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QUALIFICATIONS FOR ASTRONAUTS

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HEARINGS
BEFORE THE
SPECIAL SUBCOMMITTEE ON THE
SELECTION OF ASTRONAUTS
OF THE
COMMITTEE ON
SCIENCE AND ASTRONAUTICS
U.S. HOUSE OF REPRESENTATIVES
EIGHTY-SEVENTH CONGRESS
SECOND SESSION

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NOTE.—The chairman and the ranking minority member (Mr. Martin, Massachusetts) are ex officio members of all subcommittees.



QUALIFICATIONS FOR ASTRONAUTS

TUESDAY, JULY 17, 1962

HOUSE OF REPRESENTATIVES,
SPECIAL SUBCOMMITTEE ON
THE SELECTION OF ASTRONAUTS,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C.

The special subcommittee met at 10 a.m., Hon. Victor L. Anfuso (chairman of the special subcommittee) presiding.

Mr. ANFUSO. This meeting will come to order.

Ladies and gentlemen, we meet this morning to consider the very important problem of determining to the satisfaction of the committee what are the basic qualifications required for the selection and training of astronauts.

There is no question that our manned space flight program must make use of every available resource that can contribute to its success.

As we look into the future, we can see greater and greater demands for special talents placed upon the people from whom future space travelers will be drawn.

We are particularly concerned that the talents required should not be prejudged or prequalified by the fact that these talents happen to be possessed by men or women. Rather, we are deeply concerned that all human resources be utilized.

I am happy to note, incidentally that, following the announcement of these hearings NASA has just inaugurated an intern program which includes nine promising college graduates, selected by rigorous written and oral examination, to begin a year of intensive training in NASA's first management intern program. Two of the nine interns are women. I am also aware that women are presently active in some aspects of NASA's launch vehicle program.

I wish to emphasize that these hearings will be directed toward the sole objective of determining the many intricate and varied problems associated with the selection of future astronauts, based upon the factual evidence to be given to the committee by the witnesses this morning and those to come.

We are pleased to have with us today Miss Jerrie Cobb, a noted pilot with an outstanding career in aviation; Mrs. Philip Hart, wife of Senator Philip A. Hart, of Michigan, and also a famed pilot, as well as an outstanding wife and mother; and later, Miss Jacqueline Cochran, of whom little more need be said than that she holds more national and international distance, speed, and altitude records than any other pilot.

We will first hear from Miss Cobb, and immediately afterward from Mrs. Hart.

Following their testimonies, if everyone is agreeable, we will then begin to question both Miss Cobb and Mrs. Hart.

I assume that Mrs. Hart will also answer some questions. Is that correct, Mrs. Hart?

Mrs. HART. Yes, sir.

Mr. ANFUSO. All right, Miss Cobb, do you have a prepared statement?

Miss COBB. Yes, Mr. Chairman; I do.

Mr. ANFUSO. We will hear your prepared statement, Miss Cobb. And we are very happy to have you here. We know the great effort you have made, together with the other 12 women astronauts, in calling the subcommittee's attention to this particular phase of the astronaut training program.

This committee is noncommittal, of course, but we will make sure that all the facts will be heard and properly presented to the Congress of the United States.

You may proceed.

STATEMENT OF MISS JERRIE COBB

Miss COBB. Thank you, Mr. Chairman, honorable Members of Congress. May I say first in behalf of myself and the 12 other women space candidates that we thank you for the opportunity of letting us be heard on Capitol Hill.

We appreciate the vision and interest you are showing in recognizing the need for looking into the utilization of women in the U.S. space program on a serious, sound basis.

Please believe that these thanks are sincere, for the courtesy of a hearing has not been extended to us by any other branch of the Government.

Our purpose in appearing before you is single and simple: We hope that you ladies and gentlemen will, after these hearings and due consideration, help implement the inclusion of qualified women in the U.S. manned space program.

Mr. ANFUSO. Might I interrupt to say at this time that Congressman George P. Miller, who is the chairman of the full committee, certainly recognizes your problem, and was very glad to have these hearings scheduled.

I was honored to be selected as the chairman, and these members on the subcommittee are all honored to serve.

So I think we ought to congratulate Chairman Miller for his vision in bringing about this meeting.

Miss COBB. Yes; I certainly do thank Mr. Miller and all the members of this subcommittee for making this hearing possible.

I would like to explain that the reason you are hearing me as the first witness before this special subcommittee is twofold:

First, almost 3 years ago Dr. Randolph Lovelace II and Air Force Brig. Gen. Donald Flickinger asked me to be the first woman to undergo the Mercury astronaut tests at the Lovelace Foundation in Albuquerque, N. Mex.

Subsequently, when my pilot and physical qualifications were checked out, I passed the Mercury astronaut tests in Albuquerque, and as a result it was decided to test a whole group of woman pilots.

Second, in 1960 and 1961 I passed two additional phases of testing as a candidate for space flight, to qualify myself and to prove the feasibility of having a group of women in a space research program.

These tests were given through the cooperation of the Veterans' Administration and the U.S. Navy with the Lovelace Foundation. In both cases, results of my tests gained approval for research on additional women pilots.

Early last summer I was sworn in as a NASA consultant following Administrator James Webb's announcement of my appointment.

Later last summer, after a group of 12 other women had passed the Mercury astronaut tests, I was sort of drafted to be spokesman for all 13 of us.

As you can tell, it certainly was not because of my speaking ability.

At any rate, all this background is to tell you why I sit here now. If you would like, later in these hearings, we can see some pictures from testing I have undergone, to clarify the three separate phases.

Honorable Representatives of the Congress, you are used to dealing in terms of millions and billions of dollars, especially as they pertain to space expenditures. I hope you will be pleasantly surprised to learn that no taxpayers' money was spent to ascertain that at least 13 women pilots in the United States can pass the Mercury astronaut selection tests and prove by so doing that they are worthy of consideration for further training as space crewmembers.

Famed Pilot Jacqueline Cochran paid the expenses of many of the women who underwent the tests at the Lovelace Foundation. Twenty-five women went through those tests, and from them 12 passed to form the group of which we speak. All volunteered their time at considerable personal and professional inconvenience.

Now you may ask—who are these 12 women, always referred to but never identified?

Why don't they get together and let themselves be heard?

The answer is easy. They don't even know each other. They have never met as a group, and no one of the 12 women knows who all the other 11 are.

Because the scientists involved and I have spent several years awaiting some word from governmental circles that the women would be included in the official astronaut training program, we asked the girls for more than a year to keep their identities under wraps.

By and large, they have abided by our request, and I am sure the ladies of the subcommittee will agree with the gentlemen that this is quite an achievement in a group of women which has every right to be proud of its accomplishment in the astronaut tests.

Last spring, the wife of U.S. Senator Philip Hart of Michigan got tired of her self-imposed muzzle, and as you may remember, the two of us then conferred individually with Vice President Johnson, Senator Kerr, and Representative George P. Miller of the congressional space committees, and Chairman Anfuso.

Thanks to your House space committee, we are now given the privilege of this hearing in the Congress.

Since no funds have been available to bring the women astronaut candidates' group here, and as you will be hearing from Mrs. Hart later, I would like now to enter for the record the qualifications and brief biographical data on the 11 other women astronaut candidates not present:

Jan Dietrich: Single; California native; age 35; 5 feet 3 inches tall; weight 103 pounds; college graduate; pilot for large company; airline transport pilot's license—multiengine, single-engine seaplane; flight instructor ratings; 8,000 flying hours.

Marion Dietrich: Twin sister of Jan Dietrich; single; California native; age, height, and weight same; college graduate; writer; commercial pilot's license—seaplane and flight instructor ratings; 1,500-plus flying hours.

Rea Rhea Hurre Allison: Married; Minnesota born; resident of Texas; age 31; 5 feet 7 inches tall; weight 120; teachers college graduate; executive pilot for aircraft sales and engineering firm; commercial pilot's license—multiengine, single-engine seaplane; flight instructor, instrument instructor, ground instructor (Link and radio navigation) ratings; 1,500 flying hours.

Irene Leverton: Single; Illinois born; resident of California; age 35; 5 feet 8 inches tall; weight 145; executive pilot; airline transport pilot's license—multiengine land and seaplane; instrument instructor, flight instructor ratings; 9,000-plus flying hours.

Bernice Steadman: Married; Michigan native; age 36; 5 feet 7 inches tall; weight 140; owner and operator, aviation service; airline transport pilot's license—multiengine; flight instructor, instrument instructor, ground instructor (all subjects) ratings; 8,000-plus flying hours.

Jean F. Hixson: Single; Illinois born; Ohio resident; age 38; 5 feet 4½ inches tall; weight 125; college graduate, bachelor's and master's degrees in mathematics, the physical sciences, and psychology; Air Force Reserve captain; currently a schoolteacher; commercial pilot's license—multiengine; instrument and flight instructor ratings; 4,500 flying hours.

Gene Nora Stumbough: Single; Illinois born; resides in Kansas; age 25; 5 feet 7 inches tall; weight 120; university graduate; professional pilot with large aircraft company; commercial pilot's license—multiengine and ground instructors ratings; 1,450 flying hours.

Jerry Sloane: Divorced; Texas native; has one child; age 31; 5 feet 3 inches tall; weight 103; 1 year college; officer and pilot of aviation company; commercial pilot's license—multiengine; instrument and flight instructors ratings; 1,200-plus flying hours.

Myrtle T. Cagle: Married; born North Carolina; resides Georgia; age 36; 5 feet 2 inches tall; weight 110; now taking college studies; professional pilot at an Air Force base; former airport operator; airline transport pilot's license—multiengine; flight instructor, instrument instructor, ground instructor (radio navigation) ratings; 4,300 flying hours.

Sara Lee Gorelick: Single; Kansas native; age 28; 5 feet 5 inches tall; weight 130; university graduate with degree in mathematics, physics, and chemistry; commercial pilot's license—glider, multiengine, single-engine seaplane; flight instructor, instrument instructor ratings; 1,800-plus flying hours.

Mary Wallace Funk: Single; New Mexico born; resides California; age 23; five feet 8 inches tall; weight 125; university graduate; professional pilot with aviation company; commercial pilot's license—single-engine seaplane; flight instructor ratings; 3,000 flying hours.

Each of these women joins us in offering her abilities to our country's space efforts.

As their spokesman, I would like to make some general observations.

First, let us all, among ourselves, recognize that we women pilots who want to be part of the research and participation in space exploration are not trying to join a battle of the sexes.

As pilots, we fly and share mutual respect with male pilots in the primarily man's world of aviation. We very well know how to live together in our profession.

We seek, only, a place in our Nation's space future without discrimination. We ask as citizens of this Nation to be allowed to participate with seriousness and sincerity in the making of history now, as women have in the past.

There were women on the *Mayflower* and on the first wagon trains west, working alongside the men to forge new trails to new vistas.

We ask that opportunity in the pioneering of space.

Second, there are sound medical-scientific reasons for using women as astronauts. Without pretending to be either doctor or research scientist, I remind you that women weigh less and consume less food and oxygen than men, a very important point when every pound of humanity and the necessary life support systems is a grave obstacle in the cost and capability factors of manned space vehicles.

Women are more radiation-resistant and less prone to heart attacks because of the way the good Lord constructed them. Scientists say that women are less susceptible to monotony, loneliness, heat, cold, pain and noise than the opposite sex, vital facts to keep in mind in our Nation's plans for space exploration of increasingly longer duration.

Third, we have seen the reflected pride of the entire free world in the accomplishments of U.S. Astronauts Shepard, Grissom, Glenn, and Carpenter.

All Americans, and certainly all pilots salute them.

Now we who aspire to be women astronauts ask for the opportunity to bring glory to our Nation by an American woman becoming first in all the world to make a space flight. No nation has yet sent a human female into space.

We offer you 13 woman pilot volunteers.

Members of Congress, your special subcommittee sits here today in search of the "practicability" of training and using women as astronauts.

It is clear to us, and we hope to you, that the practicability exists and is at hand. We welcome your questions.

Mr. CHAIRMAN, I would like to request the additional privilege of summation time after all witnesses have appeared.¹

Thank you for your attention and for the honor of appearing before this committee.

Mr. ANFUSO. Miss Cobb, that was an excellent statement. I think that we can safely say at this time that the whole purpose of space exploration is to some day colonize these other planets and I don't see how we can do that without women. [Laughter.]

Now, I think that at this time, Miss Cobb, I would like to insert for the record your qualifications—and your certainly have a great array of achievements.

The biography of Miss Cobb will be inserted in the record.

¹ See app. I.

(The document referred to follows:)

BIOGRAPHY OF MISS JERRIE COBB

Miss Jerrie Cobb, 31-year-old professional pilot, is considered No. 1 among the announced 13 U.S. women astronaut candidates, by virtue of having undergone and passed 3 separate phases of astronaut testing since February 1960.

Chosen in 1959 as the first woman to undergo the Mercury Astronaut selection tests at Lovelace Foundation, Albuquerque, N. Mex., Miss Cobb completed and passed that battery of 75 physical tests in February 1960.

Following the announcement of her achievement in the summer of 1960 at an international scientific meeting in Stockholm, Miss Cobb next underwent phase II, psychopsychiatric testing, in September 1960 at a Government facility in Oklahoma City, Okla.

The psychological and psychiatric examinations passed included a 9 hour and 40 minutes, record stay in "profound sensory isolation" in water, which tests the subject's mental resources during deprivation of the five basic senses of sight, hearing, taste, feeling and smell while in a simulated weightless environment.

In April 1961 Miss Cobb underwent a 2-week-series of stress tests at the U.S. Navy School of Aviation Medicine, Pensacola, Fla., in a third phase of checking out her mental and physical capabilities for space flight.

In May of 1961 NASA Administrator James Webb named Miss Cobb a NASA consultant, and she was sworn in the following month in Washington.

Miss Cobb and the 12-woman group who subsequently passed the Lovelace tests last year, have kept in close touch in the effort to bring "lady astronauts" to inclusion in U.S. space efforts.

Assistant to vice president (marketing) for Aero Commander, Inc., Oklahoma manufacturers of twin-engine executive aircraft, Miss Cobb has set four world aviation records and holds a number of honors in her field.

Miss Cobb, who started flying at the age of 12, has more than 10,000 hours logged, in all types of aircraft. A former international ferry pilot, her ratings include: Commercial license with multiengine, flight instructor, and DC-3 (C-47) captain ratings. Also ground instructor in navigation, meteorology, civil air regulations, aircraft and engines. She has worked as a test pilot and has flown 64 different types of aircraft, including a jet fighter and 4-engine turboprop transport.

Mr. ANFUSO. I will call on Mrs. Hart. You can sit right there, Miss Cobb.

Mrs. Hart, it is a real pleasure to welcome you here.

Besides being the wife of a very distinguished Senator, you are also the mother of eight children—four boys and four girls—is that correct?

Mrs. HART. Yes, sir, Mr. Chairman.

Mr. ANFUSO. You can certainly stand on your own rights; can't you?

Mrs. HART. Yes, sir.

Mr. ANFUSO. You have a prepared statement?

Mrs. HART. I do.

Mr. ANFUSO. We shall be glad to hear it.

Mrs. HART. It will be somewhat redundant in certain aspects now. I would like to say, I couldn't help but notice that you call upon me immediately after you referred to colonizing space.

Mr. ANFUSO. That is why I did it. [Laughter.]

STATEMENT OF MRS. JANE B. HART

Mrs. HART. Mr. Chairman, members of the committee, thank you very much for letting me appear here today.

The subject at hand is certainly one of my favorite ones. It will perhaps come as no surprise to you that I strongly believe women should have a role in space research. In fact, it is inconceivable to me that the world of outer space should be restricted to men only, like some sort of stag club.

I am not arguing that women be admitted to space merely so that they won't feel discriminated against. I am arguing that they be admitted because they have a very real contribution to make.

Now, no woman can get up and seriously discuss a subject like this without being painfully aware that her talk is going to inspire a lot of condescending little smiles and mildly humorous winks.

But happily for the Nation, there have always been men, men like the members of this committee, who have helped women succeed in roles that they were previously thought incapable of handling.

A hundred years ago, it was quite inconceivable that women should serve as hospital attendants. Their essentially frail and emotional structure, it was argued, could never stand the horrors of a military dressing station.

Most of them would faint at the first bloody bandage. They wouldn't be able to keep the records straight. And anyway, it was somehow indecent for a woman to be among all those soldiers, wounded or not.

Well, the rest of the story is altogether familiar to you. The women were insistent. There was a shortage of men to do the job. And finally it was agreed to allow some women to try it provided they were middle aged and ugly—ugly women presumably having more strength of character.

I submit, Mr. Chairman, that a woman in space today is no more preposterous than a woman in a field hospital 100 years ago. And I further submit that the venture would be equally successful, although this time there should be a more realistic list of qualifications for the candidates to meet.

I wonder if anyone has ever reflected on the great waste of talent resulting from the belated recognition of women's ability to heal.

Before 1862, there must have been thousands of women with innate nursing ability who might have helped save countless lives if only they had been allowed to. But in this scientific field, no one recognized what women could do because they were never permitted to try.

It seems to me a basic error in American thought that the only time women are allowed to make a full contribution to a better nation is when there is a manpower shortage.

Consequently, women are discouraged from developing their talent and education fully because it seems they will have so little occasion to use them.

I correspond regularly with several college coeds who are in the top 10 percent of their class. They are science students and is there anyone here today who will argue that our Nation doesn't need scientists in practically unlimited numbers?

Yet many times I sense a tone of discouragement in their letters. They see so many obstacles to the realization of their hopes of a scientific career.

It is a known fact, for example, that in spite of population growth and acute need, there are fewer engineering students graduating now

than 10 years ago. So why must we handicap ourselves with the idea that every woman's place is in the kitchen despite what her talents and capabilities might be?

Now, I, like most women, have been blessed with a very happy marriage. I have eight children, four boys and four girls, a demonstration, I think, of the impartiality that I believe should be accorded the sexes.

But equality in numbers is not enough. I should hope that they will also have equality of opportunity to use their minds and talents where they will make the greatest contribution.

If the girls elect to be homemakers, excellent—provided the choice is not dictated by discrimination in all other careers.

I strongly suspect that not a few women are herded into the career of marriage—a career that fails because it is one for which they happen to have little talent.

And I think that our society should cease to frown on the woman who seeks to combine family life with a career. Time and again, it has been proven that this can be successfully done.

Our affluent society, after all, has provided so many household aids that the intelligent, energetic housewife can find many hours to devote to other useful purposes.

Let's face it: For many women the PTA just is not enough.

Up to now, you notice that I have avoided the technical and psychological questions of women in space. There are those here who are far more capable of testifying on that subject. But I do want to recommend that this subcommittee do everything in its power to insure a space role for women.

One concrete suggestion: I hope the subcommittee does everything in its power to continue research begun a year ago at the Lovelace Foundation in New Mexico.

Based on the belief that women do have a role in space, at least in the future, the Lovelace Clinic gave 24 young women tests similar to those given the 7 astronauts. It was the Lovelace Clinic, incidentally, that had previously set many of the standards for the men astronauts.

In the first step of this research program, 12 of the women were found to be qualified for space travel.

The second step of the program required the use of special Government-owned testing equipment, centrifuges and pressure chambers. Somehow, the program was canceled.

Now, I think women should be allowed to go into space without delay. But even the extreme view that women will have no place in outer space for many years does not justify the cancellation of a research program that had already begun and that would doubtlessly supply information useful right now as well as in the future.

Actually, the reinstatement of this research program will have a dual purpose. First, it will furnish valuable data. Secondly, it will encourage more talented young women to enter the specialized fields relating to space engineering.

I think it would open to the Nation a great new reservoir of ability and enthusiasm. I think this reservoir should be opened while space science is in its infancy.

Now I hope you understand that I am not trying to get all women out of the kitchen. I don't want to be the Susan B. Anthony of the

space age. The number of women who would be qualified for—and interested in—space travel would be limited.

Above all, I don't want to downgrade the feminine role of wife, mother, and homemaker. It is a tremendously fulfilling role. But I don't think, either, that it is unwomanly to be intelligent, to be courageous, to be energetic, to be anxious to contribute to human knowledge.

I just think we would be making a serious mistake if we assumed that women just have no contribution to make to space exploration.

I think we would be making a serious mistake if we were not willing to at least research the possibility that they could make a contribution.

Thank you.

(The biography of Mrs. Hart follows:)

BIOGRAPHY OF JANE B. HART

Mrs. Jane B. Hart, the wife of U.S. Senator Philip A. Hart, was born in Detroit October 20, 1921, the daughter of Mr. and Mrs. Walter O. Briggs. She attended the academies of the Sacred Heart in Detroit, Grosse Pointe, and Torresdale, Pa., and Manhattanville College in New York City.

She was married June 19, 1943, to Mr. Hart who then was a captain in the U.S. Army. They met when he was her brother's roommate at Georgetown University. The Harts resided in Birmingham (Oakland County) until 1955 when Mr. Hart became Michigan's Lieutenant Governor and the family moved to Lansing. They have eight children: Ann, 14; Jane Cameron, 13; Walter, 11; James, 10; Michael, 9; Clyde, 7; Mary Catherine, 5; and Laura Elizabeth, 4.

In addition to her duties as mother and homemaker, Mrs. Hart has been active in civic affairs and has shared her husband's interest in government and political activities. She is a trustee of the Michigan 4-H Foundation, a member of the board of the Sister Elizabeth Kenny Foundation, and also served as board member and national convention delegate for the Birmingham League of Women Voters. She was charter vice president of the Guild of the Pontiac Urban League and now is a member of the Nancy Williams Club, the National Association for the Advancement of Colored People, and the Lansing World Affairs Council.

In the field of politics, Mrs. Hart has served as vice chairman of the Oakland County Democratic Committee.

Mrs. Hart has long been interested in aviation and has been a licensed pilot for 19 years. She owns and flies a twin-engine six-passenger Aero-Commander 500-A. She is the first licensed woman helicopter flyer in Michigan. Mrs. Hart is a captain in the Civil Air Patrol. She formerly was commanding officer of Squadron 4 in Group 7. She is a member of the Flying Farmers of Michigan and in 1958-59 chairman of the annual Michigan "Small Race" sponsored by the 99's, an international organization of licensed women pilots organized by Amelia Earhart. Mrs. Hart has participated as a pilot in two national cross-country "Powder Puff Derby" flights, and is now serving as a member of the board of directors of the All Women's Transcontinental Air Race.

Mr. ANFUSO. Thank you very much for a very interesting statement, Mrs. Hart.

May I ask you, Mrs. Hart, whether your flying activity has encouraged other people, both male and female to take up flying?

Mrs. HART. Yes, sir. I could give you some very specific instances of when I have taken people up who would not even set foot in an airliner and who subsequently have taken up flying as either a hobby or a career, and have purchased aircraft, and certainly have therefore stimulated the industry a little bit.

Mr. ANFUSO. Would you also say that if you had the opportunity to participate in the manned space flight program, your experience

would encourage other women to take up science and engineering courses, particularly those applicable to space travel?

Mrs. HART. I would answer in the affirmative again, Mr. Chairman, and this would be based on the mail which I have received, and which I mentioned in my statement. It includes coeds, both at high school level and college level, who have written, and many of them in great numbers, encouraging that we continue to pursue this subject and they would continue to pursue their studies in hope they could use it in their career.

Mr. ANFUSO. Would you go so far, Mrs. Hart, that anything man can do, woman can do better?

Mrs. HART. No, sir, I would not.

Mr. ANFUSO. Miss Cobb, I understand that you have some pictures you would like to show.

Would you rather show these pictures before we ask you some questions?

Miss COBB. I have some pictures to show of the testing if the committee has time.

It will take about 15 minutes. I can describe some of the tests if the committee would be interested in knowing what tests we have been through.

Mr. ANFUSO. These are tests which women have taken.

Miss COBB. Yes.

Mr. RIEHLMAN. Would that apply to all the 13 women that have qualified? Have they had the same tests that you portray in these pictures?

Miss COBB. These pictures portray the three different phases of astronaut tests. All of the 12 women have passed the first phase which were tests primarily designed for the Mercury astronauts and administered by the same doctors at the Lovelace Foundation. The second phase was psychological, psychiatric, and isolation studies which were made on two of the women astronaut candidates besides myself. I was the only woman to pass the third phase administered by the U.S. Naval School of Aviation Medicine before the tests were canceled.

We hope it will be possible to have the other women in this group undergo the other two phases in the immediate future.

Mr. ANFUSO. Without objection we will see the pictures and then ask you some questions.

Miss COBB. Would you like me to explain some of the tests before we see the pictures?

Mr. ANFUSO. Whichever is preferable to you. Would it make it easier for us to understand the pictures?

Miss COBB. It probably would.

The astronaut examination at the Lovelace Foundation consisted of a series of tests covering everything from having to swallow 3 feet of rubber hose to riding a bicycle to the human exhaustion point.

Other tests required that one drink a pint of radioactive water, 12 ounces of chalklike barium, and 3 ounces of castor oil—not at the same time, I might add.

Since the Lovelace tests have become quite familiar to you all because the Mercury astronauts were selected thereby, I will not prolong discussion of them.

The sensory deprivation experiment is another phase of astronaut testing which I was privileged to undergo. After 2 days of complete psychological and psychiatric testing, the subject is submerged in an 8-foot-deep tank of warm water.

The tank, lightly referred to by researchers as "the dog dip," is located in a small airtight room with 8-inch steel walls which makes it soundproof, lightproof, odorproof, humidityproof, and vibration-proof.

While undergoing this experiment, the subject's five basic senses are removed as nearly totally as possible, since there is nothing to see, hear, touch, taste, or smell. Being submerged in water at body temperature simulates a weightless state. The situation is as much like being totally deaf, blind, and with no sense of touch, taste, or smell as is possible to simulate.

Under the conditions of this sensory deprivation the usual reaction is for the subconscious mind to take over and uncontrollable hallucinations begin.

An astronaut alone in the weightlessness of space, with little or no stimulation to keep his senses alert, must have the ability to remain in touch with reality without lapsing into hallucinations.

