

NASA: Making Space for Women

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What percentage of research subjects should be women? This question was the starting point for NASA's draft policy on inclusion of women in human research. The issue of women in research was not a new one; NASA had historically struggled with the inclusion of women. Though NASA has been considered one of the most advanced federal agencies since its creation, it did not lead the way in its policies dealing with women, a shortcoming exacerbated by the complacent attitudes of the public and the media.

NASA and Women

This issue was discussed in the media before any official choices were announced. The *LA Times* reported on September 7, 1958 that, to ward off boredom, the "occasional cocktail" or "feminine companionship" could be advantageous, for "[t]he spaceman is sure to retain his interest in having a female companion aboard even if liquor loses its appeal"—unless, of course, she turns out to be "a nagging back-seat rocket pilot."¹

Perhaps an official would have been able to clear up misconceptions about women in space flight. Colonel John Stapp, a "[w]orld-renowned authority on space flight," discussed some of women astronauts' supposed shortcomings in the *Star*: "The government program in space was military...and women had always been excluded from participation in defense spending." Since "[p]hysiologically women are about 85% as efficient as men of the same weight and size and age... recognized in the field of sports, where the time-scales for the 100-yard dash set up for women differs from that set up for men," Stapp concluded, "To expose women needlessly to the incalculable dangers of pioneer space flight would be like employing women as riveters, truck drivers, steel workers or coal miners."² Women seemed to have little hope before the requirements were even announced.

The barriers to women wishing to join the space program were delineated in the late 1950s when NASA began to search for the first American astronauts. NASA required that the astronauts have a bachelor's degree in engineering or its equivalent, and be a graduate of a test pilot school, with a minimum of 1500 hours of flying time as a qualified jet pilot. The military was asked to scan for prospective candidates, and from their ranks were produced the candidates that would be considered and, if lucky, chosen.³ This posed a problem for women wishing to enter the program, since at that time women were not allowed to become test pilots.⁴

However, in 1959 Dr. Randolph Lovelace, the doctor at the Lovelace Foundation for Medical Research responsible for screening the male astronaut candidates, heard that Russia was training a female cosmonaut. Deciding that American women should also be tested, he asked an acquaintance, renowned pilot Jerri Cobb, to participate in testing. She passed the same physical tests given to the Mercury astronauts. On the basis of these results, Lovelace proposed the following year that women would in fact make superior astronauts due to their lower body mass and requirements of food and oxygen. He then gathered together 25 women, 13 of whom proved capable of passing the same tests as the men. However, NASA had never sanctioned the research and in July 1961 informed Lovelace and the women subjects that they would no longer have access to the requisite testing facilities. NASA Deputy Administrator Hugh L. Dryden stated, "NASA does not at this time have a requirement for such a program."⁵

In a memo to Dr. George Low, director of spacecraft and flight missions, Dr. Dale Smith in the Office of Life Science Programs wrote: "The medical portion of a selection and training program is but a guide in selecting physically and mentally qualified people, and as you know, women fall within the physically qualified; therefore, there must be other valid reasons why or why not we are to use women in our flight program."

What was the reaction to this decision? For females in space, the 1960s can be considered a decade of sarcasm and excuses. In a speech by space pioneer Werner Von Braun given at Mississippi State College on November 19, 1962, he responded to the question "Do you ever plan to use women astronauts in your space program?" by stating, "Male astronauts are all for it...We're reserving 110 pounds of payload for recreational equipment."

Columnist Robert Ruark, writing in the August 8, 1962, *Washington Daily News*, at first seemed to support the notion of women entering space. He began, "It seems to me the government is being downright fusty in not kicking off an immediate program to send the ladies into space." However, upon reaching his closing remarks, one is forced to question his sincerity—"Strike the shackles from our women, cry I, and cut them loose in space! It might even...encourage them, after the novelty has worn off, to return to the kitchen."

Despite this prevalent attitude, the women did not give up. Mary Funk, one of the women subjects who had undergone testing for the Mercury project, declared that she was still awaiting her day.⁶ In July 1963, Jerri Cobb brought the case of women astronauts before Congress. A congressional hearing that convened to consider the issue included testimony by spacecraft and flight missions director Low as well as prominent astronauts John Glenn and M. Scott Carpenter. Glenn testified, "My mother would have been able to come to Washington and pass the physical, but she probably couldn't play for the (NFL) Redskins." He claimed a willingness to "welcome women aboard with open arms" if they demonstrated greater capabilities for space flight than men.⁷ It was clear that NASA did not intend to change its policies, continuing to uphold the highest level of personal qualifications.

