Creating a Diverse Technical Workforce in the Federal Government:
The Challenges of Growing and Sustaining Technical Talent in the New Millennium

by

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Abstract

The United States is a world leader in the global scientist and engineering enterprise, however with a shortage of US workers prepared to fill scientist and engineering positions in the future, other nations are preparing themselves to challenge this strong US economic strength. Technically skilled international workers are beginning to fill the void within corporate America, including an increase in global white collar outsourcing, but while this action may adversely affect our nation’s supply of available technical talent, the Department of Defense (DoD) faces additional challenges in their pursuit of the “best of the best.” While the war for talent exists nationally, it is only exacerbated for the DoD by the department’s unique requirements, specifically the non-traditional technical talent required and requirement for US citizenship. Coupled with these challenges, are changing diversity statistics that are not encouraging for future workforce shaping initiatives.

With the recent cutbacks to the S&E workforce and many organizations facing retirement eligibility statistics nearing 50%, the technical workforce dynamics are changing. In an attempt to create a diverse technical workforce to replace the aging workforce, DoD faces several challenges. Not only will this war on talent attempt to attract scientists and engineers, but a cross-section of social groups in this field as well. In the course of developing their own diverse workforce, the Federal Government has yet another challenge that can hinder their ability to successfully hire this highly desirable talent: private industry. While private industry can offer higher salaries, and perceivably more benefits, the federal government is challenging this once stalwart opponent for the war on talent.

This thesis will examine the organizational shifts in the workforce structure of engineers and scientists positioned in the government with respect to the recruiting, retention and advancement of underrepresented social classes and provide recommendations through initiatives and best practices to further advance and strengthen underrepresented minorities in the science and engineering workforce within the United States Air Force and the Department of Defense.

Thesis Supervisor: Lotte Bailyn
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Note

The views expressed in this report are those of the author and do not necessarily reflect the official policy or position of the Department of the Air Force, the Department of Defense, or the U.S. Government.
The Value of Diversity

“Diversity is the one true thing we all have in common.”

-Anonymous

Diversity can be defined in various ways, within a myriad of contexts, and its definition can reflect aspects of similarities while remaining focused on the differences. Bounded by a common thread, yet woven into a tapestry of varied backgrounds, life experiences and multicultural elements, diversity in the workplace promotes opportunities of a broader context to provide solutions for a more global future. Although researchers, leaders and managers differ on the benefits of diversity, most carry a sense of value and appreciation for the concept. At times even experts may not communally agree on a definition of diversity, yet many focus on the collective mixture characterized by similarities of individuals, distinguished by their differences which set them apart, which make them unique, which make them diverse.

While diversity has traditionally referred to ethnicity, sex, age, culture, social or economic class, religion, etc., the views of this powerful characterization are changing. “Diversification does not always mean different races, sexes, or cultures – it may mean different and new ideas and successful adaptation of them” (U.S. Merit Systems Protection Board, 1993, p. 48). The dimensions of diversity are clearly changing but the foundations upon which its elements are based are deeply rooted. Over generalizations, stereotypes and assumptions based upon an individual’s ethnicity, gender, age or culture different than our
own are still existent; however efforts to eradicate these biases through training and education are more widely evident. “Accepting stereotypes and invalid assumptions can make it even more difficult to discuss our differences. Unfortunately, labeling is one of the simplest ways to process information. Getting people to see the end result of this way of thinking, though, is no small task” (Stevens, 1996, p. 1). And undertaking this monumental task in shaping a technical workforce is even more daunting. How to best approach this task is debatable, but must be considered. Will training and education alone help promote an understanding of diversity values or are there best practices and developmental initiatives that may be instrumental in resolving the misconceptions and stereotypical assumptions of a diverse workforce? Based upon current and future workforce projections in the technical workforce, I will explore some avenues to build a technical workforce beginning with the element of diversity.

Creating an environment where diverse organizations, diverse products and diverse ideas can co-exist begins with a diverse workforce. Although the construction of a diverse workforce may take years to build, the long term benefits can clearly enhance the strength of an organization. These long term benefits are only realized once a sincere belief and commitment to the value of diversity is realized.

Studies vary on how diversity is perceived in the workforce. While some studies argue more diverse groups and organizations have performance advantages over homogeneous groups, others argue the converse. But an overall sense of valuing diversity and embracing its value
in the workplace has several proven benefits. Recruiting talent is one such benefit.

Instituting a multi-cultural workforce has an advantage in attracting and retaining the best available talent from the richest labor pool available (White, 1999). Having the ability to select talent from all races, genders and backgrounds, rather than a limited pool of employees allows organizations to choose the “best of the best.” In the workplace, the benefits stemming from a multi-cultural workforce offer high pay-offs from both a personal and a business perspective. Reports show diversity has a positive effect on recruitment, retention and strengthens the overall well-being of the workforce. And while businesses continue to reach into the global market, a multi-cultural workforce allows them to satisfy their external customers by tapping their internal human resource pool which is made up of individuals of varied background. “The primary business ideology behind embracing diversity is that we should aim to reflect society as a whole within our business” (Scott, 2003, p. 1).

Generating a diverse pool of talent and utilizing each individual’s life experiences for the benefit of the organization will spawn feelings of inclusiveness and promote a sense of belonging for each team member. In science and engineering organizations specifically, diverse groups are more creative and innovative and have the ability to capitalize on the strengths of each individual independently while solving an often collective problem. “Creativity thrives on diversity” (Morgan, 1989), and it is this creativity which will solve the problems created by a very dynamic, global world, given the stereotypical biases and generalizations can be overcome.
Productivity-type measures (as they relate to workforce diversity) can be shown to support either side of the diversity position, for or against. Stereotypical assumptions and biases can often promote aggravation in the workforce, with employees choosing to ignore confrontations with diverse associates. A fear of conflict can also result. “Unfortunately, it's not just fear that stops us, but apathy and frustration. As we found…many of us do not really want to fight stereotypes because it's hard work that involves uncertainty and conflict” (Stevens, 1996, p. 1). But if team members can overcome the conflict, benefits lie ahead.

Workforce data suggests that diverse workgroups often fare better in overall problem solving and organizational flexibility than homogeneous groups (White, 1999). This is key to our future success in the development of the science and engineering workforce. With scientists and engineers having a great influence on our future lifestyles and technology, the benefits realized from a multi-cultural, diverse scientist and engineering workforce are long-lasting.

Implementing a diversity focused organizational structure can also invite a variety of disadvantages into the workplace. For an agency to be “diverse”, requires more policies, regulations, metrics to periodically measure and guidelines to follow. Diversity is yet another factor to manage, and make accessions for, in an all too inclusive list of management responsibilities. It requires us to enter a whole new realm of social consciousness and reaches into an individual’s culture, emotions and beliefs which can often cause internal team conflict. But while diversity can create personal and team conflict, understanding and appreciation of differences in the long term can reduce conflict in the workplace and increase organizational morale (Scott, 2003).
There are also personnel issues and employment legalities which generate a call for concern. When speaking with individuals from the Air Force Affirmative Action Office, they made it clear that a fine line exists between affirmative action initiatives and diversity objectives. Often this fine line can introduce discrimination issues and weaken a once well meaningful diversity initiative. “While they (diversity programs) can help foster a positive culture within a company, employment specialists say there are also pitfalls. For example, reverse discrimination lawsuits can result when companies are perceived to give preferential treatment to minorities” (Crane, 2004, p. G7). Albert J. Solecki Jr., a partner in the New York-based Labor Employment Department of Goodwin Procter LLP puts it this way: “An employer can articulate that it would like to have certain goals in hiring, but you can’t have a situation where a more qualified white applicant comes in with all the things you’re looking for and you turn that person down just because they’re not black” (Crane, 2004, p. G7).

While I will further discuss diversity and affirmative action later in this thesis, I have merely touched on the topic now to set a framework for related discussion. Human resource specialists and diversity managers must recognize this delicate balance between affirmative action policy and the desire to achieve diversity in the workforce. The lines between these two entities often blur, however each can offer an overwhelming benefit in accomplishing the right workforce “mix” for optimal performance.

The concept of diversity was propelled into the workforce dynamic in the early 1990s; however diversity specialists have reported a new momentum in diversity in the aftermath of
September 11th, when “business leaders began working to counter growing sentiment against people of Middle-Eastern origin” (Crane, 2004, p. G7). Diversity benefits seem to be outweighing any of the disadvantages in the workplace. According to Judy Weil, executive director of the Northeast Human Resources Association: “Diversity has become one of the most important factors in terms of good business practice and providing a workplace that attracts and retains talent” (Crane, 2004, p. G7). Diversity is being embraced by industry, government and corporations like never before. And while diversity is valued strongly in corporate culture and government, the dynamics of a changing world including minority population shifts, career foci and influences on our youth are creating diversity implementation challenges never realized before.
The Technical Workforce – A Scientist and Engineer (S&E) Crisis?

“For surely, we all understand that if the United States is to continue to be a world leader, a nation without peer – a position Americans have enjoyed for decades and now take for granted – the nation must make a substantial investment in its scientific and technological capital, its intellectual capital” (Jackson, 2003, p. 206).

