



American Engineering Association, Inc.

Presentation to

Committee to Study Workforce Needs in Information Technology

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Introduction

The American Engineering Association was founded in 1979 on the premise that citizens should have the right of first refusal on jobs created in this country and has been involved in manpower issues since that time. AEA is a national, non-profit organization with members from virtually all disciplines of engineers, scientists, computer programmers and related occupations.

AEA is a professional organization as distinguished from a technical society. The dues and donations of individual members support AEA. The American Engineering Association does not accept corporate memberships and receives no federal funds. All AEA officials are volunteers.

AEA is concerned with the erosion of our nation's technological leadership. We believe this loss is largely due to legal immigration, which gives preference to foreign workers, and to misguided trade policies. We do not believe the American taxpayer should subsidize these activities.

We have testified before the United States Congress on a number of occasions related to these issues.

Testimony

I want to thank the chair and subcommittee for the opportunity to present our views on these very important matters. I would like to commend the subcommittee for permitting views from the people in the trenches to be heard. We are the people who are most affected and least heard by those making the decisions.

I am probably the only person on this panel who is not being paid to be here and I am sure I am the only person on this panel who gave up a days pay to be here.

The American Engineering Association is normally relegated to the roll of "token opposition" to the predetermined outcome of most hearings we are invited to. While I hope this is not true today, I must proceed as if it were.

I understand Mr. Harris Miller of the ITAA spoke at the Massachusetts hearings was allotted an hour to speak. Harris Miller is a hired gun for the Information Technology Association of America who has never worked in a technical field and has no understanding of the problems faced by any technical professional. Yet those whose livelihood depends on being able to produce a product people are willing to buy and use are allotted only a few minutes each.

Those who oppose the conventional wisdom of a crisis level shortage of technical workers and therefore the importing of more foreign workers have been called xenophobes, flat earth society members, raciest, anti-immigrant, nationalists, isolationists, and protectionist just to mention a few of the nicer things. None of these things are true.

A Little History

We are discussing nothing new here today as we have had these discussions many times since the mid 1940's as illustrated by the following quote.

"Since 1947 the number of scientists and engineers employed has gone from 575,000 to 900,000, the Chase Manhattan Bank points out....Engineers now start at \$400 per month in contrast to less than \$250 nine years ago. It is estimated that there is a current need for 45,000 engineers a year. We graduate only 23,000. Four hundred men trained as nuclear scientists graduate each year. Twelve hundred are needed."

"The most challenging aspect of the problem lies in the fact that today only 16% of university students major in science and engineering, down from 25% since 1950, while in Russia over one-third of all students major in engineering."

Does this sound familiar? This quote came from Forbes Magazine of May 11, 1981 quoting from an article that appeared there in 1956. More than forty years and the story is the same.

For the twenty years I have been involved in these issues, we have not produced enough engineers in our schools according to management and academia, yet the

Bureau of Labor Statistics has indicated that some twenty percent of each years graduating class never enter the engineering workforce.

Supporting evidence is found in a report by OTA released in 1986 titled "Demographic Trends and the Scientific and Engineering Work Force". The report states, "Less than two thirds of science and engineering baccalaureates produced in recent years have actually become a part of the science and engineering workforce."

I notice a number of the people involved in this committee work for companies who are members of the American Electronics Association. Their AEA produced an early 1980's "study" which "proved" to the nation there was a crisis level shortage of engineers.

Crying Wolf

The following items remind me of the little boy who cried wolf until one day there really was a wolf and no one would believe him. The problem here is everyone takes the word of the academics and industry leaders as the gospel. How could a lowly technical worker have any idea of what is good for the technical community or the nation?

The American Electronics Association

This survey by AEA was perhaps the most widely quoted "source" of the early 1980's. Members of Congress, the National Science Foundation, the national media as well as all of the major trade journals quoted this survey.

Only after several years of quoting their survey did AEA **admit their survey only indicated a "shortage of electronic engineers" and should not have implied a "shortage of all engineers"**. In early 1986 Pat Hill Hubbard of AEA finally admitted, **"the electrical engineering shortage no longer exists"**.

Ms. Hubbard described an article in the AEA publication "Update" which still maintained (at that time) there were a shortage of engineers as an **"unfortunate editorial misrepresentation"** and a problem of **"semantics"**.

This survey resulted in billions of dollars being funded to academia to increase the enlarge the engineering schools to produce more engineers at the same time the universities were going overseas to recruit foreign students to fill the extra capacity. At the same time many minorities were being rejected.

