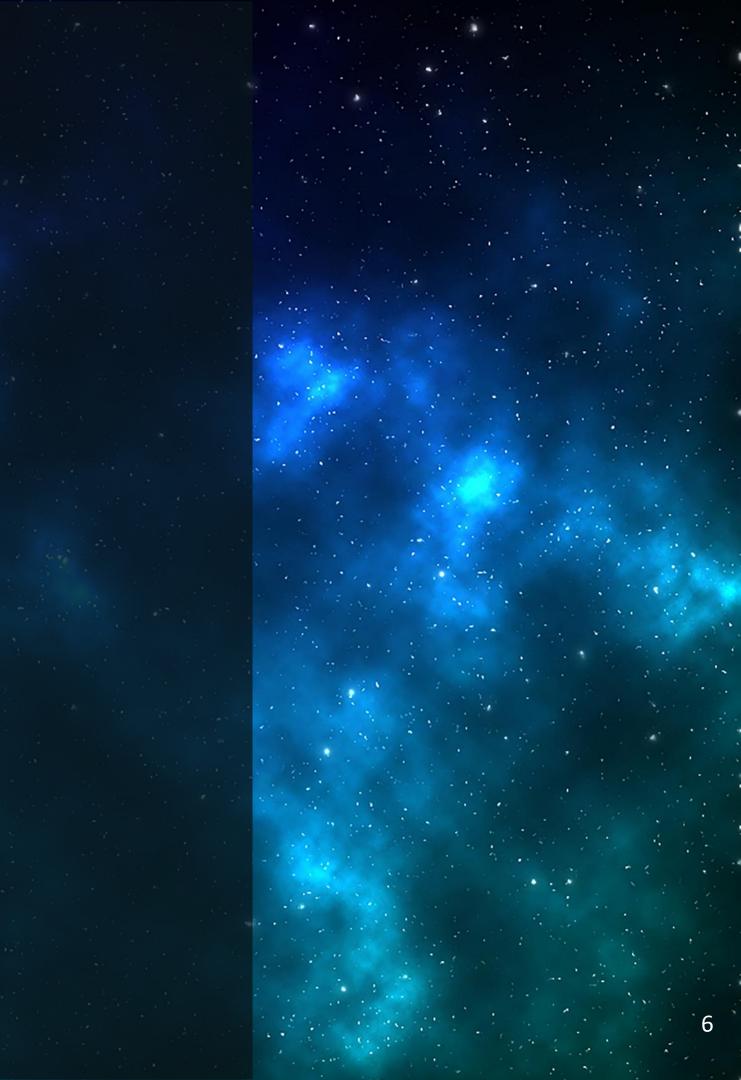
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Women in the Israeli Space Ecosystem



Background

The importance of the Israeli space ecosystem: Despite its modest size, Israel has developed a notable space ecosystem over decades, driven initially by security needs. Israel's space sector specializes in communication and earth observation satellites, developed by defense technology companies in both the private and public sectors. Many of these companies work closely with the Israeli security forces, including the IDF. In recent years, Israeli startups joined the New Space trend and have developed space-related technologies in various fields. The Israeli space industry plays a crucial role in advancing the nation's tech industry by fostering the development of cutting-edge technologies.

Women's Stairway to Space: As a field deeply rooted in scientific research, the space industry workforce requires specialized training, typically beginning at an early age with STEM-related studies. Once women enter the space industry, opportunities for promotion to leadership positions or to start their own companies become available.



Israel's Beresheet lunar lander "selfie" photo with the moon surface. credit: SpaceIL In this section of the publication, we examine the statistics outlining the journey of Israeli women into the space sector. We will present data on the initial phase of their career, prior to joining the space industry, and then explore their progression within companies across various roles and positions.

Israeli Innovation Crossroads: Where Tech Sector and Space Industry Meet In many respects, the space industry functions as a sub-sector within the broader Israeli tech sector. Initially, defense technology companies, where space-related R&D often takes place, were pivotal in establishing this sector. Over the last decade, software (services) companies have become the growth engine of Israel's tech ecosystem. Both the tech sector and the space industry depend heavily on advanced research and development and primarily export their products to competitive global markets. These shared dynamics lead to common challenges, particularly in gender equality. In this publication, we will compare the gender gap in both the space industry and the tech sector to identify lessons that could help improve and address these disparities.



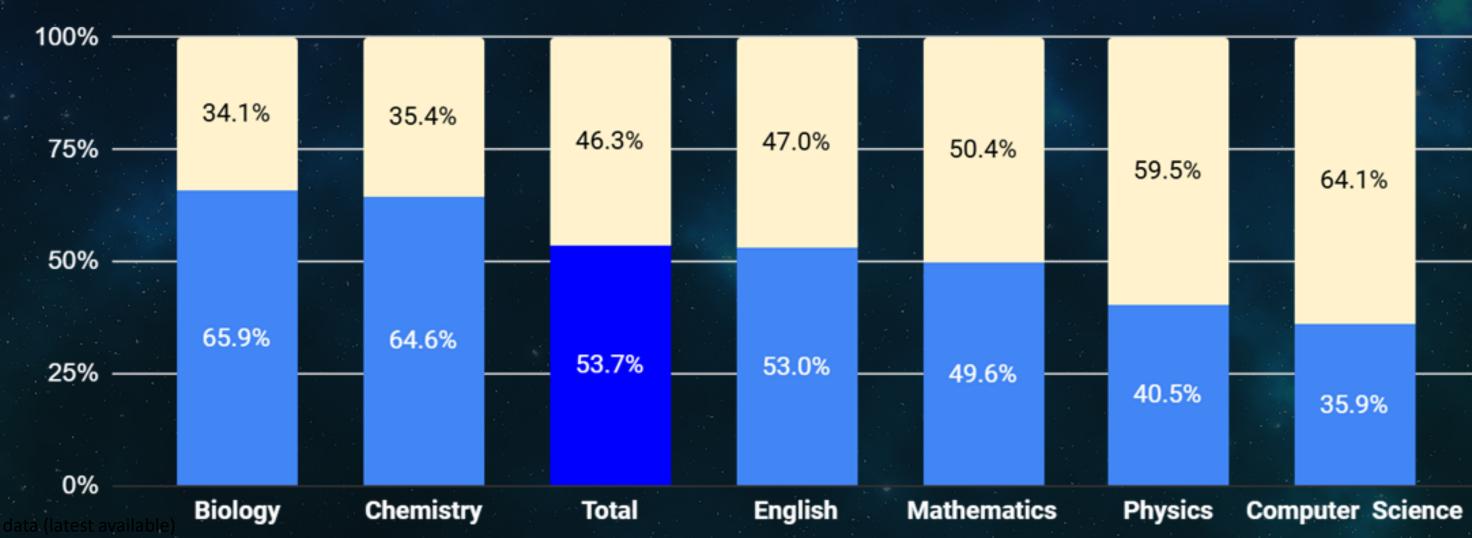
Michal Pushkov and Sahar Peretz ,SpaceIL engineer and The Parasol Foundation Women in SpaceIL fellows, Sapir Berkman SpaceIL engineer(in the center). Credit :@SpaceIL \\ Women in Space Industry in Israel

Gender Disparities in High School Final Exams

This section presents an analysis gender disparities in Israeli high school final exams (Bagrut Exam) across subjects like Mathematics and Computer Science. It highlights trends in subject choices, providing early indicators of gender imbalances that could extend into higher education and professional fields in the space industry.