The United States workforce continues to experience age, ethnicity and gender shifts in the workforce. As baby boomers grow older, more women enter the workforce and minority populations grow, shifts in the workforce continue to alter the diverse mix of the working class. The Hudson Institute’s “Workforce 2020” is a collection of predictions based on the changing environment of the US workforce. While their predictions from “Workforce 2000” have been credited with the “diversity training windfall” of the nineties, their latest projections reflect a more diverse workforce with a steady increase of Hispanic and Asian populations and steady decline of the White, non-Hispanic population (See Figure 1). It is interesting to note, that although the statistics presented in Figure 1 reflect the national averages of each ethnic group, the statistics for geographical areas will change as well. For instance, the Hudson Institute predicts that while only a relatively small proportion of the overall US population will be Hispanic in 2020 – 16 percent, the Hispanic population growth in areas such as California could hit nearly 42 percent of the state’s population. “In particular, the West – the nation’s most rapidly growing region – is rapidly becoming more diverse, as the Hispanic and Asian populations grow rapidly. In this respect California sets
the pace for the region; it serves as a harbinger of how other Western states will change later in the twenty-first century” (Judy & D’Amico, 2000, pp. 108-109).

**Figure 1:** Composition of the American Workforce by Ethnic Group, Percent, 1995-2020 (PROJECTED)

While the population continues to become more ethnically diverse, gender diversification will also grow with women comprising nearly half of the 2020 workforce (Judy & D’Amico, 2000). This growing number of women in the workforce will set new demands for work/family balance and generate new practices for life/work flexibility.
It is important to recognize the dynamic environment of the 21st century. While twenty years ago, diversity was not as evident on corporate agendas, the mere fact that the world has become more global, makes diversity key to a corporation’s competitive advantage. “The diverse organization has an increased understanding of the political, social, legal, economic and cultural environment of foreign countries” (White, 1999, p. 5) and is therefore better suited to serve a diverse external clientele. And in this age of rapid telecommunication and global enterprise, there is no greater need for innovation, creativity, productivity, diversity, and technical prowess as the field of science and engineering.

“On June 13, 1997, President Clinton issued Executive Order No. 13050, which created the Initiative on Race and authorized the creation of an Advisory Board to advise the President on how to build one America for the 21st Century” (“A White House Roundtable”, 1998, p. 2). In response to this tasking, the American Association for the Advancement of Science convened a panel of experts to inform the presidential administration on suitable goals and strategies for diversifying the scientific and technological community. The premise of this dialogue was to promote a diverse scientific and technological workforce positioning the United States for continued leadership and maintained dominance in the new millennium. The cornerstone of this initiative was not just a focus on under-representation of minorities in science and technology, but a matter of our national agenda. The statistics are startling, and reflect much of the nation’s concern for our technological goodwill.
In 2000, an astounding 800,000 skilled technology jobs in the US went unfilled due to the lack of science and engineering talent ("Valuing Diversity", 2000). This talent is deteriorating annually as undergraduates continue to choose non-technical fields of study. Figure 2 represents students from different ethnic groups and their fields of study (Judy & D’Amico, 2000).

**Figure 2:** Percent of Undergraduates Majoring in Various Fields by Race and Hispanic Origin, 1993 (Judy & D’Amico, 2000, p. 117).

As one can see from this chart, fields in education and business are favored above fields in science and engineering, across the board. Although there is no quick remedy for the lack of
technical skill evident in the United States, presidential executive orders and congressional commissions are being directed to help address such shortages. “Recently, the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development issued a report, which stated: ‘If women, underrepresented minorities, and persons with disabilities were represented in the US science, engineering and technology workforce in parity with their percentages in the total workforce population, this shortage could largely be ameliorated’” (“Valuing Diversity”, 2000, p. 1).

“The population of our nation now reflects a ‘new majority’ made up of women and minority groups which, together account for more than half of our numbers” (Jackson, 2003, p. 208). In comparison with the workforce diversity statistics provided in Figure 1, in 1997, African Americans represented roughly 11% in the total workforce, but only 3% in the science, engineering and technology workforce (“Valuing Diversity”, 2000). Similarly, Hispanics represented roughly 10% of the total workforce, but again, only 3% of the total science, engineering and technology workforce (“Valuing Diversity”, 2000). Women and people with disabilities were also largely underrepresented in these technical fields. Women comprise 46% of the total US workforce, but only 19% in the technical disciplines and people with disabilities made up 14% and 6% respectively in total workforce population and total within technical fields (“Valuing Diversity”, 2000). The only ethnic group recognizing an upward trend in science and engineering related field was the Asian, non-Hispanic.
Channeling efforts to increase diversity in the technical workforce is challenging enough, but the problem is compounded by the growing demand for employees in the field of science and engineering. We cannot continue to meet our national strategic agenda with these woefully inadequate technical workforce numbers. “Technology represents about 50% of the growth of the United States - including growth of the industry itself and cost savings from use of technology. It is the most important enabling industry in the world today. The shortage of technologically skilled workers is a fundamental threat to economic growth of the US; it hurts not only “high-tech” companies, but the ability of the entire economy to grow by missing the productivity increases available with latest technology products” (“A White House Roundtable”, 1998, p. 29).

As shown in the Table 1, scientist and engineering workforce projections are expected to increase three times faster than the rate for all occupations (National Science Board, 2002). The greatest demand overall will be seen in computer related occupations with an estimated increase of 2.2 million jobs (Deagon, 2004). This is just the tip of the “S&E crisis” iceberg. The demand for engineers and scientist is growing at an alarming rate and is creating an employment crisis that could potentially wound our strategic national agenda. To look closer at this employment crisis, it is necessary to look at a few of the factors that are contributing to this crisis:

1. The Aging Workforce: The United States has enjoyed technical leadership and innovation for several hundred years. American ingenuity has resulted in some of the
world’s greatest inventions and innovations in the 20\textsuperscript{th} Century. Current projections of S&E labor force populations, by age, show that 25% of the current S&E workforce is eligible for retirement in the next 10 years (Jackson, n.d.). While that number may seem high overall,

<table>
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<th>Occupation</th>
<th>2000</th>
<th>2010</th>
<th>Change</th>
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<td>Total, all occupations</td>
<td>145,571</td>
<td>167,754</td>
<td>22,183</td>
</tr>
<tr>
<td>All S&amp;E occupations</td>
<td>4,706</td>
<td>6,904</td>
<td>2,198</td>
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<tr>
<td>Scientists</td>
<td>3,241</td>
<td>5,301</td>
<td>2,060</td>
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<td>Life Scientists</td>
<td>184</td>
<td>218</td>
<td>34</td>
</tr>
<tr>
<td>Computer &amp; mathematical occupations</td>
<td>2,408</td>
<td>4,308</td>
<td>1,900</td>
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<tr>
<td>Computer specialists</td>
<td>2,318</td>
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<td>1,895</td>
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<td>Physical scientists</td>
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<td>283</td>
<td>44</td>
</tr>
<tr>
<td>Social scientists</td>
<td>410</td>
<td>492</td>
<td>82</td>
</tr>
<tr>
<td>Engineers</td>
<td>1,465</td>
<td>1,603</td>
<td>138</td>
</tr>
</tbody>
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\textit{Science and Engineering Indicators -2002}

Table 1: Total Scientist and Engineering Jobs: 2000 and projected 2010 (National Science Board, Science and Engineering Indicators - 2002, Table 3-23).
many organizations and departments within the federal government are closing in on nearly 50% of the workforce eligible to retire in the next 5 years. This is a hard pill to swallow in some federal agencies who are effected not only by pending retirements, but federal mandates and hiring restrictions which have become remnants of the government’s effort to downsize in the nineties.

2. Globalization: The United States has been successful at navigating the country through the industrial age, the space age and the telecommunications age. New challenges are thrust upon the US while the world embarks on a new age: the age of globalization. While some attempt to resist this change in our world, impacts of a global economy are clearly evident. Most recently our nation has seen a shift in white collar outsourcing by large industrial and technical firms such as Intel, Hewlett Packard and Dell. In an effort to reduce cost and remain competitive in the global market, US firms are finding this is a “natural evolution of business” (Deagon, 2004, p. 2). This “natural evolution” is challenging the nation’s pre-eminence, innovation and leadership in science and engineering. While the US has a history of educating and training foreign nationals in technical disciplines, many have opted to stay in the US on extended visas and fulfill technical positions in corporate America. However, in the wake of globalization, opportunities at home spawned by a global market are seducing foreign nationals to return to their home country and leave the US. In addition to the pull globalization has on foreign nationals, national security restrictions have tightened in the aftermath of September 11th. “Reductions of as little as 5 to 10 percent in the availability of H1B visas could contribute to industrial vulnerability. A reduction of 20,000 workers may
be a small number, but given the sensitivity of some of the positions and the expertise required, it can have significant impact on industrial competitiveness” (Jackson, n.d., p. 3). The impact of the mobility of foreign technical talent has an indirect effect on hiring ability within the Federal government. While not all technical jobs require US citizenship, a fair amount of defense jobs do carry this requirement. In the past, private industry had the luxury of hiring this international talent but has recently seen a reduction in foreign applicants. With corporations still eager to fill S&E jobs traditionally filled by foreign nationals, private industry becomes more of a competitor with the federal government who are quickly scrambling to discover new ways to attract technical talent. This naturally pulls away from the Federal Government pool of S&Es.