National Science Foundation

The National Science Foundation, the funding organization for these hearings, is perhaps the most anti-engineer organization in the government.

The May 12, 1986 issue of Electronic Engineering Times carried a story which makes the following statements: **"A high-ranking National Science Foundation official (Mr. Nam Suh) told engineering vice presidents here last week that America engineers are overpaid and less productive than their foreign counterparts."**

The article goes on to **state "When pressed later to clarify his remark, Suh said bluntly "Yes, I think American engineers are overpaid." " Mr. Suh was the assistant director for engineering at NSF at the time.**

The article continues **"In his speech,.....Suh said there is a shortage of engineers, a contention with which few engineering groups concur." "He told EE Times afterward. "We need to improve the quality of them and the number of them."**

I believe the term "them" is very telling of the attitude of not just Mr. Suh, but the NSF. Engineers are not a "them" or a product to be bought, sold or traded. This attitude is not limited to the NSF by the way and may still be found today in both government and industry.

In April of 1992, the National Science Foundation's unofficial, bootleg study **"Future Scarcities of Scientists and Engineers: Problems and Solutions"** was discredited in a Congressional hearing both because of its poor methodology, lack of peer review and the unusual distribution method used to get it to the media, and because the shortages projected failed to materialize.

This report was quoted extensively in Rep. Morrison's immigration hearings and in fact was the basis for nearly tripling the number of foreign engineers and scientists who potentially are to be admitted to the United States.

From the very beginning, labor economists and statisticians, including those inside the Foundation, scoffed at the methodology as seriously flawed ... However, the study, through its repeated use in speeches and testimony by the Foundation's director, university administrators, members of Congress, and countless articles and news stories, took on a life of its own that was slowed only when the engineering community publicly attacked it.

What was NSF's answer to the criticism? They indicated they had never said there was a "shortage" of engineers, they defined it as a "shortfall". My dictionary (Webster's II, New Riverside University Dictionary) defines shortfall as follows: " (1.) A failure to attain a specified amount or level: SHORTAGE. (2.) The amount by which a supply falls short of expectation, need or demand." To an unemployed engineer any difference seems inconsequential.

In late March of 1992 the CNN financial show **"Money Line"** quoted the AEA report suggesting we are facing a crisis level shortage of engineers by the year 2010 or so. **Less than a week later Money Line also ran a story about the difficult time that years crop of college graduates were having finding a job. One of the professions spotlighted as having the toughest time finding work was engineering.**

Information Technology Association of America and the Department of Commerce

ITAA issued a report, which indicated a shortage of IT, workers which was at best interesting fiction. The Department of Commerce issued their own report parroting the ITAA report. The Government Accounting Office was asked to critique the DOC report with the following results.

After reviewing a September 1997 Commerce Department report on the shortage of information technology workers, the GAO concluded that the study **“has serious analytical and methodological weaknesses that undermine the credibility of its conclusion that a shortage of IT workers exists.”**

The GAO study also criticized a 1997 survey by the Information Technology Association of America that reported 190,000 unfilled IT jobs in 1996. **“With only a 14 percent response rate in its random survey, ITAA did not have enough basis for any generalizations about the population being surveyed,”** the GAO study stated. **“A later ITAA survey, reporting 346,000 unfilled IT positions, had a response rate of 36 percent. For any sound generalizations, the response rate should be at least 75 percent, the GAO said.”**

Again, Congress responded by nearly doubling the numbers of H-1b workers, but not without controversy.

We have heard in the two ITAA surveys, that at least some US based multinationals responded with all of their worldwide vacancies, so the survey vacancy rate was significantly inflated.

Who are the players this year who are providing reports and studies supporting the H-1b increase? To no one's surprise, it is the American Electronics Association, the Information Technology Association of America along with a relative newcomer. The Computer Research Association. Where is the National Science Foundation in all of this? They used taxpayer money to fund the CRA study.

At first blush, the CRA study does not appear to be much of an improvement over the ITAA and AEA studies of previous years. The National Science Foundation, though not providing their own study has, I believe, influenced the CRA study as to the final outcome.

Should we base public policy on the new AEA study given their track record when it comes to being up front and truthful in their studies? I know I wouldn't.

The Information Technology Association of America study is the same garbage only stirred and reformatted and is just as disingenuous. There is no reason to believe it is any more credible than the previous studies.

It should be noted that the American Electronics Association and the Information Technology Association of America memberships are largely transnational corporations. In many cases they are the same corporations. Transnational meaning "transcending national borders" and I might add, "owing allegiance to none".