I spent 9 hours and 40 minutes in the tank and did not hallucinate, I am happy to report, but I did sneak a couple of naps. The Mercury astronauts' isolation tests consisted of 3 hours in an air-filled room.

During Navy testing at Pensacola, I went through everything from working in the rotating room atop the centrifuge (experiencing artificial gravity) to being "crashlanded" in the Dilbert Dunker to teach water impact survival. Among other stress tests were explosive decompression and an "airborne electroencephalogram."

The airborne EEG, as it is called, is a recording on instruments and camera while the subject flies through a high gravity load-stress aerobic pattern with 18 needles stuck in the head, which record brain waves under unusual stresses.

When Navy Pensacola wired for permission to Washington for me to fly in a Navy aircraft for that test, reporting that it wished to ascertain the difference between men and women astronauts, back came this humorous reply from the Pentagon:

If you don't know the difference already, we refuse to put money into the project.

By the way, permission was granted.

(Pictures.) So with that we will go ahead with the slides and I will briefly describe these as we go through them.

(Slide.) This is the recording chamber for the isolation test, where they keep continual tape recordings going, listening to every sound, even the breathing sound, so they can tell whether you are awake or asleep. The doctors in attendance record everything during the run while you are in this enclosed room submerged in the water.

(Slide.) This is when I got out of the tank during the debriefing temperature and blood pressure and everything.

Go on to the next one.

(Slide.) This shows what the tank is like. The water is perfectly controlled to temperature of the human body so that you don't even feel the water.

Actually you feel nothing and float in this tank in total darkness where you cannot hear, see, touch, or smell anything.

Mr. ANFUSO. You have described the tests fairly well, Miss Cobb. Lights on, please.

Miss Cobb, what do you think are the minimum qualifications for an astronaut?

Miss COBB. I could not answer the minimum qualifications for an astronaut because I am not qualified. There is still so little known of the stresses of space flight.

Of course, this would be a matter of research, determining the job to be done, and the abilities necessary to do it, under extreme stresses.

The qualifications that the authorities of NASA have set down, have made it impossible for women to qualify as astronauts or even demonstrate their capabilities for space flight, as I am sure you know.

Mr. ANFUSO. Is it because one of the requirements is that the astronauts be also engineers?

Miss COBB. No. I don't think that is it at all. There are many women engineers.

It is the jet test pilot experience that makes it impossible for a woman to meet the qualifications.

Mr. ANFUSO. Are any of your women pilots engineers?

Miss COBB. Over half of them are college graduates. Their degrees are in varied applicable subjects from psychology to mathematics, physical sciences, chemistry, and physics.

Mr. ANFUSO. Are any of your women test pilots?

Miss COBB. Some of us have worked as test pilots but it is impossible for a woman in this country to be a jet test pilot because there are no women pilots in the military services and the test pilot schools are operated solely by the military services.

There are no other test pilot schools except those of the Navy and the Air Force, and since here are no woman pilots in the services they do not have the opportunity to go to these schools to learn to be a jet test pilot or to fly in the latest supersonic jet fighter equipment, either since they all belong to the military, and civilians are not allowed to fly them.

Mr. ANFUSO. In other words, one of the requirements laid down is that astronauts be test pilots; is that correct?

Miss COBB. That is the requirement that NASA has laid down, which automatically eliminates all women because jet pilot experience is not available to them in this country.

Mr. ANFUSO. You feel as though you can't qualify because only the services give these test pilot tests; is that correct?

Miss COBB. I feel we cannot meet the jet test pilot qualifications because of the reasons I explained. It is an impossibility in this country for women to become jet test pilots. There are foreign countries that use women in their military as jet test pilots, but not the United States.

Mr. ANFUSO. Foreign countries?

Miss COBB. Yes.

Mr. ANFUSO. Which foreign countries?

Miss COBB. Many foreign countries, I have a very good friend in France who has been a jet test pilot for the French Air Force for many years. Women pilots are not used in military services of our country,

so it is impossible for them to get the jet experience or to qualify for entrance in the test pilots school, because these are run solely by the military. By the same token, most civilian test pilots for airplane manufacturers are former graduates of the military test pilot schools. So actually we can't get civilian jobs as jet test pilots, either since these jobs require past experience in jet testing, experience not available to women.

Mr. ANFUSO. To your knowledge do you think the U.S.S.R. has women test pilots?

Miss COBB. Yes. It is a known fact that they have women pilots in their armed services, doing the various jobs required. This includes jet test flying. In this country women have little chance to qualify in jet aircraft, let alone becoming jet test pilots.

Mr. KARTH. Do you feel it is essential to have been a test pilot before you could qualify as an astronaut?

Miss COBB. I personally do not feel it is essential at all. It is a means to an end, but it is certainly not the end itself. An astronaut must pilot a spacecraft—not test jet fighters.

If you total the flying hours of this group of women pilots you will find the women averaged 4,500 hours each, which is much more than the men astronauts have. Some of the women in this group have over three times the amount of flying hours that the male astronauts have.

Mr. KARTH. There is a considerable difference between straight flying—commercial or private—and test piloting; isn't there?

Miss COBB. Pardon?

Mr. KARTH. There is a considerable difference between that and test piloting.

Miss COBB. I suggest there is an "equivalent experience" in flying that may be even more important in piloting a spacecraft. Pilots with thousands of hours flying time would not have lived so long without coping with emergencies calling for microsecond reactions.

What counts is flawless judgment, fast reaction, and the ability to transmit that to the proper control of the craft. We would not have flown all these years, accumulating thousands and thousands of hours in all types of aircraft without accumulating this experience. This experience is the same as acquired in jet test piloting. I think you might acquire it faster as a jet test pilot but it is by no means the only way to acquire it. Some have 8,000 to 10,000 hours—have flown a million miles in all types of airplanes—this is the hard way to acquire that experience, but, it is the same experience.

Women have other abilities to offer besides professional flying experience. You may remember the Martin Co. in Baltimore simulated space flights for more than a year as a NASA project and found women had the edge on operating controls for space rendezvous.

E. E. Clark reported women usually came along on the first and second try, executing the maneuver more quickly and efficiently than the male test pilots. We women who want to be astronauts offer our flying experience, we offer thousands of flying hours over millions of miles and literally dozens of years, and experience in all types of aircraft, in lieu of the few hours of jet test pilot experience required by NASA.

Mr. KARTH. How many hours are required as a minimum to qualify?

Miss COBB. The Mercury astronauts had to have 1,500 hours of jet time. We have girls with upward of 10,000 flying hours.

Mr. KARTH. How many test pilot hours do they require to qualify as a test pilot?

Miss COBB. It is not dependent on flying hours but upon flying experience.

Mr. ANFUSO. May I interrupt to welcome Miss Jacqueline Cochran who has just arrived? We will proceed with her testimony after Miss Cobb and Mrs. Hart.

Miss COBB. I do not know, Congressman Karth, the exact number of jet test flying hours required to be an astronaut. NASA does require 1,500 hours of total jet time. Most all of the Mercury astronauts were graduates of either the Navy or Air Force Test Pilot Schools, as you know.

Each of them spent some months, perhaps as much as a year, as a jet test pilot. They were military pilots and jet test flying was not primarily their job in the Armed Forces either.

Mr. KARTH. Thank you very much.

Mr. ANFUSO. Mr. Fulton.

Mr. FULTON. What is the women's record of safety in the operating of jets and supersonic planes as compared to the men's?

Miss COBB. What is the safety record?

Mr. FULTON. Yes. Are the women just at competent or are they better than the men?

Miss COBB. Since it is practically impossible for a woman to fly a jet in this country—to my knowledge, I only knew of one woman who has checked out in jet aircraft, and that is Miss Cochran, whom you will hear from—perhaps she will answer that—since there are no other women pilots who checked out in jets, there can't be any safety figures available.

Mr. FULTON. Given the same planes that are generally available and the same number of hours, how does the safety record of women pilots compare with that of the men?

Miss COBB. I don't know of any studies ever made on this, but I don't think safety is a thing between male and female. It depends on the piloting ability, how safe a pilot you are, not whether you are a man or woman.

Mr. FULTON. I am trying to support you.

Women are competent to operate aircraft and as far as you know there is no greater incidence of accidents among women than men, is there?

Miss COBB. That is right.

Mr. FULTON. I am trying to get you to say it.

Miss COBB. I don't have anything to back it up with.

Mr. ANFUSO. Mrs. Hart.

Mrs. HART. I want to give one piece of evidence that might have some weight here. For 17 years now there has been a transcontinental air race piloted solely by women, with as many as 101 aircraft in it, and regularly it has about 50, and there has been not one single fatality.

It has been going on for 17 years. I question that that many automobiles could drive across the country that successfully.

Mr. FULTON. Women have a very excellent record even in airplane racing in this country, don't they?

Mrs. HART. Yes, sir.

Mr. FULTON. Secondly—I believe my statistics are correct—they have a better safety record in driving automobiles?

Mrs. HART. The National Safety Council has figures to bear that out, yes, sir.

Mr. FULTON. So then, the problem is not whether you are equal to men. To me it would be how superior are women over men. I am serious about it.

Mrs. HART. This I would not agree to.

Miss COBB. This I would not agree with either.

Mr. FULTON. I realize you are not here to justify equality. However, considering the competitive opportunities you had with men in this country, might it not be the case, that if given the opportunity you might prove superior to men in the space flight program?

Mrs. HART. Perhaps in some areas.

Mr. FULTON. I am a bachelor, so I can say that.

Mrs. HART. I don't think you can say one is superior to the other.

Mr. FULTON. But you believe you as women are competent, such as with automobiles and in planes as far as you can go. That competence, if projected, should make you at least competent in space, wouldn't it?

Miss COBB. I would think so.

Mr. ANFUSO. Miss Cobb and Mrs. Hart, tomorrow we will place in the record the standard set for astronauts. Two of the main provisions, as I understand them, are that they must be test pilots, and also engineers. Now, do I gather from your testimony, Miss Cobb, that you don't believe that an astronaut need be a test pilot?

Miss COBB. Yes, sir; you are entirely correct.

Mr. ANFUSO. Do you agree with that, Mrs. Hart?

Mrs. HART. Yes, sir; I do, sir.

Mr. ANFUSO. Do you also believe that an astronaut need not be an engineer, Miss Cobb?

Miss COBB. I am inclined to agree with that. I believe that the job to be done is to fly the spacecraft in the air and this is the job of a pilot.

Do you take a pilot to begin with or do you take an engineer and train him to be a pilot so that he can fly the spacecraft. I don't think you do that any more than you take a pilot and make him primarily an engineer.

The primary job is to fly a craft in space.

This is the job of a pilot, not an engineer.

Mr. ANFUSO. Is that your view too, Mrs. Hart?

Mrs. HART. Yes, sir.

Mr. ANFUSO. Would you say that is the view of the other 11 women candidates?

Miss COBB. I feel free in representing their views as such.

Mr. ANFUSO. Mrs. Hart, do you believe that the United States should be the first nation to launch a woman astronaut?

Mrs. HART. Well, I can give a rather philosophical answer to that, Mr. Chairman.

I would like to see the United States be the first to achieve anything in the space field, and that includes having a woman go out first.

Mr. ANFUSO. If that could be accomplished, you would be in favor of it?

Mrs. HART. Yes, sir.

Mr. ANFUSO. Do you believe that the recognized hazards in such a feat, and the potential worldwide repercussions to our prestige in the event of a tragic accident, are worth the risk and expense for us to achieve that objective?

Mrs. HART. I would not want to take a position on that, sir. I don't know what the cost would be. I am not well enough acquainted with all the hazards to be able to weigh that and make a judgment.

This is something that I think the technicians and authorities would have to decide.

Mr. ANFUSO. Miss Cobb, do you wish to take a position on that?

Miss COBB. On whether the adverse publicity of putting a woman—would you rephrase the question?

Mr. ANFUSO. Do you believe that the recognized hazards in such a feat and the possible worldwide repercussions to our prestige are worth the risk and expense for us to achieve that objective of trying to put the first woman in space?

Miss COBB. I very definitely do—very strongly do.

Mr. ANFUSO. Mrs. Hart, what are the medical and scientific reasons for using women as astronauts?

Mrs. HART. I have been told that women, because they weigh less and consume less oxygen, are therefore good candidates for outer space, and also that they are emotionally equal to crises, and therefore are quite capable of handling any crises that they might meet out there.

But you cannot base a judgment on all women. These would be people who have to meet these standards just as the men.

Mr. ANFUSO. What about the question of fatigue? We know Mr. Carpenter experienced some fatigue during his flight around the earth.

Mrs. HART. Well, he experienced fatigue because he was doing a great deal in addition to what Mr. Glenn did, and it is quite understandable that he should.

Fatigue I think is not something that is restricted to the male or the female. It is whatever you are equal to. It would be again on an individual basis.

Mr. ANFUSO. One final question of you, Mrs. Hart:

Do you believe that women pilots have been denied the opportunity to participate in our national space program solely on the basis that they are women?

Mrs. HART. I suppose there is a little of this in the picture. It is quite normal in American thought when you look in the aviation field. Miss Cobb mentioned various ratings. I would like to perhaps clarify it.

You notice she said air transport rating. She mentioned this in connection with several of the girls. This means they have passed all of the tests that any captain of any airline has passed.

I have yet to step on an airliner and find a lady pilot—even on the right-hand side, let alone the left-hand side. To me it is a psychological thing we must overcome in many fields.

It is in the medical field. To the extent this still exists in American thought this certainly has resulted in some discrimination.

Mr. ANFUSO. Do you care to venture an opinion, Miss Cobb?

Miss COBB. It is because they have set up these requirements—which NASA are as much aware of as we are—that women do not have any opportunity to meet.

Mr. ANFUSO. I have no further questions.

Mr. FULTON.

Mr. FULTON. Your complaint really would not be primarily against the National Aeronautics and Space Agency then. It would rather be directed toward the practices of the military services where women have not been able to qualify and participate fully up to their capabilities in the piloting and testing the present generation fast jet aircraft and supersonic planes; is that not correct?

Miss COBB. I do not have any complaint against the military services; I recognize there is no need for women in active combat in the services these days. Now, in the war women did fly in the service, and Miss Cochran will tell you about that, since she led the WASP group.

Mr. FULTON. My point is, you are being kept out at the military service level. NASA requires jet engineering test pilots. You cannot qualify because you have not had that experience.

Miss COBB. That is the reason we cannot meet the qualifications which NASA has set down. My point is, I do not believe this experience is necessary to be an astronaut, and if it is, it could be proved easily enough by letting some pilots without the jet test pilot experience go through the simulators and see how well they do—compare the results.

Mr. FULTON. Is it necessary to have test pilot experience to be an astronaut? I believe the answer is "No."

Mr. RIEHLMAN. Miss Cobb, outside of your not having qualifications as a jet pilot and an engineer, have you passed all of the other physical and other tests that are required for an astronaut?

Miss COBB. I have passed the tests required for an astronaut, but I would like to correct you. I am not an engineer and I am not a jet test pilot.

Mr. RIEHLMAN. I understand that.

I wanted to make sure, for the record, that you had passed all of the other tests that would qualify you as an astronaut.

Miss COBB. I have passed physical, laboratory, X-ray, physical competence, psychological, psychiatric, isolation, and Navy tests, but not the training. It was not available for us to go through the space flight simulators.

They have not approved women to go through these simulators to demonstrate their capabilities for space flight. I find it a little ridiculous when I read in a newspaper that there is a place called Chimp College in New Mexico where they are training 50 chimpanzees for space flight, one a female named Glenda. I think it would be at least as important to let the women undergo this training for space flight.

Mr. RIEHLMAN. You are willing to undergo this test?

Miss COBB. Even if I have to substitute for a female chimpanzee.

Mrs. WEIS. When you say "they" won't allow you to take these tests who are "they"?

Miss COBB. The people who are doing the tests. Some of it is under the auspices of NASA, some under the auspices of the Air Force, and

the Navy. I had the privilege of going through the Navy test and had arranged for the group to go through and that was canceled.

Two years ago we were going to go through the stress testing at WADC at Dayton and the Air Force canceled those tests.

Mrs. WEIS. Supposing they eliminated the specification for engineers and test pilots, the other 12 women you say are qualified would still have to take more tests?

Miss COBB. Yes.

Mrs. WEIS. You are the only one who has taken the three sections?

Miss COBB. I have had the privilege of being able to go through these tests but was not able to get approval for the group to go through.

Mrs. WEIS. So they can be considered?

Miss COBB. They would still have to take the test.

Mrs. WEIS. They would have to allow them to do it?

Miss COBB. That is right. I don't think the qualifications of an engineering degree and jet test pilot experience should just be knocked out, but that NASA should realize there is an equivalent experience which we can offer because we have worked real hard for many years in a man's field of aviation, gaining experience and demonstrating our professional flying skill.

Mr. ANFUSO. Now, we should hear from this side.

Mr. ROUSH.

Mr. ROUSH. Miss Cobb, I couldn't help but overhear a conversation between you and Mr. Anfuso prior to the hearing and during the course of that conversation you said—

Mr. ANFUSO. I hope you can state this for the record.

Mr. ROUSH. Yes, I can. You said, "I am scared to death." How do you reconcile this emotional statement with the fact that an astronaut must be fearless and courageous and emotionally stable?

Miss COBB. Going up into space couldn't be near as frightening as sitting here. [Laughter.]

Mr. ROUSH. No further questions.

Mr. HECHLER. I notice, Mrs. Hart, you used the phrase "Somehow the program was canceled."

Could you explain this a little bit. What were you informed about the program?

Mrs. HART. As to why it was canceled?

Mr. HECHLER. Yes.

Mrs. HART. I have no idea, sir. That is one of the mysteries of the past year.

Mr. HECHLER. The phrase you use is a rather mysterious one.

Mrs. HART. That is the only way I could express it. I was just that mystified. We were to go to Pensacola. With me there is some organizational problem of logistics, that I have to arrange with the children, and so forth. I think it was 2 days before we were to arrive when we were notified it had been canceled. It was to be a 2-week testing period.

Mr. ANFUSO. We will get the answer to that question tomorrow from NASA.

Mr. HECHLER. Do you or Miss Cobb have any suggestion about the way in which this research program could be continued within the confines of what you believe the reaction of "they" is? Can you get "half your cake" and go on with part of your program?

Mrs. HART. You are asking if we have any suggestion as to how this could go on?

Mr. HECHLER. Yes.

Mrs. HART. I don't know why we couldn't continue, put the rest of the 12 through the other 23 phases, which they had not done.

Either the Air Force or the Navy, whoever has the equipment to do it, could assume the responsibility of doing this. They do it for the male astronauts. Whether they do it under contract to NASA I do not know.

But if NASA would give approval perhaps that is all that is necessary.

And then we could continue the testing and the knowledge would be acquired which would be used for whenever—now or in the future.

Mr. HECHLER. Miss Cobb, do you want to add anything?

Miss COBB. In answer to the question on why the tests at Pensacola were canceled, perhaps I can give part of a reason for it.

I went down there and took these tests, which took 2 weeks, all the arrangements were made with the School of Aviation Medicine, there and through the Lovelace Foundation, Dr. Lovelace was working closely with the group at Pensacola.

I was to be the first woman subject to go through these tests, so they could see how many changes they would have to make to test women.

They had never had a group of women there. That is the reason I went through the tests first. I passed and the arrangements were all set for about 2 months later for the group of 12 women to come down for the tests. Miss Cochran offered to pay their expenses, the girls arranged with their employers to take off from work, and 2 days before the tests were to start I got word that they had been canceled.

I immediately notified all the girls. Two of them had already quit their jobs to participate in these tests. It is hard for a woman pilot to find a job in the man's field of aviation. They had quit good jobs to take part in the tests. This is how serious they all are about space testing. About 2 days before the tests were to begin they were canceled. I wanted to find out why.

I came to Washington and talked with NASA and Navy people here. I first contacted Pensacola and they said, "We are set, still want to do the tests, we have got everything all set up down there."

They said, "We got word from the Pentagon that the tests for the girls would have to be canceled." I talked to people with the Navy Department. It all got thrown back on NASA. I went to NASA, and all the way up and down—it took me 2 days—I finally found out that NASA would not say to the Navy, "We do not have a requirement for this."

The Navy tests were canceled for the lack of a piece of paper from NASA. It was not for funds. The Navy wanted to do the testing.

Mr. ANFUSO. Will you permit me to say this to you, Miss Cobb and Mrs. Hart, that this committee has the assurances that NASA wishes to cooperate and is cooperating. I indicated in my earlier statement that these hearings are indeed helpful. And I know that you don't criticize any branch of the Government. You just want answers.

Miss COBB. I certainly do not want to criticize. I would like very much to work with NASA.

Mr. ANFUSO. These answers will be forthcoming during these hearings.

Mr. HECHLER. I want to commend you and your associate on your initiative and courage. I think all you are asking is just to keep step in the march of history.

Miss COBB. Thank you very much, Congressman.

Mr. CORMAN. I would certainly join in these remarks. Could you tell me where Irene Leverton is at the moment?

Miss COBB. Yes. I have an address in Los Angeles. I believe it is Santa Monica.

Mr. ANFUSO. Is she one of your constituents?

Mr. CORMAN. Yes. I thought she might be back here for these hearings and I wanted to meet her.

Miss COBB. I wish she could have been.

Mr. CORMAN. The question was asked whether women are more competent than men.

I would say that was asked by a bachelor. Those of us who are married know the answer is in the affirmative.

Mr. FULTON. Did it strike the women that the reason the tests were canceled was because the men thought the women were too successful? [Laughter.]

Mr. WAGGONNER. Miss Cobb, you showed a little bit of resentment toward Glenda out in this test center. You do not feel any resentment about the female monkeys in the cancer clinic, do you? [Laughter.]

Miss COBB. No. I think there is a place for both.

Mr. WAGGONNER. Seriously, NASA has said to us on occasion that they had the requirement for the astronauts to be jet test pilots as well as engineers for a specific reason. That reason was that they felt it was not, as you said, just important that the astronauts be able to pilot the spacecraft but, more important than that, to be able to bring back certain scientific information. I realize there are comparable degrees of being able to do this, as you have mentioned, but would either you or Mrs. Hart care to comment on this requirement in light of that statement, that to bring back the information NASA feels at this point of the experiment in space is probably even more important in their eyes than just being able to pilot spacecraft, and therefore maybe there is some justification for these qualifications?

Miss COBB. I think this is true, that the astronaut has more duties to perform in space than just to operate the spacecraft. It is to observe and perform other duties, but the primary function is still that of flying the spacecraft. That is why it is easier to take a pilot and teach him the other jobs which need to be done in space than to take an engineer or a geologist, or some other scientist and teach them to be a pilot.

Mr. WAGGONNER. Would you care to add anything, Mrs. Hart?

Mrs. HART. I take a little broader position on this whole question, because as you noticed in my statement, I suggested that the research should be completed on this to obtain knowledge and to encourage young women who are currently studying scientific subjects so she could, even though not pilots, eventually, if not right away, be able to go along in these as scientific observers.

The question of Mr. Carpenter's fatigue was brought up. I think it demonstrated he was being asked to do perhaps one or two things too much. The job was piloting. It also included scientific observations.

I think we should consider the possibility of a scientific observer being a different job. It would be encouraging for young ladies in school today to continue in this field.

Mr. WAGGONNER. That leads to the second question.

I don't believe the chairman meant quite what he said in an earlier remark when he said one of the chief reasons of the space program was to colonize some of these other places that we might investigate.

I don't think that was exactly what he meant, although I think I understand what he did mean, I believe there is a point where ladies can contribute something to this space program.

There is a point where we are going to have women space travellers. It may be to colonize other planets. We don't know, and there is no way for us to know.

Could you tell us at what point in this program you think a woman could best enter initially this program and contribute the most?

Miss COBB. In date you mean?

Mr. WAGGONNER. At what phase in the experiment?

Miss COBB. What phase of the testing?

Mr. WAGGONNER. What phase of the experiment?

Miss COBB. Women would have to complete the astronaut tests, complete all the phases of testing, and then go into the training series. I think this could be accomplished within a few months on an all-out basis. My thinking is—everyone agrees as you so well said—that women will eventually go into space. There will be a need for women to go into space and they will go.

As long as it eventually will happen, why not here before any other nation accomplishes the major first in space exploration.

Mr. WAGGONNER. I have one other question:

Admittedly I think what you say is so. We are faced with several things in this space program of which you have taken cognizance here, one of which is Russia is beating us to the punch.

Do you think that we ought to sacrifice anything in the way of accomplishment in time with regard to our lunar landings and other space activities, or to go into this program to the extent that we would put a woman in space at the expense of slowing down another program?

Miss COBB. No, sir; I do not.

Mr. WAGGONNER. Would you think that it would be a reasonable thing to assume that maybe after this next orbit flight, which will go as many as six orbits, that we continue our present program toward a lunar landing, and then as soon thereafter as practical, in one of the perhaps three-orbit flights, there would be one that we could train a woman astronaut for? Would that be something along the lines that you ladies have in mind?

Miss COBB. No, sir; I think that we do not have to wait for the landing on the moon before women can go into space.

Mr. WAGGONNER. I am not saying wait until then, I am saying should be interpose between the next orbital flight of maybe six orbits and the lunar landing, a three-orbit flight with a properly trained woman astronaut?

Miss COBB. I don't think it is too soon to start training women for space flight and, in fact, we should have started long before now. The first step is to get them going through the rest of the tests immediately,

and then at the point in the training where our proficiency in these simulators comes up to the proficiency of the male astronauts, then to insert her into the next orbital flight plan.

I don't think you have to start a whole new program for women. Given the opportunity to prove our proficiency in space simulators, and when our proficiency equals that of the male astronauts, insert her in the first next coming space flight.

Mr. WAGGONER. Mr. Chairman, I don't have any other questions, but I would like to say these girls are dead serious.

Mr. ANFUSO. I think, in conclusion, I might say, Miss Cobb, that what you would like to accomplish is a parallel program, but not to interfere with any existing program; is that correct?

Miss COBB. I think it need not be a separate program, nor interfere with the current program.

Mr. ANFUSO. One final question, Mr. Fulton.