3. Pipeline: As discussed above, nearly 25% of the current science and engineering workforce will be eligible for retirement in the next 10 years, and some federal organizations which ramped up during the “Reagan Years”, have faced hiring “freezes” which have positioned them in even worse scenarios with over 50% of their technical workforce eligible for retirement by 2008. These hiring “freezes”, have placed a burden on the entire workforce structure and have left a gaping hole in the junior to mid-level (24-35 year old) technical professional age bracket. There exist several problems that amplify this issue. First, “the US college-age population declined by more than 21 percent, from 21.6 million in 1980 to 17 million in 2000” (Jackson, n.d., p. 2). The “baby boomer” generation is departing the workforce with a smaller population preparing to fill their shoes. Secondly, “US bachelor’s degree production in non-life sciences and engineering continues its long-term decline”
(Good, 2003, p. 10). Not only are we faced with a decline in the population, but those interested in pursuing science and engineering as a career continues to deteriorate. Thirdly, “Because the federal government relies on inside talent to fill so many of its entry-level and middle-level jobs, it must have a steady stream of new talent entering the pipeline at the start of career” (Light, 2003, p. 7). This has been the fundamental challenge for the federal government (even more specifically some areas in the Air Force), where entry-level positions are paid at a rate 20-25% less than private industry; the challenge to recruit and retain is an on-going battle. And finally, the demand for the “best of the best” is a compounded by more attractive fields such as medicine, law and business, which draw a high number of high performers to their career field each year. The media help draw attention to these fields with glitz and glamour of television shows featuring high-powered attorneys and medical doctors. Has there ever been a top-rated television show or movie that featured a high-powered engineer who was able to solve a complex technical problem and save the world? I think not. “The public image of scientist, engineers, and technology workers is often both inaccurate and derogatory. In addition, women, underrepresented minorities, and persons with disabilities are not adequately portrayed by the media as participating in science, engineering and technical careers” (“Land of Plenty”, 2000, p. iii).

4. Beyond the immediate pipeline: While the immediate pipeline is riddled with its own sets of problems, the feeder pipeline into colleges and universities is following a disturbing trend as well. The academic development of our children in the subjects of math and science continues to deteriorate. “Inadequacies in the pre-college environment have a major impact
on each of the underrepresented groups. A serious deficiency in educational resources (e.g., well-prepared teachers, physical infrastructure, technological resources, and curriculum standards) prevents access to high-quality science and mathematics education for underrepresented minority students” (“Land of Plenty”, 2000, p. i). One telling indicator of student readiness for college level science and engineering courses is a student’s own perception, or need of, remediation. The chart below shows the perceived need for remedial work in math and science by males, females and underrepresented minorities. “Part of this lack of confidence in their ability to do college work in math and science relates to students’ lack of persistence in these courses throughout high school. A study of course-taking behavior of high school students conducted between 1987 and 1993 shows that a significant proportion of high school seniors do not enroll in any science or mathematics course. Females, more often than males, are advised that they do not need to take math or science in their senior year. In the senior class of 1993, only 13 percent of the males and 9 percent of the females had taken calculus; only 32 percent of the males and 27 percent of the females had taken physics. Among all students planning a career in mathematics, science, or engineering, fewer than two-thirds had completed a physics course, and only a third had attempted a high school calculus course” (National Science Board, 2002, p. 93).

In addition to the underperformance of math and science education in the K-12 grades, the lack of federal funds and scholarship funds for women and under-represented minorities has most recently come under fire in cases such as the Hopwood reverse discrimination case

Of all the challenges faced in promoting a diverse technical workforce, those stated above are perhaps some of the most critical challenges we, in the US, face as a community. It is important to keep in mind the significance of diversity and why it is so critical in the field of science and engineering. The diversity of talents and strengths of our national community are only compounded in the successes we produce as a country. The great American “melting pot” has produced a multi-cultural, yet homogeneous society with varied backgrounds, races, gender and cultures ready for the challenges brought about by the dynamic changes of our global economy. Scientists and engineers are at the forefront of our technical future. Technical and scientific discoveries of the past 20 years have catapulted the world into the “information age”. “The information age is greatly changing our social and technical needs, just as the industrial age created new employment needs in the 20th century” (“A White House Roundtable”, 1998, p. 48). These new social and technical needs have driven the world into another “age”, the globalization age. The drive of technology throughout our culture has spawned many new areas of research and interest and continues to sprout new ideas, new technologies and new areas of study. Many of the jobs now needed were unknown ten years ago. “It is likely that ten years from now our job needs will be for jobs that are presently unknown” (“A White House Roundtable, 1998, p. 48). And while the information age continues to transform the way we communicate, our social and technical needs change in concert with the evolution of technology which can be heavily influenced by
our cultural needs. The wide ranging experiences and perspectives diversity provides are critical to the success of our future.

Generally speaking, many of the concerns and constraints discussed above are reflective of the challenges and barriers faced in the Air Force. Unfortunately, these problems are compounded by military and civilian regulatory restrictions in place for national security reasons. In the next section, I will explore these challenges in the context of one organization within the US Air Force, striving to retain and sustain a diverse technical workforce in the new millennium.
Achieving Diversity in the Midst of Change

_I report to you that our country is challenged at home and abroad: that it is our will that is being tried and not our strength; our sense of purpose and not our ability to achieve a better America._

_- Lyndon Johnson_

“The mission of the U.S. Air Force is to defend the United States and protect its interests through aerospace power” (Air Force Link, 2004). The U.S. Air Force is committed to serving the citizens of the United States and ensuring that their technological capabilities are consistent with the prioritized needs of the mission. In order to successfully execute their mission, the Air Force must rely on a diverse, technical workforce prepared to meet the changing and varied demands of the new global threat. The scientist and engineering workforce is vital to the execution of the Air Force mission. According to Gen Lester Lyles, former commander of the Air Force Materiel Command, “If the service wants to retain its position as the world’s premier air and space force, it must recruit and retain these scientists and engineers, and provide them with the career guidance and mentorship that will enable the Air Force to meet its 21st century challenges” (Bosker, 2003). The Air Force continues to dedicate much of its efforts in recruiting, retaining and promoting a diverse and representative technical workforce.

Shortages in almost every career field happen in the course of time. Our changing world demands it. With the baby boomer generation reaching retirement age, almost every
professional career has been affected by the exodus of this mass population. Nurses, teachers, doctors, computer scientists, and engineers have all been affected. Coupled with the dramatically changing technical environment and the nineties advent of the “dot.com” age, workforce dynamics are changing significantly. Whereas creative engineers and scientists would have traditionally continued their academic careers and searched for a steady job with a steady income, Generation Xer’s see a myriad of opportunities. Industry, military and corporations around the world are beginning to see the competition for talent not just between themselves, but a new competition among the technically savvy “dot.com’ers”. The “Generation X” crowd and beyond is looking for a more dynamic “lifestyle”. Their desires, needs and wants are much different than the previous generations. “For Gen X and organizations the focus of work has shifted to a balance between individualistic interests and organizational needs. Linking individual goals and skills with organizational initiatives while managing by promoting self-discipline and self-initiative is becoming the new definition of management” (Crandell, Chew, Thayer & Malki, 2002). Businesses are faced with creating “a work environment where employees can grow, learn and prosper; where differences are valued; and where employees can be committed to their work and their personal or family life (Galinsky, 2002).

This change in Gen Xer’s work perspective is key in the more recent critical efforts of recruitment and retention. Recognizing their needs, desires and wants and aligning them to each organization’s critical mission needs is essential in finding the right individual-organization match. In addition to finding this successful skills-to-person match, managers
must understand the new generation worker’s beliefs and values if they are to have any success in promoting a positive work environment. The changes reflected on the workforce by a new generation will have significant impacts on the ways corporations manage their people. These lifestyle changes, brought on strong by Generation Xer’s can be seen in many organizational cultures today. Initiatives such as “work-at-home”, “flex-time”, and “on-site childcare” are just a few of the changes many companies are making to help lure the best of the best into their organizations. According to the Hudson Institute’s study on the changes in the workforce, “Workforce 2020”, the future workplace will see a mix of desired benefits and working conditions: “flexible hours, telecommuting, and family leave will become increasingly attractive to both men and women who are parents of young children. In the early twenty-first century, employers who wish to recruit and retain highly skilled and well-educated workers will need to offer their employees benefits and working conditions such as these” (Judy & D’Amico, 2000)

With the competition of engineers and scientists in the future, the Air Force is positioning itself to successfully compete in the war for talent. And in addition, the Air Force must also recognize the declining pool of available talent, coupled with the increased demand. And, while there exists a lack of diversity within the engineering workforce to begin with, this problem is exacerbated with the reduction of graduates in S&E related fields. And to look at an even more interesting problem, the rate of students entering into S&E programs at colleges and universities around the country continues to increase, “however, the national attrition rate is high, and at least 40 percent of students who start engineering programs do
not finish them” (Wormley, 2003, p. 42). So how do we approach this national dilemma? And in a competitive period within this global economy, how can the Air Force compete?

At the start of the millennium, the Air Force placed a great amount of attention on the Science and Engineering workforce. This focus was generated by the engineers with critical skills that were facing retirement eligibility and the mass amount of corporate knowledge that could potentially leave the Air Force technical community all at once. Figure 3, below, shows the current staffing profile of engineers in 2001.