Congress revived study of the issue in 1963, after the Soviet Union launched the first woman into space. One senator suggested that "we launch a realistic program on every front to give them the full equality of opportunity which our space agency, in this instance, has flagrantly denied them." However, one NASA spokesman did not feel swayed, instead feeling "sick at my stomach" at "the talk of an American space woman".⁸

Women were reminded at the hearings that they could still play "a vital role" if they joined NASA behind the scenes to lay the foundations for America's space achievements.⁹ NASA even rescinded the requirement of being a test pilot before becoming an astronaut,¹⁰ which

prompted at least two women to apply—however, neither of them would be chosen.¹¹

After this noble attempt at penetrating the astronaut core, it was back to more excuses and sarcasm. What did the public and media have to say now?

Orlando Sentinel, March 18, 1965:

"Girls who are clamoring for equal rights as astronautettes should consider all the problems of space travel. How, for instance, would they like to wear the same space suit without a bath or a change of clothes for six weeks? The first thing a girl astronaut would think of, naturally, is a good supply of perfume and deodorants. How will a girl keep her hair curled in outer space? It's not too early to start working on a space travel beauty kit right now."¹²

San Diego Union, March 7, 1968:

"First of all, it would cost us more than \$100,000 just to redesign the space suit to fit the female anatomy... No women have so far qualified for the job... America already has too many astronauts... The very best reason for not choosing women as astronauts was the fact that women tend to get married."¹³

NASA Current News, March 27, 1968:

"There's just too much difference between men and women. We really don't speak the same language."¹⁴

And with that, we left the 1960s and rocketed into the slightly more promising 1970s. Unfortunately, but perhaps to no one's surprise, women's infiltration of NASA and acceptance as respected scientists made slow headway.

In May 1970, a NASA woman made headlines: a Sunday *Star* headline blared, "26-Year-Old Blonde Works in NASA Control". For the curious, the *Star* made sure to clarify that "[s]he has met several of the astronauts, but says there are no romantic entanglements." While the "blonde" said that "[t]hey offered me the job working with spacecraft trajectories. I didn't think I was qualified for the job," the newspaper pointed out that "someone, whose mind may or may not have been on celestial mechanics, decided to hire her anyway."

The 1972 Equal Opportunity Act brought federal agencies under the equal opportunity provisions of the 1964 Civil Rights Act, NASA in the midst of them. The same year, NASA hired its first Federal Women's Program Manager to facilitate the implementation of affirmative action for women.¹⁵ They began a women's newsletter to be written by NASA senior science writer Lillian Levy,¹⁶ and began developing a plan for the next selection of astronauts, providing full consideration for minority groups and women.¹⁷ NASA recognized the fact that "[w]omen would require a new design in space suits."¹⁸

NASA hit another setback when Deputy Assistant Administrator for Equal Opportunity Ruth Bates Harris released a 1974 report calling the equal employment program "a near-total failure", noting that minority employees made up 5% of NASA's total against a 20% average for other government departments.¹⁹

NASA proceeded to celebrate its first “Federal Women’s Week” in November 1974, with a focus on “[t]he equality of women and men in every sphere with particular emphasis on women adequately competing and advancing in career fields” and “[w]omen and men being freed from stereotyped roles and images.”²⁰ It took another step forward by choosing a team of four women scientists for a five-day simulated space test.²¹ A 1977 advertisement for astronauts stated, “NASA is totally committed to equal employment opportunity. Therefore, qualified women and minorities are urged to apply to become astronaut candidates.”²² Nichelle Nichols and her company “Women in Motion” were hired to help recruit young people, particularly women, for technological jobs.²³

On October 5, 1977, a NASA news release stated that the sixth group of astronaut applicants that had reported to NASA’s Johnson Space Center for interviews included one woman. That woman was Dr. Sally K. Ride from Los Angeles, CA, who would go on to become the first American woman in space.²⁴ Ride was one of six women chosen in the astronaut class that year, which had seen 1544 women’s applications out of a total of 8079. She “downplay[ed] the first woman angle of her selection,” but still faced questions about her marital plans.²⁵

In 1978, NASA once again tackled the ongoing issue of space suits for women, stating that “finding the perfect fit is important with space suits” and therefore “the system must accommodate extra-small sizes for women.”²⁶

The initial excitement of women finally being added to the astronaut corps seemed to be followed by a quiet period, during which little was done to continue recruitment or discuss women astronauts. In the search for the next astronaut group, women accounted for only 390 applicants out of 2,937.²⁷