Mr. FULTON. Women are paying their share of the taxes in this country. They have just as much right to the use of the equipment as the men, don't they?

Miss COBB. Yes, sir.

Mr. FULTON. Secondly, when the scientists first started putting living animals in space, it is rather remarkable that both the dogs and the monkeys were all without exception female.

Both Russian and American scientists put female animals into space and suddenly they stopped, when they found they were successful. I think that is very remarkable.

Thank you.

Mr. ANFUSO. Thank you very much, Miss Cobb and Mrs. Hart. You made valuable witnesses.

Mrs. HART. Thank you so much.

Miss COBB. Thank you.

Mr. ANFUSO. We will recess so we can talk to Miss Cochran for a minute.

(Recess.)

Mr. ANFUSO. The committee will come to order.

I have the honor and privilege of welcoming Miss Jacqueline Cochran who, without a question, is the foremost woman pilot in the world, and who holds more national and international speed, distance, and altitude records than any other living person.

Miss Cochran, do you have a prepared statement?

Miss COCHRAN. I do, Mr. Chairman, and I want to greet you and the members of your committee, and thank you very much for the opportunity to come here today.

Mr. FULTON. This side would particularly like to welcome you. You are accomplished in many fields, and I think it should be noted on the record that you were a nominee for Congress recently. You are interested in other fields than just space and air.

Miss COCHRAN. Well, I lost that one, Mr. Fulton, by 1,500 votes.

Mr. ANFUSO. All right, Miss Cochran, will you proceed with your statement?

STATEMENT OF MISS JACQUELINE COCHRAN

Miss COCHRAN. I only heard, Mr. Chairman, on Thursday, when I was out West, that I was going to be requested to come before your committee, and I had no opportunity to prepare very much of anything but my own thoughts more or less off the cuff.

Mr. ANFUSO. I read your statement. I think it is a very good one.

Mr. WAGGONNER. We don't know, Mr. Chairman, up to this point, whether these ladies drove or flew here. [Laughter.]

Mr. ANFUSO. Do you want this on the record or off the record? Go ahead.

Miss COCHRAN. I flew.

Mr. ANFUSO. That is on the record.

Miss COCHRAN. My name is Jacqueline Cochran. I live at Indio, Calif.

I received my airplane pilot's license in 1932. Since then I have flown more than 13,000 hours as command pilot in many different kinds of planes and have had several hundred hours of solo time in jet aircraft.

This flying has involved much high-speed precision flying. I hold more national and international speed, distance, and altitude records than any other living person.

During World War II, first as a member of the General Staff of the Army Air Force Training Command in Texas and then as a member of the General Staff of the Air Force with headquarters in the Pentagon, I directed the selection and training and subsequent operational duties of more than 1,000 women pilots known as the Women Air Force Service Pilots (WASP) and for my services in this connection received our country's Distinguished Service Medal.

This statement is being made for submission to the subcommittee of the Space Committee of the House of Representatives in connection with its hearing to determine whether there has been any discrimination against women in the Nation's space exploration program, and presumably also to determine what part, if any, women should have at this time as astronauts in this country's space program.

My general views are as follows:

1. I do not believe there has been any intentional or actual discrimination against women in the astronaut program to date. As one who has had much experience in high-speed precision flying and over the years has passed many of the tests that were given to select the seven first astronauts and also as one who would like exceedingly to go into space, I do not feel that I have been the subject of any discrimination.

2. The manned space flights are extremely expensive and also urgent in the national interests and therefore in selecting astronauts it was natural and proper to sift them from the group of male pilots who had already proven by aircraft testing and high-speed precision flying that they were experience, competent, and qualified to meet possible emergencies in a new environment.

May I digress from my prepared statement and make an observation?

I have spent a great deal of time at Edwards Air Force Base, where your test pilots are engaged in testing through all phases of new air-

craft. Up until 1953—the last time I checked it—I think 1 person out of approximately 100 would pass the requirements to become a test pilot in this country.

I believe that I would perhaps exaggerate if I were to say there are not more than 100 pilots, civilians and military, in this Nation today who can take a new type of complicated piece of machinery called an airplane, like your X-15 or your 106, 104, et cetera and take that aircraft through every phase right up through phase four.

So I think we have to give a great deal of credit to these men that have been selected, because they were test pilots.

Mr. FULTON. What is phase four?

Miss COCHRAN. That is to take the aircraft through its ultimate G forces. And all the other things you have to find out about an airplane. Particularly its G forces.

If it is built to sustain 7 G's, they might possibly have to put it up to 9, and even buckle the airplane to find out where it does fall apart. They don't wait until it disintegrates but they beat it up badly.

I have seen some of them.

Mr. ANFUSO. Proceed, Miss Cochran.

Miss COCHRAN. 3. The determination whether women should be included at this time in the program of training and use of astronauts should not depend on the question of sex but on whether such inclusion will speed up, slow down, make more expensive, or complicate the schedule of exploratory space flights our country has undertaken.

4. I believe such determination can best be made by the agencies directly involved in our space effort and should be left to such agencies.

5. Because very few individuals will be used as astronauts in the near future and there is no shortage of well-trained and long-experienced male pilots to serve as astronauts, it follows that present use of women, as such, in this connection cannot be based on present need.

6. As yet, there have not been sufficient findings to determine how the female would compare with the male from the physiological and psychological standpoints with respect to the new space environment and with respect to problems that might be encountered during space flights.

7. No woman should be selected as an astronaut trainee unless a sufficient group of women are simultaneously selected so that norms can be established rather than merely the individual capabilities of one or a few who might not be representative of women as a whole.

8. I believe, based on my experience with women in the WASP program, that women will prove to be as fit as men, physically and psychologically, for space flying. But such proof is presently lacking. It should not be searched for by injecting women into the middle of an important and expensive astronaut program. There is a simpler and sounder way available.

By giving a large group of women of various ages and experience a series of checks and tests on the ground, short of and apart from any astronaut trainee program, much beneficial data could be obtained in the aerospace medical field. Such tests should be considered of a medical research nature. They need not be limited to pilots. They should be well organized and supervised so that what is done at one aerospace medical center with one group of women (whether that

center is operated by one service or another) will tie into and be coordinated with work being done at other medical centers and so that women participating will all be treated as a part of a single planned effort with sufficient central control over their selection, severances and conduct to make the findings valid.

The value of such an experimental program might outweigh the costs. Such a program would take considerable time to complete because the "leadtime" for research having to do with people is quite long.

If I take the present astronauts as a criteria for how long it takes to train them, I believe they were in training for 3 years before we threw them up.

It might well develop a well-selected group of a dozen or more qualified women by the end of such research program to start an astronaut trainee program for women.

9. In the WASP program during World War II, I limited applicants to women pilots principally to simplify the screening process, there being so many applicants, and also automatically to eliminate at the start those subject to air sickness.

I might interject, I only required 35 hours of certified flying time and I do not care whether it was solo or dual.

Otherwise, there was little if any advantage in taking women with previous flying training.

It is for this reason I say that the experiments with women using the centrifuge, pressure chamber and exposure to heat and low temperatures need not be limited to pilots. In this connection, I have in mind not the elimination of pilots, because all other things equal, they would be the best group to start with, but the possible part-time use as volunteers at little, if any, added cost, of women already in the ground services. Also, I have in mind the need for a large group considering the time the research will take and the natural rate of attrition among the volunteers due to marriage, childbirth, and other causes.

(The biography of Miss Cochran follows:)

BACKGROUND SKETCH OF MISS JACQUELINE COCHRAN

Jacqueline Cochran, over her extended flying career, has established well over 100 international speed, altitude and distance records for both jet and reciprocating aircraft, many of which she still holds. She has been awarded many medals, citations, and honors some of which are hereinafter outlined. She has been, at the same time, a successful businesswoman whose initial work in the beauty field led her finally to carry out her own exacting ideas of a successful cosmetic line owned by a company which she formed for its purpose called Jacqueline Cochran, Inc., in which she presently serves as chairman of the board. She also shares the responsibility, with her husband Floyd B. Odlum, for the operation of their large fruit ranch and home located near Indio, Calif.

Miss Cochran is the only woman who, flying solo, has won first place in the famous Bendix Transcontinental Trophy Race. She won the race in 1938 against a field of 14 male pilots.

She was the first woman in the world to fly faster than mach 1 which is the speed of sound (sometimes referred to as breaking the sound barrier).

Miss Cochran was also the first woman to fly at mach 2 (twice the speed of sound) which, however, was not a "solo" flight.

Also, but not as a solo flight, she was the first woman to make an arrested landing in a jet on an aircraft carrier and to be catapulted from a carrier.

She was the first woman to make a totally blind landing—that is to say, non-visual, with use of instruments only.

During World War II Miss Cochran became the first woman to fly a bomber across the ocean for delivery to the British. She then recruited 25 American

women pilots and as their leader took them to England where they flew in non-combat operation for the British Forces. She was then called home by Gen. H. H. (Hap) Arnold and put in charge of the enlistment, training and operation of a group of women pilots which became known as the WASPS. In this connection Miss Cochran served first on the General Staff of the Air Force Training Command and then on the General Staff of the Air Force in the Pentagon. More than 1,000 WASPS were on active noncombat air duty at the time of their deactivation toward the end of the war.

For her war services Miss Cochran received the Distinguished Service Medal from President Franklin Roosevelt. She was also made a member of the French Legion of Honor.

OTHER DISTINGUISHED AWARDS

The Clifford Burke Harmon Trophy Award of the International League of Aviators has been awarded to Miss Cochran some 16 times. This presentation usually is by the President of the United States at the White House. She is to receive this award once again in the fall of 1962 for her outstanding accomplishments in 1961.

Miss Cochran is the only woman to receive the Gold Medal of the Federation Aeronautique Internationale which was presented to her at the annual conference of the FAI in Istanbul, Turkey, in 1954. For many international records she has also received the De La Vaulx Medal from the Federation Aeronautique Internationale on various occasions.

Woman of the year in business for 1953 and 1954: Miss Cochran was voted for 2 successive years the outstanding "business woman of the year," in the Associated Press poll membership newspaper editors.

The Woman of the Year Award and Medal by the American Woman's Association were given to Miss Cochran for her eminent achievements.

Silver Trophy: Awarded to Miss Cochran for one of the nine women of the year for successful achievement by the Los Angeles Times, December 5, 1954.

Silver Distaff Award: Presented to Miss Cochran as one of the "six most successful women" for 1954 by Woman's Home Companion in its January 1955 issue—"for personal effort, and courage—who in 1954 achieved some important contribution to all our lives."

Frank M. Hawks Memorial Award was presented to Miss Cochran for outstanding aerial accomplishments.

In addition to the Cross of the Legion of Honor Miss Cochran holds from the French Republic the Medal of Air, as well as the French Air Force Wings.

She has also received the honorary wings of the Turkish Air Force, Chinese Air Force, Spanish Air Force, and Royal Thailand Air Force.

The U.S. Air Force Association awarded a special trophy and on another occasion a medal to Miss Cochran for distinguished civilian service in the defense of our country.

Miss Cochran was elected president of the Federation Aeronautique Internationale (FAI) in April 1958 and she was reelected president the following year at the conference held in Moscow, Russia. She is the only woman who has served as president of this international aviation organization since it was established over 50 years ago. Upon the expiration of her term as president of FAI in October 1960, she was elected U.S. vice president of FAI, an office which she currently holds.

She is chairman of the board of the National Aeronautic Association, which is the U.S. affiliate of the Federation Aeronautique Internationale.

Miss Cochran received the Billy Mitchell Trophy as the outstanding woman pilot of the year, the only woman to be honored, in 1938.

The only woman who ever received the W. J. McGough Trophy for outstanding performance for the year 1939.

Awarded the Woman of the Year, 1953, Trophy by the California Wing Auxiliary, the Air Force Association in 1954.

Awarded the Lady Hay Drummond-Hay Trophy "in recognition of outstanding achievements in aviation."

May 5, 1955, received the Golden Fleece Award from the National Association of Wool Manufacturers for achievements in her chosen fields.

In 1957 she was specially honored by the Air Force Association, celebrating the 50th anniversary of the Air Force, as one of a select group who had contributed to the progress of the Air Force.

On the occasion of the Stonybrook, Long Island, "Salute to the Air Force" in 1958, Jacqueline Cochran was awarded the official Scroll of Honor of the State

of New York, in honor and recognition of her achievements and many contributions to strengthen American aviation, presented to her by Gov. Averell Harriman.

Miss Cochran was initiated a member of Theta Sigma Phi, the national fraternity for women in journalism, during the national convention of the organization in Colorado Springs, June 25, 1960.

January 30, 1962: Miss Cochran received the General Electric Trophy for "significant achievement in aviation."

She has received the honorary degree of doctor of humane letters from Russell Sage College, the honorary degree of doctor of laws from Elmira College and the honorary degree of doctor of science from Northland College.

In 1957 Jacqueline Cochran received Zonta International Achievement Award for her contribution to aviation.

In 1957 Miss Cochran was named by President Eisenhower as his personal representative, with rank of Special Ambassador, to represent him at the inauguration of President Somoza of Nicaragua.

She served as a member of the Committee on Security headed by Lloyd Wright, president of the American Bar Association.

Miss Cochran holds a commission as lieutenant colonel in the U.S. Air Force Reserve and also a commission as lieutenant colonel in the Civil Air Patrol.

During 1950 she served as special consultant to the Chief of Staff, U.S. Air Force.

She served for 9 years on the national board of directors of Camp Fire Girls and now holds an honorary membership on that board.

She is a director of Northeast Airlines; and of the Air Force Academy Foundation.

Miss Cochran is the author of "The Stars at Noon," the story of her career, experiences, and thoughts, published in 1954 by Little, Brown, & Co. "The Stars at Noon" has also been published in England, France, Germany, Spain, Turkey, and Switzerland.

Mr. ANFUSO. Thank you very much, Miss Cochran.

May I ask this question: In paragraph No. 2 of your statement on the first page you say:

The manned space flights are extremely expensive and also urgent in the national interests and, therefore in selecting astronauts it was natural and proper to sift them from the group of male pilots who had already proven by aircraft testing and high speed precision flying that they were experienced, competent and qualified to meet possible emergencies in a new environment.

Does any woman to your knowledge meet those specifications that you, yourself, have laid out?

MISS COCHRAN. Again, Mr. Chairman, I don't think anyone could make such a statement. I can only examine what happened with women pilots in World War II and would be happy to offer you that evidence.

No. 1, the sad part of the program was, our attrition rate was very high, due to marriage. I don't know the exact figure. Somewhere in the neighborhood of 40 percent. They flew every type of aircraft this Nation had, just as successfully. In fact, their fatality and accident rate was only slightly under the men doing the same work. Elimination rate on pilot training was slightly under that for cadets.

I attributed that particular fact to the reason that they were so carefully selected, and we were already down pretty well at the bottom of the barrel of manpower for trainees for pilots when we started the women program. I took a group of 25 already trained to England and 1 received the King George Medal. These girls were successful in England.

We were having trouble with the plane B-26. Pilots were walking off the program because, they kept saying, "I don't mind being killed in combat but not in a training program."

I recommended, and the plan was accepted, that we put women on B-26's.

I had a theory that if we took them out of the school, where they didn't get exposed to normal scuttlebutt among pilots, on a voluntary basis, we might prove something in training.

I had approximately 150 women flying an operational duty.

They did about 70,000 hours of operational duty—towing targets, being shot at with live ammunition, without a single fatality other than one minor accident. It was a very unique and very fine experience and I think contributed a lot in the effort in World War II.

So I don't have any doubt about women. I am thinking with the great rush that is necessary now to maybe catch up, from all I have been told by the newspapers, that we do not want to slow down our program, and you are going to have to, of necessity, waste a great deal of money when you take a large group of women in, because you lose them through marriage.

That is why women are not on airplanes. I have been a director of an airline for 14 years. Airlines spend \$50,000 average to check a pilot out on a 707 or Convair 880.

That is expensive if you lose them through marriage.

I think first and foremost no one is successful unless they are first a woman and first a man and have all of the instincts and desires of the two sexes. So therefore you have that kind of attrition rate when you start a program. Therefore, for the very necessary evaluation, I do not think it makes much difference whether they are pilots or not.

One of these girls that was tested at Lovelace has an engineering degree. She works for the telephone company as a research engineer. We have a very unique group of women—as you can see from Mrs. Hart and Miss Cobb.

I did not have anything to do with her coming into it. She was the first. But I think it must be a very large group, to determine many things, before we jump into something where we do not know what we are doing.

Mr. ANFUSO. Miss Cochran, you do believe that women belong in the space program?

Miss COCHRAN. I certainly think the research should be done. Then I can tell you afterward, Mr. Chairman. If they prove successful under the test, then I could answer that question.

Mr. ANFUSO. Then, even though we may lose some of the women through marriage, I suppose the importance of the program should at least call our attention to, or at least require very serious thought, as to whether or not we should not have a parallel program for women for training purposes.

Miss COCHRAN. Mr. Chairman, if you take a large enough group of women, as many pilots as you can get, as many as you can take that are already in the armed services, and put them through every single test, as we know it now, short of orbiting—I again say it is better if you have pilots, because they already have some mental conditioning to what goes on—I think it would be a very fine thing to do, and then, if they prove on all these tests they are just as fitted, or maybe more fitted, they might prove—who knows, nobody knows, it has not been done—then you start the next phase of your program—

but certainly they did not put these astronauts up until they had had almost 3 years of training?

Mr. ANFUSO. That is right.

Miss COCHRAN. I don't see how you could make a crash program with a woman, or give her less than given the men—when already it is admitted there are problems with at least one of the men. So let's face some facts.

Mr. ANFUSO. Getting down to the technical phase of this program, I am sure you are familiar with the criteria laid down by NASA for the selection and training of astronauts.

Do you believe that this criteria is sound and realistic?

Miss COCHRAN. Well, it has proven so. I do not know all of the criteria laid down. I know the medical aspect of it pretty well.

Mr. ANFUSO. Two of the principal requirements are a test pilot experience and an engineering background.

What is your comment on that?

Miss COCHRAN. It seems logical to me. I think if you have a group of people with more knowledge you are going to take the best you have. If you go to a bunch of bananas you pick the best one from the bunch to eat.

To answer your question more specifically, I don't think it is necessarily mandatory—I don't know, we have not tested that out—that they have an engineering degree.

I just don't think anyone has. I don't think NASA themselves can truthfully answer this question at this point.

They have had only seven men, sir, in this program. So I just don't think anybody can answer that question.

Mr. ANFUSO. Do you think women should be trained as test pilots?

Miss COCHRAN. Again, this goes back to 1956. When I checked the cost of checking a pilot out in a B-47, as I recall the figures it was \$144,000 at that time—for one human being. If we are economically sound enough—and I don't think we are, from what I read in the newspaper—to spend that type of money, and take a chance that about the time we are ready to use that person, she starts a family, then, I am all for it, but I am against waste, because I don't think we can afford it.

Mr. ANFUSO. Do you think we should start training women, not as astronauts, but as crewmembers?

Miss COCHRAN. That makes sense.

Mr. ANFUSO. Any questions?

Mr. KARTH. Miss Cochran, I think I understand your answer to the question by the chairman as to the requirement of being an engineer and whether or not you felt it was necessary to be an engineer to qualify as an astronaut.

As a flyer, having had a great deal of experience in jets as well as conventional aircraft, do you feel it is essential to have been a test pilot as a qualification or condition to being an astronaut?

Miss COCHRAN. Sir, the only thing I can say is that, again, if I were starting a program, which no one knows anything about, and we still know little about the environment of space, I would still choose those people that had the highest level of exposure and experience in the area that I was dealing with.

Therefore, if I had pilots that were superior—and the test pilots certainly are superior in their piloting ability or we wouldn't have so

few, and if that test pilot also has had an engineering degree in aeronautics or in aerodynamics, I would choose that person. Again, I repeat, I don't believe anyone, including NASA, can at this point, with the limited experience we have, say, whether it is necessary or not to have an engineering degree in aeronautics or aerodynamics or some phase of aeronautics. I don't know. I can't answer.

Mr. KARTH. At this phase of the U.S. space program do you feel that it is a reasonable requirement for NASA to have as one of the qualifications that of being a test pilot?

Miss COCHRAN. The only thing I can say is that Major White who, I believe, did about 90 percent of the research flights on the X-15 last year is a test pilot and has a degree in aeronautical engineering, or in some phase of aeronautical engineering.

I don't know just which one he majored in. I think that is interesting. On the other hand, you have the first man in the world who flew faster than sound—which was a great breakthrough in aviation—the British at that time were running a friendly race with us to make mach 1—that was Colonel Yeager, and I think he only finished high school.

He is from your home State, one of the greatest pilots who ever lived, in my opinion.

Mr. KARTH. Getting away from the engineering requirement, I would like to ascertain whether you, in your opinion, feel it is a reasonable requirement that NASA has laid down that you be a test pilot before you be considered as one of the astronauts in the space program?

Miss COCHRAN. If you want my own honest personal opinion—nothing to do with any knowledge, because I have not seen any of the data—

Mr. KARTH. Your personal opinion.

Miss COCHRAN. I don't think so, no. I was flying an airplane last year that they thought had some inertial coupling problems.

I flew it to its maximum speed of mach 1.35. The chief pilot said, "Did you have any trouble with the aircraft?"

I said, "No, nothing serious, but something noticeable."

He then said, "I think we got a little tail trouble."

My reply was, "I think it is in the vertical stabilizer."

My belief happened to prove true. So apart from technical training, you learn as you go along. I have learned a great deal. I know about the practical side of flying, shall we say, and the way planes are rigged.

Mr. ANFUSO. I have two more questions.

Would you say that a program to train selected American women as astronauts, apart from our present astronaut program activities, in order to launch a woman pilot into space before the Soviet Union, is a worthwhile national objective?

Miss COCHRAN. Well, sir, that is a very difficult question to answer. I think the national objective would be to try to surpass them in every field of space exploration—thrust—but I think there are many things more important, let's put it that way. Sure it is nice to be first, but it is also nice to be sure.

I don't think it would justify having a crash program. It would make the hard years of training these men look a little silly, even if it succeeded.

So, no, I can't quite say I think there should be. In the first place, I heard more than a year ago Russia was going to—I mean, heard it in the United States, not with any authority but through the usual scuttlebutt—going to orbit a woman.

In the meantime they have only orbited two men. The gossip is that they have had some difficulty and it may be sometime before they orbit another man.

I don't know if that is true. I have heard it, and I am sure you have too.

Mr. ANFUSO. Yes. In other words, we should not try to launch a woman in space merely for propaganda purposes, we must be sure of the safety?

Miss COCHRAN. Yes, I believe that with all my heart. I think it would be sad if we had difficulty rushing forward trying to beat some other country in something.

I think we could have a program as I have described in my prepared statement. I think it would be very helpful and might be very rewarding. I feel certainly our exploration of space will be far more rewarding than any of us expect it to be.

I would rather see us program intelligently and with assurance, and with surety, than to rush into something because we want to get there first, whether the moon or a satellite.

I would like to see us do it properly and successfully rather than to make a mess of it.

Mr. ANFUSO. Miss Cochran, a final question: What program would you recommend that could be initiated for a women's space program?

Miss COCHRAN. Mr. Chairman, I think I described that in my prepared statement quite well.

Mr. ANFUSO. Yes, you did. Your final thoughts are what?

Miss COCHRAN. I think they should select as many women as they can, say, not to exceed 150, 200, but it should be a sizable group—whatever the powers that be decide, I think, both pilots and nonpilots and I think these girls should be put through every possible test on the ground that we can, so long as it does not slow up, interfere in any way with the present program that is being carried forward with our astronaut program, because I think that is of prime importance to this country.

Mr. ANFUSO. This is a parallel program that you would recommend?

Miss COCHRAN. If it can be done with the present facilities, or perhaps putting more people to work, maybe the cost is justified, but nothing should interfere, in my opinion, with the present research program that is being conducted.

Mr. ANFUSO. Thank you very much, Miss Cochran.

Any questions on this side?

Mr. ROUSH. Miss Cochran, I gather from your testimony that your experience has led you to the belief that a woman is as physically capable as a man and as emotionally stable and psychologically fitted as a man for flight.

Is that correct?

Miss COCHRAN. Yes, sir, I do. They certainly are with airplanes. Whether we can say that about space I don't know.

Mr. ROUSH. One of your main objections—at least one of the hesitations I noted in your testimony—was the fact we might waste money

because of the high attrition rate if we put a group of women into this program.

I have noted, however, from the previous testimony, that most of these ladies who are involved are in their thirties. And, of course, the astronauts we have selected are in their thirties or very, very early forties. It would seem to me that from this group the attrition rate would not be quite so high.

Would you care to comment on that?

Miss COCHRAN. Well, it depends on what your exposure is, and how clever you are, and where you get around. I can't answer that one. A very good friend of mine, age 42, just had triplets—so I don't know.

Mr. ROUSH. May I ask how you feel about this matter, about the competency of a lady pilot, for example, who is in her thirties as compared to one in her twenties?

Miss COCHRAN. In our program in World War II the average age ran 22½. The woman pilot program was the only one that took them at 18½. If I were to subtract about 30 women who were top women pilots, had 200 hours of flying time, et cetera, that were aged 32 to 35, which was the top limit, we found the young ones trained very well—let's put it that way. So I don't know. I think maturity and a great deal of exposure and flying time certainly have to tell some kind of a tale.

Mr. ROUSH. Apparently someone disagreed with this in the selection of astronauts.

Miss COCHRAN. Naturally they took experience. You are not going to get experience among these young people and I don't blame them. But I am talking about starting a research program from the ground. It might be very much of an advantage to take younger people, but if you want to get something off the ground to start with, as we did in the astronaut program, you will take those people with the greatest level of experience.

I think I would want to do that with the women under the same circumstances.

Mr. ROUSH. If we institute a program of lady astronauts, do you agree it would be well in our research to have women of all age groups?

Miss COCHRAN. Yes, sir; all age groups. I think we should start with 18 if you can get them, right on through to those that, well, perhaps as old as I am, I have a lot of experience.