Percentages of examinees at the level of 5 study units, out of all examinees by subject and gender

Source: SpaceIL adaptation to the Israeli Central Bureau of Statistics (CBS) data



- % of boys out of all examinees 🛛 🗧 % of girls out of all examinees

\\ Women in Space Industry in Israel - Gender Disparities in High School Final Exams

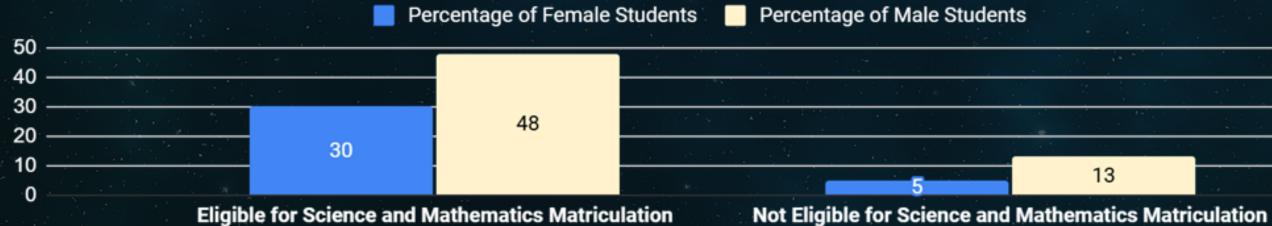
The data shows that female students, who represent more than half of the examinees at the 5-unit level of the Bagrut final exams, are underrepresented in Physics and Computer Science, at 40.5% and 35.9% respectively.

There is gender equality in Mathematics and English, while females are the majority of examinees in Biology and Chemistry. This data highlights that gender disparities in subjects closely connected to the space industry, such as Physics and Computer Science, begin as early as high school.

According to data previously published by the Israeli Central Bureau of Statistics (CBS), 30% of high school female students eligible for a matriculation certificate in science-oriented subjects and mathematics enroll in an academic STEM degree program, in contrast to 48% of their male counterparts. Among those not eligible for a science-oriented matriculation certificate, merely 5% of females and 13% of males choose to study in STEM fields (Sources: 1, 2).

This data illustrates how the academic decisions of high school students, both male and female, determine their future educational and professional paths.

Percentage of High School Students Pursuing STEM Degrees by Gender and Eligibility Source: SpaceIL adaptation to CBS data



Military Service as a Gateway to Space Career

Military service, mandatory for Israeli citizens by law, may impact one's career course. In this way, individuals who gain relevant professional experience during their military service may leverage it to pursue a career in that field. As previously mentioned, the Israeli space industry is closely connected to defense needs. In March 2024, the IDF officially announced the establishment of a new Space Directorate Unit that would focus on satellite projects (Source).

Even prior to this, the IDF has operated a satellite unit within the 9900 VISINT Intelligence Directorate, where soldiers operated earth observatory satellites and worked closely with space industry companies. Often this role is a gateway to a space career.

Public information about gender equality in these professions is limited. However, an IDF website article about the satellite unit argues that **the majority of satellite operators are women** (Source). According to data shared with us for the purpose of this publication, more than 70% of those who currently serve as satellite operators in the IDF are women.

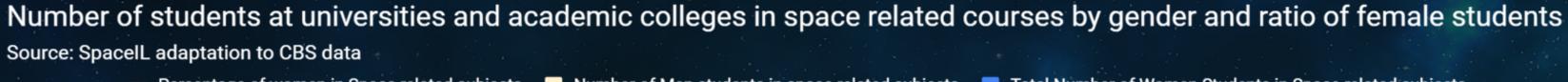
Having said that, the situation in other technological development professions within the IDF differs. According to the latest available data, in 2019 only 23% of those serving mandatory military service in core technology roles—including development and cyber—were women. The ratio of women soldiers serving in cyber roles in 2019 was just 13%.

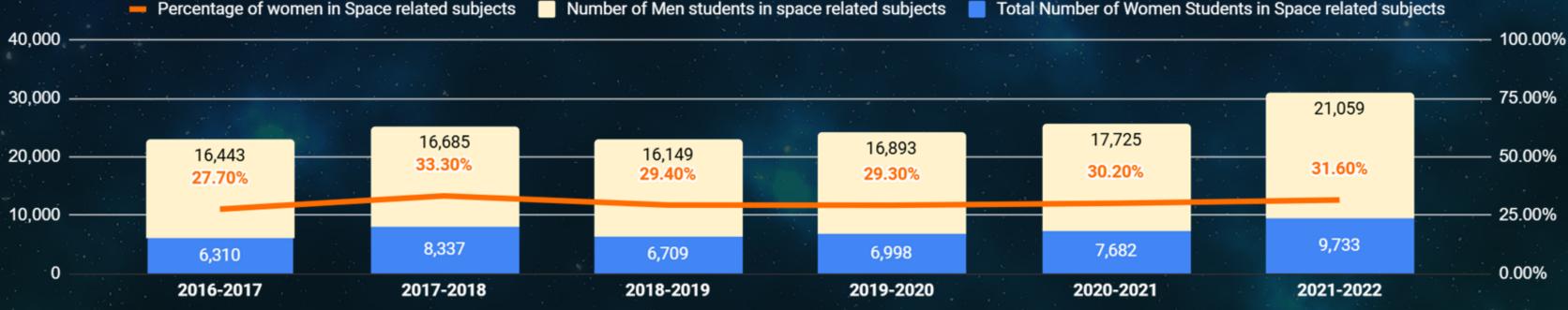
These figures eventually impact the number of women in tech careers (Source).



Academy: Women in Space-Related Subjects

In this section, we examine the academic choices of women in disciplines relevant to the space industry. We have compiled a list of subjects* essential for space careers, which include a range of scientific and engineering disciplines crucial for supporting the technology and research driving the space industry forward, as well as business training. As a knowledge-intensive industry, the space sector requires specialized training and education in these areas to prepare a workforce capable of advancing these cutting-edge fields.





The list of subjects include: Mathematics and natural sciences teaching; Business administration; Business administration-Entrepreneurship; Mathematics; Mathematics computer sciences; Computer sciences; Chemistry; Physics; Physics - Mathematics; Geophysics; Earth sciences; Sciences - general; Mechanical engineering; Electrical engineering; Computer engineering -electrical; Computer engineering - computer sciences; Communication systems engineering; Data engineering; Aeronautical engineering; Chemical engineering

Number of Men students in space related subjects 🛛 🗖 Total Number of Women Students in Space related subjects

\\ Women in Space Industry in Israel - Academy

2021-2022 **31.6% 9,733** Women studying space-related subjects





increase in the number of women studying space-related subjects over five years.

Although there was significant growth in the total number of female students, their overall percentage representation increased only slightly from 27.7% in 2016-2017 to 31.6% in 2021-2022. This modest increase in representation is due to the simultaneous growth in the number of male students.

