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## Paper Session III-A - Workforce 2000 and Its Education Implications for Space Organizations

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WORKFORCE 2000 AND ITS EDUCATIONAL IMPLICATIONS  
FOR SPACE ORGANIZATIONS

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The aerospace industry relies heavily on developing and implementing cutting-edge technology. To accomplish this, the industry needs employees whose education prepares them adequately for its tasks. There seem to be, therefore, two major workforce challenges facing the industry as it moves toward the year 2000:

1. Utilizing the present workforce;
2. Preparing the future workforce.

Aerospace companies are already matching the most highly qualified members of their workforces with unit functions. Those members who want to continue to be valuable will need to keep their skills and knowledge not only as current and specific to the job as possible but also broad enough to enable them to fill other assignments. Companies who want to keep their workforces compatible with their goals will need to continue and also to expand their variety of in-house training programs and incentives for outside educational opportunities.

The industry cannot, however, leave the preparation of its future workforce up to other if it wants to have a supply of workers adequate to fulfill its needs. It must actively work with the educational system and all parts of the community to see that those who will be available for work are aware of job options and obtain the training necessary.

WORKFORCE 2000: KEY TRENDS AND POLICIES

At the request of the Department of Labor, the Hudson Institute undertook a major study to "furnish the basic intelligence on the job market that we can use in evaluating the adequacy of our current public policies (into the 21st century) and, where needed, undertaking new policy initiatives....(T)he trends discussed in the report have implications for more than federal policy. Business, labor, the schools and state and local government officials in communities across the nation will all need to reflect on how well they are positioned to meet the increasingly higher levels of skills and education that will be required by the jobs of the future." 1

Assistant Secretary of Labor Roger D. Semerad, in his Foreword to the book Workforce 2000, the published report of this study, continues, "Our job is now to reach our destination: an economically competitive America that fully utilizes the talents and skills of all its citizens." 2

"The last years of this century," the report continues, "are certain to bring new developments in technology, international competition, demography, and other factors that will alter the nation's economic and social landscape...and produce an America that is in some ways unrecognizable from the one that existed only a few years ago.

"Four key trends will shape the last years of the twentieth century:

1. The American economy should grow at a relatively healthy pace, boosted by a rebound in U.S. exports, renewed productivity growth, and a strong world economy.
2. U.S. manufacturing will be a much smaller share of the economy in the year 2000 than it is today. Service industries will create all the new jobs....
3. The workforce will grow slowly, becoming older, more female, and more disadvantaged. Only 15 percent of the net new entrants to the labor force over the next 13 years will be native white males, compared to 47 percent in that category today.
4. New jobs in the service industries will demand much higher skill levels." 3

#### OPPORTUNITY 2000 AND CIVIL SERVICE 2000

Two volumes expanding on Workforce 2000 have been published: Opportunity 2000 and Civil Service 2000.

The first of these, Opportunity 2000, declares, "These changes (in the workforce) mean that the ability of companies to effectively compete in the years ahead will be determined in large measure by their success in employing productive workers in a labor market characterized by scarcity, skills deficiencies, and demographic diversity. The most successful companies will be those that meet this challenge creatively and aggressively." 4

It...presents a composite picture of how people in many diverse organizations approach, with vision, the common challenge of finding and expanding the potential of their human resources...."5 The major portion of the book consists of details of "affirmative action techniques" organizations are using to "ensure that they have an adequate supply of qualified, well-trained employees." 6

It then describes eight major trends that will revolutionize the workforce by the year 2000.