Mr. ANFUSO. To be fair with all the members, we have about 10 minutes. I would like to call on every member here, so it will be helpful if you will limit yourselves to one or two questions.

Mr. FULTON. I yield to the lady.

Mr. RIEHLMAN. I yield to the lady.

Miss COCHRAN. I would like to point out, Mr. Chairman, I have a letter from Miss Cobb. I think this is an interesting statement:

The qualification rules have been laid down for astronauts, and although NASA says they have nothing against women, it just so happens the requirements are such that no one can meet them.

I don't know much about regulations, but I do know that exceptions have been and can be made as to qualifications without destroying the scientific basis of the program.

Mr. Glenn did not graduate from college, and I checked upon Slayton's heart condition. It had not been known for 3 years. I called Dr. Randolph Lovelace last night and asked him.

Mrs. WEIS. One question, Miss Cochran.

In the other testimony the question was brought up that these 12 gals who had taken the tests had not completed them. Before a larger program, such as you envision, got started, would you be in favor of having these 12 women complete the full test?

Miss COCHRAN. They could be part of the program. I donated the funds for these women to have the medical examinations. As you know, the same medical institution also was responsible for the medical checks of the astronauts. If I had not been interested in women having a look-in on the program I would not have gone to this expense and trouble.

I just want to see it done on an extremely sound basis when it is done, and well coordinated, and not just a big hoopla.

Mrs. WEIS. Do you feel they could get a medical history from these 12?

Miss COCHRAN. I think it is too small a group, and if you start anything you should start with a really large group of women, including some of those in the armed services.

Also, I think we should train some medical technicians. I am sure you will get medical technicians that will volunteer.

I think you are going to need, if you send out large groups of people, more people than just those people who know how to fly an airplane. I think Mrs. Hart was very wise in her statement when she said perhaps in view of what happened to Mr. Carpenter you need to have some one else along to do the photography.

I chatted with him at length.

He had to load the cameras, and so forth, I got up to nine extra things he did.

I believe there were nine, perhaps seven, that were not required of Mr. Glenn when he orbited in that 3-hour period.

Mr. ANFUSO. Thank you.

Mr. CORMAN. You alluded to the fact that it would involve a substantial amount of money, Miss Cochran, to train lady astronauts, that this same consideration has been given to the training of pilots for airlines, and that all of this would be lost in the event of marriage.

If we follow that, wouldn't that eliminate all women from all professions?

Miss COCHRAN. No, because I don't believe you would want your wife—Mrs. Hart certainly is a great example here—when she is having a child to be flying for nearly a year.

Secondly, if the astronaut's end of flying is going to be on a parallel with airplane flying—which I am quite familiar with—it requires a great deal of constant work and training.

Why do they give the airline pilots a check every 60 days on their instrument proficiency?

A friend of mine, who has flown with an airline company for 20 years, finally washed out and couldn't hack it on his procedures.

I could only liken it to a person who plays a musical instrument, or a dancer, or that kind of thing, they have to train constantly.

I asked Mr. Heifetz—I look upon him as one of the greats of the violin—I said “It is obvious you have a great gift, but apart from your gift, how many hours of training do you go into before you give a concert”?

He said, “I just couldn’t say, I work so hard at it.”

I think that same thing applies to flying. Therefore, if you lose a whole year, as fast as we move, your practically have to start over. So you cannot compare that to the normal job.

You take a person in medicine today. Even a technician. I have heard them make the statement if they go away for a year, and don’t keep up with the advancement they have to get in and dig hard to resume their work also.

Mr. CORMAN. Thank you.

Mr. ANFUSO. Mrs. Riley, I would like to give you the opportunity of asking some questions.

Mrs. RILEY. You spoke of educational background or training of one of the astronauts. Looking at me, you know I am living in my second childhood. Did Mr. Lindbergh have a limited educational background.

Miss COCHRAN. I really don’t know.

Mrs. RILEY. High school, I believe.

Miss COCHRAN. Well, Colonel Yeager only had high school and he was the first to make mach I in the world.

Mrs. RILEY. I tried to encourage some of my erstwhile pupils by saying that Mr. Lindberghs didn’t finish college and look where he got.

Miss COCHRAN. If we took a poll in this room, you probably wouldn’t find any straight A student.

This world is run by B students.

Mr. ANFUSO. You mean it is run by boys.

Miss COCHRAN. Sometimes they act like that.

Mr. WAGGONER. Probably governed by C students.

Miss COCHRAN. I agree with that too.

Mr. HECHLER. I am delighted you mentioned the great West Virginian, Colonel Yeager, the first man to break the sound barrier.

You mentioned attrition rate for marriage.

I notice 3 out of the 12 who have passed the Lovelace test are married and that did not seem to interfere with their desire to go on.

Miss COCHRAN. No, I didn’t say it did, but if you initiate a program I say you are going to lose, if the WASP program is any criteria—that is all I have to go by—a great many through marriage, who are pretty soon producing their families.

Mr. HECHLER. I want to commend you for a very objective statement.

You have given the committee a lot of useful guidelines.

Miss COCHRAN. I think I have proven that I am interested in women having a chance at this, but I think it should be done, and can’t over-stress it, in a very careful and well-planned fashion across the board.

Mr. HECHLER. Thank you.

Mr. ANFUSO. Mr. Riehlman.

Mr. RIEHLMAN. First, I want to commend Miss Cochran for the very fine statement she has made and the forthright manner she has proceeded here.

In your experience with the WASP what percentage did actually wash out?

Miss COCHRAN. It was just a fraction under 40 percent, as I recall. This is almost 20 years. I have the records. They are in my dead files. The attrition rate I believe runs higher today in the armed services.

I don't know this but I am under the impression it is so. I think it was about 40 percent. It paralleled that of the men. Just a fraction under the men at that time.

Mr. RIEHLMAN. That is all.

Mr. ANFUSO. We will have a summation by our bachelor of the committee, Dr. Fulton.

Mr. FULTON. I want to read the last sentence of your statement.

I have in mind the need for a large group considering the time the research will take place and the natural rate of attrition among the volunteers due to marriage, childbirth, and other causes.

My question is this: What size group would you want?

Miss COCHRAN. I would not want to see less than 50 to 75 or 100.

Mr. FULTON. It should be—

Miss COCHRAN. Say 50 would be minimum.

Mr. FULTON. About 50 to 100?

Miss COCHRAN. Even more.

Mr. FULTON. Training as astronauts?

Miss COCHRAN. Yes.

Mr. FULTON. Next, would you put them through the same kind of a training as the astronauts got in their 3-year period?

Miss COCHRAN. Yes.

Mr. FULTON. So you would start them on astronaut training after this preliminary selection?

Miss COCHRAN. The ground training, yes, sir.

Mr. FULTON. Would you have to qualify both for aeronautics and astronautics?

Miss COCHRAN. I don't know, I think it might be interesting to train astronauts that have never been pilots. Extremely interesting.

Mr. FULTON. Would you have the Air Force open up the Air Force Academy to these women for courses?

Mr. ANFUSO. Will you yield there before she answers that question?

In reference to what you just said, about being extremely interesting to train one who has not been a pilot, would you say that we might train a scientist, either female or male?

Miss COCHRAN. Yes, sir; if you have an opportunity.

Mr. FULTON. Would you open the service academies up so they could be taking under the same conditions these courses that would advance their careers in astronautics?

Miss COCHRAN. No, sir; but you will have to bear with me a minute. When I was called home from England by General Arnold in 1942 to head up and select a group of women, at that time we had already the WAVES and the WAC. The Marine Corps was just getting ready to have their Marine girls—

Mr. FULTON. Then you would not put these women in our U.S. armed services?

Miss COCHRAN. May I finish, sir? Otherwise I can't get to your question—unless you hear my thinking through.

Mr. FULTON. All right.

Miss COCHRAN. Therefore, the Air Force was the part of the Army, and at that time there were 101 women flying in England, with about 40 ferry pilots composed of quite a number of nationalities, including 25 American women. What they were doing in Russia we didn't have any knowledge of.

General Arnold said that because the Marines will have their women under their banner we will have no trouble having a group of women put into the Air Force.

I said I would like to make a recommendation, for whatever it is worth. No one knows how well women can fly collectively—to take a cross-section of the women of our country—it has never been done. Of the some 10,000 who held licenses less than 200 had 200 hours of flying time—because I surveyed every one of them.

Only 40 could be found that had ever flown an aircraft that had retractable landing gear. Therefore, they did not have a very high level of training so far as pilots.

I said:

It costs about \$530 to swear one of these women in and get her out of the service. It will not be any credit to the Air Force if you find collectively and psychologically they are not fitted, so why didn't we take a group and set a criteria, if they met it, request Congress to make them a part of the Air Force, put them on the civilian basis until that is determined.

This recommendation was approved. I had more than 33,000 applications from women. On 12,000 of them I processed paper; about 5,000 were put through their medicals. All of them claimed they had equivalent of 2 years of college. Some of the other services got pretty jealous of this.

We kept publicity down. Some were looking for numbers, not quality. So a little bit of squabble started as to who wanted to take over my WASP.

A bill to militarize the WASP was introduced, 411 votes, it was defeated by 11 votes.

The women did prove satisfactory.

I come back. We are in a new era. I don't think you should open the Academy to the women. Maybe never. You have the ROTC, NROTC, perhaps institutions of higher learning in which you can put them. Don't clutter up the Air Academy with women unless we know we want them.

We are different.

Mr. FULTON. You might make these women and this particular corps a peacetime civilian corps of about 50 to a hundred women and a 3-year training period. Is that about what I sum your statement up to be?

Miss COCHRAN. Whatever training period is necessary, sir.

I don't know—3 years or 1 year. I haven't seen the evaluation of the 3-year training that the astronauts had.

Mr. FULTON. I hope you will not take marriage as a disqualification for space.

Miss COCHRAN. I would not.

Mr. FULTON. All of our present astronauts are married—Shepard, Cooper, Glenn, Grissom, each of them have two children, Carpenter has four.

So either marriage or children would seem to be an asset for space rather than a defect; wouldn't it?

Miss COCHRAN. It would not be an asset while you were having the babies.

They didn't have them, you know.

Mr. FULTON. I am sure you are the first one that ever thought of having babies in space. [Laughter.]

The other point that I should think we should emphasize is we are coming to the Gemini program—that is the two-man, or a man and a woman, flight, and also the Apollo program with maybe three or five people.

Actually, women could be very good assistants in those flights, even if they were not the captain of the astronaut ship, isn't that correct?

Miss COCHRAN. I agree, you may want a medical technician aboard that is a woman, or a woman who is assistant pilot. I don't know. I am not against women being in this program. Don't misunderstand. I would not have done what I did to get at least a small group a showing.

Mr. ANFUSO. I don't think your testimony indicates that.

Miss COCHRAN. I don't want anybody to get that idea. If I had not been for women in space at one time I would not have even financed the women getting the medicals.

Mr. FULTON. You might point out that Molly Pitcher in the battle of Monmouth, outlasted her husband, John Hays. She took over the cannon when he collapsed.

Miss COCHRAN. Yes, also the women who crossed the continent.

Mr. FULTON. The ladies in the pioneer wagons, covered wagons, went along and drove with their men with guns across their laps.

As a matter of fact, we have Sacajawea, who led the Lewis and Clark expedition in searching for the river leading to the Pacific Ocean and was cited by the President.

Likewise we have a gal named Malinche who was a guide for Cortez.

You ladies ought to be celebrating July 20 because it was on July 20, 1588, that a woman took charge of the seas. Queen Elizabeth on that date defeated the Spanish Armada. The Spaniards had 880 ships, and she had 130 ships. If a woman could take strategic command of the seas maybe women could also take command of space and use it for peaceful purposes.

Queen Isabella financed the expedition of Columbus.

You ladies own most of the stocks, most of the bonds, most of the savings accounts. You really are financing this.

And then we must never forget Pocahontas. John Smith said about her, "At the moment of my immediate execution, at the peril of her own life, she saved my life."

So that there was a case where a woman was an assist in a very dangerous situation.

Miss COCHRAN. I think that was done for love, sir. Women will do an awful lot for that.

Mr. FULTON. I hope you don't think that space is going to be without love, do you?

Miss COCHRAN. Well, I would hope not.

Mr. FULTON. Ladies can be courageous for various reasons in space.

Miss COCHRAN. I think there is no doubt women can go into space and be as successful as men, but I say I don't want to see it done in a haphazard manner.

Mr. FULTON. Maybe we men shouldn't be talking about keeping you out of space. We should be helping you. Women have come to the fore and taken over and performed a magnificent job when men failed. This is really brought home to me by the maid of Orleans, who, at the head of 10,000 men, after every other person had failed, won and carried the day; didn't she?

I am very serious about it. I am pointing out where women under extreme conditions have risen and have really either done as well as a man or better.

Miss COCHRAN. Well, sir, in 1938 there were 14 pilots took off. I won the race across the board from the boys. So, women can fly as well as men. But, we are in a new environment. We are in a new era. Even if we are second in getting a woman into the new environment, it's better than to take a chance on having women fall flat on their faces.

Mr. FULTON. I congratulate you.

Mr. ANFUSO. Mr. Fulton is a bachelor and he thinks women are out of this world. He would like to get them out of this world. [Laughter.]

Miss COCHRAN. May I make this one remark: There was one general who gave me a lot of trouble. He was a colonel then. I got very angry with him in a meeting and I said, "You like women, but you don't like women pilots." He married one of my WASPs.

Mr. ANFUSO. Thank you very much. The committee will stand adjourned until 10 o'clock tomorrow morning.

(Whereupon, at 12 noon, the hearing was recessed, to reconvene at 10 a.m. Wednesday, July 18, 1962.)

QUALIFICATIONS FOR ASTRONAUTS

WEDNESDAY, JULY 18, 1962

HOUSE OF REPRESENTATIVES,
SPECIAL SUBCOMMITTEE ON
THE SELECTION OF ASTRONAUTS,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C.

The special subcommittee met at 10 a.m., the Honorable Victor L. Anfuso, chairman of the special subcommittee, presiding.

Mr. ANFUSO. The committee will come to order.

Ladies and gentlemen, we meet again to continue our investigation into the problem of the qualifications necessary for the selection and training of astronauts.

There is no question that the witnesses who appear before us today have demonstrated by their background as engineering test pilots, and as products of NASA's astronaut training, that the criteria for choosing space pilots at this point in our national space program were wisely selected.

Certainly in the not too distant future many more astronauts, pilots, and crew members will be necessary. Furthermore, the development of new type of space craft of much more complex design and advanced performance, will perhaps not require such stringent qualifications on the part of the crew members. It is not too early to begin to determine these facts.

Today we have with us two Americans of heroic stature, of whom nothing further need be said. They are Col. John H. Glenn and Comdr. M. Scott Carpenter.

With the two astronauts, as a representative of the new breed of American, the space scientist, is Mr. George M. Low, who is Director of Spacecraft and Flight Missions, Office of Manned Space Flight, NASA.

We are privileged to have these distinguished Americans here.

We are very happy that our distinguished chairman, Mr. George Miller, chairman of the full committee, was able to attend this meeting.

Do any of you gentlemen have a prepared statement?

Mr. Low. I have a brief statement to start off with.

Mr. ANFUSO. Mr. Low, you may proceed.

Mr. Low. My statement this morning covers the qualifications that we have set in our current program for the selection of astronauts.

Mr. ANFUSO. At this point, before Mr. Low makes his statement, I should like to place in the record the biography of Mr. Low, which is indeed outstanding. It will be inserted at this point in the record.

(The biography of Mr. Low follows:)

GEORGE M. LOW, DIRECTOR OF SPACECRAFT AND FLIGHT MISSIONS, OFFICE OF MANNED SPACE FLIGHT

George M. (Michael) Low was appointed Director of Spacecraft and Flight Missions, Office of Manned Space Flight, on November 1, 1961. He is responsible for the development of manned spacecraft and for the management of manned space flight mission operations, including Projects Mercury and Apollo.

Low was born in Vienna, Austria, in 1926. He came to the United States in 1940, and became a naturalized citizen 5 years later. He earned a bachelor of aeronautical engineering degree in 1948, and a master of science in aeronautical engineering degree in 1950, both from Rensselaer Polytechnic Institute.

Low joined the National Advisory Committee for Aeronautics, predecessor of NASA, at the Lewis Research Center in Cleveland, Ohio, in 1949. There he specialized in research in the fields of aerodynamic heating; boundary layer theory and transition; and internal flow in supersonic and hypersonic aircraft. During his years at the Lewis facility, he was head of the Fluid Mechanics Section and later Chief of the Special Projects Branch. In October 1958, when NASA was established, he was assigned to the headquarters office as Chief of Manned Space Flight, and later was named Assistant Director for Manned Space Flight Programs.

The author of numerous technical papers and articles, Low is an associate fellow of the Institute of Aerospace Sciences, and a senior member of the American Rocket Society.

Low is married to the former Mary McNamara. Mr. and Mrs. Low and their four children live at 7204 Broxburn Drive, Bethesda, Md.

Mr. MILLER. Have you included, too, the biography of the seven astronauts? I think it should go into the record.

Mr. ANFUSO. At this point it will be ordered that the biography of the seven astronauts will also be inserted.

(The biographies follow:)

BIOGRAPHIES OF PROJECT MERCURY ASTRONAUTS

BIOGRAPHY OF MALCOLM SCOTT CARPENTER, PROJECT MERCURY ASTRONAUT

Malcolm S. Carpenter, a lieutenant commander in the U.S. Navy, was born May 1, 1925, in Boulder, Colo. He is 5 feet 10½ inches tall, weighs 155 pounds, and has green eyes and brown hair. His wife is the former Rene Louise Price, whose father, Mr. Lyle S. Price, lives at 963 Ninth Street, Boulder. The Carpenters have four children: Mark Scott, Robyn Jay, Kristen Elaine, and Candace Noxon. Carpenter's mother is living in Boulder at 2635 Mapleton Street. His father, a retired chemist, lives in Palmer Lake, Colo.

After receiving his early education through high school in Boulder, Carpenter entered Colorado College in 1943 to participate in the V-5 flight training program sponsored by the U.S. Navy. After a year there, he spent 6 months in training at St. Mary's Preflight School, Moraga, Calif., and 4 months in primary flight training at Ottumwa, Iowa. When the V-5 program ended at the close of World War II, Carpenter entered the University of Colorado to major in aeronautical engineering. Although he left the university in 1949 without having received his degree, he was awarded an "earned" degree in aeronautical engineering in May 1962, after his three-orbit flight.

Carpenter rejoined the Navy in 1949 and received flight training from November 1949 to April 1951 at Pensacola, Fla., and Corpus Christi, Tex. He spent 3 months in the Fleet Airborne Electronics Training School, San Diego, Calif., and was in a Lockheed P-2V transitional training unit at Whidbey Island, Wash., until October 1951.

In November 1951 he was assigned to Patrol Squadron 6 based at Barbers Point, Hawaii. During the Korean conflict, he was with Patrol Squadron 6 engaged in antisubmarine patrol, shipping surveillance and aerial mining activities in the Yellow Sea, South China Sea, and the Formosa Straits. In 1954 he entered the Navy Test Pilot School at the Naval Air Test Center, Patuxent River, Md. After completion of his training, he was assigned to the Electronics Test Division of the NATC. In this assignment Carpenter conducted

flight test projects with the A-3D, F-11F, and F-9F and assisted in other flight test programs. He then attended the Navy's General Line School at Monterey, Calif., for 10 months and the Naval Air Intelligence School, Washington, D.C., for an additional 8 months. In August 1958 he was assigned to the U.S.S. *Hornet*, antisubmarine aircraft carrier, as air intelligence officer. He has accumulated more than 2,900 flying hours, including 400 in jet aircraft.

Carpenter's hobbies include skindiving, archery, and skiing.

BIOGRAPHY OF LEROY GORDON COOPER, JR., PROJECT MERCURY ASTRONAUT

Leroy G. Cooper, Jr., a major in the U.S. Air Force, was born March 6, 1927, in Shawnee, Okla. He is 5 feet 9 inches tall and weighs 150 pounds and has blue eyes and brown hair. His wife is the former Trudy Olson of Seattle, Wash. The couple has two daughters: Camala K., and Janita L. His hometown is Carbondale, Colo., where he and his mother, Mrs. Leroy G. Cooper, own a small ranch. His mother is now residing there. His father, the late Col. Leroy G. Cooper, was retired from the Air Force in 1957 and died in Denver, Colo., in March 1960.

Cooper attended primary and secondary schools in Shawnee. He also attended secondary schools at Murray, Ky. He entered the Marine Corps in 1945 after his graduation from high school. He attended the Naval Academy Preparatory School for some months and was later a member of the Presidential Honor Guard in Washington until his discharge in August 1946. He attended the University of Hawaii in Honolulu, Hawaii, for 3 years (where he met and married his wife). While at the University of Hawaii, he received a commission in the Army. He transferred this commission to the Air Force and was recalled by that service for extended active duty in 1949 for flight training. After his training, he was assigned to the 86th Fighter Bomber Group in Munich, Germany, where he flew F-84's and F-86's for 4 years. While in Munich, he attended the European extension of the University of Maryland Night School for 1 year. He attended the Air Force Institute of Technology at Wright-Patterson Air Force Base, Ohio, for 2 years, where he received a bachelor's degree in aeronautical engineering in August 1956. After his graduation from AFIT, he was assigned to the Air Force Experimental Flight Test School at Edwards Air Force Base, Calif. He was graduated from this school in April 1957 and was assigned duty in the Performance Engineering Branch of the Flight Test Division at Edwards. He participated in the flight testing of experimental fighter aircraft, working as an aeronautical engineer and a test pilot.

Cooper has 2,600 hours flying time, 1,600 of which are in jet fighters.

His hobbies are flying, photography, woodwork, hunting, fishing, and boating.

BIOGRAPHY OF JOHN HERSCHEL GLENN, JR., PROJECT MERCURY ASTRONAUT

John H. Glenn, Jr., a lieutenant colonel in the U.S. Marine Corps, was born July 18, 1921, in Cambridge, Ohio. He considers New Concord, Ohio, his permanent home. He is 5 feet 10½ inches tall, weighs 168 pounds and has green eyes and red hair. His wife is the former Anna Margaret Castor, daughter of Dr. and Mrs. H. W. Castor. The Glens have two children: John David, and Carolyn Ann. His parents are Mr. and Mrs. John H. Glenn. The elder Mr. Glenn is a retired operator of a plumbing and heating business. The elder Glens and Castors all live on Bloomfield Road in New Concord. Glenn also has a sister, Mrs. Jean Pinkston, of Cambridge.

Glenn attended primary and high schools in Concord and attended Muskingum College there also. Glenn entered the Naval Aviation Cadet program in March 1942. He was graduated from this program and commissioned in the Marine Corps a year later. After advanced training, he joined Marine Fighter Squadron 155 and spent a year flying F4U fighters in the Marshall Islands. During his World War II service he flew 59 combat missions. After the war, he was a member of Fighter Squadron 218 on north China patrol and had duty in Guam. From June 1948 to December 1950, he was an instructor in advanced flight training at Corpus Christi, Tex. Glenn then attended Amphibious Warfare School at Quantico, Va. In Korea he flew 63 missions with Marine Fighter Squadrons 311 and 27 while an exchange pilot with the Air Force in F-86 Sabrejets. In the last 9 days of fighting in Korea, he downed three MIG's in combat along the

Yalu River. After Korea, Glenn attended Test Pilot School at the Naval Air Test Center, Patuxent River, Md. After graduation, he was project officer of a number of aircraft. He was assigned to the Fighter Design Branch of the Navy Bureau of Aeronautics in Washington from November 1956 to April 1959, during which time he also attended the University of Maryland. In April 1959 he was selected as an astronaut for Project Mercury.

Glenn has been awarded the Distinguished Flying Cross on 5 occasions, and holds the Air Medal with 18 clusters for his service during World War II and Korea. In July 1957, while project officer of the F8U, he set a transcontinental speed record from Los Angeles to New York, spanning the country in 3 hours and 23 minutes. This was the first transcontinental flight to average supersonic speed. He has more than 5,100 hours of flying time, including 1,600 hours in jet aircraft.

The Glenn family hobbies are boating and water skiing.

BIOGRAPHY OF VIRGIL I. GRISSOM, PROJECT MERCURY ASTRONAUT

Virgil I. Grissom, a major in the U.S. Air Force, was born April 3, 1926, in Mitchell, Ind. He is 5 feet 7 inches tall, weighs 150 pounds, has brown eyes and brown hair. Mrs. Grissom is the former Betty L. Moore. They have two sons: Scott and Mark. Grissom's parents, Mr. and Mrs. Dennis D. Grissom, live at 715 Baker Street, Mitchell. He has two brothers and a sister: Norman, of Mitchell; Lowell, a senior at Indiana University, and Mrs. Joe Beavers, of Baltimore, Md. His wife's father, Claude Moore, lives in Mitchell; her mother is deceased.

Grissom attended primary and high schools in Mitchell. He first entered the Air Force in 1944 as an aviation cadet and was discharged in November 1945. He was graduated from Purdue University with a degree in mechanical engineering in 1950. He returned to aviation cadet training after his graduation from Purdue and received his wings in March 1951. Grissom joined the 75th Fighter-Interceptor Squadron at Presque Island, Maine, as an F-86 fighter pilot. He flew 100 combat missions in Korea in F-86's with the 334th Fighter-Interceptor Squadron. He left Korea in June 1952 and became a jet pilot instructor at Bryan, Tex. In August 1955 he went to the Air Force Institute of Technology at Wright-Patterson Air Force Base, Ohio, to study aeronautical engineering. In October 1956 he attended the Test Pilot School at Edwards Air Force Base, Calif., and returned to Wright-Patterson Air Force Base in May 1957 as a test pilot assigned to the Fighter Branch. He has flown more than 3,400 hours, over 2,500 in jets.

Grissom has been awarded the Distinguished Flying Cross and Air Medal with cluster for Service in Korea.

His hobbies are hunting and fishing.