When 1983 arrived and Ride was preparing for her flight, the media turned its attention back to women astronauts, who now comprised 8 out of 76, or 10.5%, of the astronaut corps.²⁸ Ride wasn’t often called an ‘astronette’, but *Time* magazine did ask whether she wept when things went wrong. Ride responded to the attention by saying, “It may be too bad that our society isn’t further along and that this is such a big deal.”²⁹

The attention did not seem to solve NASA’s recruitment issues, however. There were only two women among the 50 astronauts selected for the next 10 flights. NASA headquarters, responsible for space policy, and Johnson Space Center, responsible for choosing amongst the applicants, had a “mini-war” over the optimal recruitment strategy.³⁰

In 1984 NASA created the Women’s Advisory Panel (WAC) to increase public awareness of women’s potential and maximize opportunities for, and recognition of, their contributions at NASA. By 1987 NASA News suggested that the assignment of a woman to a space shuttle crew was a routine matter based on ability and need and was no longer a cause for particular notice.³¹

Throughout the late 1980s and 1990s, NASA continued to create more programs to benefit women. In 1987 NASA began the Women in Science and Engineering (WISE) Scholars Program to provide scientifically talented women the opportunity to pursue undergraduate studies in science. In 1994, it organized a “Take your Daughter to Work Day,” in which over 100 girls aged 9 to 15 visited NASA headquarters.³² In 1995, NASA created a special internship opportunity for women and minorities. The HSCaRS Summer Enrichment Program encouraged minority and women students to pursue advanced degrees in Earth system and global change science.³³ In 1997, the two-year initiative “There’s Space in My Life” was launched by NASA Administrator Daniel S. Goldin to reach out to women and their families. NASA also signed a historic agreement to work more intensively on a number of technologies to benefit women’s health.³⁴

In 1995, Eileen Collins became the nation’s first female pilot, and in 1999, she became the first female space shuttle commander.

NASA now features women on the Internet, showing women from all walks of life that have made historic achievements.

Despite efforts made by NASA, there have been some setbacks. NASA halted work on a \$16 million program to develop a space suit designed for smaller women. Officials said they could not afford the \$9 million needed to complete work on the new, smaller suit and that only a small proportion of women astronauts would be affected. The suit would have increased the total percentage of women astronauts accommodated from 60% to 95%, while also benefiting smaller men. NASA calls the decision a “deferral” rather than a cancellation.³⁵ It should be noted, however, that the statistics dealing with the issue are controversial.

In the most recently selected group of eleven astronauts, two of them were women. While this may seem low, it is representative of the applications. Women sent in 556 of the 2882 applications received by NASA and 22 of the 99 candidates NASA chose to interview.³⁶

NASA continues to develop its services to women, with a new women’s newsletter that premiered in June 2004, and activities for women’s equality day the following August.

Women and Research

NASA is not the first governmental agency to examine this issue. The National Institutes of Health (NIH) and the Federal Drug Administration (FDA) are currently implementing policy in this area. The evolution of the FDA and NIH may provide some insight into how NASA can best incorporate guidelines in this field.

One of the first mentions of women in federally funded research occurred in 1977 when the FDA barred women of childbearing potential from participation in early phase clinical research. This included all premenopausal females regardless of whether or not they were using any type of contraception, were single, or had

husbands who had been vasectomized. Before large-scale clinical trials of women could be initiated, phase I research and female animal testing had to be completed.³⁷ This effectively prohibited women from participating in medical research until the method or medication was well understood.

It was not until July 1993 that the FDA decided to change their earlier policy of excluding women of child-bearing potential, admitting the 1977 guideline left “virtually no room for the exercise of judgment by responsible female research subjects, physicians, investigators, and Institutional Review Boards”. The FDA went on to state that “the early exclusion also may have perpetuated, in a subtle way, a view of the male as the primary focus of medicine and drug development.” The new policy would not routinely require that women be included in phase I studies, but would remove the “unnecessary Federal impediment” to that practice.³⁸

The National Institute of Health Revitalization Act was passed in 1993, clearly stating the mandatory policy on clinical research equity regarding women and minorities. It required that the Director of NIH ensure that women were included as subjects in clinical research in numbers sufficient to provide for a valid analysis of whether women were affected differently than other subjects in the trial. It reiterated that cost was not a permissible reason to exclude women from a trial. NIH was asked to create guidelines about the manner in which these trials should be designed. As of 1995, NIH would not be allowed to approve any proposal unless it specified how it would comply with the inclusion policy.