ITAA Convocation

As most of you are aware, the ITAA held convocation in January 1998 in California. You may or may not be aware of the events leading up to and including the event.

Several months before the convocation Commerce and ITAA held meetings via the telephone to get input in order to support their position of a shortage of IT workers. The American Engineering Association complained to the DOC until we were invited to sit in on these conference calls.

We complained in the first such call that the conclusion had been made and it appeared the only reason for the calls was to justify their position. After that one call, we were either never notified of the next calls or were never given the phone numbers to call.

We asked for a place on one of the panels at the convocation and were given the runaround until "all of the spots were filled". At this point in time I requested an investigation of DOC through their OIG indicating our tax money was being used to promote this event and staff was being used to prepare for it, yet we were to have no input into the process.

As you might expect, things became rather strained between AEA and the DOC after that. We received an offer from DOC to put one of our representatives on a panel if we would put out a press release saying, in effect, the DOC were the "good ol' boys" in this fiasco. They even offered to write the release for us.

Somehow word was received by the subcommittee overseeing DOC about the proposed press release and it was withdrawn the same day the offer was made. We did get our seats at the convocation.

The day of the convocation arrived and still other obstacles were placed in our path. For example we were denied a space at the literature table. Perhaps the only good thing Harris Miller, head of the ITAA, has ever done for engineers was to get us that space.

When time for our panel came, a press conference was scheduled at a nearby university campus with DOC Secretary Daley and members of the press being bussed to it. They never heard our presentations.

All of this time, we were repeatedly assured by both the DOC and ITAA this effort was not aimed at increasing the numbers of foreign technical workers. Within days after the close of the convocation ITAA officials had announced they wanted to remove any limits to foreign workers to be admitted under the H-1b visa.

What could these people be afraid of? The truth perhaps?

Gap

There are over thirteen million people who have graduated with technical degrees in science and engineering during the last 40 years. (40 years being the approximate working life of an individual.) Only about four million are currently working in these fields today.

From these numbers, one has to assume one of two things. Either we are producing three times the numbers of technical workers we need - or - second, companies are producing working conditions and or pay levels, which are not sufficient to retain these workers. In other words other fields have better prospects than engineering.

Now that the administration has solved the Y2K problem, there will be thousands of programmers who will be available after the first of the year. It seems reasonable that these people could be retrained, if they needed it, for nearly nothing.

The following quotes are from the Bureau of Labor Statistics Occupational Outlook Handbook for 1998/1999.

KEY

Changing employment between 1996 and 2006

If the statement reads...	Employment is projected to...
Grow much faster than the average	Increase 36 percent or more
Grow faster than the average	Increase 21 to 35 percent
Grow about as fast as average	Increase 10 to 20 percent
Grow more slowly than average, or little or no change	Increase 0 to 9 percent
Decline	Decrease 1 percent or more

Aerospace Engineers: "... employment of aerospace engineers is expected to **grow more slowly** than the average through the year 2006."

Chemical Engineers: " Although employment in the chemical manufacturing industry is projected to grow slowly through 2006, employment of chemical engineers should increase **about as fast as the average** for all occupations..."

Civil Engineers: " Employment of civil engineers is expected to increase **about as fast as the average** for all occupations through the year 2006."

Computer Programmers: " Employment of programmers is expected to grow **faster than the average** through the year 2006."

Computer scientists, computer engineers, and systems analysts: " are expected to be the **three fastest growing occupations** through the year 2006."

Electrical Engineers: " Job openings resulting from job growth and the need to replace electrical engineers who transfer to other occupations or leave the labor force should be sufficient to absorb the number of new graduates and other entrants, making for good employment opportunities through 2006. Employment of electrical and electronics engineers is expected to increase **faster than the average** for all occupations. "

Geologists and Geophysicists: " Employment of geologists and geophysicists is expected to grow **about as fast as the average** for all occupations through the year 2006..."

Industrial Engineers: "Employment of industrial engineers is expected to grow **about as fast as the average** for all occupations through the year 2006..."

Mathematicians: " Employment of mathematicians is expected to increase **more slowly than the average** for all occupations through the year 2006."

Mechanical Engineers: "Employment of mechanical engineers is expected to grow **about as fast as the average** for all occupations through the year 2006."

Metallurgical, Ceramic and Materials Engineers: "Employment of metallurgical, ceramic, and materials engineers is expected to increase **more slowly than the average** for all occupations through the year 2006."

Mining Engineers: "...employment in the mining industry and of mining engineers is **expected to decline** through the year 2006."

Nuclear Engineers: " Employment of nuclear engineers is expected to grow **more slowly than the average** for all occupations through the year 2006."