BIOGRAPHY OF WALTER MARTY SCHIRRA, JR., PROJECT MERCURY ASTRONAUT

Walter M. Schirra (Shi-RAH), Jr., a commander in the U.S. Navy, was born March 12, 1923, in Hackensack, N.J. He is 5 feet 10 inches tall, weighs 170 pounds and has brown hair and brown eyes. His wife is the former Josephine C. Fraser, of Seattle, Wash. The couple has two children: Walter III and Suzanne. Mrs. Schirra is the daughter of Mrs. James L. Holloway, wife of Admiral Holloway, USN (retired), who was commander in chief of the North-eastern Atlantic and Mediterranean area. Schirra's parents Mr. and Mrs. Walter M. Schirra, reside in Honolulu, Hawaii, where the elder Schirra was a World War I ace in the Army Air Corps. After the war, he and his wife barnstormed throughout the eastern United States in a light plane. Schirra also has a sister, Mrs. John H. Burhans, who lives in La Jolla, Calif.

Schirra attended primary and junior high schools in Oradell, N.J. He was graduated from Dwight Morrow High School, Englewood, N.J., in 1940 and attended Newark, N.J., College of Engineering 1 year. He was graduated from the U.S. Naval Academy in 1945.

Schirra has had service on board the battle cruiser *Alaska*, on the staff of the Seventh Fleet, flight training at Pensacola, in Navy Fighter Squadron 71, and as an exchange pilot with the 154th U.S. Air Force Fighter Bomber Squadron. He went with this squadron to Korea where he flew 90 combat missions in

F-84E aircraft. He downed one Mig and has one probable Mig. He took part in development of the Sidewinder missile at NOTS, China Lake, Calif. He was project pilot for the F7U-3 Cutlass and instructor pilot for the Cutlass and FJ3 Fury. He flew F3H-2N Demons as operations officer of Fighter Squadron 124 on board the carrier *Lexington* in the Pacific. He then attended Naval Air Safety Officer School at the University of Southern California, and had test pilot training at the Naval Air Test Center, Patuxent, Md. His last assignment was at Patuxent in suitability development work on the F4H. He has 3,200 hours of flying time, 2,000 in jets.

He has been awarded the Distinguished Flying Cross and two Air Medals for his Korean service.

Schirra's hobbies include waterskiing, snowskiing, hunting, and sport cars.

BIOGRAPHY OF ALAN BARTLETT SHEPARD, JR., PROJECT MERCURY ASTRONAUT

Alan B. Shepard, Jr., a commander in the U.S. Navy, was born November 18, 1923, in East Derry, N.H. He is 5 feet 11 inches tall, weighs 160 pounds, has blue eyes and brown hair. Shepard is married to the former Louise Brewer of Kenneth Square, Pa. The couple has two daughters; Juliana and Laura. His parents, Col. and Mrs. Alan B. Shepard, live in East Derry where the elder Shepard, a retired Army officer of the United States, is an insurance broker. Shepard's sister, Mrs. Pauline S. Sherman, resides in Attleboro, Mass.

Shepard attended primary school in East Derry and was graduated from Pinderton Academy, Derry, N.H., in 1940. He studied 1 year at Admiral Farragut Academy, Toms River, N.J., and then entered the Naval Academy, Annapolis. He was graduate from Annapolis in 1944. He was graduated from the Naval War College, Newport, R.I., in 1958.

The astronaut, saw service on the destroyer *Cogswell* in the Pacific during World War II. He then entered flying training at Corpus Christi, Tex., and Pensacola, Fla. He received his wings in March 1947. Subsequent service was in Fighter Squadron 42 at the Norfolk Naval Air Stations and Jacksonville, Fla. He also served several tours aboard aircraft carriers in the Mediterranean. Shepard went to USN Test Pilot School at Patuxent River, Md., in 1950 and served two tours in flight test work there. During this service he took part in high altitude tests to obtain data on light at different altitudes and on a variety of air masses over the North American Continent. He also took part in experiments in test and development of the Navy's inflight refueling system, carrier suitability trials of the F2H3 Banshee, and Navy trials of the first angled carrier deck. Between his flight test tours at Patuxent, Shepard was assigned to Fighter Squadron 193 at Moffett Field, Calif., a night fighter unit flying Banshee jets. He was operations officer of this squadron and made two tours with it to the Western Pacific on board the carrier *Oriskany*. He has been engaged in the test of the F3H Demon, F8U Crusader, F4D Skyray, and F11F Tigercat. He was project test pilot on the F5D Skylancer. The last 5 months at Patuxent were spent as an instructor in the Test Pilot School. After his graduation from the Naval War College, Shepard joined the staff of the commander in chief, Atlantic Fleet, as aircraft readiness officer. He has 3,700 hours of flying time, 1,800 in jets.

Shepard's hobbies are golf, iceskating, and waterskiing.

BIOGRAPHY OF DONALD KENT SLAYTON, PROJECT MERCURY ASTRONAUT

Donald K. Slayton, a major in the U.S. Air Force was born March 1, 1924, in Sparta, Wis. He is 5 feet 10½ inches tall, weighs 160 pounds and has blue eyes and brown hair. His wife is the former Marjorie Lunney, daughter of Mr. and Mrs. George Lunney, of Los Angeles, Calif. The Slaytons have one son, Kent. Slayton's parents, Mr. and Mrs. Charles S. Slayton, live in Sparta. A brother, Howard, and a sister, Mrs. Lyndal Hagen also live in Sparta. Slayton's immediate family also includes a brother, Richard, of San Francisco, Calif.; another brother, Elwood, and two sisters, Mrs. Milton Madsen and Mrs. Harold Schluenz, all of Madison, Wis.

Slayton attended primary and high schools in Sparta, graduating from Sparta High School in 1942. He entered the Air Force as an aviation cadet in 1942 and after instruction at Vernon, Tex., and Waco, Tex., won his wings in

April 1943. He flew 56 combat missions in B-25's in Europe with the 340th Bombardment Group (medium). In mid-1944, he returned to this country as a B-25 instructor pilot at Columbia, S.C., and then served with a unit checking out pilots in the A-26. He joined the 319th Bombardment Group (medium) and went to Okinawa in April 1945, where he flew seven combat missions over Japan. He was an instructor pilot in B-25 aircraft for about a year after the war. He entered the University of Minnesota in January 1947, and was graduated with a degree in aeronautical engineering in August 1949. Following his graduation from the University of Minnesota, he was an aeronautical engineer with Boeing Aircraft Co. in Seattle, Wash., until recalled in early 1951 to active duty with the Minnesota Air National Guard, in which he maintained membership during his student days at the University of Minnesota. On his recall, he was assigned to Minneapolis as maintenance flight test officer of an F-51 squadron. He then spent a year and one-half at 12th Air Force Headquarters as technical inspector, and a like period as fighter pilot and maintenance officer with the 36th Fighter Day Wing in Bitburg, Germany. He returned to the United States in June of 1955 and attended the Air Force Flight Test Pilot School at Edwards Air Force Base, Calif. From January 1956 until April 1959, he was an experimental test pilot at Edwards, where he flew most jet fighter-type aircraft, built for the Air Force, and some foreign fighters. His last assignment was chief of fighter test section A. He has 3,600 flying hours, 2,200 in jets.

His hobbies are hunting, fishing, shooting, archery, and skiing.

STATEMENT OF GEORGE M. LOW, DIRECTOR OF SPACECRAFT AND FLIGHT MISSIONS, OFFICE OF MANNED SPACE FLIGHT, NASA

Mr. Low. Mr. Chairman, members of the committee, it is a privilege to appear before you again and to present to you the following information on the subject of astronaut qualifications.

The National Aeronautics and Space Administration, for the past few months, has been engaged in a program for the selection of additional astronauts to add to the seven initially selected for Project Mercury.

These additional astronauts will fly as pilots or copilots in the Gemini project and will be available for Project Apollo.

The qualifications for the new astronaut applicants were determined only after lengthy consideration. There is ample motivation for a correct determination of these qualifications since, as this committee is well aware, the success or failure of our manned space flight program rests, to a large degree, with the capabilities of our astronauts.

ASTRONAUT QUALIFICATIONS

The basic qualifications for the selection of the new group of astronauts are as follows:

1. Citizenship: U.S. citizen.
2. Age: Under 35 years.
3. Physical qualifications:
 - (a) Height: 6 feet or less.
 - (b) Physical condition: must be excellent.
4. Education: Degree in physical or biological sciences or in engineering.
5. Experience: Must have experience as a jet test pilot having attained experimental flight test status through the military services, the aircraft industry or NASA, or having graduated from a military test pilot school. Preference will be given to those presently engaged in flying high-performance aircraft.

6. Recommendation: Must be recommended by his present organization.

RATIONALE IN ESTABLISHING ASTRONAUT QUALIFICATIONS

I would like to comment on the rationale for establishing these qualifications.

Qualification 1, U.S. citizenship: The flight experience of the astronauts is so valuable a national asset that it should be reserved at this time for citizens of the United States.

Qualification 2, age: Astronauts who are under 35 years of age at the time of selection can be used in a flying status for a considerable period of time in order to make maximum use of their training and flight experience.

A lower maximum age would not allow sufficient time for a reasonably large group of candidates to acquire the necessary training and experience.

Qualification 3, physical qualifications: The maximum height of 6 feet was established to reduce the engineering problems of clearances, cockpit design, egress, etc., which would result if no height limit was established.

Qualification 4, education: The requirement for a degree in the physical or biological sciences or in engineering will assure that the astronauts will have a background knowledge which will:

(a) enable the astronauts to work most effectively with the engineers responsible for the engineering aspects of the program;

(b) provide the astronauts with the foundation for additional engineering and scientific training which will be given;

(c) enable the astronauts to understand how spacecraft systems function and the basic principles of space flight.

Qualification 5, Experience: Careful examination and evaluation of the tasks that an astronaut must perform, and the emergency situations with which he must be prepared to cope, have led to the conclusion that, of all existing occupations, the testing of jet aircraft most nearly approximates the piloting of spacecraft.

All jet test pilots are selected and trained to make rapid decisions and take immediate action based upon their own evaluation of the situation in the presence of high personal risk.

In many ways, manned spacecraft can be considered as a next generation of very high performance jet aircraft.

Their velocity and altitude capabilities are very great. A spacecraft has life-support systems, control systems, landing systems, power and fuel systems, and many other similarities with high-performance jet aircraft.

Thus, there is a logical reason for selecting jet test pilots—who have the training and best directly applicable occupation—for the piloting of spacecraft. In order to limit the selection to those applicants who have demonstrated their capabilities, the further qualification that the applicants be experienced jet test pilots was established.

Today, in our manned space flight program, we are in a similar situation as in the early development flights on a new aircraft.

Each spacecraft differs slightly from previous ones. Procedures are modified and improved from flight to flight. Test pilots are trained and experienced in just this type of work.

Thus, the requirement that the candidates must have attained experimental flight test status through the military services, the aircraft industry or NASA, or must have graduated from a military test pilot school was established. This assures that the applicants have had either formal training at a highly selective and rigorous test pilots' school or have gained their flight test experience at organizations requiring a high standard of performance.

This also provides a preliminary screening of candidates since only the better pilots are selected for test pilot duties.

Those engaged in flying high-performance aircraft are preferred because they will be up to date and familiar with the current state of the art in such things as environmental systems, escape systems, communications procedures and personal survival equipment.

Qualification 6, recommendation by present organization: The requirement for recommendation by the astronaut applicant's present organization provides an appraisal of each applicant by his employer and, in the case of each military pilot, signifies the willingness of the military department concerned to assign that military pilot to duty with NASA.

Mr. Chairman, this completes the list of all the qualifications we have established for the current group of astronauts being selected.

We consider the above qualifications to be the best possible for the present stage of manned space flight.

These qualifications are not static, but will be reviewed from time to time and are subject to modification as our space flight experience increases.

Mr. ANFUSO. Could you explain further the last one? That is, who is the employer?

Mr. Low. In the case of a civilian applicant it would be the company supervisor of the man concerned.

In the case of the military applicant it would be his squadron commander or the head of the school that the man is attending.

Mr. ANFUSO. Thank you.

Go ahead.

Mr. Low. Further, in the case of the military applicant, we also have the recommendation of the service itself at the top level of that service. I might point out these qualifications are similar to those used 3½ years ago in the selection of the present seven astronauts, and I think the gentlemen sitting at my side well demonstrate these were good criteria.

Mr. RIEHLMAN. In what major areas have they changed?

Mr. Low. The age has been lowered from 40 to 35, the height has been increased from 5 feet 11 inches to 6 feet. I believe these are the only areas where there are significant changes.

Mr. FULTON. Mr. Chairman, for clarification, as soon as the pilot becomes employed by NASA, is he then employed by NASA alone and not by the military nor previous employers?

Mr. Low. The military pilots that we have today are still employed by their military departments but they are detailed to NASA.

Mr. FULTON. Who has the direction and control?

Mr. Low. NASA has the direction and control over these men for the time of their detail.

Mr. RIEHLMAN. We may get into this area, Mr. Chairman, at greater length, but could you briefly say, or tell us, why the change in age and height were made?

Mr. Low. The change in age was made because we believed that the men we are selecting today will be flying not only in Gemini but also in Apollo. The Apollo lunar landing program is a program not scheduled for completion until the end of this decade. We felt by taking men who are younger than those we selected initially we will have a better assurance of having these men in flying status for a longer period of time.

The change in height was made because our capacity for boosting spacecraft will be somewhat better in the future, we will have more room, larger spacecraft, and we felt we could tolerate the extra inch in height.

Mr. ANFUSO. Is the decision to take candidates from civilian employment something new, or is that one of your new provisions? Did it exist before?

Mr. Low. This is a new provision and I should have pointed that out.

Mr. ANFUSO. Thank you.

Please proceed, Mr. Low.

Mr. Low. Using these qualifications, NASA presently is on schedule in the process of selecting 5 to 10 additional astronauts. On April 18 of this year, we announced our intention to select these additional astronauts.

The qualifications which I have listed above were published at that time. Over 250 applications were received by the 1st of June deadline. Of these, 63 met the qualification requirements.

These 63 applicants ranged from 26 up to 35 years of age; 13 applicants have completed 1 or more years of graduate work. Their total flight time ranges from 1,000 to 7,000 hours, with jet time ranging from less than 500 to 3,000 hours. Their flight test experience ranged from 6 to 92 months in this type of work. A total of 58 are married, with the number of children ranging from none to 6.

Based upon these statistics, NASA finds that the average applicant meeting all qualifications is 33 years old, is married and has three children, has a total of 2,500 hours of flying time of which 1,500 hours is in jet aircraft and has been in test flying for 2½ years.

During June the number of applicants was screened down to a total of 32. These 32 currently are being given very thorough medical examinations. By the fall, exhaustive evaluation of the experience and capabilities of these 32 highly qualified candidates will result in the final selection of 5 to 10 potential astronauts.

This completes my statement, Mr. Chairman. We are ready to answer questions.

Mr. ANFUSO. Thank you very much, Mr. Low.

May I ask you what you think are the minimum professional qualifications for an astronaut?

Mr. Low. I believe, Mr. Chairman, that the qualifications we have set we consider to be the minimum qualifications for this period of time.

Mr. ANFUSO. Have you set any qualifications for crewmembers? Have you given any thought to that?

Mr. Low. Yes. The term "astronaut," for Project Gemini, at least, involves and concerns all crewmembers. Although we have not yet firmed up all of our requirements for astronauts in Project Apollo, we believe also that similar qualifications will be required.

Mr. ANFUSO. In other words, the crewmember must be an astronaut according to your present regulation?

Mr. Low. Yes, sir. This is because the work involved in one of these space missions is such that each and every crewmember must be trained to do every function in the spacecraft.

Mr. ANFUSO. In your experience, and from the experience of Mr. Shepard and Mr. Carpenter and Colonel Glenn, and other astronauts, is it necessary that he be a test pilot?

Mr. Low. I tried to answer that, Mr. Chairman, in my statement. Perhaps I should let one of the gentlemen with me clarify this.

Mr. ANFUSO. Colonel Glenn, what do you say? Do you think that an astronaut or crewmember necessarily has to be a test pilot?

Colonel GLENN. First, let me preface my remarks by one statement. I am not "anti" any particular group. I am just pro space.

Mr. ANFUSO. That I am sure.

Colonel GLENN. Anything I say is toward the purpose of getting the best qualified people, of whatever sex, color, creed, or anything else they might happen to be.

Mr. ANFUSO. You are not against women. You are a married man, you have children.

Colonel GLENN. Yes.

I think there are several requirements for the program. There are technical requirements certainly that everyone is aware of.

The demands of just understanding the space vehicle systems requires a good technical background. It is an experimental program, also. In that regard, you use your judgment of past events, and past experience, of course, in applying this judgment to this new experimental area.

One of the design criteria we are working on is just where the astronaut is an integral part of this system, not just a passenger who goes along for the ride, as a biological specimen. He is an integral working part of it.

Scott and I have come from a couple of days of looking at some of the future equipment, where we went into just this area.

A lot of the things we had in the past to protect human life in the early missions, will be given over to the control of the astronaut, where his function will not be backed up by automatic systems. The astronaut is being designed into these systems as an integral part of it.

We feel that the astronaut brings several things into the program. He brings an adaptability, certainly, in his ability to make observations that instruments and other equipment cannot make.

He also increases the reliability of the whole operation considerably by his ability to take over, manually, and his ability to analyze.

He brings to it his judgment, and not only the judgment from his training, but also the judgment that he brings to the program from his past background and experience, which is at least as large or larger than the training that he has been given.

The astronauts' function is actually then to take over full control, to analyze, assess, and report the various things that he encounters, or new situations in which he finds himself. In doing this he must perform these functions under periods of high stress, both mentally and physically, and observe many complex functions under these stresses.

This is an unusual position to be in. Under periods of high stress, of, say, insertion into orbit, where you are getting up close to 18,000 miles an hour, you are at 6 g.'s, you are observing many instruments and trying to observe your own physical condition. I think the on-board tapes would confirm that we were capable at that time of making good observations.

This might be similar to the testing of high performance aircraft, where you are at high speed and are performing piloting functions and tracking functions with control systems. These things we have been used to doing in the past under these very unusual conditions.

This is not to say that no one else could be trained to do it. However, the test pilot program is built around people who continually demonstrate the emotional, physical, and mental stability, to do this.

The test pilot program might be termed sort of a program of survival of the fittest, I guess, because I think the losses in that program, or the types of people that are weeded out of it early, are pretty well known.

To bring all this back to what type person you want, we felt that the person who can best perform all these functions is still represented most nearly by the test pilot background. That is the cadre of people we have available in this country now without a lot of special training, and are available immediately for selection for a program of this type more than any other single source we know of.

Mr. ANFUSO. Colonel Glenn, would you say that the psychological adjustment of a test pilot to hazardous flight is a prime essential to qualifying as an astronaut.

Colonel GLENN. It certainly is the same type thing. When we all went into test flying and entered test work it had its hazardous side. This we adjusted to at that time. Certainly the type adjustment we make in going into our astronaut training and into space flights is a similar step, probably another notch beyond the test flying experience of adjustment.

Mr. MILLER. Colonel, how long does it take to train a test pilot?

Colonel GLENN. Well, that is a rather difficult question.

Do you mean just to go through test pilot school?

Mr. MILLER. No. I mean for a man to qualify as a test pilot.

He has to go to school. How long does he go to school?

Colonel GLENN. Well—

Mr. MILLER. First, he has to qualify as a pilot.

Colonel GLENN. Yes.

Mr. MILLER. Then he goes to test pilot school. How long is that?

Colonel GLENN. Test pilot training normally is given to those people who have expressed a desire to get into that type work and who have also been highly recommended. These are competitive billets also. In other words, getting into test pilot training in the military services is normally a weeding out process and selection program in itself.

School, say, is 6 months, or in some cases a year, for test pilot training.

Some people may go through school and still never be fully qualified test pilots.

Mr. MILLER. I was thinking about the average.

Colonel GLENN. On the other hand, I would say the average man that goes through test pilot training, by the time he has completed, say, another year of work in actual test work after he is out of school, he probably is pretty well qualified and his qualifications go up certainly beyond that, but I would say he is certainly a qualified test pilot at the end of another year, or 1 to 2 years out of school.

Mr. MILLER. Would you say it is a safe assumption that it takes about 2 years to train a man who is already a pilot, a man who has to be an extraordinary person—just not the run of the mill. It takes an average of 2 years to train him, to bring him up to the qualifications of a test pilot?

Colonel GLENN. To be a really qualified competent test pilot I would say—it is a difficult area to assess and this is a judgment area—I would say that is a fair statement for the average person coming out of school.

Mr. MILLER. I had in mind, Mr. Chairman, that if we have to take people as astronauts who are not test pilots, and if it then takes 2 years to train them as test pilots before they can become astronauts, this shortens the span in which they can serve as astronauts. I believe this is important because, although we have before us 2 of the 7 who pioneered in this field, and we are adding 5 or 10 new astronauts to the group within the next several months, from now on astronauts will be trained continuously. As this goes on we must bring people into the program who we can expect will serve as astronauts for at least 10 to 15 years.

While I have, like the Colonel, no prejudices, and I feel that eventually women will come into this field, I think perhaps at present it is a little premature to introduce them into our manned space program unless we could find the extraordinary one who is qualified as a test pilot.

Commander CARPENTER. I would like to add one thought.

I believe that there is nothing magic about a test pilot, although they have had benefit of training and experience. The best reason for selecting test pilots for this job I believe, is that they have had the opportunity to demonstrate that they have the capabilities required of the job by reason of the fact that they have been employed in the past in the profession that most nearly approximates spaceflight.

Our training for astronauts really began when we began flying. So when we came to NASA and participated in the NASA astronaut training program, NASA was taking advantage of 10 or 12 or 15 years of experience that we already had as a group.

Our job is to get this national program on the road and do it the best way we know how, and in this interest it seems clear to me that we should select the best people available.

Mr. ANFUSO. Let me finish a few questions.

Commander Carpenter, what do you find to be the strong attraction to becoming a test pilot? Why does a pilot want to become a test pilot?

Is it for professional advancement?

Commander CARPENTER. No, sir. I think part of it is curiosity, part of it is a need to do something on your own, something new.

After you have had a period of duty with the fleet or with operating squadrons, you see new or better ways of doing things. You would like to give what you can to this program, and to get into the very beginning of the utilization of an airplane is a very good way to contribute of yourself to making the service better and the airplanes better.

Mr. ANFUSO. How do you view that, Colonel Glenn?

Colonel GLENN. The same. I have been asked that question before, I have thought about it quite a bit—as to why we volunteer for something like that.

I might turn this around and ask the gentlemen on the committee why, when most of them had very fine business or law practices at home, why they aspired to the high offices they now hold.

I think that, to be very philosophical for a moment, I think we all aspire to the top of the heap in our particular professions because it gives us most control over the future, which is unknown to us.

If you have respect, or have achieved eminence in a certain field, your future is more secure to you than it would be otherwise.

Maybe this gets beyond philosophy, but this is at least what I have reconciled to be one of the factors in my own mind as to why any of us aspire to a higher spot on the heap when we are very comfortable in the present surroundings, this desire to contribute, to use our experience, certainly goes into this same thing.

If you can see, in air combat, that certain things are needed, and you know your experience can be put to use in designing or testing so people in the future in squadrons will be better prepared and better equipped than you were when you went out, certainly you want to see these things get put in the new airplanes.

Mr. ANFUSO. Colonel Glenn, from your experience—by the way, are you an engineer?

Colonel GLENN. Not a graduate engineer, no, sir. I was taking engineering in college.

Mr. ANFUSO. You have engineering experience?

Colonel GLENN. Yes, sir.

Mr. ANFUSO. From your experience in flying around the earth, do you think that your engineering experience was a necessity?

Colonel GLENN. Oh, yes, sir. I think more than just actually being in orbit, but prior to flight, to fully understand all the systems, to work in the design areas that we worked in, in helping ferret out troubles with the systems, in being able to analyze these in flight and make the best contribution following the flight, you do need an engineering background.

Mr. ANFUSO. Do you feel the same way, Commander?

Commander CARPENTER. Not exactly.

Mr. ANFUSO. I am glad to note a difference.

Commander CARPENTER. We will fight later. [Laughter.]

I feel that it does need a man with an engineering bent, and if it is a good one, he will have demonstrated this a long time ago by following this bent through an engineering school—

Mr. ANFUSO. You said a "man." Don't you mean a "person"?

Commander CARPENTER. I stand corrected.

His talent for the mechanical sciences will have led him to an engineering education long before.

Mr. ANFUSO. Are you an engineer?

Commander CARPENTER. Yes, sir, I am now a graduate engineer. [Laughter.]

Mr. ANFUSO. To get back to you, Mr. Low, these qualifications that NASA has set out apply to women as well as men, do they not?

Mr. Low. Yes, sir, the qualifications were not set to exclude anyone.

Mr. ANFUSO. I want to get that point clear.

In other words, if women can qualify under those standards, they can be taken?

As a matter of fact, have you not chosen two women trainees?

Mr. Low. No, sir.

Mr. ANFUSO. I don't know where I got that from, but I thought it was so. For the management program, was it not, that you selected two women?

Mr. Low. I am not aware of this.

Mr. ANFUSO. All right. We won't press it.

Now, let me ask you this: At the present time, do any of the women candidates that we know of meet these qualifications?

Mr. Low. Mr. Chairman, we had several applications from potential women candidates in this last group of applications.

Mr. ANFUSO. How many?

Mr. Low. About half a dozen out of the 250 who applied. None of them met all of the qualifications.

As a matter of fact, I don't think any of them were jet test pilots, several of them did not have the educational requirements, another was too old, and one, I believe, was not a U.S. citizen.

Mr. ANFUSO. Prior to these new regulations, of course, women could not qualify because they had to be in some military outfit, is that correct. But now you have changed that, changed that so that civilians can become astronauts; is that correct?

Mr. Low. That is correct.

Mr. ANFUSO. And women can become test pilots, they can be trained as test pilots. Miss Cochran, for example, is a test pilot?

Mr. Low. Yes, Miss Cochran is an outstanding example.