![Bar chart showing years of experience](image)

**Figure 3:** Workforce Shaping Projections (Kelly, 2001, p. 22)

While a significant number of engineers are eligible for retirement, there exists a gaping hole in the population with less than 13 years of experience to replace the critical skills left vacant...
by the eligible retirees. The hole within the profile exists due to a lengthy hiring freeze
brought on by the fall of the Berlin Wall and end of the Cold War. The downsizing and “re-
engineering” of the Clinton Administration maintained the hiring freeze and introduced
additional changes to shape the government. A large concern during this period, was not just
the loss of jobs, but the loss of diversity. “Since the inauguration of President Clinton,
several Executive orders requiring cost savings and the elimination of 100,000 jobs have
been issued. During this challenging time, it is essential that we manage diversity” (U.S.

The impact of the nineties “re-engineering” was just the beginning of the series of events that
were to change the look, and shape, of the workforce. The events of September 11, 2001 left
a devastating impact on the US economy, including manpower reductions in several sectors
of the United States and altering the traditional military mission. Changes in mission
resulted in changes in strategy and changes in acquisition programs which resulted in
changes in funding profiles, manning and overall general resources needed to execute
programs. This daisy chain of events placed workforce shaping initiatives and hiring
opportunities on hold until funding and program status could be re-aligned with the current
and imposing threat. The Air Force needed to “realign resources from lower priority to
higher priority missions, e.g., special operations and force protection” (Russo, 2003, p. 9).
These changes will affect manpower skills needs and desired scientist and engineer
disciplines for future technical efforts.
The workforce at Wright-Patterson Air Force Base in Dayton, Ohio is relatively representative of Product and Test Centers within the Air Force Materiel Command, the Air Force and most of the Federal Government (Russo, 2003). Data at Wright-Patterson shows the average age of civilian employees is presently 46 years of age and is expected to grow to 50 years of age by 2007 (Russo, 2003). This often translates directly to retirement eligibility statistics reflecting potential mass exoduses of our senior workforce.

Re-alignment of the workforce was key to any success the Air Force would have in maintaining its superiority in defense, in technical prowess and in maintaining a dominant technical edge. With the adverse impacts stated above, the Air Force is facing:

- The potential loss of years of corporate knowledge through eligible retirements.
- An overall aging workforce limited in their time to train replacements.
- A change in threat requiring a potential change in the skills mix of the technical workforce.
- Lack of scientists and engineers in the “junior” category standing by to replace the aging workforce.
- Scientists and engineers continue to have the poorest accession and retention in the USAF (Plummer, 2003).

As a result of the changes in world events, changes in the economy, changes in hiring regulations and changes in personnel requirements, the Air Force faced major workforce re-
alignment challenges due to the above constraints. In order to counter many of these challenges, the Air Force, (and the Federal Workforce in general), needed to discover ways to overcome hiring restrictions, limitations and personnel bureaucracy that the Federal government is so well known for.

In addition, the once “guaranteed career” with the government was being challenged by very public reduction in force, downsizing and rightsizing initiatives. During a Senate hearing, Dr. Vince Russo, the executive director of the Air Force’s Aeronautical Systems Center stated: “Realizing they may be the first to leave, our junior employees are concerned about reduction “talk” and are already thinking about career options outside the government. In addition to impacting our ability to retain good employees, the reductions hamper our ability to recruit the best and brightest into our workforce. Potential employees are starting to question why they should seek employment with an organization that is seemingly headed back toward the downsizing path” (Russo, 2003, p. 9). This fear of reduction coupled with the typical, traditional governmental hiring barriers, Air Force civilian recruiters faced the challenge of “showcasing” high-tech government jobs amidst the more alluring industry jobs that often had greater benefits. Industry jobs offered higher pay, often better benefits and “perks” government jobs couldn’t offer. To counter these tempting offers and perceptions, the Air Force set out to change the perception of not only government jobs, but the technical opportunities available in a military environment. Coupled with this image transformation was a desire to “rightsize” the workforce and attend to affirmative action objectives and diversity initiatives. For those organizations facing a “gaping hole” in their workforce spread,
this was not an exercise in an attempt to meet an affirmative action objective, it was clearly an imperative in an attempt to build a strong, diverse future technical workforce.
Affirmative Action vs. Diversity Initiatives

“Our nation’s security and prosperity depend on our ability to develop and employ the talents of our diverse population. Equal opportunity is not just the right thing to do; it is also a military and economic necessity.”


Around the turn of the 21st century, many of the departments and agencies within the Air Force were changing. The global environment was changing, military temperament was changing and shifts in demographics required a change in the workforce. It was truly a transformational time for not only the military, but the civilian agencies and departments that supported the changing mission of the United States military. Wright Patterson Air Force Base was one of many installations focusing on their civilian scientist and engineering population, but Wright Patterson Air Force Base was also a good “test bed” for future workforce initiatives and would be a “proving ground” for future efforts at other installations.

In addition to local recruiting, retention, and diversity training measures, the Air Force Directorate of Personnel in Washington D.C. published their annual report on the Air Force’s affirmative action employment program for women and minorities. This report provides employment data, workforce analysis data and affirmative action objectives and initiatives. The information is broken down by minority, by career field and grade level. Figures 4 and 5 show the minority representation in two of the engineering disciplines within the professional civilian labor force (CLF). The professional civilian labor force is comprised of all technical
and non-technical professional positions with in the United States Air Force. These positions include degreed specialties in engineering, contracting, accounting and law and typically represent the higher paying salaries in the federal government. The classes within the civilian labor force are broken down into White Female, Black Male, Black Female, Hispanic Male, Hispanic Female, Asian/Pacific Islander Male, Asian/Pacific Islander Female, American Indian/American Native Male and American Indian/American Native Female. The figures below portray two of the larger, more relevant, mission essential groups of the professional technical workforce, GS-0801 (General Engineers) and GS-0855 (Electronics Engineers). One can see that in both cases, in comparison to the entire professional civilian labor force (CLF), females of every ethnicity are underrepresented.

![General Engineering (Professional) - 0801](image)

**Figure 4:** General Engineering Workforce Minority Representation, GS-0801 (Department of the Air Force, 2002).
Figure 5: Electronics Engineering Workforce Minority Representation, GS-0855

(Department of the Air Force, 2002).

One of the largest concerns is that while the Air Force saw an increase across the board in white females, there is still a large under-representation within the technical workforce. In addition to the technical professional analysis, the affirmative action report also reported grade level (pay/salary level) analysis. All civilian employment grade levels increased from 2001-2002 in all categories, except for the GS-13 to GS-15 grade levels. This is to be expected since grade is closely related to years of service, and the GS-13 through GS-15 levels are typically held by professionals with 15 years of service and above, correlating with the large exodus of baby boomers who were expecting to retire. This is yet another indicator of how downsizing and retirements hampered the Air Force’s ability to “shape” the workforce. “We experienced an overall decrease of 1,436 in the GS-13 through 15 grades
from FY01. Minorities decreased by 135. Women decreased by 1,324. Other decreases included: Asian Males -60, Hispanic Males -35, Black Males -24, and White Females -5. Black Females increased by 22 and Asian Females by 6” (Department of the Air Force, p. 3).

In an effort to promote their affirmative action program, the department of Personnel created several objectives to enhance the participation of minorities and women in the workforce.

- Establishment of Special Emphasis Programs: Special emphasis programs such as Federally Employed Women (FEW), Blacks in Government (BIG) and Federal Asian Pacific American Council (FAPAC) are created to promote under-represented minorities within the Federal Government. The Air Force affirmative action team created an initiative to ensure every special emphasis program manager was trained in their agency specific program.

- Improve under-representation of women and minorities in GS-13 and above positions:
  Although the department of Personnel has little direct hiring control, (most hiring is done at the installation level), they have initiated a metric to track the performance of this metric Air Force wide. Tracking numbers may not aid in the objective, but it does send a message to installation managers that this is an important metric for the Air Force.

- Impact of employee development programs on women and minorities: Another metric the Department of Personnel tracks is a review of the training opportunities offered to women and minorities. “In FY02, women received 37% and minorities 21% (Blacks 10%, Hispanics
7%, Asians 3%, and American Indians 1%) of the developmental training” (Department of the Air Force, p. 27). “A joint memo, signed by both the Air Force Chief of Staff and the Secretary of the Air Force, was sent to all major command commanders encouraging them to support civilian professional development and urging them to be proactive in ensuring diversity is reflected in their nomination of civilians for developmental opportunities” (Department of the Air Force, p. 27).

-Civilian Voluntary Separation Incentives: The Air Force continues to downsize and offers separation incentives to reduce the workforce and simultaneously attempts to create and maintain a diverse workforce. By collecting separation and “Reduction in Force”, or “RIF”, data, they can determine if women and minorities are greatly affected by these changes.

“There were a total of 826 incentives affected during FY02. The demographics for Separation Incentives were: Whites 75%, Blacks 9%, Hispanics 14%, Asians 1%, and American Indians 1%” (Department of the Air Force, 2002, p. 29).