\\ Women in Space Industry in Israel - Academy

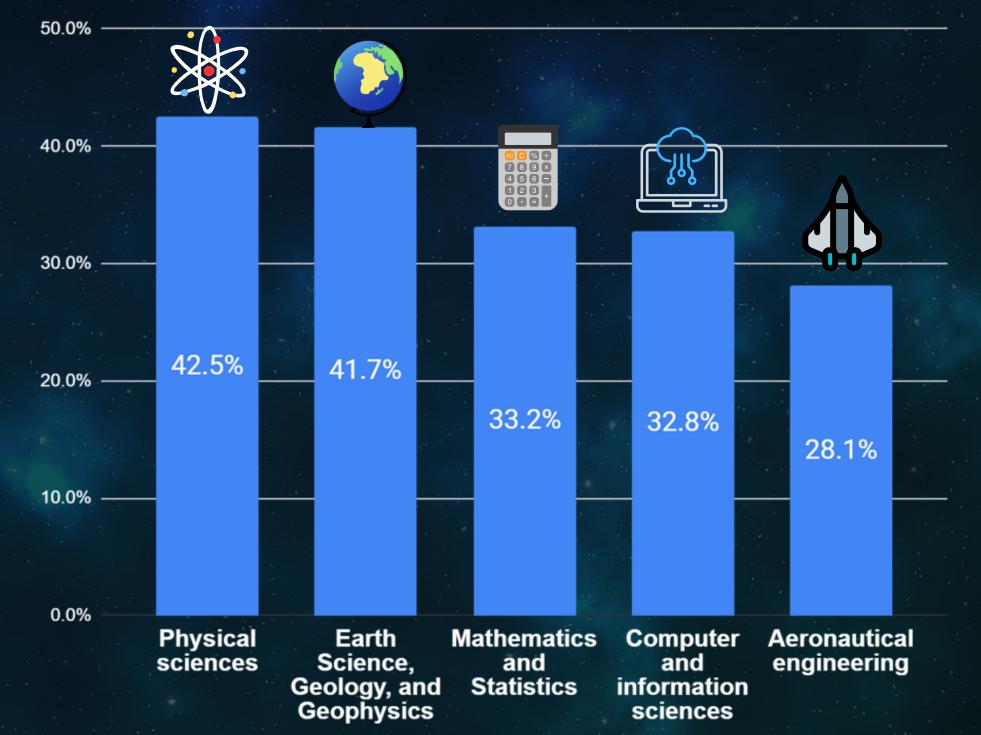
When examining the representation of women in specific fields for the 2021-2022 academic year, it appears that women are most highly represented in the Physical Sciences, where they constitute 42.5% of first degree university students. Similarly, Earth Science, Geology, and Geophysics also show a substantial female presence at 41.7%. These numbers are quite similar to the representation seen in high school 5-unit exams.

However, there is a notable decrease in the percentage of women in Mathematics and Statistics, and Computer and Information Sciences, with women comprising 33.2% and 32.8% of students, respectively.

The lowest representation is observed in Aeronautical Engineering, where women make up only 28.1% of the student enrollment.

Percentage of Women in Space-Related Subjects Among First Degree University Students (2021-2022)





Source: SpacelL adaptation to CBS data

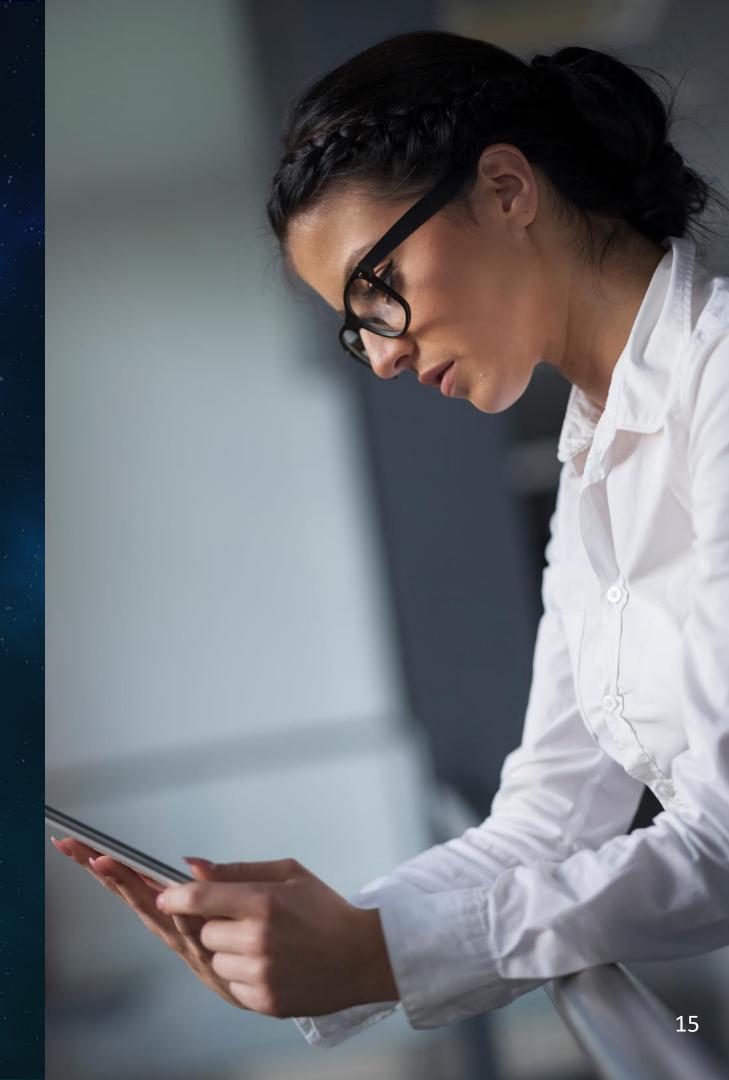
Women Researchers in Space-Related Fields

for more than 200 researchers in space related fields are women

For this purpose, we used preliminary data collected by the Israeli Space Agency, representing another perspective on women in leadership positions within the space ecosystem.

The data include space-related researchers from various disciplines among them Physics, relevant Engineering fields, and Atmospheric Science. The researchers are from the following universities: The Hebrew University of Jerusalem, Technion - Israel Institute of Technology, Tel Aviv University, Ben Gurion University, Ariel University, Bar Ilan University, Haifa University, Reichman University, Sami Shamoon College, The Open University, Volcani Institute, and the Weizmann Institute of Science.

This data is consistent with our findings about women in leadership positions in the Israeli space ecosystem



Overview: Women in the Space Industry

While previous sections outlined the state of women prior to entering the space industry, this section introduces the gender situation within the space workforce.

However, a methodological challenge arises in precisely defining what constitutes a space sector company. Globally, there are major space employers like NASA or SpaceX, but the Israeli case is more complex due to the multidisciplinary nature of leading companies in the Israeli tech industry. Some of the major Israeli space companies in Israel are "pure" space related companies, focusing on downstream or upstream businesses such as Gilat and ISI.

Other prominent firms, such as Rafael or IAI (Israel Aerospace Industries), develop and manufacture satellites and other space-related systems, while managing at the same time other lines of business that are not connected to the space industry.

To tackle this complexity, we employed different approaches and methodologies to estimate the percentage of women working in the Israeli space industry.

Some were based on official databases such as the Central Bureau of Statistics (CBS). Additionally, we reached out to major employers in the space industry, including space divisions of defense companies, other space companies, and startups, seeking information on the state of women in these organizations across various roles and seniority levels.