Mr. ANFUSO. How many women test pilots would you say we have?

Mr. Low. I cannot answer that question. Miss Cochran, Mr. Chairman, is the only woman test pilot that I know of.

Mr. ANFUSO. This will be my final question for the moment.

Is NASA opposed to carrying on a parallel program that would not interfere with the present program—and nobody wants to interfere with that—I don't think any of the women that testified want to interfere with that program—is NASA also studying a possible parallel program to train more women as test pilots and to become future crewmembers? Is any study being given to that?

Obviously we don't want to rule out the future of women in space, do we?

Mr. Low. No, sir, and we are certainly not opposed to anything like that, in the future, Mr. Chairman.

On the other hand, as Colonel Glenn and Commander Carpenter pointed out, we have at this time a large pool of men who have gone

through a preselection process by virtue of having become experienced test pilots.

We know, and we have demonstrated, these men can and will perform efficiently in space.

Also, let me make another point here: We don't foresee in the near future—talking about the next 5 or 10 years now—the need, at any given time, for more than perhaps 40 or 50 space pilots in the NASA program. We see, therefore, at this time, no need to broaden out the available pool of people that we could use as test pilots.

We, therefore, have no plans for an immediate program, to start a major training program for space pilots, be they men or women.

Mr. ANFUSO. Would the fact that the Russians are training women alter your opinion in this regard?

Mr. Low. I don't know for a fact whether or not they are training women. I don't think it would at this time, Mr. Chairman, because we do have this large pool of qualified people that we can draw on for our present piloting needs.

One more point. As we testified before this committee during our authorization hearings, the equipment available for training pilots for our flights, the centrifuges, the vacuum chambers, all of this equipment is very much loaded up at the present time.

Mr. ANFUSO. That is the best point you have made. In other words, you are not objecting to women, but at the present time, to let them use the things that you are using now for the astronauts, would be interfering with that program.

Mr. Low. We would be interfering with the current program.

Mr. ANFUSO. All right. That I can see. In the future, when that relaxes, and when more equipment becomes available, you think you will give consideration to it?

Mr. Low. Then I think we should certainly look into this problem.

Mr. ANFUSO. We do not want to leave out the women.

Mr. Low. No, sir; I certainly don't.

Mr. ANFUSO. Let me ask you this question:

If it should be desirable in the future for the United States to place in space together an American and, say, an English astronaut, would you then rule out this question of citizenship, or would that be done by bilateral agreement?

Mr. Low. Yes, sir; this is an agreement that would have to be reached.

Mr. ANFUSO. International agreement.

Mr. KARTH. Pursuing qualification No. 5, which is the one involving experience of test pilot training, yesterday two of the witnesses spoke very strongly about this qualification. They felt, quite frankly, that an extensive number of logged hours in actual flight compensated for all of the variables or invariables and the emergencies that one might meet as a test pilot. Therefore the test pilot requirement was not a fair one, because it ruled out too many people who normally get this training if they had logged a great number of flying hours.

Would you care to address yourselves to that?

Mr. Low. I will briefly comment on that.

I think I will have to disagree with the statements made yesterday on this point.

The type of emergency situation that test pilots get into daily in their own flying experience is not matched by the piloting community as a whole.

It is true that other pilots also get into stressful situations, but not as often or as frequently as these men do—as the experimental test pilots do.

These men have demonstrated repeatedly under actual stressful situations that they can cope with these situations; Glenn and Carpenter in their flights, and Shepard and Grissom in theirs also, demonstrated time and again that this kind of training is what allowed them to make the flights.

We all know that in John's flight, he had trouble with his automatic control system.

He had to assess the difficulties and then calmly go on the manual system and use it, and use it effectively, under trying conditions.

I am also sure that the decision to leave the retro-pack on in John's flight would have really upset almost anyone, man or woman, that did not have the kind of training that these men have had.

Mr. KARTH. This was, in my opinion, the crux of the testimony yesterday. I wonder if the two astronauts would like to address themselves and give me their opinion.

Commander Carpenter, would you care to remark on that aspect of the testimony that we received yesterday?

Commander CARPENTER. Yes, sir.

I feel that this analogy may be valid. A person can't enter a backstroke swimming race and by swimming twice the distance in a crawl qualify as a backstroker.

I believe there is the same difficulty in the type of aviation experience that 35,000 hours provides a civilian pilot and the experience a military test pilot receives.

Mr. KARTH. So you would agree with the statement that was made yesterday?

Commander CARPENTER. No. I apparently did not make myself clear.

I feel that the preponderance of hours received in normal civilian flying does not compensate for lack of military jet test flying.

I also believe that maybe we should reevaluate our goal in this program.

Is it to put an American on the moon in the best and in the safest manner, or is it to put a woman on the moon in the safest manner, or should we limit it to just putting a man on the moon?

It is quite apparent to me that if it is just to put a man on the moon, an American man on the moon, then we must take the best American available, and we can get this type of man from the group that we have selected here, test pilots.

Mr. KARTH. Colonel Glenn.

Colonel GLENN. Long experience certainly is good, but I do not see that these are apples and peaches here. We want long experience and we want the test flying background too.

I think there are many things learned from the long experience certainly that are good.

I think you learn these same things, and more, a lot faster in a test program and come out with a better qualified person at a younger age than by any other means I know of that is available.

To say that a person can float around in light planes or transports for—I don't care how many thousands of hours, you name—and run into the same type emergencies that he is asked to cope with in just a normal 6-month or 1-year tour in test flying is not being realistic. They are a different type operation completely, dealing with different types of equipment and people, and it is just not the same type flying.

There is a lot to be gained by long experience, I am certainly not knocking that, and you run into many emergencies, but by and large they are not the same type.

I am surprised that maybe we are not taking the other tack. Instead of trying to reduce our qualifications to a lower level than we have insisted on so far, perhaps we should be upping the qualifications and saying we have to have test pilots with doctorate degrees and with even more experience than we have had to date so far.

We are just trying to maintain the highest standards we can possibly maintain.

If I am on a space mission and I have someone with me, I want the highest qualified person I can over there, whether it is a woman—without regard to color, race, creed or whatever it is, if that person, or glob, whatever you want to term it, on the other side is better able to take care of the job, that that seat was designed to take care of, I could not care less who is ever there, and that is all we are trying to do with this type of selection.

Mr. KARTH. Thank you very much. One last question of Mr. Low.

How many commercial or private airlines test pilots are there in the United States today?

Mr. Low. I do not know, sir.

Mr. KARTH. Could you try to make an evaluation of this question and put it in the record?

Mr. Low. Yes.

(The material requested is as follows:)

There are no commercial or private airline pilots who qualify as "test pilots" in the sense used in these hearings. Information furnished by the Society of Experimental Test Pilots and the Aerospace Industry Association of America, Inc., indicates that approximately 125 civilians could qualify as current, experimental test pilots, qualified in jets. Of these, 65 are employed by the Federal Aviation Agency or the National Aeronautics and Space Administration and the remainder in the aerospace industry.

Mr. ANFUSO. Mr. Fulton.

Mr. FULTON. I disagree basically on your approach, because I believe that space is not an experiment or adventure. I think it is a new area where everybody will operate.

Under those circumstances, when women are paying the taxes here, as much or more than the men, I don't think they should be kept out of space because of rigid requirements.

For example, on the basis of the requirements that Mr. Low has stated, obviously Colonel Glenn would have been eliminated.

You wouldn't have passed, because you don't have an engineering degree—do you?

Colonel GLENN. I have one now. I did not at the time of selection.

Mr. FULTON. You would not have been selected.

So we can't look at these methods of selection and requirements as rigid. They must be variable, to get various characteristics. Wouldn't you agree with that?

Colonel GLENN. To back up just one moment, my background at the time of the original selection, I believe, was gone into, and if you will note, when NASA has relaxed anything previously on the original selection program it was an engineering degree or the equivalency thereof.

Mr. FULTON. I am glad you said that.

Colonel GLENN. Mine was the equivalency thereof, and it was felt, with my inservice experience and the schools I had been to, while I did not have the actual hours at college, I had more than the equivalency of an engineering degree.

Mr. FULTON. If a woman then, through her experience, and her flight experience, can give the equivalent capabilities and characteristics for a good astronaut, she should not be rejected because of a requirement which she is unable to fulfill. In this country a woman is not allowed to fly in the latest jet supersonic equipment. The women are not in the military services.

Secondly, your test pilot schools are military; aren't they?

Colonel GLENN. Yes, sir.

Mr. FULTON. So she is automatically excluded unless we eliminate the new rule you and I are speaking about.

Another thing is this:

I believe that the United States should adopt a program of the first woman in space. We should set that as a national goal.

I think for the world it would be a tremendous step forward. While we do have this plan which calls for a race to the moon within this decade, nevertheless I feel that in a program this broad, billions being spent, we should have a first woman in space program, and should state it as a national goal, probably at the highest level, and I would hope that President Kennedy would state such a program.

Would you agree?

Colonel GLENN. I think this is a little out of my province, sir. [Laughter.]

I am not qualified to judge what national goals we should have in this regard, sir.

I am trying to work on this particular project and work with people that I feel are best qualified for the goals we have set up for us. If we are to establish other goals and other criteria, obviously we would probably change our selection criteria.

Mr. FULTON. You are here as an expert and as a taxpayer, not just as an astronaut.

Colonel GLENN. Not as an expert on national objectives, sir.

Mr. ANFUSO. Will the gentleman yield?

I don't think it is fair to ask any of the astronauts that question.

Mr. FULTON. I don't want them to shy away from any question.

Mr. ANFUSO. I think you might ask that question of NASA, as to what they think should be their future goal.

Mr. FULTON. I thought I would get a better reception from one of the astronauts.

Mr. ANFUSO. I think you should ask Mr. Low.

Mr. FULTON. I ask Mr. Low.

Mr. Low. I feel, Mr. Chairman, that you gentlemen of the committee are much better qualified than any of us here to advise us on what the national goal should be.

Mr. FULTON. You would not object to that as a national goal—first woman in space program?

Mr. Low. I don't believe, Mr. Fulton, that I am wise enough to state what our national goals should be.

Mr. FULTON. Come, come. How about Commander Carpenter?

Commander CARPENTER. I think maybe the question would better be, When should we do this? I disagree with you that this is only a new area that we will all soon travel in. I think at this time it is definitely an experiment. There are many unknowns and it is important for us to eliminate as many of these unknowns before the flights take place as is possible.

Mr. FULTON. Yes, but, you see, doesn't that lead you into the old question of protecting women? And to me it sounds as if we are going to protect women in the kitchen, on the ground and in the home. We do not want them to get out where things are exciting, or have adventure, where there might be risks.

Commander CARPENTER. No, I believe it is protecting our program.

Mr. FULTON. Against women?

Commander CARPENTER. No, sir; not against women.

Mr. ANFUSO. If the gentleman will yield. Wouldn't you say, Commander Carpenter, that you are protecting women by letting men do the daring first, and when the trip to the moon, or any place else, becomes less hazardous, then we would take the other position; is that your point?

Commander CARPENTER. No, sir, Mr. Chairman. My point is, again, that it is I believe prudent for us at this time to select people who have demonstrated the best qualifications that we can find.

I believe that at this time we can't find this type of woman.

Mr. FULTON. Jacqueline Cochran holds more aviation and speed records than any living human being, and everybody admits her qualifications as a jet pilot.

Secondly, in 1959 there were the Lovelace Foundation tests at Albuquerque, N. Mex., 75 physical tests were completed in February 1960 by Miss Jerrie Cobb. Miss Cobb and this 12-woman group passed these tests.

Then Miss Cobb underwent the 2-week series of tests at the U.S. Navy School of Aviation Medicine in Pensacola in April 1961, and passed.

Then what happened?

In May of 1961 Administrator James E. Webb names Miss Cobb a NASA consultant. So she holds a position and says what is to be done but is not allowed to do it. She is not allowed to participate.

Now, my feeling is this. Since this group of women has passed these tests successfully, NASA should outline a training program that does not interfere with the current programs but will let women participate.

If I could finish with this, Mr. Chairman: It is the same old thing cropping up, where men want to protect women and keep them out of the field so that it is kept for men.

Yesterday, I pointed out that Molly Pitcher in the Battle of Monmouth in New Jersey, when her husband, John Hays, collapsed from exhaustion, fired his cannon from there on.

Let me tell you, don't underestimate the action of Queen Elizabeth when she took over the control of the strategic oceans of the world and beat the men in 1588, July 20, when the Spanish Armada attacked.

Likewise, if you look in our country's history, we should not overlook the Lewis and Clark expedition, when an Indian woman named Socajawea led the expedition. She was the guide and opened the Northwest for us.

Cortez was led by a woman, Malinche, that guided that expedition through Mexico.

I can bring up many instances where we, the men, failed.

The thing I am pointing out is this. With regard to the statement that Col. John Glenn made, on emotional, physical, and mental stability, I believe that we can't say that women will not pass those tests.

Don't you think they could pass those tests just as well as men?

Colonel GLENN. Oh, yes, sir. [Laughter.]

Mr. FULTON. If they pass the test, waive the engineering degree, women have the same emotional, physical, and mental stability.

Colonel GLENN. We are not saying all women have this, sir.

Mr. FULTON. You are not saying all men have it either.

Colonel GLENN. No. We are drawing from a cadre of men who have demonstrated they have this.

Mr. FULTON. When you go to the moon you would want a scientist or astronomer along. Why wouldn't a woman be good company on a trip to the moon?

Colonel GLENN. I am not looking for company, Mr. Congressman. I am looking for the best qualified person to do the job at hand.

Mr. FULTON. You must remember that Ham made a successful trip too. Ham was able to. I think a woman could do better than Ham.

Colonel GLENN. That is not a fair comparison, sir, with all due respect.

The missions that these people are being selected for, Ham is not qualified either.

I would like to point out too that, with all due respect to the women that you mentioned in all of these historic events, where they performed so fine, they rose to the occasion and demonstrated that at the time they had better qualifications than the men around them, and if we can find any women that demonstrate that they have better qualifications for going into a program than we have going into that program, we would welcome them with open arms. [Laughter.]

For the purposes of my going home this afternoon, I think that should be stricken from the record.

Mr. ANFUSO. I think we will let the record stand, Colonel.

Mr. FULTON. Mr. Low, couldn't we through NASA have the capabilities, and secondly, the physical assets and the test ability so that during this coming year, when we are making a great expansion of \$2 billion over the last year, in the NASA program, we could include women in the training programs, looking toward operational work within the near future and that is not just engineers which I think is too narrow, because I think we need astronomers, biologists, experts in live sciences, geologists, and why can't the women, with their tremendous abilities, help us on that?

To me it just seems arbitrary at this point to shunt them aside and say, "You are a consultant."

Mr. Low. We are at this time selecting astronaut candidates only for Project Gemini, although we would expect these people to fly even beyond Gemini.

We will go through another selection process in the not too distant future for Project Apollo, as I mentioned earlier.

All of our qualifications for that program are not yet set and we will certainly take all of your comments here under full consideration as we set those qualifications.

Mr. FULTON. Don't you think the age qualification for women should be completely eliminated? Seriously.

Mr. ANFUSO. You don't want a 50- or 60-year-old woman to become an astronaut.

Mr. FULTON. I volunteered to go with Glenn.

Mr. ANFUSO. After all, you are a bachelor. Maybe you would like to go out of this world.

Mr. FULTON. I am serious. Don't you think that because women group averages are a little older than the 35, that you should then ease up on the age qualifications when they are completely competent?

Mr. Low. Mr. Fulton, I agree that age as measured by a calendar may not be a very fair criterion. On the other hand, at this time, and for this selection, the best advice we could get, medical and otherwise, tells us that as people get older there is a greater chance of them either having to drop out during the training program, or even becoming incapacitated during flight.

We, therefore, set these criteria for the present selection. We will again examine them for the next selection.

Mr. ANFUSO. Isn't it a fact that you also have an age limit on test pilots?

Mr. Low. I don't know. Dr. George Knauf is with us today. Perhaps he knows the answers.

Dr. KNAUF. I don't know of any age limit.

Mr. ANFUSO. I wish you would look into that.

Mr. Low. I will.

Mr. FULTON. I was at the Edwards Air Force Base and saw the X-15 pilots.

Why aren't they automatically astronaut candidates and pilots?

Mr. Low. The X-15 pilots?

Mr. FULTON. All of them now.

Mr. Low. They were given a chance to volunteer in this current selection. Some of them undoubtedly felt that the job they are doing today on the X-15 program is more important than entering the training program for future flights.

Others perhaps felt they would not want to volunteer for personal reasons.

Mr. FULTON. In conclusion may I compliment Col. John Glenn and Commander Carpenter.

We as Americans are very proud of you and the wonderful job you have done, as well as the other astronauts. And I want to tell you, Col. John Glenn is a stellar witness before a congressional committee.

You are excellent.

Colonel GLENN. Thank you, sir.

Mr. ANFUSO. Gentlemen, I believe it necessary to set this testimony straight, for the record; as far as it has gone. According to your new regulations, there is absolutely no discrimination against women.

Mr. Low. That is correct.

Mr. ANFUSO. If women can meet those conditions you have set out, then they will qualify.

Mr. Low. Yes, sir.

Mr. ANFUSO. And you have set up these regulations, I gather, first of all, to achieve success in this program, because you want the best?

Mr. Low. Yes, sir.

Mr. ANFUSO. As Colonel Glenn said, whether they be women or men is immaterial, but you want the best.

Mr. Low. Yes, sir.

Mr. ANFUSO. So that we can advance in this program?

Mr. Low. Yes, sir.

Mr. ANFUSO. Now, of course, I assume also that you are taking into consideration the question of safety.

Now, there is a lot of talk about women astronauts. I am in favor of women. I am certainly in favor of giving them every opportunity—and they are getting it at this hearing.

I will push and fight to see that the opportunity in spaceflight will be given to them.

But I am sure that if we had lower standards than those that you have outlined, it might be dangerous. I think the loss of prestige in losing a woman in space would certainly be something that we would hear about.

So let us not be too hasty in changing those regulations.

But I will say, and I will urge NASA, and I am sure the committee will too, that they carry on some kind of a parallel program, without interfering with your present program, to give these women a chance to someday become test pilots.

I think the military test pilots school should be opened to them. They should be permitted to take those tests.

They should be permitted to be trained as test pilots—because there is a potential cadre of good pilots.

Miss Cochran and Miss Cobb and Mrs. Hart are wonderful examples.

So you have to take this in mind.

Mr. Low. Yes, sir.

Mr. ANFUSO. You say, perhaps, in your next regulations you will come up with something which will include women; is that correct?

Mr. Low. We will certainly consider all possible qualifications and reconsider them.

Mr. RIEHLMAN. Will you yield?

Mr. ANFUSO. Yes.

Mr. RIEHLMAN. I think Mr. Low made the statement that when they consider the Apollo project they will take another look at the qualifications of people.

Mr. Low. Yes, sir.

Mr. RIEHLMAN. You do have an idea you will be less stringent in these qualifications for the Apollo project than you have been for the Mercury?

Mr. Low. Colonel Glenn pointed out perhaps we would have to be more stringent, but at this time we have not set the qualifications for the Apollo program and will take another very hard look at it before we set those qualifications.

Mr. RIEHLMAN. That is the point I want to make.

There will not be any letdown, Mr. Chairman, to include people less qualified.

Mr. ANFUSO. May I make myself clear. I don't expect a letdown in regulations, but I insist that NASA consider a parallel program, where you would not have to have such stringent regulations.

For example, a training program for future passengers, future navigators. Certainly women could qualify for that.

I am not saying for the Apollo project, but for any future project. We must look ahead 10 years perhaps. And if we do the thinking now and act upon these things now we will save many years in the future. That is what I have in mind.

Mr. FULTON. Mr. Chairman, why not have a "first woman in space" project and get started on it right away?

Mr. ANFUSO. I see no objection to that, Mr. Fulton.

Let me ask these questions and I will recognize Mr. Roudebush.

Mr. Low, do you think that because of the shortage of trained, talented, and experienced people in many phases of space work an effort should be made to eliminate discrimination against women in these shortage areas, such as aerospace engineering, for example, in order to increase the available present and future work forces?

That is, giving them a new opportunity.

Mr. Low. I don't believe, Mr. Chairman, that there is any discrimination against women in aerospace engineering. I personally went to a school that had, until shortly before I started there been considered a man's school—Rensselaer Polytechnic Institute.

At the time I was there, which was in the forties, there were a number of women engineering candidates who graduated and who are now working in the industry. I think it is perhaps the lack of interest on the part of the average woman that leads us to the fact that there are few women engineers, but there are some and very competent ones.

Mr. ANFUSO. I am glad you answered the way you did, because this question was given to me by a woman who thought there was that discrimination.

This same woman also thought perhaps we ought to have something in employment, an equal employment opportunity clause, in the NASA contracts with commercial vendors. Do you have such a clause?

Mr. Low. May I point something out here, that was just shown to me? We have now in NASA a total of 146 women who are classified as professional aerospace technologists. These are engineers. Another 77 women who are professional mathematicians. These women are working in NASA along with the engineers in a professional capacity.

Mr. ANFUSO. I think the women of America should know that there is a definite place for women in the space program.

Mr. Low. And one more point, the director of our space astronomy program, Dr. Nancy Roman, foremost expert in her field, is of course a woman.

Mr. ANFUSO. I was referring to the release from NASA dated July 15, 1962, where you selected among nine college graduates two women, Miss Cunningham, of Virginia, and Miss Elliott, in one of your intern training programs.

Mr. Low. This is probably part of our management intern program, a program to train people who work in all areas of NASA.

Mr. ANFUSO. Mr. Roush.

Mr. ROUSH. Mr. Low, wouldn't the establishment of a national goal at this time to be the first Nation to put a woman in space interfere with our present program?

Mr. Low. Yes, sir, absolutely.

Mr. ROUSH. It would mean the lowering of the criteria and a changing of programing, which would slow down our present space program, would it not?

Mr. Low. It would slow it down in that all of the resources that we have available—and I can only speak for the manned space flight program now—are required for projects Gemini and Apollo.

If we diverted some of these resources, both financial and personnel, to another program, we would necessarily have to slow down our national goal of landing a man on the moon before the end of this decade.

Mr. ROUSH. Thank you. I would like to go to your qualification No. 4, and ask if in the qualifications set up for our present seven astronauts you included the requirement for a degree in physical or biological sciences or in engineering?

Was the requirement of a degree in physical or biological sciences included in your previous requirement?

Mr. Low. As I recall, the qualification at that time was a bachelor's degree or the equivalent. I don't recall that we stated it must be in engineering. I will have to look that up.

Mr. ROUSH. Do any of your seven astronauts have degrees in the physical or biological sciences?

Mr. Low. I believe they are all engineers by profession.

Mr. ROUSH. Could you tell the committee, of the 32 you have screened down to at the present time, how many of those individuals have degrees in engineering and how many in the physical and biological sciences?

Mr. Low. No, sir, I do not have any details on those 32.

Mr. ROUSH. The point of my question is, are we making any attempt to find people who can use this type of knowledge when we land on the moon, not just people who can pilot the spacecraft, but people whose knowledge will be available and will be useful to us in other areas.

Mr. Low. Yes, sir; we are making this attempt even in this selection, and this is why we specifically stated that a degree in the physical or biological sciences would qualify a man as a candidate.

We will most certainly look into this even further in the Apollo selection.

Mr. ROUSH. In the Apollo selection, is there any plan or design to use, say, an astronomer on this trip to the moon, or people in the other sciences other than your pilots?

Mr. Low. As I mentioned before, we have not yet set the criteria or the qualifications for the Apollo selection.

I think all of us here feel very strongly that people with the kind of background of John Glenn and Scott Carpenter will still be needed in at least the early Apollo flights; but this does not mean that we cannot find people who have both the excellent flying experience and

in addition to that a background in geology or astronomy, a background which can be brought out even further during the training program.

I think if we examine what makes a good scientist, it is a man who has an inquisitive mind. All of our astronauts with additional training certainly could qualify as outstanding in any other scientific field.

Mr. ANFUSO. Will the gentleman yield?

Mr. ROUSH. Yes.

Mr. ANFUSO. The age limit you have specified in your new regulation does not apply to the present astronauts, does it?

Mr. Low. No, sir.

Mr. ANFUSO. You have not yet set up any retirement age for astronauts?

Mr. Low. No, sir; and we do not plan to.

Mr. ROUSH. I have one final question.

Mr. Low, I was somewhat disturbed that your final selection of new astronauts would result in the selection of only 5 to 10 potential astronauts. This seemed to me to be a rather low figure. Do you have plans to periodically bring new astronauts into the program, and do you have a goal as to how many will be involved in the program, say 2 years from now or 5 years from now or 10 years from now?

Mr. Low. We do not yet have such a goal firmly established. Our estimates are that within this decade we will certainly need 40 to 50. We are only taking a relatively small number at this time, for two reasons: First, these men will fairly severely tax the available training facilities; but perhaps even more important, we would like to train only men who will be flying within a reasonable period of time.

We feel the training program is of a finite length. We don't want to take people away from their relatively important jobs and then have them just sit around in NASA and not have a job to do.

This is why we are phasing them in 5 to 10 at a time, until we have the full number that will eventually be required in Apollo.

Mr. ROUSH. Do you know when you will undertake your search for the next 5 or 10?

Mr. Low. Not yet.

Mr. ROUSH. That is all.

Mr. RIEHLMAN. Mr. Low, following the question by my colleague, Mr. Roush, in respect to the criteria set down for these people that you are going to be taking a look at in the future, there is nothing in there that would eliminate women from qualifying, is there?

Mr. Low. Since we do not have these criteria yet, the answer is in the affirmative.

Mr. RIEHLMAN. He was asking about people that might be accompanying a trip to the moon with all qualifications other than of a test pilot or an astronaut completely qualified.

Mr. Low. There is nothing in the present criteria, nor will there be anything in the future criteria stated to eliminate women from qualifying.

Mr. RIEHLMAN. To go back to the qualifications, and once and for all settle this problem about women astronauts, the qualifications set down at the present time and those that you are looking to in the future, certainly are not going to permit a lady to be included in one of these programs.