It is important to recognize the difference between affirmative action goals and diversity initiatives. While the Air Force maintains its affirmative action goals, they would be foolish to not ensure diversity is achieved throughout their department. Affirmative action goals measure gender, race and age, while diversity initiatives attempt to expose the varied life experiences, cultures and values unique to individuals, yet so essential in capturing a diverse team environment. Because it can be difficult to discriminate between affirmative action goals and diversity initiatives, and the metrics collected to report achievement of each are
frequently similar, diversity demographics are often misconstrued as measures of affirmative action. Achieving diversity is not about meeting quotas, but capitalizing on individual differences for the benefit of the group. This can be a difficult aspect to measure. “The idea of diversity metrics is taboo to most Labor and Employment Relations attorneys because of the perceived similarity to illegal quotas or other measures designed to ‘count heads’” (Jones, n.d.). Managers are often confused by affirmative action legislation and diversity initiatives within a corporation; however there exists a fine line between diversity and affirmative action. “One of the major differences between diversity and EEO and affirmative action is that, to date, the statutes that we rely on in the EEO and affirmative action arena do not apply to diversity, per se” (U.S. Merit Systems Protection Board, 1993, p. 41). But we must keep in mind that diversity is not about numbers, or quotas, but differences in an individual’s perspective, values and life experiences. In a recent Boston Globe article, author Joyce Pellino Crane, explains how corporate diversity efforts are beginning to broaden in scope. No longer are corporations focusing on just race and gender, often an affirmative actions measure, but they are focusing on the true benefits of diversity, such as broadening of perspectives, and critical thinking skills. Valuing the perspectives of a diverse group of talent can provide a measurable difference in organizational performance (Crane, 2004).

But even with diversity goals and initiatives, employers often resort back to numbers of minority populations in an effort to increase varied representation of employees. In a March, 2002 article from the Air Force Research Laboratory, an EEO officer speaks of the importance of a diverse workforce. “Each person within AFMC (Air Force Materiel
Command) brings a unique background, life experience, and thought process with them when they join our team; it’s out of these differing characteristics we find our best ideas and implementation strategies for the future” (Maurer, 2002, p. 1). The article continues to describe the performance of the Command in attracting and using minority populations: “Overall, AFMC as a command is doing better than, or as well as, the Air Force in attracting and using minority populations. African-American, Asian-Pacific Islander, Hispanic, Native American, disabled and women are the primary groups Air Force officials monitor” (Maurer, 2002, p. 1). Because diversity means so much more than gender, race, or ethnicity it is often hard to find metrics that will capture the true differences between an individual’s life experiences, thoughts and culture. It is in managing these differences that an organization can breed the benefits of diversity and capitalize on the results.

Although various types of quantitative and qualitative diversity metrics are available, human resource managers often resort to Equal Employment Opportunity (EEO) and affirmative action metrics. Air Force Materiel Command statistics for scientists and engineers within a ten year span, with respect to ethnicity, are shown in Figures 6 and 7. While there exists little difference between 1991 and 2001 in the size of each ethnic group, there is a small increase in every category, except Hispanic. And with the Hispanic population now recognized as the largest minority in the United States, it’s important to increase this representation within the Air Force workforce. Albeit small, this negative change over a ten year period is troubling in that the number of technically based Hispanics in the Federal Government (Air Force) is decreasing while the overall population of Hispanics nationwide is increasing.
There are several factors that could be impacting this reduction including the citizenship requirements in the civil service, overall workforce downsizing that occurred over the same ten year period and the reduction in science and engineering graduates nationwide. The ethnicity statistics for the United States’ technical workforce is shown in Figures 8 and 9 below. Comparing Figures 6 and 7 to Figures 8 and 9, we see that the Federal Government (Air Force) is performing better than the national average in terms of representation of minorities in the field of science and technology. Figures 8 and 9 also show increases in each ethnic category, however the exception here is Black, Non-Hispanic scientists and engineers which suffered a 1% decline over a nine year period from 1990 – 1999.
**Figure 7:** Air Force Materiel Command Ethnicity Statistics Technical Workforce, 2001 (personal communication, February 3, 2004).

**Figure 8:** United States Ethnicity Statistics in Technical Workforce, 1990 (Science Indicators, 2000)
Figure 9: United States Ethnicity Statistics in Technical Workforce, 1999 (Science Indicators, 2000)

While overall representation of minority groups in technical fields within the Air Force is strong in comparison with the United States technical labor force, there are still some obstacles to overcome. Citizenship requirements for civil service positions will always continue to hamper these statistics as well as any future downsizing of the civilian force and the decline of technically skilled college graduates.

The task of building a technical, diverse future for the Air Force lies in creating a delicate balance between several factors. Affirmative action objectives, diversity initiatives, workforce shaping goals and rightsizing are all influential factors in creating the Air Force’s future technical workforce. Clues to how organizations might accomplish the goal of
developing a diverse workforce are covered in the next section with evidence of existing programs and future workforce initiatives for consideration.
Building a Technical, Diverse Future

“Diversity: The art of thinking independently together.”

-Anonymous

Over the course of approximately three years, the Air Force and the Federal government introduced legislation, implemented creative hiring procedures, and created a hiring transformation that would, hopefully, make a positive impact on civilian hiring and workforce shaping. The Air Force’s Affirmative Action Plan cites various civilian initiatives directed specifically at the science and engineering workforce. The Air Force Personnel Center also transformed recruiting practices and shared their vision on the value of diversity. In addition, legislation introduced by Senator George Voinovich of Ohio in late 2003 includes provisions enabling flexibilities in offering recruitment, retention and relocation bonuses. This Federal Workforce Flexibility Act of 2003 would allow enhanced bonuses to be paid to employees in a lump sum, or over time, with the intention of increasing the recruiting and retention ability of civil service positions. Each of these efforts, both independently and jointly, was a giant step in the direction of building a technical, diverse future for the Air Force.

The Air Force Affirmative Action Office and the Air Force Directorate for Personnel began looking at civilian initiatives directed specifically at the science and engineering workforce. In an effort to fill the “gaping hole” brought on by a decade of hiring freezes and downsizing, the Air Force is attempting to revitalize their science and engineering workforce through a
series of initiatives. These initiatives are independent of any legislative, or installation level initiative previously addressed in this paper.

Diversity is a major thrust behind all initiatives, and the recruiting and retention of scientists and engineering are two primary objectives. Within recruiting, there are five elements for consideration. First are specific recruiting incentives for graduating seniors. These incentives may be monetary or non-monetary and include such options as student loan repayment and graduate level tuition re-imbursement. Since starting government pay tends to be lower than average starting salaries, this can make an entry-level position more attractive. The second initiative offers funding for potential recruits in their sophomore or junior year of engineering school who are interested in a cooperative agreement with the Air Force. This is a “win-win” situation for both the student and the gaining organization in that it offers both “on-the-job” training and positioning opportunities for the potential recruit and educated manpower for the Air Force. The third initiative is to build a robust college recruitment office to enhance an Air Force/University relationship. Fostering these relations at the University level will not only help build a bridge for current recruits, but help construct a strong foundation for future technical recruits. Ideally, this relationship would certainly be a “give-and-take” arrangement that allows Air Force alumni and Air Force employees to assist in mentoring and coaching potential candidates. The fourth initiative is strictly a monetary bonus at the time of commitment. Signing bonuses were once reserved for the best of the best in sports once an athlete committed to play for a particular school. But in the last 10 years, this form of incentive has become a critical aspect of the recruiting game and with
some companies paying as much as $50,000 for the top scholars; technical recruits with 4.0 GPA’s are looking to pull in a minimum of $25000 in pure signing bonus dollars (A nice down payment on a house, or dream car for a young college graduate). Unlike many of the other incentives listed above, the final initiative is related more toward the way the government operates in comparison to private industry than anything else. In order to capture, lure and sign on the best and the brightest, organizations must be ready to make a move immediately. If a student is scheduled to graduate in the spring, many are anxious to have a job position by the end of winter semester. Many corporations have “on-the-spot” hiring authority that allows them to sign on candidates at the moment they have met or interviewed the potential candidate. Paperwork to follow can be merely a formality to seal the deal, but confirmation of appointment is typically days earlier. Within the Federal Government, this is not the case. Days and weeks are spent reviewing applications, resumes and transcripts. Applications are compared against forms which are compared against position descriptions which often travel through several departments before a candidate is even contacted. While this can be very laborious and tedious, government regulations require a thorough review, and at times, initial security clearances must be conducted to further a candidate’s approval process. A streamlined hiring process would help the Air Force increase their chances at offering jobs quicker, with less paperwork and less hassle on the part of the potential candidate.