Furthermore, to shed light on women in space entrepreneurship, we analyzed the gender of founders at Israeli space-related startups.

\\ Women in Space Industry in Israel - Overview

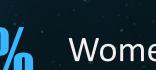
Over the past three decades, the rate of women employed in Israel's tech sector has remained steady at approximately one-third of the workforce (Source). Companies and activities related to the space industry generally fall under the tech manufacturing sub-sector, particularly when the technologies, services, and products are developed by established defense firms. Within this sub-sector, the proportion of female employees is slightly lower than the overall tech sector rate, with women comprising 32.6% of the workforce in 2022.

However, the Central Bureau of Statistics classifies the manufacture of air and spacecraft separately, where the percentage of women among employees drops to 18.2%. Notably, the number of employees in these sub-sectors has remained relatively constant in recent years, indicating slow growth and change over time.

Women in Tech Sector

2022

34.1%

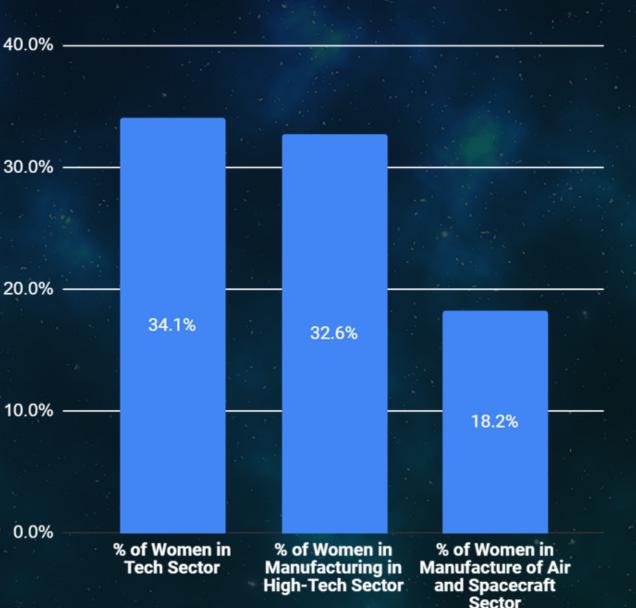


Women in Manufacture of Air and Spaceraft sector

Percentage of Women Employees by Sector (2022)

Source: SpacelL adaptation to CBS data

50.0%



Data Collection Insights from Israeli Space Companies

To better understand the gender gap in Israeli space companies, we compiled a list of major space firms and space divisions within defense companies. Our aim was to gather specific data on the representation of women in these divisions, revealing the situation across various levels of seniority and positions.

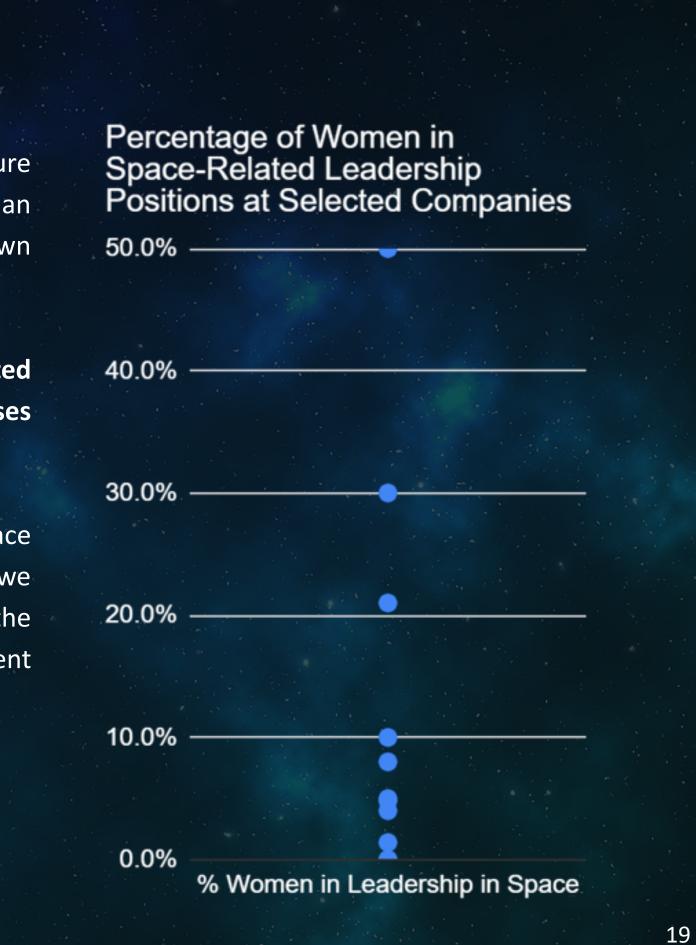
Methodology:

- We compiled a list that covers the most substantial space-related companies and sampled some of the space-related startups. 1. We requested the companies to share the following information for the purpose of this study:
 - Overall percentage of women in the company
 - Percentage of women in engineering roles related to space
 - Percentage of women in senior management or leadership positions related to space
 - Percentage of women in non-engineering roles within the space sector.
- 11 companies cooperated with our request and provided us with full or nearly complete information. We divided the companies into 2. two categories: corporate established companies, which include mature Israeli space companies and space divisions within defense companies; and younger companies that are considered small to medium enterprises. This classification was established to determine if there is a difference in gender representation between the more established companies and the smaller, younger ones.

\\ Women in Space Industry in Israel - Data collected from space companies

Main findings:

- The overall percentage of women employed in space companies, including both mature corporations and small to medium enterprises, is approximately 25%, which is lower than the averages in the broader tech industry and tech manufacturing sub-sector as shown before.
- When it comes to the percentage of women in engineering roles within space-related operations at these companies, the average drops to 9% in small to medium enterprises and rises slightly to 12% in the more mature companies.
- It's important to note that the percentage of women in engineering roles in space companies varies significantly. Since the sample size for our analysis is relatively small, we highlight the distribution of this indicator in different companies. As seen in the chart, the percentages of women in engineering roles range from 4% to 23% across different companies, with **most companies having less than 10%**.



\\ Women in Space Industry in Israel - Data collected from space companies



The percentage of women in space-related leadership positions varies significantly.

Despite this high variance, in most companies, the percentage of women in space leadership positions is 10% or lower, with three exceptions.

In some cases, there are no women at all in leadership roles. It's important to note that in two of the largest companies, the percentage of women in leadership positions is only 4% or lower. In non-engineering space-related positions, the percentages of women are higher. For corporate companies, the average is 24.8%.

This finding aligns with data published a decade ago, in 2014, as part of a report describing the space industry workforce (Source).

For smaller companies, the average percentage of women in non-engineering positions rises to 36%, but due to the small sample size, there is significant variability and large differences among different companies.

Percentage of Women in Space-Related Leadership Positions at Selected Companies

50.0%

40.0%

30.0%

20.0%

10.0%

0.0%

% Women in Leadership in Space

Women In Space Entrepreneurship

With the growing opportunities for New Space companies, we have examined the representation of women among founders of space startups. Monitoring this situation is crucial, as new companies represent the industry's next generation. Furthermore, founding teams that include female entrepreneurs tend to hire more women (Source). Additionally, the presence of more female entrepreneurs creates a ripple effect across the ecosystem, inspiring more women and young people to pursue their own paths in the field.