Petroleum Engineers: "Employment is **expected to decline** through the year 2006...new graduates are not likely to significantly exceed the number of job openings arising as petroleum engineers transfer to other occupations or leave the labor force."

Physicists and Astronomers: " reductions in defense-related research and a continued slowdown in the growth of civilian physics-related research will result in a **small decline in employment** of physicists and astronomers through the year 2006. "

Only three of the 15 categories of engineers and scientists above have better than average prospects according to the BLS.

Seven of the categories either will grow more slowly than average or will decline in numbers between now and 2006.

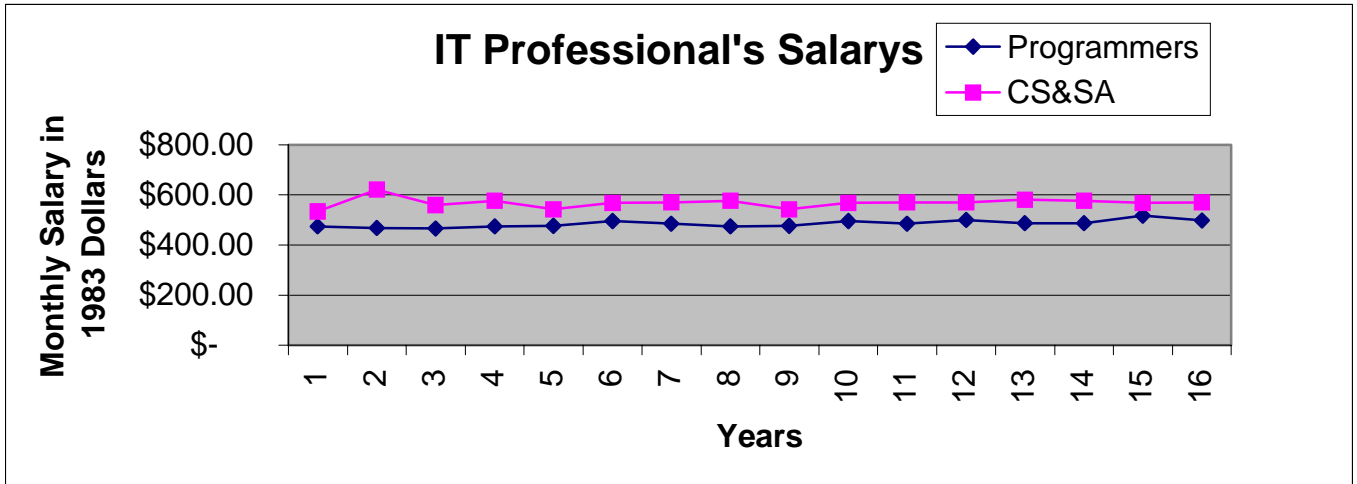
The remaining five will grow only about as fast as all occupations.

Salaries as an indicator of Demand

Here is annual average median weekly wages for Programmers and CS&SA adjusted by the CPI-U for July of each year. The purist might use the average of June and July but that is not meaningfully different from the July figure. Base year is 1983 as is the CPI-U(Urban).

The only conclusions are that programmer real wages were flat from 1983 through 1996, jumped up about 7% real in 1997 and fell back to 5% real in 1998. CS&SAs jumped up in 1985 after termination of the 1983 recession and practically flat for the last fourteen years.

Economics 101 teaches us that as demand exceeds supply the price of goods or services rises and as demand falls so does the price.



Note: Year 1 is 1983 & year 16 is 1998.

There is no gap in numbers between supply and demand!

Meeting Needs

Industry would have you believe the only solution to their perceived problem is to import foreign workers. If industry spent half of the time and money seeking alternatives to importing the foreign worker and upgrading the skill of the citizen that they do lobbying to get the immigration laws changed we would not be here holding these discussions today.

We see there is no shortage of people who are capable of meeting the IT challenge. The problem now becomes matching the people with the demand.

Industry would have us believe they cannot find the 340,000, or whatever their current numbers are, from the approximately 9 million who hold technical degrees and are not working in their degree field.

Could there be other sources of potential programmers? The answer to that question is a resounding yes.

Again, from the Occupational Outlook Handbook we find:

Table 1. Percent distribution of highest level of school completed or degree received, computer programmers, 1996.