These initiatives are focused only on recruitment and would be a great enhancement to the Air Force’s current recruiting efforts. But once a candidate is hired, it is important to
concentrate on retention of the individual. As noted earlier, the Air Force lost a fair number of under-represented minorities within a 12 month period in 2001. While the numbers do not provide the reason why the individuals left, some, more than likely, left to pursue other opportunities outside of the government, perhaps to higher paying jobs. For this reason, retention initiatives are just as important, if not more important, than recruiting initiatives. On average, it costs an estimated $7,000-$10,000 to recruit an entry level technical employee. If recruiting isn’t accomplished correctly, nor mentoring, “care and feeding” or career building by an employee’s supervisor isn’t executed correctly, the turnover and cost to recruit can magnify, which is why retention of good employees is so important. The Air Force is focusing on three potential initiatives to address retention issues. First are retention allowances. Similar to the “signing bonus”, retention allowances are monetary bonuses offered to high demand technical positions. Rather than losing skilled talent to industry, these bonuses help make up for the pay dispersion between federal government and industry. The second initiative considers special salary rates for high demand and critical skill positions. This would allow particular skill types either accelerated promotion schedules or greater pay for each level of promotion achievement. Finally, relating performance and pay is the third proposal under consideration as a retention initiative. Receiving pay commensurate with one’s contribution to the mission is a fairly new concept in some organizations within the Air Force. As in most pay for performance models, there are always disadvantages and advantages to the employee. While this is beyond the scope of this thesis, it is an option for further research.
Recruiting teams also began to transform the way they recruited. Technical recruiters teamed with administrative specialists from personnel centers to highlight the benefits of working in a technically grounded government organization. More creative and dynamic recruiting styles replaced dull, salary based tactics. Pamphlets, booklets and recruiting packets focused on both tangible and intangible benefits of working in the Federal Government. For example, although industry counterparts offered more in salaries and wages, they often required more overtime and additional duty time in a typical workweek. Federal law mandates additional, overtime pay for federal workers working over and above the required 40 hours per week. Another benefit potential recruits liked was the level of responsibility and career opportunities available to junior engineers within the Air Force. This was dramatically different in comparison to private industry. And finally, the opportunity to continue their technical education while being reimbursed by the government for their tuition was a great selling feature as well.

In addition to the recruiting initiatives and awareness campaigns at colleges and universities, the Air Force began an internal review of their scientist and engineering workforce. In late 2000, the Air Force held a Scientist and Engineering “Summit” “to demonstrate that AF leadership is engaged in maintaining the S&E Career Field” (Plummer, 2003). As a result of this meeting, a newly designated “Functional Manager” for all Air Force scientists and engineers was assigned, and a new “Advisory Council” was formed to address the critical nature of the Air Force’s technical workforce. This was a milestone for scientists and engineers in that no such technical representation at such a high level in the Air Force ranks
had existed before. This newly found attention was not only comforting to many in the technical workforce, but signaled a new appreciation for their skills and dedication.

With the combination of new leadership, new legislation and a rejuvenation of recruiting initiatives, the Air Force was beginning to transform a critical erosion of talent into a strong foundation of technical expertise. But while much attention lay on the Air Force’s ability to recruit and retain their technical workforce, there was also a need to ensure that the workforce had the ability to maintain a diverse environment and strongly commit to a diverse technical staff.

In an effort to concentrate diversity efforts in the hiring of scientists and engineers, visits to Historically Black Colleges (HBCs) and Hispanic conferences were emphasized and visits to the traditional tech school venues such as Purdue University, Penn State University and Georgia Tech continued. Looking for the most qualified talent was imperative; achieving it with diversity in mind was a true success. Beyond this focused effort of the Secretary of the Air Force’s acquisition office, there was also a local, base level effort to help boost the demographics at Wright Patterson Air Force Base in Dayton, Ohio. While many of Air Force bases were feeling similar talent crunches, Wright Patterson Air Force Base, with the Air Force Materiel Command headquarters, Aeronautical Systems Center Headquarters, Air Force Research Laboratory Headquarters, the Air Force Institute of Technology and the National Air Intelligence Agency, felt the squeeze as much, if not more than any of the other
installations. To help shape the demographic imbalance throughout the workforce at Wright Patterson Air Force Base, leaders took the following initiatives:

-Visit (at least) 40 colleges and universities per year targeting scientist, engineering, business and medical fields to attract and retain a diverse pool of applicants (Russo, 2003).

-“…Actively leveraging existing authorities by extensive use of recruitment/retention bonuses and payment of relocation expenses in recruiting programs” (Russo, 2003, p. 7).

-Establishment of a ‘Retention Center’ to address retention issues of employees (Russo, 2003).

-Designed and “implemented diversity training for all Wright Patterson Air Force Base employees, which will ensure we have a work environment where awareness, acceptance, and effective inclusion of human differences will enhance accomplishment of the mission” (Russo, 2003, p. 7).

- Provide leadership training to supervisory staff “highlighting six characteristics of an effective leader: challenge the process, inspire a shared vision, enable others to act, model the way, encourage the heart, and have fun” (Russo, 2003, p. 7).
-Established two on-site masters programs, one leading to an MBA and the other leading to an advanced technical degree (Russo, 2003).

Each of these initiatives focused on creating opportunities, growing engineering talent and maintaining a critical aspect of our nation’s technical superiority. All of these factors are relevant components in building and retaining a technical and diverse workforce of the future.
A Framework to Achieve a Diverse Workforce

If we are to achieve a richer culture, rich in contrasting values, we must recognize the whole gamut of human potentialities and so weave a less arbitrary social fabric, one in which each diverse gift will find a fitting place.

-Margaret Mead

The challenge to grow a diverse, capable and well represented technical workforce goes hand and hand with the Air Force’s desire to reach its operational mission to defend and protect the United States through aerospace power. Through an increased focus on recruiting and retention initiatives, the Air Force can further its ability to successfully build a diverse, creative and technically savvy workforce. There certainly are challenges and barriers in achieving diversity, however developing a strategic plan with objectives and goals will be critical to ensuring success.

As described in the previous sections, the Air Force employs various initiatives to recruit, retain and effectively promote a diverse, technical workforce for the entire department. While building a technical workforce in the new millennium continues to challenge these initiatives, the Air Force must continue to utilize the best tools possible to hire and retain technical talent of the future. Several industry and government institutions have touted “diversity best practices” that serve both as benchmarks for existing initiatives and springboards for creative management ideas to improve diversity. These measures can help organizations more selectively create the initiatives and metrics needed to address minority
group under-representation. I will proceed with a discussion and outline of a workforce "construct", or framework, which can be applied to science and engineering workforce development, followed by some of the more common diversity best practices.

In creating diversity metrics, measures and best practices it is important to recognize each category that influences the workforce mix. Mentoring, recruiting, retention, succession

**Figure 10:** Scientist & Engineer Workforce Construct
planning, and workforce analysis all play an important role in creating a diverse workplace. Figure 10 graphically portrays how a strong scientist and engineering workforce is built. While the “feeder pipeline” promotes technical education and sponsorship of grades kindergarten through grade 12, the pillars represent efforts that must continue for the incoming and existing workforce to sustain a diverse technical workforce. I will proceed with an explanation of how the foundation and the pillars all work in concert to support a technical workforce.

The foundation is made up of the feeder pipeline, young students in grades K-12 who may not be aware of the opportunities that exist in the sciences. And although the current technical workforce may not reap the benefits of this generation until many years later, it is their responsibility to educate and instill the scientific grounding necessary to construct a technical mind. To build upon the youth, or the “feeder pipeline”, the Air Force community must take action to reinforce a future workforce. One example in forming this foundation is through educational outreach. Educational outreach opportunities are the first encounter the Air Force, or its workforce, have with the future generation. The Air Force participates in a variety of educational outreach programs across the country. At Wright Patterson Air Force Base in Ohio, base scientists and engineers volunteer their time in educational outreach programs such as Wright State Engineering Preparatory Program (Wright STEPP) for science and engineers. This six week program focuses on inner city youth who have the interest and potential in pursuing an engineering curriculum in college. The program, which is now in its sixteenth year, continues to grow and graduate top scholars who have become
technical leaders in their field of study. Sponsoring science fairs and robotic competitions are also popular favorites in working with school-age children. Judging science fairs and coaching the construction of mechanical models are also great opportunities to encourage youth to continue in the science and engineering field of study.

The first pillar in the construct represents mentoring. Forming mentoring relationships whether through co-operative engineering assignments or one-on-one mentoring sessions, maintaining a connection with underrepresented engineering college students is essential to developing a future diverse workforce. The Air Force and individual bases must form relationships with colleges, universities and professional societies upon which they can access talent. While the Air Force has maintained participation in recruiting fairs at Historically Black Colleges and participated in career fairs sponsored by affinity organizations, such as the Society of Hispanic Engineers and the National Society of Black Engineers, a stronger bond with university engineering departments and national societies would not only help educate under-represented minorities on Air Force civil service, but also build a bridge for future recruits. Co-operative agreements, popular in the 1970’s and 1980’s were stymied during the hiring freeze years with base-university relationships fading in the process as well. Re-engaging this communication will help forge the relationship and build more co-operative assignments for future scientist and engineers.

The second pillar is “recruiting”. Recruiting continues to be a “war for talent”, attempting to garner the best students with the best futures. Recruiting must not be passive such as human
resource professionals distributing brochures, but an active engagement of scientists and engineers who can share their passion with graduates who are excited about their own future. The Air Force does a tremendous job in capturing the “fire” of the department. Energetic and passionate engineers are often part of their recruiting booths and with the attractive display of state-of-the-art defensive systems, the booth often gets much attention. But the excitement can quickly subside when weeks after a recruit submits an application, they still have yet to receive even a phone call. The response time is lengthy and recruits often become discouraged or search out other opportunities. As described earlier in this paper, the Air Force is looking into streamlined hiring actions that would potentially offer jobs on the spot.