1. The number of young job seekers is falling and will drop by 2 million by 2000 as the result of the low fertility rate of the "baby boomers." Many of them ended up in jobs not nearly as well paid or stimulating as they had hoped, given their level of education. Two-thirds of all those who will be working in 2000 are already in the workforce. 7
2. Because of the rise in median U.S. worker age (36 in 1987 to 39 in 2000) the older workforce will be more experienced, reliable and healthy but older workers are less interested in adapting to changes or taking career risks. 8
3. Over the last 20 years the all-American family in which father worked and mother stayed home to raise the family has changed. By 2000, 47 percent of the workforce will be women and 61 percent of all U.S. women will be employed. Women still continue to be concentrated in traditionally female jobs and therefore earned only 70 cents to the dollar earned by the average working man. Women are advancing faster in new high-tech industries like aerospace than in the older established ones.9
4. Members of current minority groups will make up almost one-third of all new entrants into the workforce and so they will be less of a minority. Their populations (especially Black and Hispanic) will increase also because their birth and immigration rates have grown much more rapidly than for whites. Unfortunately too many are still born in poverty; out-of-wedlock births are the fastest growing segment of the Black population. 10
5. There will be more immigrants, primarily from Latin America and Asia. Today's immigrants are quickly finding a place in the workforce. Many are willing to accept lower-paying and less prestigious jobs because they are

trying to improve themselves. If legal and illegal immigration continues at the present pace, about 16.1 million will be added to the population and 6.8 million to the workforce between now and 2000. 11

6. The U.S. workforce will move from manufacturing into a predominately information- and service-oriented economy. New technologies have made manufacturing less labor-intensive and these productivity gains, not the Japanese competition, have primarily resulted in manufacturing layoffs. 12

7. The new jobs will require higher skills. Computers allow the workplace to become simpler while more productive, resulting in the need for fewer workers. These workers, however, will need higher level language and math skills and reasoning abilities in order to provide services. The need for scientists will increase by 68 percent by the year 2000. 13

8. Business must face an immense challenge and must realize that the workforce is changing. It will have to look beyond the usual young white males to minorities and women. It will have to accommodate well-trained experienced women in their dual roles of workers and mothers. It also will have to help minorities become better qualified. 14

In making these projections, Workforce 2000 indicated that about 47 percent of the 1985 workforce was native white males and 36 percent native white females. The increase in the labor force between 1985 and 2000 shows that only 15 percent of these ENTERING the workforce will be native white males; the difference-- a very significant one--is filled by non-whites, females and immigrants. These segments, which have not in the past been attracted to science and engineering careers, will have to be drawn in during the 21st century. 15

The book Civil Service 2000 outlines in detail the increasing levels of skills and training that will be needed for federal workers in the fastest growing federal job categories such as scientists and engineers. Federal jobs are shifting rapidly toward those that require language skills above level 3 and math skills above level 5 on a scale of 6.

"Unless the average tenure of Federal workers drops sharply from its current 13.5 years, more than half of the year 2000 Federal employees are already on the pay roll...Federal training needs will be concentrated in two areas: 1) among new workers in the lowest level jobs, where turnover is high; and 2) among the highest-skilled professionals with transferable skills, alternative job opportunities and rapidly evolving fields..." 16

President Reagan, in the Foreword to Workforce 2000, writes, "The quest for excellence in the twenty-first century begins in the schoolroom, but we must go next to the workplace. More than 20 million new jobs will be created before the new century unfolds and by then our economy should be able to provide a job for everyone who wants to work. We must enable our workers to adapt to the rapidly changing nature of the workplace." 17

"Aviation Week" gives some examples of the increase of women and minorities in aerospace. While there has been an increase for these groups, it has not kept pace with the total increase in aerospace employment. The percentage of women (25) in the entire aerospace industry is greater than the combined percentage (16) of Blacks, Hispanics and Asians together. Approximately the same percentages show for women in managerial and professional positions in aerospace and for the minorities in those positions. Although the representation of women and minorities in aerospace remained far below their representation for all industry as a whole, their gains outstripped those made by women outside the industry. The scarcity of women and minorities in technical fields in labor pools seems to be one of the primary reasons for their slow increase. 18

#### CHALLENGES FOR THE FUTURE

If America is to survive competitively in the 21st century, the authors of Workforce 2000 believe that American policy makers must meet six challenges:

1. Stimulating balanced world growth;
2. Improving productivity in service industries;
3. Improving dynamism of an aging workforce to insure adaptability;
4. Reconciling the needs of women, work and families;
5. Integrating Blacks and Hispanics fully into the workforce;
6. Improving workers' education. 19