High school graduate or equivalent or less	10.0
Some college, no degree	20.9
Associate's degree	9.6

Bachelor's degree 45.2
Graduate degree 14.2

The majority of computer programmers—almost 60 percent—had a bachelor's degree or higher in 1996. (See table 1.) Of these, some hold a B.A. or B.S. in computer science, mathematics, or information systems while others have taken special courses in computer programming to supplement their study in fields such as accounting, inventory control, or other business areas. As the level of education and training required by employers continues to rise, this percentage should increase in the future.

Corporations should eliminate their practice of age discrimination. Some 17% of programmers over the age of 50 are unemployed even with the Y2K problems using many older programmers. Surely some of these folks could be utilized to meet the demands of industry.

There are some 70,000 Immigrant visas per year that are not used. Doesn't it make sense that if the critical need is there for non-citizens we would want to make them permanent as soon as possible? Why increase the numbers of temporary workers when the opportunity is already there for permanent workers who have made the commitment to become citizens?

Challenges

The largest challenge we see is to break industry's addiction to the foreign worker. Just as the cocaine or heroin addict must have increasing amounts of their drug, industry has demonstrated they must have increasing amounts of their drug of choice - the foreign workers.

I think the cure for a drug addict is perfectly appropriate for industry's addiction to foreign workers. Remove their drug for three to five years and we would see they are able to function without it and we would see some very innovative solutions to their need for workers. Just as the drug addict will suffer with-drawl pains, industry will also. Will they find a way to get their work done? Of course they will.

House Report 98-115 on HR-1510 issued in 1983 or 1984 discusses waivers for foreign students including technical professions. "In providing waivers for high technology fields, the Committee seeks to address some of the SHORT TERM NEEDS in these areas. WITH THE EXPECTATION THEY WILL MEET THE CHALLENGE OF FUTURE DECADES WITH U.S. WORKERS." (Emphasis added) Clearly there was a recognition that we must become less, not more dependent on foreign workers.

Ed & Train

Industry has indicated they have spent millions of dollars on retraining of their employees. AEA believes this is a true statement. However, using ITAA information, this amounts to less than \$100.00 per employee.

They imply, but do not state, these funds were for technical training. How many of these companies had ethics, diversity or sensitivity training that was included in their "training" budget? Even if the funds were all for technical training, this is a pitifully small amount.

Very few, if any, federally funded training/retraining programs have had any modicum of success. Therefore, we believe the best approach would be to offer tax incentives to companies to establish or sponsor their own training programs at their facilities.

AEA believes any taxpayer funded training/retraining programs should be restricted in the following ways:

- ❑ First, retraining funds should be limited to smaller companies of 500 total employees or less.
- ❑ Second, no federal or state retraining money should be spent unless it is for "OJT" or on the job training.
- ❑ Third, those receiving the training or retraining must be citizens or permanent resident aliens.
- ❑ Fourth, the retraining should be targeted to those employees who are most vulnerable to being laid off or forced out.

It is our experience that very few people who are out of work or about to be laid off would refuse the opportunity to train for something that would enhance their chances of remaining employed.

Presence Help or Hurt

We have had forty years of the same proposals and the same solutions to the so called worker shortage. If these were good solutions, the problem would have gone away within the first five years.

If it is your intention to continue down the same path of crying wolf, then my presence here will have been in vain. There are many professions which are eligible to use the H-1b visa other than IT professionals. Virtually none of these are in short supply by anyone's definition.

We have had nothing but phony studies which had predetermined outcomes, critical omissions of data within these studies, lies to the media, personal attacks on those who have different opinions, stonewalling of opposing views and payoffs to those politicians who were at the forefront of support for increasing the H-1b quotas.

Has industry organizations with virtually unlimited funds critiqued our data and found it faulty? No, they just produce another study to be debunked and resort to name calling.

The "Red Herring" magazine carried an article in their July 1998 issue under the headline "**Leader: If high tech says there's a labor shortage, there's a labor shortage**".

Indicating there was opposition to increasing the numbers of H-1b visas by the American Engineering Association and Professor Norm Matloff of UC Davis, the article stated:

"Though factually correct, these criticisms are, we feel, ingenuous.... And if companies say they want to hire more skilled foreign workers because those workers are cheaper, we should believe them--and increase the number of visas issued."

The American Engineering Association has tried to work within the system for our entire history and provide credible and factual information that would provide some insight to the debate. I don't know if that helps or hurts the American worker.

What follows is a series of relevant articles and information.