Once a new recruit has been hired, it is important to nurture and build their career. Retention is the next pillar that if ever weakened, would not only place stress on the other pillars, but potentially damage the roof line, or, in our case the diverse technical workforce. Retention and development of personnel is critical for an organization and even more critical when diversity is at stake. “The Hudson report indicates that in the future only 15% [net] of entrants into the workforce will be white men. The remaining 85% [net] will be comprised of women, minorities and immigrants. Yet companies have difficulties retaining them due to career stagnation, biased performance evaluation and promotion standards, lack of training opportunities and workforce discrimination” (“Women and Diversity”, 2002, p. 1). With this in mind, one can see the importance of career development and advancement opportunities from day one. Within the ten year hiring freeze at Wright Patterson Air Force Base,
supervisors and managers seemed to become comfortable with the environment. New hires became a thing of the past and career development was something you only had to worry about with the seasoned engineers who were interested in progressing. But when numbers of new hires began to descend upon the engineering organization, it seemed to be more of a novelty than a wake-up call to engage mentoring, training and career development programs. One particular organization set up a mentoring program specifically geared toward the large number of junior engineer new hires. The mentoring program was a multi-faceted coaching, training and peer counseling initiative for all newly hired engineers. This maiden program went over well for the first influx of new hires and continues to keep tabs on the careers of the junior engineering workforce.

The fourth pillar is necessary to maintain a steady development and growth of the organization. Succession planning looks at the organization’s internal pipeline of talent to ensure a steady progression of leaders is prepared to fill the shoes of the current leadership. This cannot happen without the forethought of career planning and the creation of opportunities for future leaders. In a diverse workforce, the continuity and depth of diversity must be reflected from the top leadership down the organizational work chart. “In order to diversity your workforce, reflect diversity in the leadership of your organization. This allows people if diverse backgrounds to have realistic role models, supporters and proof of opportunities for advancement” (“Women and Diversity”, 2002, p. 1). Therefore creating a succession plan and making considerations for all eligible talent is a critical part of building a diverse future workforce.
Analyzing the workforce and conducting periodic measures with respect to diversity is the final pillar in our scientist and engineering workforce construct. Both quantitative and qualitative metrics are essential in characterizing a truly diverse workforce. The Air Force Personnel Office continually tracks metrics and measures of performance against affirmative action initiatives. Similarly, lower level organizations and divisions track ethnicity changes, performance measures and percentage of minorities who were provided opportunities for advancement and training. These measures are good indicators of diversity within an organization; however, as addressed earlier, there are other elements of diversity such as an individual’s understanding of different values and perspectives, their childhood upbringing and overall life experiences. These are difficult variables to measure, so it is important to capture periodic surveys that help analyze workforce dynamics as a whole. Climate surveys, morale assessments and team effectiveness measures coupled with demographic and grievance statistics can shed light on overall workforce performance much better than ethnicity alone. While diversity typically brings forth increased productivity and creativity it can also invite conflict and friction between team members, so a periodic analysis of a team’s performance is important. Some organizations suggest “benchmarking” diversity measures throughout an organization to better understand the organization’s goals, how to effectively reach those goals and how to measure the return on investment (“Diversity Inc.”, n.d.). These benchmarking audits can provide not only statistical data, but diversity awareness and improvement issues, staff development needs and feedback from participants that may be helpful in preventing future conflict or diversity issues (Ball, 1998). While this thesis will
not cover specific measures for benchmarking, this is a valued area of interest with much research that deserves mentioning for future reference.

I believe these five pillars that I have described above are essential to a strong, diverse technical workforce for the future of the Department of Defense. Beginning with young, impressionable minds of school-age children through the succession planning for our future workforce, each pillar offers a unique and multi-faceted perspective to future Department of Defense engineers and scientists. But without metrics to measure diversity initiative success or organizational performance, our organizations will never be able to capture their true potential. And in capturing this potential, it is also important to recognize best practices throughout the industry and government to obtain diversity success. In my next and final section, I will discuss some of the best practices discussed in more recent literature and provide my own personal analysis on how the Department of Defense rates against these best practices.
Shaping Our Future – Best Practices in Diversity

The challenges of change are always hard. It is important that we begin to unpack those challenges that confront this nation and realize that we each have a role that requires us to change and become more responsible for shaping our own future.

-Hillary Rodham Clinton

Best practices often grow out of issues and challenges organizations have faced and have successfully overcome through a series of goal oriented activities. These best practices often become cornerstones for advancing future initiatives and, in the case of diversity, they are the foundations for growing and maintaining a high performing technical workforce. Listed below are a series of best practices of diversity development and management garnered from various resources, but overall representative of initiatives and goals promoting organizational diversity.

1. Commitment: Although I have numbered each best practice, they are not ranked in any fashion, except for this one. Commitment must be number one, for without it, the challenge to even attempt to build a diverse workforce is futile. There must be commitment from the very top, down to the lowest rung on the organizational workforce ladder. “Diversity initiatives cannot be driven through an organization by human resources people alone. There must be commitment from the CEO and senior line managers throughout the organization” (Mattis, 2002, p. 18). This commitment must not only be a personal commitment of success, but a financial and institutional commitment as well. In order to execute a successful
diversity program, an organization must recognize its fiduciary responsibility to this critical element. I have presented examples above where “money talks” when attracting technical talent, and although this may sound “superficial” it is representative of just one cost associated with building a strong technical workforce.

In my opinion, the Air Force continues to be strongly committed to this practice. Their participation in educational outreach programs for under-represented minorities and cooperation with minority professional societies is clearly evident through sponsorship and advocating of affinity groups. Even through continuous government cut backs and downsizing, the Air Force continues to ensure representation of all classes, ethnic groups, gender and other diversity measures are included in the workforce.

2. Formal Process: Ensuring a formal process is in place to assist the progression of diversity initiatives is essential. By utilizing a formal process, established in a strategic or business plan, employees can feel reassured that should an issue or concern arise, they have a fair, equitable and documented process they can follow to resolve it. Organizations have moved from informal, ad hoc procedures to more formalized processes that demonstrate the value they place on the importance of diversity. Diversity processes also include the metrics and measures organizations wish to obtain through employment of their goals and initiatives. “In best practice organizations, diversity is a process that is an integrated, ongoing and measurable strategy” (Reichenberg, 2001, p. 3). Continual measurement and assessment
against a documented process and strategy will help an organization better define diversity performance objectives and goals.

The Air Force maintains a pulse on their diversity representation through a series of policies and procedures. Policies and procedures at the department level are aligned more closely with the Equal Opportunity Commission rules and regulations; however processes at the installation or organizational level are more focused on an “open door”, all-inclusive policy with processes to raise concerns clearly outlined in guidelines on the installations website. While more focus and effort could be put forth regarding the education of managers and supervisors in the area of policy and procedures, the Air Force continues to strive for excellence in the service of its civilian workforce.

3. Training: As important as training is to the overall understanding of diversity, it is perhaps the most mis-understood and most placated practice of all. Diversity awareness training alone will not change a manager or supervisor’s behavior or actions alone. “Awareness training to shift perceptions and unarticulated assumptions is critical to change – and must be a part of an overall strategy that includes specific goals, measurement, behavior skills training and accountability” (Frost, 2001). Make no mistake that training is important, but it must be coupled with strategy, goals and initiatives in order for it to work effectively.

While in prior years, the Air Force offered diversity training as an option, many organizations and installations have now made it a mandatory requirement for all personnel.
Many see this as just a passing fad or buzzword of the day and attend training to fulfill a requirement, however until all can truly grasp the essence of the benefit of diversity and recognize the relationship between productivity success and celebration of differences, this will continually be a concern for the Air Force training directorate.

4. Access to Opportunities: Succession planning is a necessary activity for leading organizations and agencies. Mapping career paths for future leaders becomes an essential part of growing a business and a critical element in building a diverse workforce. All qualified individuals must have access to opportunities within all levels of the organization. Diversity must be representative at senior levels as well as mid-level and entry-level candidates with movement laterally as well as vertically also being a part of the career building process. “Formal career goals, succession planning, and evaluation of employee interest and track records are part of this process” (Arvizu, 2002, p. 21). It is important to recognize that job opportunities and promotions are two very different personnel actions. Providing opportunities to broaden and build networks in other areas is often a good career move. Promotions, on the other hand, are wise career choices when the timing is right. In the long run, promoting too soon could have an adverse effect on an individual’s career and hinder agency morale as well. “More time should be spent preparing minorities for senior positions because there are fewer of them and because they sometimes require different experiences” (Turlik, 2002, p. 27).
One of the biggest advantages working in the Department of Defense, or any government organization is the ability to move between and within agencies and departments. The Air Force, for instance, has installations in almost every part of the country and overseas locations as well. While some skills are concentrated in specific parts of the country, there are more variations and opportunities than one might expect. For the scientist or engineer, opportunities to broaden and excel are evident through centrally funded training opportunities, job exchange programs and experiential programs. In addition, scientists and engineers often are afforded the opportunity to change career fields and advance through the management chain. Program managers who have traversed through the technical ranks have a firm technical grounding that adds a nice complement to Air Force business.

5. Accountability: “Accountability is determined through the use of metrics, surveys, focus groups, customer surveys, management and employee evaluations, and training and education evaluations. Diversity competencies may be incorporated into management systems” (Reichenberg, 2001, p. 4). Some organizations tie compensation packages to diversity goals, offering monetary rewards for achievement of team diversity. “In a 2000 survey conducted by the Society for Human Resource Management, 66 percent of human resources professionals said their organizations were committed to diversity. A recent e-Survey conducted by the Northeast Human Resources Association in Wellesley [MA] fund that 46 percent of those responding said their company had a diversity strategy” (Crane, 2004, p. G7). With the rise of diversity plans and strategies, it is imperative that accountability accompany these strategies to ensure plans, initiatives and goals are acted
upon. Whether accountability is tied to monetary rewards, or recruitment and retention
success, diversity must be measured to claim success.