#### THE PIPELINE AND THE TASK FORCE ON WOMEN, MINORITIES, HANDICAPPED

The route students use to prepare for careers from high school through graduate and professional degrees has been named "The Pipeline." The National Science Foundation has prepared some graphics to illustrate the "Persistence of Natural Science and Engineering Interest" in the pipeline both by gender and ethnic group. Both graphics show that while the number of the general population who complete Ph. D. degrees in science and engineering is a small percentage of the total population, the number of minorities who do so is so miniscule as to be undetectable. In addition, in both graphics, the drastic reduction in numbers occurs during high school. It is there that students are opting NOT to take the math and science classes that will prepare them for the increasingly highly skilled jobs that are predicted for the 21st century. Once students leave high school, there is little likelihood that they will again undertake the education necessary for such training. 20

A Task Force on Women, Minorities and the Handicapped In Science and Technology was formed to study the pipeline problems and to come up with goals and specific actions to be taken by various segments of America. Among the data presented were statistics on the numbers of degrees earned in 1987 in science and engineering disciplines by the various minority groups. This is compared to the numbers of new entrants from these groups predicted to be needed in the year 2000.

Discussion is presented about the problems that appear to reduce the participation of each minority in science and engineering along with actions proposed by the Task Force. A brief recap of each is given here.

**WOMEN.** Although white women make up 43 percent of the U.S. population, they represent only 10 percent of all employed engineers and scientists. White women earned 22 percent of all bachelor's degrees and 13 percent of Ph.D.'s in engineering and science in 1987. Women are not entering these careers in the same proportions that they are entering other professions. Therefore, young women should continue to get additional encouragement to pursue these studies all along the pipeline. Negative attitudes towards women here still exist. Re-entry programs should help women whose earlier studies have deflected them from science and engineering. Finally, policies at all levels need to help women with their careers and family responsibilities.

**AMERICAN INDIANS.** American Indians make up 0.6 percent of the U.S. population and 0.5 percent of employed engineers and scientists. Women earn two-thirds as many bachelor's of science degrees as men but only one-sixth as many engineering degrees. Unfortunately, most American Indians receive poor mathematics and science educations. Most American Indians who do enter college return home and do not graduate. These students need especially strong family and tribal support systems and positive school experiences.

**DISABLED.** Of the estimated 22 million Americans who are of working age and disabled, only about 7 million are employed. A National Science Foundation quest found less than 100,000 working in science and engineering in 1986. Many more disabled could be in these careers and now that medical science is helping a larger number live longer, this is a growing part of the population. These students need a great deal of encouragement and counseling to help them find science and engineering careers within their capabilities. In 1987 about 10 percent of all students enrolled in postsecondary education reported having at least one disability, thus the disabled form the largest minority group.

**BLACKS.** Although Blacks make up 12 percent of the U.S. population, they are only 2 percent of the employed scientists and engineers. Since the 1970's, when many minority engineering programs began, Black participation in these careers has risen. Black women earn more bachelors' degrees in science than Black men but only about one-third as many bachelors' degrees in engineering. Many Blacks seem to avoid science and engineering because their schools do not adequately prepare them. School districts, especially in urban areas, with large proportions of Blacks need to do a better job. Finances for higher education also are a block to the entry of Blacks in such careers. Data shows that most Blacks who earn advanced degrees were undergraduates at Historically Black Colleges and Universities.

**HISPANICS.** The fastest growing minority group, Hispanics, is 9 percent of the U.S. population but only 2 percent of our employed scientists and engineers. Hispanic women earn a little smaller number of bachelors' degrees in science but less than one-sixth as many bachelors' degrees in engineering. Mexican-Americans and Puerto Ricans tend to be in the lower economic levels and 40 percent of Hispanic children live in poverty. Because of this, Hispanic children receive poor educations and have a high drop-out rate. Too often Hispanic parents do not encourage their children to go to college, especially if it means moving away from home. 21

As a result of this data, the Task Force on Women, Minorities and the Handicapped in Science and Technology formulated goals for the nation for the year 2000.