In May 2004, a comprehensive report tracking human subjects research reported that approximately 94% of fiscal year 2002 applications involving human subjects met the inclusion requirements. Women made up approximately 55% of subjects in Phase III trials. It was found that, excluding sex-specific studies, the proportions of the subjects approximated the proportions found in the general population.³⁹

Women in NASA Policy

NASA has not traditionally mentioned women specifically in its policies. This does not mean that the idea of studying women was completely ignored; even as far back as 1963 (about twenty years before the first woman would go into space), the *New York Times* news service reported that “it would appear worthwhile to test the reactions of a woman to the stresses of space flight.”⁴⁰ No official testing occurred, however, until 1973, when the first all-female bed-rest study was conducted. NASA concluded that the “females showed deconditioning responses similar to those of the males, although with some differences.”⁴¹

In 1987 the Space Science Board of the National Research Council listed questions that NASA might consider answering in the next decade and concluded that there was a lack of information about the effects of zero gravity on women. In the 1990s the issues of women’s

health care were being brought to the forefront by the Revitalization Act and the establishment of an Office of Women’s Health Research. NASA, and the unique research opportunities it could provide, could no longer keep out of the spotlight. Senator Kay Bailey Hutchison stated, “Several women U.S. senators have asked NASA and the NIH to cooperate more closely on women’s health concerns. We are also calling for a greater slice of the space station budget to be allocated for studying the special medical needs of women.”⁴² In 1999 the National Academy of Sciences report “Safe Passage” faulted NASA for a paucity of information on research between male and female responses to microgravity.

With more emphasis placed on the physiological differences between men and women, and the importance of studying health issues in relation to gender, NASA had to wonder if they might be falling behind. In 1999, Kathy Sawyer reported, “Dr. Arnauld Nicogossian, whose office is responsible for planning studies of human physiological responses to weightlessness, began pondering whether there were gaps that should be filled with in-flight research on women.”⁴³ NASA began to contemplate the possibility of sending an all-female crew into space. Eventually, they decided it would be unnecessary.⁴⁴

This time, however, the issue of women as research subjects did not disappear. NASA decided to hold a workshop in 1999 on “Gender-Related Issues in Space Flight Research and Health Care.” The panel, consisting of NASA officials, medical doctors, and experts on women’s health issues, was asked to make recommendations to address the adequacy of existing demographic and epidemiological information, the best means of accelerating research to provide the best care to diverse space crews, and specific clinical or scientific measurements that should be included in upcoming missions. The panel reported findings in three areas: research and countermeasures, health care, and human-machine interface.

On the issue of research and countermeasures, they found that it was necessary for ground-based research to be strengthened: “Women should not be excluded from studies for reasons of cost or convenience. Only by including a sufficient number of women in all future protocols will it become clear whether gender differences exist.” It also suggested that in “ground based studies where there are trends indicating gender difference, the number of females should be increased to ensure findings achieve statistical significance.”

Under the heading of health care, the panel addressed the issues of bias due to pregnancy and family life of women astronauts. It pointed out that “all women are accepted into the astronaut program during their child-bearing years.” Since female astronauts are not considered for assignment if they are pregnant or attempting to become pregnant, women are at a disadvantage if they have difficulty conceiving. The panel suggested that NASA provide assisted reproductive technologies as part of the astronauts’ medical care. It also stressed the

“unknown risk to mother and fetus if conception occurs just prior to or in flight” and the lack of data on “the pharmacodynamics of birth control pills in zero gravity.” The panel noted that learning about birth control pills would be important since it is also used for noncontraceptive benefits, adding that “the design of ‘family friendly’ training schedules, travel responsibilities and deployment to remote sites should be taken seriously.”

The final issue on which the panel made recommendations was human-machine interfacing, stating that “[i]t should be the goal that all people selected to be astronauts be able to perform all tasks associated with the astronaut job regardless of size or gender.” They even pointed out a particular problem with Extravehicular Activity (EVA) suits and Shuttle egress suits, noting “poor design in current suits or lack of appropriately sized off-the-shelf suits in the future should not be used as an excuse to exclude women from certain jobs or to provide them with equipment that is less than optimal for their own performance.” The panel concluded that much research was still needed to deal with gender differences and that NASA must not take a “one size fits all” approach.⁴⁵

In November 2002, a second conference was held on the issue of gender differences. “Sex, Space and Environmental Adaptation: A National Workshop to Define Research Priorities Regarding Sex-Differences in Human Response to Challenging Environments” was sponsored by NASA and the National Center for Gender Physiology and Environmental Adaptation of the University of Missouri. The objective was “to define and report on the direction of research needed to increase our fundamental knowledge of gender and sex-specific factors that influence humankind’s ability to adapt to challenging environments on Earth and in Space.” Six groups were formed with representatives from NASA, NIH, the National Science Foundation, and the nation’s top academic institutions, attempting to review questions fundamental to NASA’s bioastronautics critical path roadmap. The six groups were musculoskeletal physiology, cardiovascular alterations, immune function, neurovestibular/neuroscience, reproductive biology, and human performance and behavior. Each came up with specific recommendations for its own area.