Methodology:

- 1. Using the Startup Nation Central 'Finder' platform, we identified approximately 100 space and aviation startups. We used the following tags to curate the list of space and aviation startups: space-tech, space-research, aerospace, astronautics, astrospace, satellite-imagery, and satellites.
- 2. We refined this list to include companies founded between 2004 and 2023, enabling us to monitor trends over the last two decades. Additionally, we verified that these companies are related to the space sector. After applying these filters, we identified 49 companies that align closely with the space industry.
- 3. We classified the gender of the founders of each startup, using open source information.



\\ Women in Space Industry in Israel - Women In Space Entrepreneurship



Startup analysis findings reveal that out of 49 space-related startups founded from 2004 to 2023:

8 companies have a female co-founder, representing 16% of the total.

Of the total 99 co-founders, 8 are female, which constitutes 8% of the total—lower than the benchmark in the Israeli tech industry. The roles of these female co-founders include CEO, CTO, VP of Space Operations, and President. Only 2 out of 49 CEOs are women, accounting for 4% of the total.



Space related startups



Female cofounders



Out of 99 space startup co-founders are female



Gender Diversity in Youth Space Education Programs

In Israel, several educational programs introduce children and teenagers to space exploration. This section reviews gender-related aspects of these programs, focusing on the presence of female role models and participation rates among boys and girls to assess gender diversity and inclusivity in space education.



The **Horizon Community** of teachers and industry leaders of the Israeli Space Agency aims to increase youth exposure to the space field. It has 272 members, with 52% women and 48% men. Among the 129 educators in the community, 57% are women and 43% are men, possibly reflecting the higher proportion of women in the teaching profession.



In **SpacelL**, a non-profit organization that promotes science and science education, the majority of both the volunteers and the engineering team are men. Among the 105 volunteers, 71% are men (75 men) and 29% are women (30 women). The engineering team, which includes employees and consultants, consists of 12 employees (50% women and 50% men) and 14 consultants (7% women and 93% men). Overall, the engineering team comprises 27% women (7 women) and 73% men (19 men).

\\ Women in Space Industry in Israel - Youth Space Education Programs

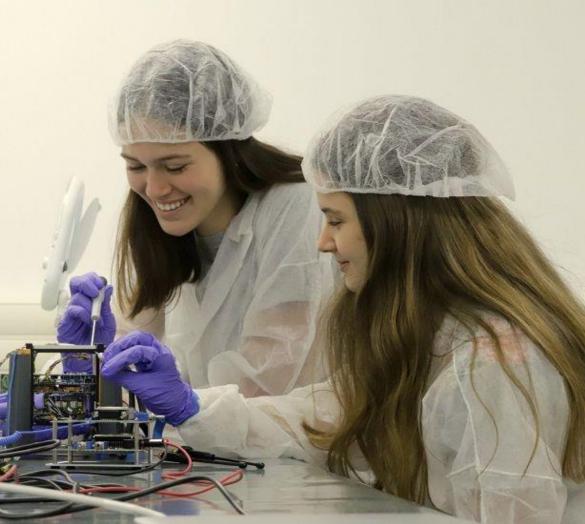


Another program for teenagers is **Tevel** (Which means in Hebrew "world" and on the same time the acronym for Students Build Satellites). Tevel is an An educational-vocational program designed to develop scientific skills mainly in the space area in its graduates by using the development and launch of satellites into space as a practical tool.

According to the Israeli Space Agency, in the second cohort, Tevel 2, there are 240 participants, of which 104 are female high school students—43% of the participants. Compared to other programs and career stages, this is a relatively high percentage.



Participant of the Tevel program while developing a satellite . Credit: Herzliya Science Center



Programs Aiming to Promote Gender Equality in Space

There are several Israeli programs, such as WiSpace and SheSpace, aimed at promoting gender equality within the space ecosystem in Israel. WiSpace provides a platform to promote professional women's career growth and actively participates in influencing the Israeli space community.

The She Space program is designed to inspire young girls to study STEM subjects through educational space science projects focused on developing satellite imaging research applications. The leaders of these programs contributed to this publication.

In addition, Israel is involved in international efforts. Israel's participation in the UNOOSA Space4Women initiative illustrates its commitment to advancing gender equality in the space sector. By providing support and funding for the project, Israel plays a key role in mentoring and guiding women in space-related disciplines. The country has actively sponsored educational programs, workshops, and networking events designed to empower women and increase their participation in science, technology, engineering, and mathematics (STEM) careers. This backing not only demonstrates Israel's focus on promoting international collaboration in space exploration but also showcases its dedication to fostering inclusivity and diversity in the global space community.

In 2025, Israel will host the Space4Women expert meeting at Ben-Gurion University of the Negev, further solidifying its role in supporting the initiative.





Global Snapshot: Women in Space Ecosystem

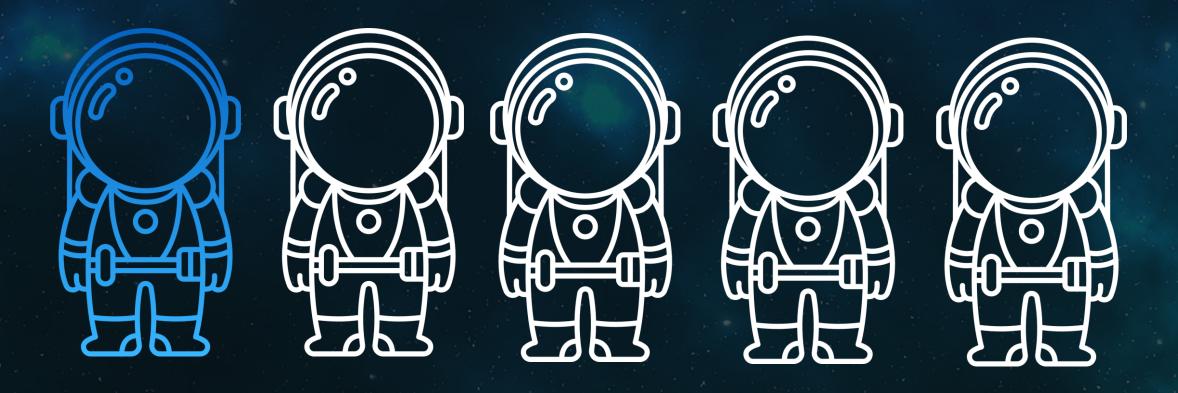


Overview: Women in the Global Space Industry

In this section, we explore the status of women in the global space industry. The purpose of this analysis is to compare the situation in Israel with other countries that have developed space industries.

Globally, according to 2021 UN data, women represent just 20-22 percent of the workforce in the international space industry. This figure is roughly the same as it was 30 years ago, indicating little progress in increasing female representation in the field over the past three decades. (Source). According to the same source, women CEOs constitute only 19% of the leaders in the aerospace and defense sectors, further highlighting the gender disparity at the highest levels of leadership in the industry.

Only around 1 in 5 space industry workers are women



Source: UN, 2021

When it comes to <u>space exploration</u>, which represents the forefront of the space industry, the gender disparity worsens. Valentina V. Tereshkova became the first woman to orbit the Earth in 1963, and Sally Ride was the first American woman to travel to space in 1983. According to an analysis of <u>WorldSpaceFlight</u> data up until May 2024, out of 634 people who traveled to space, only 78 were women, comprising just 12% of astronauts. The USA leads in the number of female astronauts, with 61 American women having traveled to space, accounting for 78% of all female astronauts. American women are also planned to land on the moon as part of the Artemis mission.