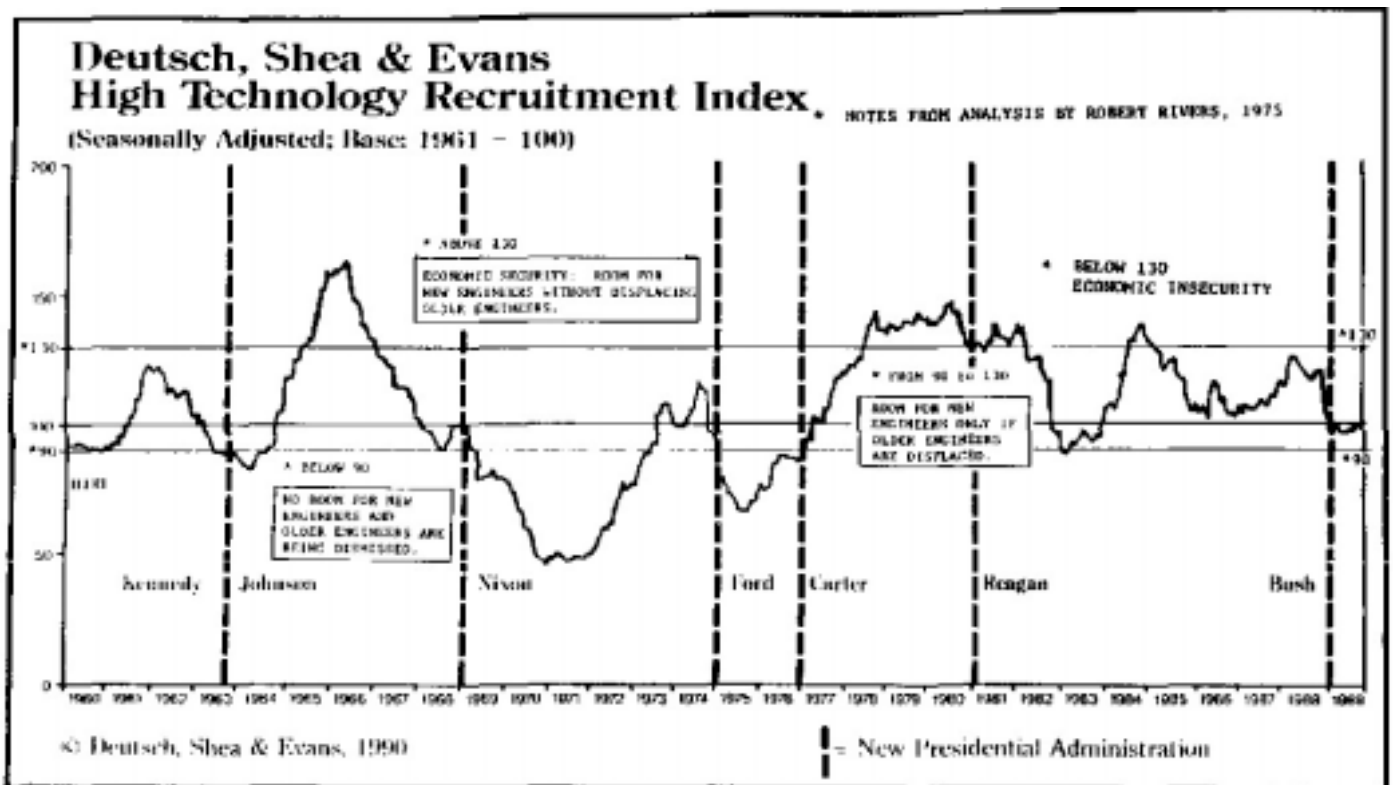
Thank you again for the opportunity to be here today.

High Technology Recruitment Index

The instability of the engineering profession is graphically represented by the Deutsch, Shea and Evans High Technology Recruitment Index (HTRI). The HTRI is a national indicator of technical manpower demand and based on a monthly count of recruitment ads directed to four-year or more degreed engineers and scientists. They maintained the Index for 30 years from 1960 to 1990. While the index is no longer being maintained, it is useful because of the time span it covers and the general trends in engineering employment/unemployment.

The curve shows less than 16% of the 30-year period from 1960 to 1990 there was room for new engineers without displacing older engineers. The rest of the 30 years or 84% of the time, there was room for new engineers only if older engineers were displaced or a surplus prevailed.

Twenty five percent (25%) of the time there was no room for new engineers and older engineers were still being displaced or a large surplus existed. The manpower unbalance is derived from reduced demand, recruiting foreign students by the U.S. engineering schools, excessive degree production and the importation of foreign engineers.