Mr. Low. The present qualifications are such that there appear to be no women who are qualified in the program.

Mr. RIEHLMAN. Until you change these qualifications there is no possibility of a lady becoming an astronaut?

Mr. Low. That is correct.

Mr. RIEHLMAN. As Colonel Glenn and Commander Carpenter?

Mr. Low. That is right.

Mr. RIEHLMAN. One other question and I am finished.

I think yesterday in the testimony before our committee this group of, I think, 10 or 12 or 13 women, had gone through certain tests. Then, as I understand it, they were planning to continue this program of tests, which the two gentlemen here today have gone through, but at one point they were cut off.

I think it would be helpful if we knew why. I think I know the answer, I think it was given today, that if the women who are trying to qualify for astronauts had been given their permission, then you would have had to have set aside the testing that was going on for the regular astronauts because of the lack of a separate program; am I correct in that?

Mr. Low. Let me add to that, Mr. Riehlman. The tests to be given to these women were not to be given by NASA; they were going to be given by one of the military services.

The commitment to give those tests had been made by that service. NASA was asked only later whether or not we had a requirement ourselves for such tests. At that time the answer was "No," NASA did not have a requirement for women astronauts.

That was the only time when we were asked about this program. We were asked only that one question, and our answer was that we had no requirement.

Mr. RIEHLMAN. Do you have any idea why the tests were cut off?

Mr. Low. No, sir; I think the military would have to answer that.

Colonel GLENN. I would like to add on this physical examination program—the program run out there for some of the women at Albuquerque: I think sometimes in the papers and magazines the writeups on this have been a little misleading—at least I felt they were.

I think the tests mainly are run to see if there is anything wrong with a person physically. It isn't that it qualifies anybody for anything.

It just shows that they are a good healthy person.

These things are such a minimum thing, I think it has been over-emphasized in magazines and in newspapers—as if once they had passed the physical examination they were automatically astronauts.

A real crude analogy might be: We have the Washington Redskins football team. My mother could probably pass the physical exam that they give preseason for the Redskins, but I doubt if she could play too many games for them.

Mrs. WEIS. You picked a bad team. Maybe she could. [Laughter.]

Mr. RIEHLMAN. That is all.

Mr. ANFUSO. Mr. Hechler.

Mr. HECHLER. I would like to ask the astronauts and Mr. Low this question:

When you are planning ahead for manned space missions, even beyond Apollo, would there be any advantage in having a rather large

group that starts fairly early, say in their late teens, maybe several thousands, that express a motivation, and then go through a training and testing course as the facilities and equipment become available? Then perhaps you could utilize those who don't meet your superior standards for other missions in the space program as it expands and develops and becomes more complicated.

Colonel GLENN. This has been discussed at times and I think has a lot of merit for the future.

It does two things, really.

The broadest base you can possibly draw from this selecting qualified people means that you come out at the top up here [indicating] with the superior group that you want, you hope.

So the more people that become interested in the space program, instead of lowering our criteria for selection, we probably may be able to be more selective, and, as I say, perhaps select people not only who have test-pilot training but have doctorates in a specific type of engineering.

So the broadest base from a group as you suggest is really excellent. This would give us a trained group to draw from. In addition it would take care of one other problem we are all faced with, that is just the lack of engineering talent and capable people in this field, and people, as you say, who did not qualify, could then go into the outlets of activity in engineering or project management that are in critically low supply at the present time.

I think there is a lot of merit to what you suggest.

Mr. HECHLER. As the group develops, I suppose there is a point toward training to what is specifically needed.

Commander CARPENTER. I think this program exists now. It is just not sponsored by NASA.

I don't know that there is a need to have it nationally sponsored. Anyone with the ambition can find the education he could be given under a program sponsored by NASA.

Colonel GLENN. What you are speaking of would be analogous to the National Science Academy that has been proposed from time to time.

Perhaps if that was put into effect something like this can be an outgrowth of that Academy.

Mr. HECHLER. Yes. Mr. Low, would you care to comment on that?

Mr. Low. I think John and Scott have stated all that I would say on the question.

Mr. HECHLER. Thank you.

Mr. ANFUSO. Mrs. Weis.

Mrs. WEIS. My understanding from the testimony yesterday was that since NASA had no requirement, those additional tests were called off 2 days before they were scheduled to go on, that the armed services involved were willing to do it but when NASA stated there was no requirement, that was the end; is that true?

Mr. Low. I believe that is true. On the other hand, we had not requested the tests in the first place, and I am not aware, at least, why they were scheduled, or why they were canceled.

We were asked whether we had a requirement, and the answer was "No."

Mrs. WEIS. You felt it was completely unnecessary to follow this up, even those tests were being financed independently and would be no strain on NASA.

Mr. Low. This wasn't the question.

The point I am trying to make is that at that time we were in the middle of Project Mercury. I believe it was even before the Glenn and Carpenter flights and I believe before Shepard and Grissom, but I am not sure of that.

The service did not come to us to ask whether we were interested in a research program on women. I think they themselves had to decide whether they wanted to do this. We were only asked whether we need women candidates, and at the time we did not.

Mrs. WEIS. One is always hearing that the training period for astronauts is about 3, 3½ years. Is that still the criteria for a training period, or was it 3½ years because the missions were not ready to go?

Mr. Low. Let me start to answer that, and perhaps John and Scott can add to it.

Taking the highly qualified men we took in the initial seven and we are taking today, we feel the time period is not 3½ years. At the time we selected the Mercury astronauts, we needed their talents also to work with the engineers in developing the spacecraft systems, in giving us the pilots' insight into how the displays should be built, how the control panel should be built, and so on.

For Gemini and Apollo we still have our seven men to give us this experience and we, therefore, can select the pilots somewhat later than we did in the first program.

Do you want to add anything?

Commander CARPENTER. I might add one thing to that.

This is experience that Mr. Low mentioned about contributing to the manufacture of a new airplane, that test pilots receive automatically, and it is difficult in any other field of aviation to get this experience.

I think this probably was another good reason for making test pilots available.

Mrs. WEIS. One final question, Mr. Chairman. It is obvious, though there is no intentional discrimination, in these criteria, there is a built-in discrimination because the candidate must be a test pilot.

Is there anything, in your opinion, that can be done to enable women to be accepted as test pilots? Is that an area where women should be operating now to qualify themselves for these jobs, to bring the kind of pressures they are bringing on this committee to get the military forces to accept them or civilian companies to accept them as test pilots?

Mr. Low. I see no reason why women should not enter into the test piloting field.

I don't think that in the civilian test pilot area there are any roadblocks now.

It is just that none of them have seen fit to get into this area, in large numbers at least.

Mrs. WEIS. My feeling was there was a definite roadblock against them in that the field was relatively closed to women.

Mr. Low. Would you either like to comment on that?

Colonel GLENN. I think this gets back to the way our social order is organized, really. It is just a fact. The men go off and fight the wars and fly the airplanes and come back and help design and build and test them. The fact that women are not in this field is a fact of our social order. It may be undesirable.

It obviously is, but we are only looking, as I said before, to people with certain qualifications. If anybody can meet them I am all for them.

Mrs. WEIS. I think we all agree with you there.

Thank you, Mr. Chairman.

Mr. ANFUSO. Thank you.

Mr. Corman?

Mr. CORMAN. Of the 32 people left in the present selection, Mr. Low, are any nonmilitary?

Mr. Low. Yes, sir. Some of them are. I don't have the exact number. There is a fair number of civilians in this group.

Mr. CORMAN. I understand. I am thinking of more than one person in the crew of these future flights. You are still thinking of each person in the flight having all the qualifications of a present astronaut.

Any different qualifications would be in addition to that.

Mr. Low. That is correct. You might argue, for example, that in Project Apollo, where we will have three people flying, that one of them could have less training. On the other hand, as you know, we have recently selected the lunar orbit rendezvous approach as being the best means of getting to the moon at the earliest possible time. In this approach one man would be in the mother ship, the so-called command module, and he himself for the time that the other two are on the moon will have to perform all the functions within that ship.

The other two then will land on the moon and in their smaller craft, the lunar excursion module, will make observations on the moon, they will then have to launch the smaller vehicle and rendezvous again in lunar orbit.

We believe, now at least, that the qualifications of these men will be very similar to the qualifications of Glenn and Carpenter and the other astronauts.

Mr. CORMAN. I don't think you could reach any different conclusion. I think that is right. I don't think we should be thinking in terms of a five-man crew, in which each one would only know 20 percent of the job.

Mr. Low. That is right.

Mr. ANFUSO. Mr. Bell.

Mr. BELL. Mr. Low, you said that you had 63 applicants ranging from 26 to 35 and when you made a final selection I believe you said there were 32.

I was wondering about the age bracket of the 32.

Mr. Low. I don't have any statistics, Mr. Bell, on the 32.

Mr. BELL. That is all.

Mr. ANFUSO. Mr. Waggonner.

Mr. WAGGONNER. I think Colonel Glenn has hit in his statement on the exact differences of opinion which exist here, and fundamentally our social order prescribes some differences. This program is developed to this point because of the differences in our social order which time has laid down for us.

I don't think that anyone can deny that the criteria which NASA has used to this point in selecting astronauts has been one which has been successful and is beyond criticism, as far as I am concerned.

I only hope that in the future selections we will just be a small percentage as fortunate as we have been in the other selections which have been made.

I would disagree with Mr. Fulton that we should establish a national goal at this point to land a woman on the moon which would be to the detriment of our program, which I think the criteria for have been excellent.

The program in space to this point has been oriented toward peaceful as well as military applications.

I think we have made tremendous progress and think the criteria which have been established by NASA as national aims have been good and should be pursued.

The idea is, among some, that we should do this because the Russians do it.

I do not think the women of America want to do all the things that the Russian women have to do, in the first place, nor do I believe that we Americans should do something simply because the Russians do it, or that we as neighbors ought to do something that the Joneses do.

If something has merit, we should do it.

There is one thing I think the astronauts could do at this time to put this problem in perspective with regard to the qualifications of selecting astronauts, and that is to describe for this committee the day-by-day activities of astronauts, without regard for just that one day, every so often, that they are in orbit.

This is like a minister; he does not go up and preach only on Sunday. He has to do preparation every day to give a good sermon.

Therefore, I think the astronauts, by telling these people what they do and what they contribute every day, would add more to this than anything else at this point. I would ask Colonel Glenn and Mr. Carpenter to describe for us their day-by-day activities, which make these requirements necessary.

Commander CARPENTER. If there is a question as to whether or not a woman is physically capable of passing, I think that in general she would be.

Each of us, say in the month preceding flights, have a pretty regular schedule of physical exercise to keep in good trim. There are many meetings. And many hours spent in the spacecraft itself during the preflight testing. None of these are particularly stressful.

The hours are long and at this time we draw a great deal on the experience we gained as test pilots in designing new airplanes.

If your question is, Can a woman stand the pace? I believe the answer is "Yes."

Mr. WAGGONER. No, Mr. Carpenter, my question was not that. My question was—it really wasn't a question—but I think the public, and everybody, in order to understand this, probably needs to know how much you people contribute to the actual development of the capsule and the methods and the systems day by day in the actual work of this project.

It is not just a matter of preparing for a flight that somebody else designs. You actually enter into the development and planning of these orbital flights.

Commander CARPENTER. That is correct.

Mr. WAGGONNER. You can demonstrate how day in and day out you have to make application of your engineering or your test activities and background which help to make these programs successful. That is the thing I'm saying. A lot of people think that, for example, astronauts could appear on every public occasion—which would be desirable in many respects—but they don't know how much work you people actually are required to contribute to this program, and in a technical way, as well as a physical way.

Colonel GLENN. I believe that is true.

Commander CARPENTER. I believe that is true.

Mr. ANFUSO. I think, Mr. Waggonner, if I understand you correctly, you are not saying that women eventually won't be able to do these things, but at the present time they just can't; isn't that right? We don't have any women candidates to do the things that these astronauts can do, and for that reason they are disqualified at the present.

Mr. WAGGONNER. That is exactly right, Mr. Chairman, and there has been no designs of anybody that this has come to be.

That has not been an intentional thing by any stretch of the imagination.

Colonel GLENN. Let me comment on that.

While Scott was talking I had a chance to think about it. Our last couple of days might be an example of what you are talking about.

We were having a mockup in the Midwest in the last couple days on one of our future craft.

I arrived out there on Thursday afternoon about 2 o'clock and went directly in the plant, where we went through some of the seat ejection work first.

In that area you not only get into the structure of the seat and strength, but we went over the data, where some of the angles were not quite right, where a man could get his harness or suit caught up on corners. We modified some of those. We went through the propulsion which the rocket ejection will have, which I had had some experience with. We went through the harness system used with the seat, which gets into the life sciences area, as to what a human body will take.

We went into the loadings—eyeballs in and eyeballs out—as we say.

Also the angle at which these forces would be applied to the body and what the support structure was in the spacecraft to take this.

That was about 2 hours that afternoon. Yesterday morning we started again by going through a simulator for the mission that they have on this, where the instrument is set up and hooked up through computers, where we get into simulated cockpit and run the hand controller.

I assure you we had some different opinions on this hand controller and the way the instrument system worked on this future vehicle.

We were drawing here on our experience. The placement of the instrument is not what we would like to have. Placement with relationship to the vision you expect to get from the window on rendezvous mission was not what we liked.

We went through mockup to the spacecraft and we went through this in a very detailed fashion. We spent several hours with regard to placement of switches, vision patterns, rest handles, correlating this with the new pressure suit they had out there, as far as vision patterns and rest patterns.

This we were still doing at about 4 o'clock last night when we caught the airplane at 5 o'clock to come back here to Washington.

So in this area you can see we went not only into the test piloting experience and background, but into engineer, life sciences, and structural work in engineering.

We have just about been across the board in the last 2 days. This was an especially concentrated period where all these things fit into a small area.

I don't say every day is spent like that, of course, but we also had some discussions with some of the people out there regarding length of mission and what they thought we could take, how long you can stay in that position or this position, from which we draw our experience.

This might give you a very small feeling of the sort of thing we get into at some of these discussions.

Mr. WAGGONER. That is what I had in mind, Mr. Chairman, which demonstrates the need for all of these qualifications.

I have nothing further.

Mr. ANFUSO. Thank you.

Mrs. Riley?

Mrs. RILEY. I notice one of your qualifications, sir, is age 35 or under. Being a woman, that age question is a very important consideration.

Suppose one of your potential astronauts is under 35 and during the period of training he or she passes age 35. Are they eliminated?

Mr. Low. No, Mrs. Riley. The qualifications state under the age 35 at the time of selection.

In fact, John is a good example here. The criteria the first time around was that the men must be under 40 at the time of selection.

John's 41st birthday is today and he made his flight in February.

Mrs. RILEY. You can understand my interest in the age.

Mr. ANFUSO. Is that all, Mrs. Riley?

Mrs. RILEY. Yes. Thank you, sir.

Mr. ANFUSO. Mr. Ryan.

Mr. RYAN. I was interested in pursuing the question of the tests which, as I said yesterday, the women were apparently mysteriously denied.

Would you explain what happened in those tests?

Mr. Low. Again, Mr. Ryan, I cannot explain this exactly because this was done by one of the military services.

Mr. RYAN. Which service?

Mr. Low. Navy.

Mr. RYAN. Were the women told it was done by the Navy?

Mr. Low. All the dealings these women had were either with the Lovelace Clinic or with the Navy. They were not with NASA.

Mr. RYAN. Is there any way in which NASA could pursue this and help the women to pursue these tests so at least we can begin to have an evaluation?

Mr. Low. If NASA had a requirement, or if there were qualified women applicants, most certainly we would give them the tests that are needed in the selection.

Mr. RYAN. Would it be in the interest of NASA or in the interest of the space program to have these tests administered?

Mr. Low. As pointed out before, Mr. Ryan, it might have been of interest in the area of medical research to take a large group of women and determine what their physical stamina, what their qualifications are.

We don't feel at this time this would be an essential asset for our space program.

Mr. RYAN. I don't want to pursue the matter further, Mr. Chairman. I might only observe that if—and I hope it is true—one of the objectives, one of our national objectives, is a world at peace under international law—it seems to me to be important that space be used for peaceful purposes. I think that women throughout history have demonstrated, unfortunately for the men, that they are more concerned with peace than men.

Witness the example of women's strike for peace. I would advocate giving them a voice in what happens in space.

Mr. ANFUSO. Mr. Moeller.

Mr. MOELLER. I would like to make a comment, Mr. Chairman: First, I am not sure that the statement of Mr. Ryan a moment ago would be subscribed to by everybody. I will never become an astronaut.

I certainly am interested in peace and the peaceful uses of outer space. I don't believe that is the thing we are really talking about.

Mr. Low, I would like to ask you one question.

If you got a directive today that women astronauts are to be trained, and our priority program today is to get somebody on the moon, would your program in any way be impeded by this directive?

Mr. Low. Very much so.

Mr. MOELLER. No. 2, people in industry today say that it costs them more in many, many instances to use women in their employ than men, and it is for this reason that oftentimes women take lesser pay than men take.

Would it cost the Government more money to train women astronauts and use women as astronauts than it would men?

Mr. Low. My opinion is that it would, because the training program would have to be far more extensive, and because there are no women today who are up to the same level of background as there are men.

Mr. MOELLER. Possibly the physical environment at test centers, and even in the capsule itself, require certain adjustments that would be more costly.

Mr. Low. I am sure it would require adjustments.

I cannot assess the cost of these adjustments here and now.

Mr. MOELLER. So that if today our priority program is getting a man on the moon maybe we should ask the good ladies to be patient and let us get this thing accomplished first and then go after training women astronauts. Would you agree with that?

Mr. Low. I think that even Miss Cochran yesterday in her testimony had this very same point of view, that a training program for women should in no way interfere with our program.

Mr. MOELLER. Just for the record, Mr. Chairman, thank you.

Mr. ANFUSO. Mr. Low, I think we are all in accord on this committee that we should do nothing to interfere with the present NASA program, but I think that it is also the general feeling of this committee that this country is big enough to tackle a program for women.

In line with what Miss Cochran said, she had a program, and a good program, I think.

And I think without interfering with the present program, NASA should have a program to train women pilots as test pilots, and in all the things that are necessary to some day be used for space travel.

I don't think we ought to put that off. I think it would encourage womanhood, it would encourage women to take up science and engineering, if they felt there was such a career for them.

If you need money, and if you suggest such a program, I think Congress might look upon it with favor.

I think that is what Mr. Fulton had in mind. He did not have in mind to shoot a woman into space right away, but it was a question to be thought of and something for us to do some thinking about.

What do you say about that, Mr. Low?

Mr. Low. I wholeheartedly agree that we should not exclude women from any activity in this country, Mr. Chairman.

I would like to make one or two points. One question I would have is when should such a program be started.

This last year has been one of the most difficult years for NASA, in that we are embarking on the beginning of a very, very major program. Next year, also, our task will be enormous.

I would be most concerned if we took any steps that would delay by even 1 day the possible achievement of the manned moon landing.

Mr. ANFUSO. So would we.

Mr. Low. So I would want to take under consideration as to when such a program should be started.

There is another point that perhaps might be worth making. If we are convinced that we need the kind of background that John and Scott have for pilot candidates, in other words, if we don't relax our requirements for an engineering degree, this in itself I think would be an impetus for more women to get into the field of engineering and science, which will be of benefit to our total space program.

Mr. ANFUSO. One final question, Mr. Fulton.

Mr. FULTON. I would like to rebut a few things.

For my friend Mr. Moeller from Ohio, I would disagree strongly with his point that we should complete the moon program and then look to the women. That means that if we are going to the moon within this decade, it is telling these women we are going to wait 10 years.

I hope you didn't agree with that.

Mr. Low. I did not.

Mr. FULTON. Next is this. I did agree with my friend from Louisiana because he is a fine Southern gentleman from Louisiana, and I am a Northern progressive from Pittsburgh.

Mr. WAGGONER. Who has had the women waiting indefinitely.

Mr. FULTON. You state that our social system prescribes certain differences that we should abide by them, and that is the reason why we can't have women in the space program at this time?

To me that is the same thing that has been said to women when they were interested in suffrage, or when they were interested in planes.

I would like to point out that this is about the same time as in the development of the airplane that women begin to take part. With the Wright brothers in 1903, the first woman passenger in a plane was a French woman on July 8, 1908, several months later Wilbur Wright took up an American woman at LeMans in France—a Mrs. Burg.

In addition to that, we had two women who, by 1910, tried to pilot a plane personally. One was a Miss Rashe, and the other was a Miss Well.

Each of these women took the planes up without even having a pilot's license.

Don't underestimate these women.

By 1910 we had the famous French flier, Miss D'Triame, with a pilot's license, who came over to the first international air meet or race that was in the United States at Belmont Park in New York.

The question is this.

Are the women to be put in a more restricted position in going into space than they were in the older days in piloting?

My answer to that is quickly "No."

May I say this to Mr. Low, too, in rebuttal:

Of course, nobody wants to retard the lunar program. You have adequate facilities. You are being given \$2 billion more this year, and it is not all programed.

You have been changing your programs. You could very well make a small test program for these women and get them started.

The second point I would make to Mr. Low is this: When President Kennedy—and I praise him on this, and I am a Republican—said to move the space program further, it changed the attitude of NASA Administrators who came before this committee.

Previously, they would come and say they were handling the programs as efficiently as they can, they were using all the people as much as they could, and that they did not need any more money; if we gave them more money they would only waste it.

When the President set the goal, within 90 days, as everyone on this committee will remember, up they came and changed their minds and gaily said, "Oh, we can use \$1 billion more." Now, the second year, you want \$2 billion more.

I believe we do have the facilities in this country for training women without interfering with these prime programs.

I feel that we should equally be in a race with Russia to place the first woman in space.

I think that would be a clear first, as much as landing on the moon—to me, it would be more.

I would like to end up with this for Colonel Glenn:

Do you believe that it is impossible in this country to expand our space program for peaceful uses beyond what it is now?

Is it impossible to go any faster?

Colonel GLENN. Nothing is impossible.

Mr. FULTON. All right, then, it is possible to expand it in certain directions, and why not in the direction of women?

Colonel GLENN. As I said, I am not anti anybody; I am just pro space. We have not seen the idea of women in space put forward

with the idea that they are better qualified, which is what we are looking for. The only thing we have seen thus far is women coming in space just by the very fact they are women.

Mr. FULTON. Let's face this. Mrs. Weis brought it out beautifully.

The very setup of our military training structure now effectively eliminates every woman because the test pilot schools are all military and the women can't get in them.

It is obvious that the present training structure eliminates women. The standards Mr. Low sets, based on those particular educational structures without equal training opportunities otherwise effectively eliminates women.

My question is, wouldn't you depart from Mr. Low's strict requirements? NASA did do it for you on your engineering degree.

Colonel GLENN. No, no, I see no requirement to do this.

As I said, I don't want to get into the international situation, that is the consideration of you gentlemen on the committee here, but looking at it as we do we have qualified people available from these schools now to do the job, yes, we do, and for the numbers we are talking about in the foreseeable future, we do. Now, to spend many millions of dollars to additionally qualify other people, whom we don't particularly need, regardless of sex, creed or color, doesn't seem right, when we already have these qualified people.

Mr. ANFUSO. The House is in session. I think we must recess.

Mr. FULTON. Let me finish this: You wouldn't oppose the proposal of the chairman and myself to have a small training program for women to let them qualify because of other missions there might be in space, such as science, and astronomy?

Colonel GLENN. I wouldn't oppose it. I see no requirement for it.

Mrs. RILEY. One observation.

Mr. ANFUSO. I always yield to a lady.

Mrs. RILEY. You are in close company. This objective appreciation of Mr. Fulton has touched me very deeply. [Laughter.]

Mr. MOELLER. May I make a quick insertion, I am sure there are other ways by which Jim can become popular with the ladies.

Mr. ANFUSO. Yes. Gentlemen, the House is in session. Before we adjourn I want to say this: This may be the last time that I will preside over a committee. I am assuming other duties. I want to say that this committee has functioned in perfect harmony, I don't know of a committee in the whole House that functions with such unanimity as this committee.

As you know, we passed the authorization bill not only unanimously in committee but unanimously in the House, which is quite a record.

That is why I say to you, go back and talk to Mr. Webb and Dr. Dryden and come up with some kind of a program so that you can continue to have the bipartisan support which you have always seen and enjoyed to make your program go ahead.

Your program has gone ahead and I want to congratulate NASA for the speed in which it has accelerated this program.

I want to take this last opportunity of congratulating our two great American astronauts who have demonstrated not only a great ability in the field in which they are engaged but also that they have assumed a personal responsibility, whether they like it or not, of demonstrating leadership throughout the world.

When I see women here bring their children just to look at them, you can see what our youth is looking forward to. This is the kind of leadership that they want and they look up to—as great men as you are.

I want to thank you.

Mr. RIEHLMAN. Mr. Chairman, before you hit the gavel, as a fellow New Yorker, and a colleague of yours, Mr. Chairman, I did not realize that this was possibly the last meeting that you might be chairing on this committee. May I say to you that it has been a pleasure for me, as a colleague of yours, to work with you. No one has been more sincere, and active, in putting every bit of effort that you have behind this program since you have been on this committee. It has been a pleasure for me to work with you, and Vic, we hate to see you leave.

Mr. RYAN. May I add my voice and say you have certainly served with great distinction as chairman of the various subcommittees you have presided over. As a member of the whole committee, I know I speak for all of us, when I say we will miss your services on this committee.

Mr. ANFUSO. Thank you.

Mr. FULTON. May I add to the Republican side, you are tops.

Mr. ANFUSO. Thank you, gentlemen.

(Whereupon, at 12:05 p.m., the hearing was adjourned.)

It has been suggested that you should be a member of the committee. I am sure that you would be a very valuable member. I am sure that you would be a very valuable member.

I am sure that you would be a very valuable member. I am sure that you would be a very valuable member. I am sure that you would be a very valuable member. I am sure that you would be a very valuable member. I am sure that you would be a very valuable member.