Russia is the second largest, with six women having traveled to space. Israel has never sent women to space, with both of its astronauts being men.

61 American Women: 78% of All Female Astronauts

Count



Out of 634 Space Travelers, Only 78 Were Women

Male 👤 Female 👤

Source: Authors' adaptation of WorldSpaceFlight data

75%



Source: Authors' adaptation of WorldSpaceFlight data

Women in Space Organizations & Agencies

Share of female employment in different types of occupations, selected space organisations (2022, or latest available data)

As highlighted in the OECD publication "The Space Economy in Figures" (2023 edition), a persistent gender gap exists in both space-related employment and educational fields.

Overall, women are 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. However, the OECD notes that there is variation across countries and space activity segments. The share of female employment tends to be lower in larger agencies that are also involved in science and engineering activities.



50

Share of female in total staff (%)

0

CNES NASA DLR ONERA ISRO JAXA CSA

Share of female in "non-administrative and/or non-clerical staff" (...

Source: Authors' adaptation of OECD data. *KARI and other government institutes

Women Graduate from International Space University

The International Space University (ISU) is an institution dedicated to advancing space education and developing future leaders of the space community.

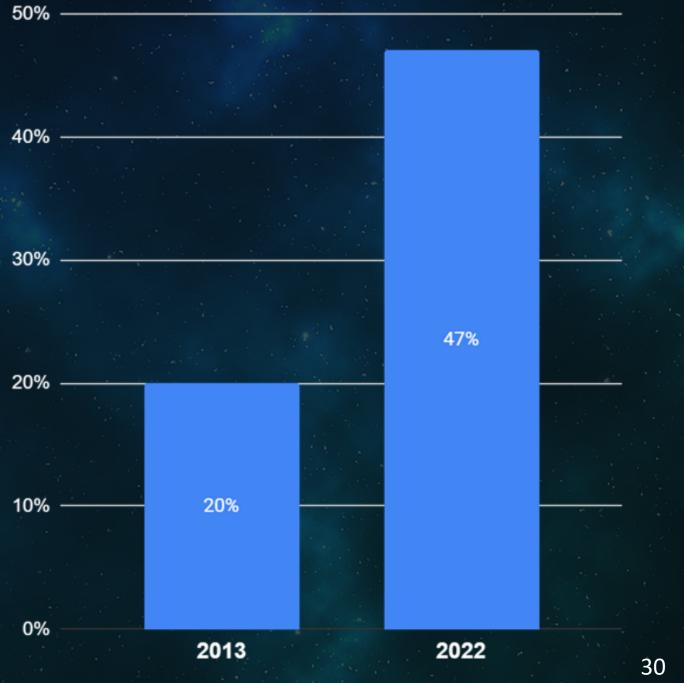
For the purpose of this publication, we reached out to ISU to obtain information about the participation of women in their programs.

On average, women constituted 33% of ISU graduates over the last decade. However, this percentage has risen from 20% in 2013 to 47% in 2022, indicating a positive trend. According to ISU, several factors contribute to this upward trend.

First, ISU has implemented a comprehensive <u>Gender Plan</u> that emphasizes the institution's dedication to fostering a balanced and inclusive environment. Moreover, ISU's sponsors play a crucial role by advocating for gender equality in granting fellowships. Some fellowships specifically reserved for female candidates. This ensures that women have significant opportunities to advance their education and careers in the space sector.



Ratio of Women Graduating From ISU



Source: Authors' adaptation of ISU data

Gender Representation in IAF

The International Astronautical Federation (IAF) is an international space advocacy organization that organizes international conferences for the space community. For the purpose of this publication, we reached out to the IAF to learn about the participation of women in space-related events and conferences as another indication of the state of women in the space ecosystem. In terms of gender representation among IAF members, women hold 15% of the Head of Member positions, while men hold 85%. At the International Astronautical Congress (IAC), the gender distribution of delegates has been consistent from 2019 to 2022, with women comprising 30% and men 70%. This marks

an improvement from 2018, when only 23% of delegates were women.

The Global Space Conference on Climate Change (GLOC) 2023 showed more balanced gender representation among its participants. Women made up 40% of the delegates and 45% of the speakers, while men comprised 60% of the delegates and 55% of the speakers. Within the IAF Bureau, women represent 25% of the members, and men 75%. In IAF Committees, the distribution is slightly better, with women making up 27% and men 73%.



INTERNATIONAL ASTRONAUTICAL FEDERATION

Women in Space Companies: Global View

Women are also under-represented in the private space sector, especially in the upstream segment of space manufacturing and launch. Data from the OECD indicates that in 2021, women made up approximately 23% of the workforce in the upstream segment in Europe, a figure that has been stable over the past decade.

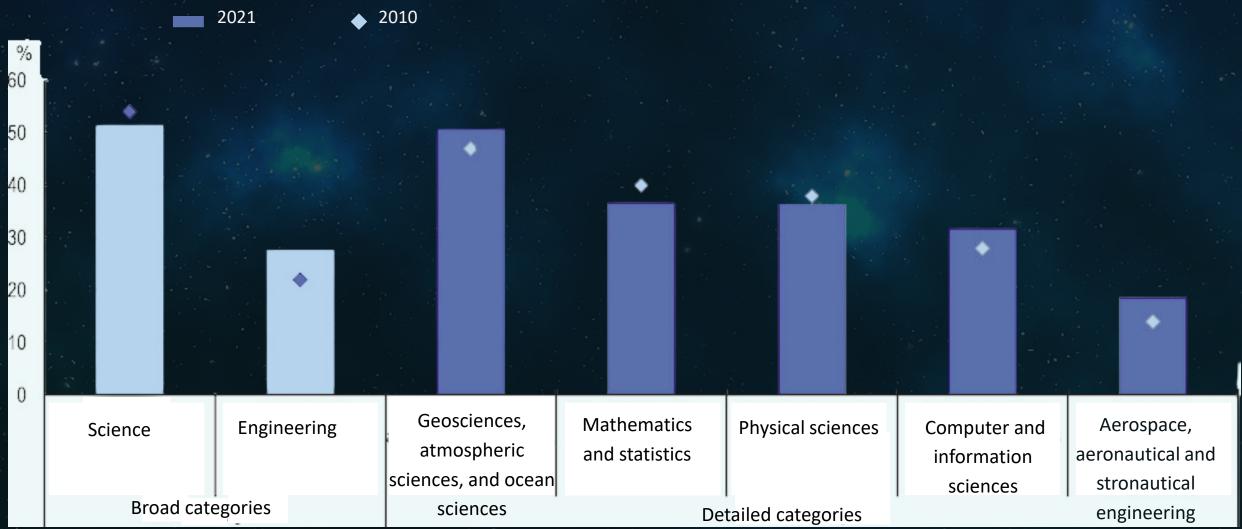
In the United States, women comprised 34% of aerospace manufacturing roles in 2023. In Canada, Korea, and the United Kingdom, women represented 29%, 15%, and 24% of the space industry workforce, respectively, for the years 2021 and 2020. In Australia and the United Kingdom, women constituted 20% of the space research workforce in 2020. A 2022 survey by Abbie Hutty from iSpace, presented at the Space4Women meeting (source), showed that women make up 33% of the workforce and 22% of leadership roles in the space industry. This data, consistent with previous findings, was collected from 58 companies, indicating ongoing trends in gender representation within the sector.