American Engineering Association Manpower Bulletin

Vol. 1, #1, April 1999

Engineering and Information Technology Manpower utilization in the United States is in a state of flux. Overall engineering unemployment was 2.2% (49,000) in the first quarter of 1999. Employment was at a historic high level of 2,124,000, up 5,000 from the last quarter of 1998. Last year, the unemployment level was between 1.6 and 1.7% leaving the present higher level as an indicator of the easing of demand. There was a time when 3.2% unemployment was a crisis level (1971-72). Full employment for engineers was about 0.6% in 1965.

The BLS collects data on 13 subspecialties of engineering. Those are; Aerospace, Metallurgy, Mining, Petroleum, Chemical, Nuclear, Civil, Agricultural, Electrical-Electronic-Computer, Industrial, Mechanical, Marine and Not Elsewhere Classified. Of these, Electrical etc. is the largest subspecialty with a current 692,000 count. Engineers account for only 1.6% of workers in the current population survey conducted monthly and aggregated for quarterly data. The survey population is between 50,000 and 60,000 resulting in approximately 960 engineer responses per monthly survey at the most. That results in good data in the aggregate but for smaller specialties such as Mining and Agricultural with 4,000 workers in each, the employment sample for those are only 1.8 individuals, hardly a statistically useful sample size. Aggregating for quarterly data increases the sample by three times. When one considers the unemployment data at 2.2%, that is only 21 individuals. Aggregating it for the three months it is still only 63 individuals-useful but subject to statistical variations.

Electrical engineers had a record population of 692,000 in the first quarter of 1999. The survey count would have been 313. Unemployment however was at 1% indicating an unemployment number of 3.13 individuals that aggregated to 9.39 individuals counted during the quarter. During 1998, EE unemployment increased rapidly from 0.8% to 3.4% due to the delayed response to the Pacific Rim monetary problems. It just as rapidly decreased to 1% as EE's quickly found employment in other economic sectors. The rapid rise in unemployment was predictable and was predicted. Another engineering specialty, Petroleum, with only 15,000 population did show enough variation in unemployment to indicate problems in the Oil Patch. The statistically invalid number was 26.7% and it indicated serious problems from the collapse of oil prices. Marine engineers with 19,000 population showed a statistically invalid increase to 12.3% as exports to the Pacific Rim collapsed.

Information Technology employment is showing signs of some problems. last year, Programmer unemployment averaged 1.4% and Computer Science employment averaged 1.3% The first quarter of this year showed Computer Science and Programmer unemployment at the 1.9% level. Computer Science unemployment had been increasing quarterly from 1.1%, 1.3%, 1.7% and then the 1.9% The trend is a statistically valid indicator of developing oversupply.

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American Engineering Association Manpower Bulletin

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Never a Shortage, Always a Surplus

We have been taken in by the shortage shouters for a long time. They have controlled the public and political agenda. Akin to the master propagandists of 60 years ago, they have by repetition caused everyone to think that shortages are the issue.

Nothing can be further from reality. The reality is that there has always been a SURPLUS of engineers, never a SHORTAGE. Have you ever seen the unemployment rate of engineers go negative? It never does. Only then would it be credible to discuss shortages.

The BLS CPS data on unemployment of engineers over the last 35 years has varied between a few tenths of one percent to over 4%. For EE's the unemployment rate has gone as high as 6%. At the peak of unemployment of engineers in the second quarter of 1993, there were 81,000 unemployed engineers. In the second quarter of 1994, EE unemployment reached a peak of 34,000 with only 540,000 employed.

Even in the high demand economy of the second quarter of 1999, there were 21,000 EE's SURPLUS based on the narrowly defined 6,000 BLS unemployed. The definition of a SURPLUS is more than enough.

SESTAT data has shown a more significant SURPLUS. Data on Total Scientists and Engineers shows significant numbers NOT IN THE LABOR FORCE that are in addition to the limited number that are classified as unemployed. By age brackets, here are the numbers for those not in the labor force with degrees in Science and Engineering fields:

Under 30, 181,547
Age 30-39, 199,450
Age 40-49, 198,871
Age 50-59, 201,950
Age 60 and over, 968,663 (55.6%)!

No, there are no displaced decimal points. The total degreed population is 13,328,900. The NSF SESTAT survey list is obtained from US colleges and universities. It would not include the large number of immigrants and temporary workers educated outside of the US.

During 1998, there was a rapid increase in unemployment of EE's from a base level average of 5,500 in 1997 to a peak of 21,000 in the third quarter of 1998. In the same period, employment decreased from a 1997 average of 652,000 to a low of 601,000 in the 1998 third quarter.

The relationship we can conclude that the total SURPLUS including the classified unemployed is 3.3 times the current unemployment level. The rapid decline in

unemployment and the large increases of employment at the ends of previous recessions qualitatively supports the relationship.