#### CHANGING AMERICA: THE NEW FACE OF SCIENCE AND ENGINEERING

1. Changing America with quality education for all;
2. Reform of pre-K-12 education to better prepare youth;
3. Increase the number in higher education and diversify their studies;
4. Use federal research and development grants as leverage to encourage and involve minorities, since the federal government is the largest supplier of this type of funds;
5. Improve the environment in all areas of employment but especially in those to which it is desired to attract more minorities;
6. Influence the change in cultural attitudes towards science and engineering careers. 22

#### RECOMMENDED ACTIONS FOR SPACE ORGANIZATIONS

Industry performs the largest part of the nation's research and consumes three-fourths of all R & D dollars while employing two-thirds of U.S. scientists and engineers. At its conclusion, the Task Force on Women, Minorities and the Handicapped recommended actions that various U.S. groups should take to reach the identified goals for the year 2000. Those for industry, translated into educational implications for the aerospace industry, are:

- \*1. Continue to sound the alarm about how poor science and mathematics education contributes to the declining economic competitiveness of the U.S....
- \*2. Mobilize a national campaign to increase science literacy and show that mathematics, science and technical knowledge are important to our country and valuable in everyone's life and career.
- \*3. Forge partnerships with schools...Finances, equipment, management expertise, and time spent in class by industry employees...all contribute to that success.
- \*4. Encourage retirees to assist...(with) time and talents local school systems.
- \*5. Provide summer work and research opportunities to teachers...

"6. Provide scholarships to (underrepresented groups) who major in science...or plan to become science and mathematics teachers.

"7. Finance in-service teacher training and sponsor teachers to attend professional conferences....

"8. Provide paid leave (so that) employees can teach or assist teachers...

"9. Open career paths widely and visibly to encourage women, minorities and people with disabilities in science and engineering.

"10. Provide dependent care services to all employees." 23

Secretary of Labor Elizabeth Dole in her "State of the Workforce" address commented, "There is no doubt that our workforce crisis is a challenge to education, labor, business and government. But it challenges something much more fundamental. It challenges the very foundation on which American is based.

We are now in danger of losing (the American) dream. For if you do not possess the basic skills required to survive in today's world, then you cannot get a job, you cannot succeed and you will spend a lifetime on the outside looking in." 24

"Businesses," according to Opportunity 2000, "will be able to satisfy their labor needs only if they successfully confront those barriers (to full and effective participation in the workplace of all workers) and empower individuals presently outside the economic mainstream to take advantage of meaningful employment opportunities." 25

In a study conducted by Morgan Guaranty, the conclusion was: "Companies that invest heavily in training, which often goes hand-in-hand with heavy emphasis on internal advancement of workers, may well find that pay off is unusually high." 26

"Secretary of Labor Ann McLaughlin remarked, "Because the problems of the employee are the problems of the employer, more involvement by business will be a strategic necessity, in areas as basic as teaching literacy skills, training and retraining as jobs change, and providing child care and flexible benefits.

"Business will simply have to get serious about investing in its workforce. The effort will not be born of altruism, but out of strenuous competition for employees, and the need to maintain a high level of productivity in increasingly tough markets." 27

For space organizations, how to meet the two workforce challenges is clear.

#### TO UTILIZE THE PRESENT WORKFORCE:

Invest in training employees to maintain productivity and economic advantages;

Promote employee job satisfaction through actions that enhance their abilities to perform higher level tasks;

Remove barriers that hinder advancement, especially of underrepresented groups.

#### TO PREPARE THE FUTURE WORKFORCE:

Be a booster of your local schools, their students and teachers;

Participate in actions to help the community become aware of the need of all citizens for science and mathematics education to live a better life and find meaningful careers;

Creatively and aggressively assist minorities to choose, train for and advance in science and engineering careers.

President John Kennedy commented, "All do not have equal talents but all should have equal opportunity." You can use education to help make these opportunities appear in the aerospace industry.

#### FOOTNOTES

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