Mr. Astor, Thank you. Mr. Astor, Thank you. Mr. Astor, Thank you. Mr. Astor, Thank you. Mr. Astor, Thank you.

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APPENDIXES

APPENDIX I

SUPPLEMENTAL STATEMENT BY MISS JERRIE COBB

Mr. Chairman and members of the subcommittee, we were given to understand that your subcommittee hearings on the qualifications for astronauts and practicability of testing and using women as astronauts would take place for 3 days and were scheduled as such. Instead, the hearing was terminated without prior notice at the end of 2 days, July 17-18, 1962.

On this premise, and since at the conclusion of my opening statement July 17 I had requested the privilege of summation time, I ask that the following and two other items be included in the record of the 2-day hearing:

Speaking for myself as having passed three phases of astronaut testing and the 12-woman group which subsequently passed the first phase (the Mercury Astronaut selection tests at Lovelace Foundation, Albuquerque, N. Mex.), we ask that (1) a parallel program of testing and training women pilots as astronauts be instituted by NASA as a civilian agency using civilian women and, (2) that as already requested of President Kennedy by Representative James Fulton of Pennsylvania and others, a national goal be established to put the first woman in space.

It was pointed out at the hearing on July 18 that the NASA requirement that an astronaut be an experimental jet test pilot is presently impossible for any U.S. woman to meet and is therefore a built-in discrimination against women.

In the new astronaut qualification requirements, a college degree in engineering or the physical sciences is nonprohibitive, but equivalent experience has been recognized also, as in the cases of Mercury Astronauts Glenn and Carpenter, neither of whom had college degrees when accepted into the program.

As Colonel Glenn said, "While I did not have the actual hours at college, I had more than the equivalency of an engineering degree." With our group of women pilots averaging 4,500 flying hours as against the average of 2,500 hours of the new male astronaut group, equivalent experience should be accepted for women since they can get neither military jet test experience or jobs in the civilian jet test pilot pool which is drawn from men with military flying backgrounds.

Mr. Chairman, I preface further remarks by reminding the committee that testimony by Mr. Low, Colonel Glenn and Commander Carpenter regarding the matter of astronaut qualifications for either sex, or regarding the possibility of a woman being capable of space flight, was purely opinion. No expert witness testified either pro or con on the evidence so far established that in some fields women are better qualified for the stresses of space flight.

Now to continue, regarding "qualifications," Colonel Glenn, following his opinion that the astronaut must be able to "analyze, assess and report * * * under periods of high stress, both mentally and physically, and observe many complex functions under these stresses," goes on to opine, "This is not to say that no one else could be trained to do it."

I am no more a doctor or research scientist than the other witnesses who testified at this hearing, but I would like to mention just two examples of stress testing which significantly point up the tolerances of women.

You remember I referred to my 9 hour 40 minute run in water isolation. I did not have the opportunity to add that 2 of the 12-woman astronaut candidate group, Mrs. Rhea Hurrell Allison and Miss Mary Wallace Funk, underwent these same tests later with equally good results. The Mercury astronauts have had only 3 hours of sensory deprivation, or isolation, in an air environment. You may be interested in the preliminary report on three women astronaut

candidates under the prolonged deprivation examination, from the qualified scientists who conducted it. The report is a separate item under this final addenda.

Studies under a NASA grant at Florida State University indicate that women have a higher heat toleration point. As you know, heat was a problem during Commander Carpenter's three-orbital flight. Dr. D. R. Kenshalo, of Florida State University, is conducting experiments with men and women which show that women would be comfortable in a spacecraft with temperatures from 16° to 26° higher than men would be. Dr. Kenshalo's research is looking toward the elimination of thousands of valuable pounds of instrumentation now thought necessary for human comfort on long space flights.

We women who wish to be tested for astronaut flights believe that no one can speak fully on "qualifications" until a broader base is established. How can anyone say that women are or are not qualified until they are given the opportunity to demonstrate their ability? Mrs. Hart put it plainly when she urged a continuation of the tests which were started at Lovelace Foundation and were dropped before the 12 women could go through the scheduled tests at the U.S. Navy School of Aviation Medicine at Pensacola or the remainder undergo the isolation study.

Mr. Chairman, President Kennedy himself spoke of "any effort we could make in time or money which could put us first in any new area."

A member of your committee said during a discussion of the advantage of having a "first" in space by putting up an American woman that the United States didn't have to keep up with the Joneses, or in other words with the Russians who so far hold all the prestige "firsts" in space.

Prof. Jerome B. Wiesner, the President's Special Assistant for Science and Technology, has reported that space achievements are a matter of national prestige, that "During the next few years the prestige of the United States will in part be determined by the leadership we demonstrate in space activities."

There is hardly need to add that a woman in space would say more for NASA's "peaceful uses of space" goal than the seeming ambivalence of using solely male military pilots as U.S. astronauts, as has been and apparently is intended to be the practice.

Several of you have pointed out that funds are available or could be added to the NASA budget for testing and training women for space flights. Understandably this would be a parallel program which would not interfere with work on the current programs. I do not think 1 woman of the 13 of us wants to interfere with the national goal of putting the first man on the moon. We only ask that we be tested and trained in order to be part of, not ahead of, the manned space flight program of our country. Astronauts Glenn and Carpenter themselves have said that the training program is shorter now, because much of their time in the first 3-year period was spent working on design and modification of space vehicles.

Mr. Chairman, in conclusion may I say that the argument that phasing women into astronaut training would "hold up" training of men is fallacious reasoning? The July 18 witnesses testified that in addition to the 7 Mercury astronauts, 32 male astronaut candidates now are being tested, of whom 5 or 10 will be selected. No other astronaut group is even in process of being chosen, thus the testing and training devices at such scattered locations as Dayton, Ohio; Pensacola; Johnsville, Pa.; Cape Canaveral; Houston; Edwards AFB, Calif.; San Antonio; and Washington, D.C. must have some free time to schedule a small group of 13 or fewer women among the males.

We ask to complete the tests originally scheduled and that the successful candidates go on to even more rigorous tests and astronaut training.

All we need is the opportunity to prove that we are "capable," "qualified," and "required."

ASSESSMENT OF WOMEN ASTRONAUT'S PERFORMANCE IN SENSORY DEPRIVATION (EXTREME ISOLATION)

In a dark-proof, sound-proof room, three women pilots, all candidates for astronaut training, were suspended in a tank of water for a prolonged period of extreme sensory isolation. Purpose of this testing is to obtain information regarding certain areas of functioning. Most pertinent information pertains to the total reaction to, and tolerance for, the extreme monotony and isolation. In addition, some notion of levels of anxiety and conflict, and of habitual pat-

terms of psychological defenses is gained. A measure of the individual's ability to refrain from action, and ability to tolerate stress without resorting to motor activity to dissipate anxiety is also derived. There is also implied here an opportunity to observe for tendency to somatization of anxiety. Finally, the subject's physiological reactions gives some indication of responses likely under prolonged weightlessness or diminished force.

Assessment of clinical observations, psychological testing, psychiatric evaluation, and reaction to the deprivation experience, revealed that the three candidates not only possess no significant liabilities, but also possess exceptional, if not unique, qualities and capabilities assumed to be important for serving on special missions in astronautics, viewed from the standpoint of personality makeup and functioning. Each of the three candidates performed at a significantly better level of adaptation than "normal" controls. A rank ordering of subjects can be made on any or all items tapped by this performance test and use of this technique permits experimental assessments and clear-cut clinical judgments to be made which may well have significant predictive value for candidate selection.

It is the opinion of the investigators that these three candidates have much to recommend them for selection as astronaut candidates.

JAY T. SHURLEY, M.D., *Principal Investigator.*
 CATHRYN WALTERS, *Project Psychologist.*

LOVELESS FOUNDATION COMPARISON DATA—MALE-FEMALE ASTRONAUT CANDIDATES

Physiologic data

Test	Male astronaut candidates (31)		Male astronauts selected (7)		Female candidate (1), unit value
	Median	Range	Median	Range	
Height.....centimeters.....	175.5	167-180	176.9	170-180	171
Weight.....kilograms.....	73.4	60.9-87.1	75.3	69.8-87.1	55
Body surface area.....square meters.....	1.9	1.7-2.06	1.927	1.81-2.06	1.61
Lean body mass.....kilograms.....	63.9	54.6-71.1	66.81	59.0-71.1	-----
Total body potassium.....grams.....	168.6	142-204	175.4	167-199	94.6
Total body water.....liters.....	41.3	36.3-47.2	41.47	37.0-44.6	27.8
Blood volume.....do.....	4.917	3.33-6.91	5.404	4.35-6.91	3.31
Total lung capacity.....do.....	6.82	5.36-8.19	7.016	6.34-8.02	5.23
Functional residual capacity.....do.....	3.22	2.25-4.23	3.410	2.96-4.23	2.62
Vital capacity.....do.....	5.49	4.35-6.91	5.537	5.11-6.02	3.95
Residual volume.....do.....	1.32	0.83-2.00	1.479	1.13-2.00	1.28
Maximum breathing capacity.....do.....	179.5	149-247	191.4	156-247	142
Nitrogen clearance equivalent.....do.....	11.1	9.3-13	10.93	9.20-12.0	11
Final O ₂ uptake during exercise.....do.....	2.41	1.90-2.84	2.603	2.07-2.84	1.71

Laboratory tests

Test	Male astronaut candidates (31)		Male astronauts selected (7)		Female astronaut candidate (1) Unit value
	Median	Range	Median	Range	
Hgb.—gm/100 ml.....	15.97	14.5-17.9	15.59	14.5-16.2	13.4
Leucocytes.....	8,136	4,700-15,250	7,736	5,000-10,000	8,150
Sed rate—mm/hr.....	5.03	0-32	3.9	2-6	17
Cholesterol—mg/100 ml.....	225.20	150-320	237.6	184-280	246
NA in mEq/l.....	142.20	139-146	142.6	141-144	133
K in mEq/l.....	4.57	3.4-5.5	4.69	4-5.5	4
Cl in mEq/l.....	104.98	102.5-110	105.40	103.1-108	106.8
CO ₂ in mEq/l.....	26.08	21.8-29.8	26.01	23-29.8	27
Blood sugar, astmg—mg/100 ml.....	101.70	84-112	100.3	88-108	88
FBI—mg/100 ml.....	5.84	4.2-10.35	5.47	4.9-6	4.7
BSP—percent in 45 min.....	3.23	0-6.7	2.69	1.5-4.3	2.7
17 KGS—mg/24 hrs.....	19.07	8.8-29	18.33	11.1-23	6
17 KS—mg/24 hrs.....	13.69	8-22.6	13.26	9.9-17.5	7

FINAL REPORT FROM THE LOVELACE FOUNDATION ON THE FIRST WOMAN TO UNDERGO
THE ASTRONAUT SELECTION TESTS

THE LOVELACE FOUNDATION FOR
MEDICAL EDUCATION AND RESEARCH,
DEPARTMENT OF AEROSPACE MEDICINE,
Albuquerque, N. Mex., July 21, 1960.

The following is the summary of the positive clinical findings in the case of Miss Jerrie Cobb, age 28, never married, born March 5, 1961, Norman, Okla., 1 year college. Clinic No. 157-869.

Medical history

1. Mumps, age 25, no complications or sequellae.
2. T. & A. 1942 no complications or sequellae.
3. Surgical closure laceration right ankle, age 5, no complications or sequellae.

Family history

Mother age, 56, living and well; father age 62, living and well; 1 sister, age 31, living and well.

Maternal grandfather, living and well, age 78; maternal grandmother, age 70, Parkinson's disease with complications; paternal grandfather, died age 72; paternal grandmother, living and in fair health, age 84.

Aviation history

She has had about 7,000 hours with about 5 hours of jet time. She has flown mostly transport aircraft and has had 200 hours in the last 6 months. Has had a good deal of ferry experience with fighter aircraft to South America. Has had no oversea service but has ferried aircraft to Europe and South America from 1952 to 1956. Has had about 10 hours at ambient pressures over 30,000 feet equivalent and about 6,500 hours over 20,000 feet, 10 hours over 30,000 feet and 2 hours over 40,000 feet. She has had no low pressure chamber or explosive decompression experience but has had no symptoms at altitude. No accidents or injuries.

Physical examination

1. Height 67 inches, weight 124 pounds, temperature 98.4, blood pressure 118/70 right, 115/70 left, pulse 66.
2. 1½ scar 6 cm. above right medial malleolus.
3. Feet are cool, moderate hyperhydrosis, slight cyanosis, but all major pulses are adequate.

Cardiology examination

EKG, Phono cardiogram, Vector cardiogram, Ballisto cardiogram, Master double 2 step—all within normal limits.

Neurological examination

All reflexes are normal.

Electroencephalogram showed slight irregularity after hyperventilation but within normal limits.

Proctoscopic examination

Inserted to 18 cm. normal.

Gyn consultation

Normal pelvis in all respects. No unusual menstrual history.

Laboratory findings

Blood, blood chemistry, urine and 24 hour specimens, throat cultures (H. influenzae), gastric analysis are all within limits. Stool specimens were given after barium and therefore inadequate. No other specimen could be obtained.

Ear, nose, and throat

No abnormalities noted, equilibration normal.

Audiology examination

No noteworthy hearing losses except at the 4000, 6000 and 8000 cps. frequencies on the left where there is a hearing loss of around 60 db. Right is normal. Not considered significant. Complete recruitment on left.

Ophthalmology examination

20/20 right with J1 bilaterally same left.

Refraction—right +75s—25cx100=20/20; left +25s—crx 170=20/20.

Slight weakness of convergence—advised corrective exercises. Not considered significant.

Dental examination

Has 1 tooth needing repair. Has 12 teeth restored is repaired and all wisdom teeth missing.

X-ray examination

All X-rays are negative except for thickening of floor of left antrum, not believed significant at this time. No symptoms noted.

Physiological examination

In exercise tolerance test she showed a normal circulatory and ventilatory response. Her overall performance based on oxygen uptake per kilogram per minute and oxygen pulse is good. Her physical competence is good.

Impressions

Miss Cobb is the first female to receive the astronaut type examination as given at the Lovelace Foundation. She is a very highly motivated, intelligent and stable adult female who created a very good impression throughout the clinic. She adjusted rapidly and well to the clinic situation.

Everyone who came in contact with her remarked about her pleasant personality. She has a remarkable negative history and her physical examination was essentially normal. It is considered that from all information available and tests done here that she would qualify for special missions. As the result of her exercise program since February 1960 the results of her present exercise tests were excellent. It is recommended that she proceed on to the Aeromedical Laboratory for stress tests followed by a final evaluation based upon all available test information.

For the Board :

A. H. SCHWICHTENBERG, M.D.,

Head, Department of Aerospace Medicine, Lovelace Foundation for Medical Education and Research.

SCHEDULE OF THE NAVY TESTS GIVEN TO MISS COBB AT PENSACOLA NAS

Itinerary for Miss Jerrie Cobb while at U.S. Naval School of Aviation Medicine

Date	Time	Place	Tests
May 15	0800	625B.....	Electrocardiographs, electrocardiographs and oxygen consumption during graded exercise. Phonocardiograph, and ballistocardiograph.
16	0730	625D.....	Four X-ray views of chest, complete hemogram, fasting serum cholesterol, protein bound iodine, atherogenic index, α/β lipoprotein ratio.
	0800	655.....	Routine electroencephalograms with hyperventilation and straboscopic stimulation.
	1000	625B.....	Complete exercise tests.
	1400	625D.....	Tilt table test.
	1430	625B.....	Hand dynamometry.
	1500	Ward M, U.S.N.H.	Otorhinolaryngology evaluation.
17	0800	655.....	Airborne electroencephalogram.
	1100	625A.....	Audiogram.
	1300	LPC2.....	Lecture on basic low pressure chamber techniques.
	1400	LPC2.....	Full pressure suit run.
18	0800	16.....	Psychologic testing and evaluation.
	1300	625D.....	Caloric testing of threshold of vestibular function.
	1400	Acceleration.....	Run on slow-rotation room.
	1500	Treadmill physical endurance test.
19	0800	625B.....	Pulmonary velocity-volume study; maximum breathing capacity.
	0900	625B.....	General medical history and physical examination.
	1300	Counter rolling demonstration.
	1400	EEG with carotid sinus stimulation.
22	1030	Hangar 74.....	Preflight physical fitness testing, speed-agility testing, jump reach, chin ups, endurance run, sit ups.
	1300	Ward N.....	Neuropsychiatric evaluation.
	1430	Ward N.....	Ophthalmologic evaluation.
23	0700	Training, Tank I.....	Water survival, Dilbert dunker.
	1200	Training, Tank I.....	Water survival techniques.
	1415	Acceleration.....	Ejection seat and airborne survival techniques.

SAMPLE RESULTS OF ONE PHYSICAL COMPETENCE TEST GIVEN AT PENSACOLA NAS
TO ONE FEMALE ASTRONAUT CANDIDATE

MAY 19, 1961.

TREADMILL TEST OF PHYSICAL FITNESS FOR HARD MUSCULAR WORK ON MISS
JERRIE M. COBB

The subject was placed on a treadmill at 3.5 m.p.h. and 8.6-percent incline for 5 minutes. Then, following 5 minutes of rest while seated, she mounted the treadmill at 7.0 m.p.h. and 8.6-percent incline.

She maintained her smooth running pace for 1 minute before evidence of fatigue. A second minute of less coordinated running followed. Total duration to exhaustion: 140 seconds.

Subjectively the limiting factor was an entire body response rather than either a leg or pulmonary collapse. Recovery was prompt.

The calculated resulting score is 44. This is in the "average" range by the normal standards for "men of military age." However, this result, if anything is fallaciously low, because her pulse rate between 4 and 4.5 minutes had returned to her usual resting rate of about 90 beats per minute. If her normal heart rate were slower, this test result might have been still better.

This test demonstrates an entirely adequate capacity for hard muscular work.

R. A. CARLETON.

Lieutenant, Marine Corps, U.S. Naval Hospital.

SAMPLE SUMMARY OF ONE FEMALE ASTRONAUT CANDIDATE AFTER PSYCHOLOGICAL,
PSYCHIATRIC, AND ISOLATION TESTING

SUMMARY

Subject: Jerrie Cobb.

D.O.B.: March 5, 1931.

Civil status: Single, never married.

Education: 1 year of college (Oklahoma).

Religious affiliation: No formal affiliation, possesses strong personal sense of religious affiliation (Protestant).

Occupation: Professional pilot and aeronautic sales executive.

Purpose of study: Miss Cobb's purpose: To subject herself to those tests proposed by NASA and other authorities in order to qualify as the first American woman astronaut. She is very highly motivated and intensely serious in pursuit of this goal.

Our purpose: To extend the range of subjects studied and information recorded and analyzed from persons undergoing profound experimental sensory isolation and solitude.

Clinical interview: A feminine-appearing slender blonde woman wearing a ponytail hairdo, who walks and moves with the grace of an athlete, and establishes immediate warm and friendly rapport but volunteers minimal information. She is alert and her answers are goal-directed and pertinent without circumstantiality. Actually she tends to be laconic in replies. One is struck by her economy of both words and motion, her low level of manifest anxiety, her calm and unflinching pleasant personality. The picture of her personality which emerges in an interview is that of a very well-adjusted "average" person who is exceptionally well-endowed in the area of psychomotor skills and coordination, and is blessed with excellent health. She has shown unusual single-mindedness of purpose in pursuing a career in aeronautics as a pilot with consistently effective performances. In many hazardous situations, in a hazardous occupation, she has had a superb safety record and would appear to be success, rather than accident or error-prone in pilot judgments. It would appear also that she gets on very well with other persons of both sexes and all ages. Her basic drives appear to be unusually highly sublimated into her occupational activity with a minimum of tension and frustration evident. Clinical impression is that of a healthy functioning, action-oriented personality with the structural configuration of the uncomplicated, normal hysterical type.

Past medical history: Remarkably negative.

Physical and laboratory data: All within normal limits (see Lovelace Clinic Report).

Clinical E.E.O. : Normal awake and asleep with predominant 9-10/sec. activity.

Psychological test evaluation: Wechsler adult intelligence scale, Rorschach, draw-a-person, sentence completion, and personality self-inventory (the Minnesota multiphasic personality inventory) were administered.

Results show high comprehension and high psychomotor coordination in an individual who scores in the lower half of the bright normal range of general verbal and performance intelligence.

Minimal intra-personal anxiety and conflict; with minimal introspective tendencies in a highly conforming, moral, and conventional person with very effective sublimations of basic drives. More a "doer" than a creative thinker.

Sensory isolation performance: Reveals exceptionally effective psychophysiological functioning and excellent adjustment to sensory isolation. Far exceeds any other female yet tested in tolerance for sensory isolation, with limitations of water activity. Emotional reaction: calm and positive. No complaints, a high degree of pleasurable feelings experienced and very well tolerated. Minimal perceptual stimuli clearly and realistically perceived with no evidence of a tendency to project in any sensory sphere and no evidence of depersonalization fragmentation of the ego, somatization of anxiety, nor loss of body-image integrity, despite the usual marked deviation in estimation of elapsed time. Somewhat constricted in indices of ideational content and reporting. Exposure to sensory deprivation self-terminated after 9 hours, 40 minutes, without evidence that any absolute limit of tolerance had been reached. Maximum tolerance for all other female subjects tested so far: under 6 hours. Physiological adaptation: Cardiovascular, respiratory, and body-temperature values shifted in the expected direction and in the usual degree (e.g. pulse dropped from 84/min. before isolation to 52/min. afterward) etc.

FINAL IMPRESSION

Based on the above partial assessment through psychiatric and psychological techniques and augmented by a special test under conditions of profound experimental sensory isolation, it is our opinion that Miss Jerrie Cobb not only possesses no significant liabilities, but also possesses several exceptional, if not unique, qualities and capabilities for serving on special missions in astronautics, viewed from the standpoint of her personality makeup and functioning. Among these are: A ready acceptance of direction or a ready assumption of responsibility, as circumstances dictate. An exceptional ability to remain passive and relaxed when action is unavailable or unwise. An unusually smooth integration of psychophysiological functioning, a stable ego, and a strong, healthy motivation. Her pleasant personality would lend itself as well to nonsolitary missions.

I believe she has very much to recommend her for selection as an astronaut candidate.

JAY T. SHURLEY, M.D.,
Professor of Psychiatry.

APPENDIX II

SUPPLEMENTARY STATEMENT, MISS JACQUELINE COCHRAN

To avoid any possible confusion in the minds of the committee as to some of the facts, I would like by way of summary to state the following:

First: There is not now and to date has not been any women in space or women astronaut program.

Second: No woman to date has passed Mercury astronaut tests. I have the word of Dr. Lovelace on that. The tests at Albuquerque were preliminary medical tests. They did not qualify any person as an astronaut or astronaut candidate. Many series of subsequent checks and tests would be necessary to do this.

Third: The NASA has never approved any astronaut program for women or designated any candidate or candidates for such a role.

Fourth: What the Navy's aerospace laboratory at Pensacola planned to do with the women who passed the medicals at Albuquerque was in the nature of further research to that conducted at Albuquerque. It might possibly have led to eliminations and further checks of the remainder and thus might have served as a nucleus for a women's astronaut program. It was arranged by some of the doctors. The NASA, so far as I know, had nothing to do with it. It was called off because the Navy authorities thought that the work and expense should not

be involved unless the NASA said there was need. The NASA could not say there was need and therefore did not say so.

Fifth: When the doctors at Albuquerque decided they wanted to make a comparative medical check of women to lay down for comparison beside the check of the male candidates who had passed through that institution, they wanted a group, and just not one, two, or three. They asked the 99 Club, which is an organization of women pilots, to dig up a number of candidates. Only one, Miss Cobb, showed up. Because a check of one was not indicative of much of anything, Dr. Lovelace subsequently contacted me. The result was 20 candidates. Several who had expressed willingness to take the tests on the first invitation lived at quite a distance from Albuquerque and travel and living were important items. That's why I personally financed these items for most of them. It was not the results of the tests on the first candidate that gained approval for research on the others. A group was considered important from the start.

Sixth: I am not here as a spokesman for the 12 women who passed the medical tests. I have neither sought nor received authority from any of them in this respect. But they know my general views as expressed in my prepared statement and some of them have told me they approve of such views. Therefore, I question that any person who expresses contrary views has been appointed or drafted as a spokesman for the 11 not present at these hearings. In this connection, I hand the committee copy of a letter I wrote to Miss Cobb under date of March 23, 1962, a copy of which went to all the 12 persons who passed the medical tests. I also hand the committee copy of a letter received from Miss Gene Nora Stumbough of Wichita, Kans., dated June 11, 1962. These are self-explanatory and for your files and need not so far as I am concerned go into the transcript of testimony.

Seventh: There had been considerable publicity that seemed to give too much importance to the earlier of these medical tests of women. Because they were of a research nature without any support or authorization by NASA and publicity could have been harmful to further work, it was thought wise by Dr. Lovelace to pledge the 20 candidates for tests not to engage in any publicity.



I believe she has very much to recommend her for selection as an astronaut candidate.

JAY T. SHAWNEY, M.D.
Director of Psychiatry

Appendix II

PREPARED STATEMENT MISS JACQUELINE BARNES

To avoid any possible confusion in the minds of the committee as to some of the facts I would like by way of summary to state the following:

First: There is not now and in the past has not been any women in space or women astronaut program.

Second: No woman to date has passed military astronaut tests. I have the word of Dr. Lovelace on that. The tests at Albuquerque were ordinary medical tests. They did not qualify any person as an astronaut or astronaut candidate. Many ways of equipment checks and tests would be necessary to do this.

Third: The NASA has never approved any astronaut program for women or designated any candidate or candidates for such a role.

Fourth: What the NASA's aerospace laboratory at Langley planned to do with the women who passed the medical tests at Albuquerque was in the nature of further research to that conducted at Albuquerque. It might possibly have served as eliminations and further checks of the remainder and this might have served as a nucleus for a women's astronaut program. It was arranged by some of the doctors. The NASA, so far as I know, had nothing to do with it. It was called for because the NASA authorities thought that the work and expense should not





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