Additionally, **younger women tend to have a higher representation in the space sector**. According to the OECD, for instance, in Korea, they make up 28% of employees under 30, compared to 15% of the total workforce. A survey conducted in the UK by <u>Space Skills Alliance</u>, revealed a similar situation: younger age groups are generally closer to gender parity than older ones. However, the authors mentioned that this may indicate that the gender balance in the sector is improving, or it may be an example of a phenomenon known as the 'leaky pipeline', common in STEM fields. The data obtained from other countries aligns with the information presented about Israel in the first part of this publication. In Israel, women are similarly under-represented in the space sector, reflecting global trends.

\\ Global Snapshot - Global Space Companies

The persistent gender gap in the global space sector appears to mirror the educational choices of women, similar to the trends observed in Israel and presented in the first part of the publication. For instance, "The Space Economy in Figures" by the OECD, published in 2023, shows that while women account for more than half of all graduate students in geosciences, atmospheric sciences, and ocean sciences, they continue to be underrepresented in computer and information sciences (around 30%) and mathematics (less than 40%), and especially in aerospace engineering (and engineering more generally). Nonetheless, the trend is positive, with the share of women graduate students in aerospace engineering increasing from 14% in 2010 to almost 19% in 2021.

Figure 4.5. Female graduate students in space-related fields of education, in the United States Share of female students enrolled in master's and doctoral programmes



Source: The Space Economy in Figures, OECD, 2023





Discussion and Recommendations



Conclusions

The goal of this study was to examine the representation of women in the Israeli space ecosystem and to explore opportunities for improvement. Here are our main insights and conclusions:

1. Women are a minority in the Israeli space industry

According to the different approaches applied in this study, women represent 25% or less of the space workforce. In engineering positions, the percentage is lower than 10% in most companies sampled. In terms of space entrepreneurship, only 8% of startup co-founders who founded space-related companies over the last two decades were women.



2. Gender disparity in the Israeli space industry is similar to the tech sector

The findings regarding the representation of women in the space industry mirror the situation in the overall Israeli tech sector. This similarity is not surprising, as the space sector, being a sub-sector of the Israeli tech industry, relies on a workforce with similar skill sets and backgrounds, such as system engineers, software engineers, and physicists. For the last three decades, the share of women working in the tech sector has remained stable at about one-third of tech employees in Israel, while the total number of employees grew tremendously (Source). The share of women in the space industry is slightly lower than in the tech sector, a difference that may be explained by the specific expertise needed in the space sector and perceptions of the space field by potential candidates.

3. Gender gap in the Israeli space ecosystem reflects global trends

The gender gap described in this study aligns with global trends in other space ecosystems. In this context, the situation in Israel is not significantly different from that in other countries. The disparity exists both in the overall space workforce and in leadership positions, and it is rooted in the educational choices of women. We can assume that the reasons explaining the gender disparity in the Israeli space sector are similar to those in other places. In our discussions with industry leaders, they did not identify unique reasons differentiating Israel from other space ecosystems in developed countries.

4. The gender gap in the space ecosystem starts at a young age with educational choices

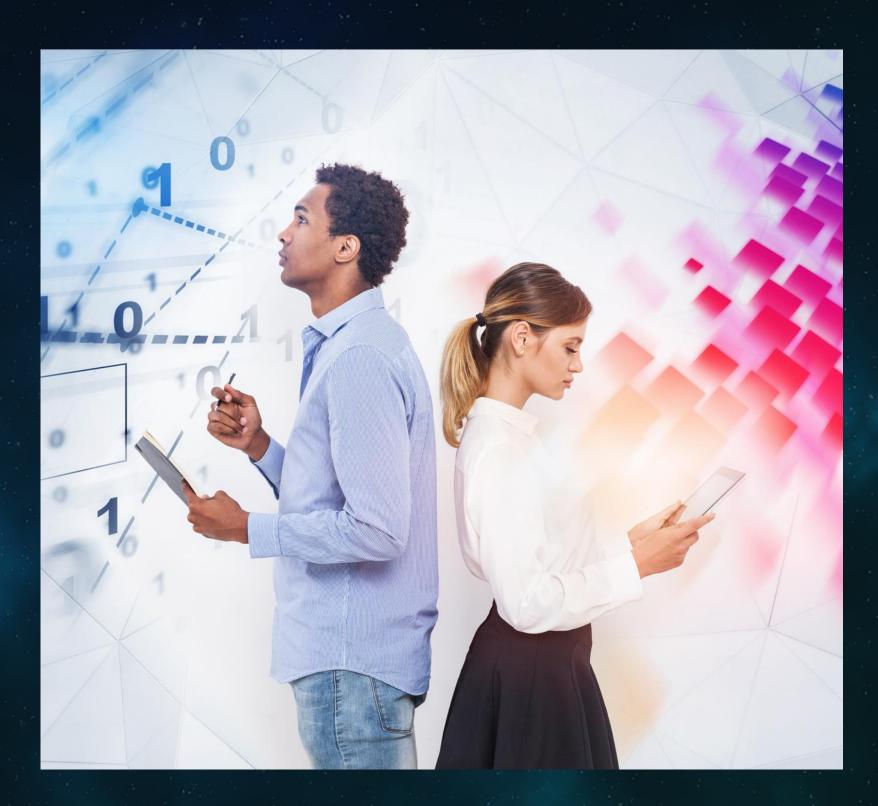
The gender disparity recorded in high school final exams in subjects like Mathematics and Physics continues as women mature and make their educational and professional choices. Although the number of university students studying space-related subjects has grown by more than 50% in the past five years, the share of women has only changed slightly. The overall impact remains minor since the total number of students has also increased during this period. Therefore, it is important to focus on long-term programs for school students, their parents, and teachers to change the pattern of choices influenced by their environment.

5. A significant gender gap is evident in leadership positions in space companies

Leadership positions in the space industry are predominantly held by men, who consequently make most of the decisions regarding the careers of women in the sector. This highlights the importance of involving men in efforts to address gender disparity. Increasing the number of women in senior roles is crucial, not only for their own advancement but also to serve as role models and inspire more women to pursue similar paths.

While changing the gender composition of the overall workforce is a longterm process that involves influencing the educational choices of girls, it is possible to address the gender gap in leadership positions more quickly. This can be achieved by raising awareness, constantly monitoring the representation of women at all levels within space companies, and providing training for hiring and management personnel.

A case study from the IDF satellite operators unit demonstrates that tailored programs encouraging women to take on leadership roles and supporting their needs can effectively increase the talent pool in these positions.