The Air Force continues to make strides in the area of accountability. Whereas firms in
private industry may provide incentives to managers who build diversity into their teams, I
do not see the federal government offering these types of incentives to managers or
supervisors in the near future. Linking recruitment, retention and development strategies to
organizational performance is a more appropriate measure for Air Force success. Building a
diverse workforce in the Air Force is the responsibility of many, not just one, so in some
sense, all employees must carry a responsibility for accountability.

6. Mentoring: “Coaching and mentoring are helpful in retaining and developing diverse
talent” (IBIS Consulting Group, 2002). Recruiting can be an expensive proposition for many
companies, and losing a recruit within the first year can prove even more costly. Setting up a
mentoring program and complementary coaching staff can help new hires make the
adjustment from academic life to the world of defense and help both the mentor and mentee
understand each other’s generation, culture and circumstances much better. In military
technical fields, mentoring, coaching and on-the-job training is even more important to
ensure new employees understand the mission and concept of a particular technology that
may not necessarily be mainstream. But regardless of technology or industry, mentoring and
coaching have become an essential part of many company diversity programs.
The military, in general, have always done a good job at mentoring and coaching junior officers and enlisted in active duty. It is part of their history and culture. On the civilian side, and primarily in the technical environment, that has also generally been the case as well. However, in situations where ten year hiring freezes stopped the natural flow of mentoring and coaching, some organizations were out of practice. With a resurgence of new hires and junior engineers flooding the workforce, formal and informal mentoring programs have been activated to provide a quick transition for junior engineers to acclimate rapidly to the engineering environment and help alleviate some of the talent loss set forth by pending retirements. In addition to the benefits of rapidly growing talent and responsibility, the mentoring programs are multi-faceted offering various opportunities for junior engineers to engage with technical leaders, managers, mid-career engineers and peers. Creating an open environment where junior engineers feel a part of the team helps technical workforce retention rates.

This list of best practices is applicable to all types of labor forces, but is only the start of many other diversity best practices that are continually gaining popularity throughout government and industry. As time passes, various cultures may have a greater impact upon diversity measures of the future, so it will always be necessary to research changes in best practices. The Air Force and Department of Defense continue to make strides in creating, developing and maintaining a diverse technical workforce for the future, however there are some specific areas within these best practices they may consider emphasizing in future efforts. First are flexible work arrangements. In an effort to increase the availability of
certain underrepresented groups, instituting flexible work schedules may strike an interest in
mothers who choose to share their time between a career as a professional and a stay at home
mother. While the government offers various “flextime” options on workday arrival and
departure times, expanding work-at-home opportunities may entice more women into civil
service. Secondly, I mentioned above the “access to opportunities” best practice including
succession planning and career monitoring for minorities, however I am aware of only a few
metrics which measure this practice, and the measurements can often be misinterpreted. The
Air Force’s Affirmative Employment Program Report collects data on the amount of training
taken by minorities and also data on the number of promotions accepted by minorities.
These data serve as an indicator of accepted actions, however fail to report the training and
promotions offered, but declined by the individuals. In the Air Force Personnel System, a
potential candidate is not even considered for promotion unless they physically nominate
themselves for the position, so considering the number of those candidates actually eligible
for a promotion, but not choosing to participate can be a telling statistic. Finally, with the Air
Force employing scientists and engineers in disparate locations across the United States, it is
important to ensure diversity initiatives are decentralized to each individual installation so
affirmative action data are not generalized for the entire workforce at an aggregate level.
This will help independent installations garner a greater advantage from their own diversity
plans and help create a more representative workforce.
Concluding Remarks and Visions for the Future

“The wave of the future is not the conquest of the world by a single dogmatic creed, but the liberation of the diverse energies of free nations and free men.”

-JFK

While the United States enjoys the richness of a multicultural society, it is perhaps recognized as a more monolithic society, uniform in its style and culture. But deeply rooted in this society is a diversity of intellectual capital that if well cultivated can reap an abundant harvest for our nation’s future. The ability to maintain our nation’s technical superiority will be based upon our ability to grow, nurture and mentor a generation of scientists and engineers diverse in their culture, race, gender and life experiences. With the dynamically changing world environment, managing human capital will be more than just an exercise for the Human Resource department, but an integrated, necessary task for the entire workforce chain. Leaders in the civil service technical arm of the Department of Defense must use this task to their advantage in creating their labor force. No longer will filling the job mean simply reviewing resumes and selecting a “qualified” candidate. Every facet of the individual must be considered in an effort to truly match the person to the job for maximum effectiveness. While leaders must understand the pros and cons of diversity, they must recognize that teamwork is based on a conglomeration of individuals whose talent, skills, abilities and life experiences create the foundation upon which solutions are based and opportunities are realized. Department of Defense teams tend to be bounded by the common mission and unit core values but it is the varied perspectives and ideas that help create the
optimal solutions necessary for the advancement of science and technology. And it is the varied make-up of this team that will further the Air Force’s ability to remain a stalwart leader of technology.

With a dynamic global environment, there are several factors that influence an organization’s ability to successfully execute their diversity workforce plan. Finding a true balance of these factors (e.g. incentives, affirmative action initiatives, and workforce shaping objectives, etc.) is critical to the successful achievement of any diverse workforce plan. Implementing best practices and benchmarking these practices to attain results will also help frame the roadmap for future initiatives.

What the future holds is of question, however recent events suggest “asymmetric warfare”, while typically a military concept, is making its way into the business world. Asymmetric warfare is an unconventional approach to warfare, now being applied to business, and its advancement and application to business has been attributed to a late military strategist, Col John R Boyd, a former U.S. Air Force fighter pilot who influenced not only aircraft fighter design and pilot training, but more importantly how the military approaches war (Brown, 2004). Simply put, asymmetric warfare is a method in which the enemy avoids its opponent’s strengths and focuses on attacking its vulnerabilities. Terrorism is a form of asymmetric warfare. To go to war with the United States conventionally would be suicidal for a political or religious power. No one in their right mind is going to build an arsenal of weapons and capabilities to compete with the United States, so their only opportunity is to
fight unconventionally. The war on talent is under a similar constraint. To be successful in constructing a diverse workforce, we must search for unconventional (i.e. diverse) candidates to make our labor force more effective and overall, more efficient.

Using this concept of “asymmetric competitive advantage” in the workforce can be best described through the example of the Ford Windstar mini-van development. In an attempt to challenge Dodge’s dominating position as the nation’s most popular selling mini-van, Ford avoided focusing on the strengths of the Caravan and attacked its vulnerabilities. Using the diversity of its workforce, Ford assigned female engineers to the research and design of its new Windstar. “Thirty female design engineers, known as the “Windstar Moms”, were responsible for making the Windstar minivans more family-friendly for women with children, Ford’s core consumer base. Some of those features included thinner steering wheels, a drop-down “conversation mirror” for checking on little passengers in the rear seats, and rectangular cup holders for juice boxes” (Brown, 2004, p. 46). This was truly an asymmetrical approach in designing a mini-van which certainly offered a greater competitive advantage over Ford’s competition.

Achieving diversity in a technical workforce for the Department of Defense is not much different than the Ford Windstar example. As the global environment changes, the military mission reacts similarly. In response to these changes, the Air Force’s technical workforce must have the immediate ability to reflect those changes in their designs. This can be achieved most effectively with a diverse technical workforce. Americans bring a vast
amount of diversity and culture to the table and the Air Force must tap into this great resource in an effort to execute an asymmetric competitive strategy on human capital. Including the ideas and life experiences of a diverse group of technical candidates better prepares the Air Force to adjust to the changing mission of the new millennium. According to Admiral Gerald L. Hoewing, U.S. Navy, diversity creates a force that leverages the strengths of every person on the team. Diversity is an absolute key linkage to force readiness and future mission readiness. (Diversity Inc, April/May 2004). In the same respect, it is the diversity of our technical workforce that will provide the ampleness and quick ability to meet mission requirements of the future global environment.

With respect to the Department of Defense, our nation’s future is strongly determined by the ability of our technical workforce to sustain our dominance. Drawing upon the talent from a representative national population sounds simple, but is riddled with barriers, challenges and issues not so easily resolved. In some cases, we must “grow” this talent from our existing resources and mentor what we have sown to date for continued success. “Land of Plenty, Diversity as America’s Competitive Edge in Science, Engineering and Technology”, a report of the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development describes the need for diversity in the technical workforce. “The push toward greater diversity across job categories has always been a social imperative, but current economic and demographic realities bring a new urgency to the mission (Land of Plenty). “The nation has a strategic need to achieve parity in its SET [science, engineering and technical] workforce. It is time – more than time – to move
beyond a restatement of the issues and to establish a system of accountability that ensures real, measurable progress toward a scientific enterprise empowered by the best rather than simply by the traditional” (“Land of Plenty”, 2000, p.66).

The United States, as a nation and civil service workforce, must build upon a technical labor force development framework, dependent upon participation at every organizational level to achieve true diversity representative of our nation as a whole and reflective of the intellectual talent that has become a trademark of our American heritage.
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