The summary recommendations included generally improving understanding of the influence of sex on how biological systems adapt to challenging environments, developing realistic models for sex-based differences in fundamental physiology, encouraging complimentary research in animal models and humans, and exploring the mechanisms of sex differences in transgenic models and gene expression. They also recommended developing education and research training opportunities for the future generation of scientists in terms of sex similarities or differences in research approaches.

The resources the groups felt would be necessary included, among other things: small space suits for

women, a databank for basic science regarding sex-based similarities and differences, and a tissue bank on all astronauts.⁴⁶

In January 2004, NASA held a third workshop. The “Sex/Gender Inclusion Workshop” aimed to draft a policy for the inclusion of women in NASA-funded clinical research. This group reviewed the NIH guidelines and the findings of the 2002 workshop previously mentioned. They broke into small group discussion to discuss how to approach the issue of inclusion of women. The groups found they had all come to the conclusion that women’s representation should be equal to men’s in NASA-funded research, and that in the case of in-flight research where that would not always be possible, they should be included to the greatest extent possible.⁴⁷

The draft policy created at that conference is now under consideration for implementation by NASA.

NASA's New Draft Policy

NASA’s draft policy is modeled quite closely on NIH’s inclusion policy, but does include a number of differences. The scope of NASA’s draft policy requires all NASA-funded human and associated modeling research to provide a statistically valid analysis. It encourages compliance of animal research studies with this policy, but does not mandate it.

The policy allows exceptions if they are appropriate based upon the purpose of the research or health and safety of the research subject. This is to ensure that someone doing research on a single-sex health problem, such as prostate cancer, is not prevented from doing research because he or she is not including women.

The NASA draft policy requires that research be done to show whether sex/gender effects are to be expected. NASA recommends examining the same types of past studies with the addition of bed-rest studies and space flight studies.

NASA also requires that the research plan then include a description of the composition of the proposed study population in terms of gender and provide a rationale for the selection. The plan is also to include proposed outreach programs for recruiting and retaining subjects. NASA requires that statistical analysis be conducted if prior studies strongly support the existence of significant differences or if prior studies neither support nor negate significant differences.

In all of these cases final analysis of sex/gender must be included as part of the deliverables or a plan must be given to show that analysis will be completed in the future. The policy also stresses the importance of including the results of sex/gender analysis in publication submissions, even if the analysis reveals no sex/gender effects.

When prior studies do not support the existence of sex/gender effects, the policy encourages but does not require sex/gender considerations in the experimental design.

Implications: The Future of NASA

If the policy is incorporated into NASA's Office of Biological and Physical research, and possibly into NASA in general, it is important to understand the implications such a policy would have.

The immediate effects of the policy would be on the staff of the Office of Biological and Physical Research, who would need to learn about and understand the policy as well as monitor compliance. Time may be required to set up a database and to evaluate how well NASA's policy is working. Also affected would be the principal investigators who would need to begin recruiting and retaining women test subjects as well as compiling analysis with respect to sex/gender. Initial fears that this measure could increase the cost of research have been dispelled; since the NIH policy has been implemented at NASA, there has been no reported increase in cost. Recruitment has been an issue, particularly when research is to be done on astronauts, since women only make up 20% of the astronaut corps. There is also the risk of more variability in research.

The policy is also expected to increase the safety of women astronauts, who will be able to be sure that the countermeasures and health care solutions will surely work on them as well as on men.


The increased understanding of women in space would likely be extended to knowledge about the health

of women on Earth. It is very likely that women in the general population would benefit from research done by NASA.

NASA's adoption of this policy may improve its image. A policy that is somewhat progressive, especially since it would be done without a mandate, may lead many to appreciate NASA's apparent focus on safety and equality.

Perhaps the policy could be extended to include hardware, and many women astronauts would benefit from items such as well-fitting space suits that allow for optimal productivity. This increased productivity could help NASA become more efficient. A small suit would also allow more women to participate in research studies, increasing the value of the inclusion policy.

Once this policy is in place, it could help to change the attitude towards women at NASA in general, drawing attention to the importance of sex/gender equality even in areas beyond research. A more woman-friendly attitude at NASA could lead to more women applicants and more women working in the NASA centers and the astronaut corps.

The policy of inclusion of women in NASA-funded human research will have far-reaching effects on all of NASA. Not only will the Office of Biological and Physical research be affected, but all of NASA and perhaps the entire world. 

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