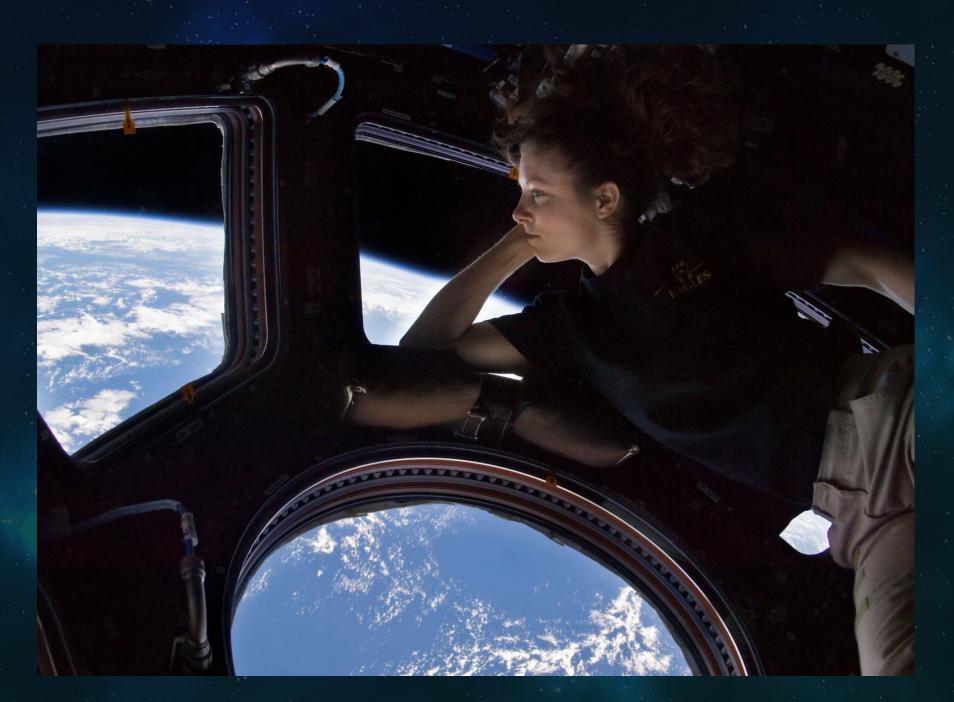


6. Measuring women's representation in the space sector is challenging

While consistently collecting and monitoring gender-related data in the space sector is crucial for any future plans and policies, it was one of the main challenges we faced during this study. The availability of granular data is limited. Standardized data collection practices and improved transparency are required.

Additionally, it is essential to define what constitutes a space sector company to ensure accurate and comprehensive data collection.

While having a policy to increase women's representation is important, tracking and monitoring these numbers is essential to determine the effectiveness of such plans.





Recommendations

Based on the findings and conclusions of this study, we propose the following recommendations to address gender disparity in the Israeli space ecosystem and to promote greater inclusivity and representation of women in this sector.

1. Encourage girls, from a young age, to pursue STEM studies

It is crucial to engage girls in STEM subjects from an early age. By fostering interest in these fields early on, we can build a stronger pipeline of female talent for the future. For this purpose the following steps are suggested:

• Programs to encourage girls to choose STEM studies:

Initiatives should be developed to encourage girls to engage in STEM subjects from an early age - especially before they choose their 5 units exams subjects in high school. Highlighting space exploration as an exciting and appealing topic can capture children's imaginations and interest. Educational programs should leverage the inherent fascination with space to make STEM subjects more attractive and accessible to young girls, fostering a lifelong interest in these fields.

Those programs should also focus on the fundamental part of parents and teachers on the decision making of girls.



\\ Discussion and recommendations

• Expand existing space programs and monitor the educational choices of their participants: While there are already programs that expose children to space, it is crucial to expand these initiatives to reach more young girls. This expansion can help build a stronger pipeline of female talent in the space sector. Prior to extending the programs, it's important to research and learn from past experience. It's crucial to track the career and educational paths of program participants. Industry leaders involved in these initiatives have noted the lack of follow-up research or data collection on participants after program completion. Monitoring and analyzing the long and short terms impact of these programs will provide valuable insights into their effectiveness and areas for improvement. Understanding how these early interventions influence educational and career choices can help refine and enhance future programs. The tech sector as a whole would benefit from the success of space exposure programs for children and teens. 2. Raise awareness to space sector as a possible career for women

Increasing awareness of the space sector as a viable career option for women is important. According to a 2019 lpsos survey, female space personalities are less familiar compared to their male counterparts. This gap in visibility can be addressed by highlighting successful women in the space industry, showcasing them as role models.

Additionally, leveraging the growing interest in the Israeli tech sector and the increasing number of students in related fields such as software development and data science can help attract more women to the space companies. Emphasizing the intersection of these fields with space exploration can make careers in the space sector more appealing. Moreover, it is essential to implement career awareness campaigns in schools and universities to inform young women about the diverse opportunities available in the space industry. These efforts can be supported by fostering partnerships between educational institutions and space industry companies to provide internships, mentorship programs, and workshops, offering practical experience and insights into the sector.



3. Promote internal gender diversity plans

To promote gender diversity within space companies, it is essential to implement comprehensive **internal training programs and gender diversity initiatives**. Promoting women to leadership positions should be a priority, as it not only addresses gender disparity but also provides role models for other women in the industry.

Companies should **set clear goals (KPIs)** for women's representation, focusing on new hires and promoting women to leadership positions. These goals will help track progress and ensure accountability.

Additionally, it is crucial to implement unconscious bias training to **raise awareness among managers and decision-makers about their ability and responsibility** to change the situation.

Furthermore, companies should adopt policies that support working parents and promote flexible workplaces. Industry leaders mentioned that the space divisions within defense companies offer limited work-from-home possibilities, and it's a challenge for working mothers and parents. Flexibility is a key element for more diverse companies. These policies can help retain talented women who might otherwise leave the sector due to work-life balance challenges. By fostering an inclusive environment, space companies can benefit from a diverse workforce that drives innovation and success.



4. Develop a national space gender diversity policy

To effectively address gender disparity in the space sector, it is essential to develop a national space gender diversity policy that covers multiple aspects. This policy should include investments in education to encourage girls and young women to pursue STEM subjects, with a particular emphasis on space-related fields. Implementing nationwide awareness campaigns can help highlight the importance of gender diversity in the space sector and showcase female role models. Transparency in monitoring and reporting women's representation within the space ecosystem is crucial. Regular assessments and public reports will ensure accountability and track progress over time. Additionally, partnerships between government, educational institutions, and industry can foster an inclusive environment by developing mentorship programs, internships, and networking opportunities specifically for women. We suggest learning from the experience of space ecosystems like UAE and Australia who have invested efforts in this area.

5. Conduct Regular Monitoring and Reporting

To raise awareness and encourage companies to lead internal equality processes, it is essential to monitor the representation of women in the space sector on an ongoing basis and publish the findings. This should involve both internal and external monitoring at the company level and across the entire ecosystem. Regular assessments will highlight progress, identify areas needing improvement, and ensure transparency.



Suggested Follow Up Research

Over the course of this study, we have encountered questions that we believe can further the discussion and understanding of gender diversity in the Israeli space sector. These follow-up research questions aim to support and promote this cause by providing deeper insights and actionable recommendations.

- 1. How does participating in space-related programs during elementary or junior high school influence the choices of junior high and high school students? Does it help? If yes, how can we grow the impact? If not, why not? It is important because the path students choose in high school can change the course of their lives.
- 2. What are the experiences of women in the space industry? Identify the barriers they face and the opportunities available to them.
- 3. Why do fewer women than men who are eligible for STEM final exams choose STEM subjects at the university level?
- 4. Investigate whether the situation is improving among younger age groups. If so, how can we encourage and sustain this positive trend?