An untold number of non-immigrant workers are presently working on or learning of high technology products, services or software that are being exported. It is publicly stated by employers that non-immigrants are crucial to the development of advanced technology yet their use or contact with products, services or software makes that use a "deemed export" and subject to licensing or refusal to license. Use without a license is subject to fines and criminal penalties.

Non-immigrants can only be used on low technology products separated and isolated from any controlled products or information. The 95 to 98% of applicants turned down by high technology employers would certainly qualify for the low technology activities and completely eliminate the need for non-immigrant workers.

It is in the short term interest of employers to have a large SURPLUS labor pool from which to draw when they have expanding or replacement needs, but it is not in the interest of professionals to be a part of that SURPLUS labor pool.

Professionals should demand that discussions of supply be couched in terms of SURPLUSES that are 3.3 times the unemployment rate and readily available to return to the Science and Engineering workforce.

Those not readily available can be brought back in to the available workforce by economic inducements and training. The current and potential supply of US educated workers puts a lie to any arguments for the need for temporary foreign workers.

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From Flight Journal Magazine

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"Tailview" Feature

The Demise of Aerospace

By Dr. Sliderule

Since 1989, more than half of the workers in aerospace have lost their jobs. In any other business, this would be considered a national disaster. In modern America, it is a "peace dividend."

American aerospace is headed for a crash. In an effort to justify ever shrinking defense budgets, the government is holding on the notion that no new military aircraft designs will be needed for at least 30 years. At the same time, existing programs are being cut or canceled. The national-security implications of this policy are frightening. We can pay now in gold or later in blood.

The current administration has also forced a dramatic consolidation within the industry. In 1990, there were eight prime airframe contractors in the U.S. Now, there are two (or three, if you still count Northrop Grumman). The companies that built the majority of the aircraft now in service with the U.S. military have gone.

CEOs and boards of directors are under enormous pressure from Wall Street to deliver short-term financial performance. When combined with an executive compensation scheme that emphasizes stock price as the goal, the result has been devastating.

In an industry in which product cycles are measured in decades, short-term thinking and cost-cutting rule the day. Layoffs and plant closures are everyday occurrences.

Irreplaceable facilities are being destroyed to reduce overhead. One company already bulldozed two wind-tunnel facilities. As this is being written, its last wind tunnel is slated for destruction within a year. The same company just disposed of its technical library, claiming that it cost too much overhead and "...all that information is on the Internet." The same week, most engineers had their Internet access revoked to reduce "data-processing overhead costs" by saving \$7 per person per month. (The executives' bonus budget the previous year exceeded \$150 million, and the company bought a shiny new Citation X bizjet to ferry them around.)

The result is a profound malaise within aerospace engineering. The spirit of innovation that led American aerospace to a world-dominating position is fast dying. It has been buried under a pile of financial spreadsheets formulated by "business"-oriented people whose knowledge of aircraft does not extend beyond the first-class cabin.

We are in danger of losing the technical capability to design successful airplanes and spacecraft. Engineering is taught by an apprenticeship system. A new graduate with an engineering degree is not yet an engineer. Real engineering is learned by working with experienced people. It takes about five years for the "apprentice" to gain enough experience to be a full-fledged engineer. It takes much longer to achieve the ability to lead a design effort.

The demographics of the workforce herald trouble. The average age of working aerospace engineers in the U.S., according to one source, is 49. There are very few young people because the industry has been shrinking rather than growing for the last 10 years.

Ahead is a die-off of knowledge. Within five years, half of the engineers currently working in aerospace will be eligible for retirement. Most will take it, since current conditions leave little reason to stay.

By then, the remainder will be nearing 50. If they have not already been laid off, they will be planning to work for at most another five to seven years. This is just barely time to train successors before they, too, have gone.

Unless things change dramatically within the next five years, we can look forward to a shrunken aerospace industry populated primarily by inexperienced people. They will not have worked on actual flight hardware and will have had little or no time to learn from the old hands.

This may not be the worst case. We may not have many engineers at all. Most of the incentives that attracted my generation into aerospace engineering have gone. We wanted to build flying machines. We knew that we wouldn't get rich doing it, but we expected interesting work, a reasonable standard of living, a bit of respect and, eventually, a pension. All of this has changed.

Few programs survive to build hardware. When a program does go forward, the result is painfully predictable. Before first flight, the budget will be cut and the program stretched to "save money." When the cost increases caused by the stretch-out appear, the politicians shift their attack to the unit cost and question the need for the program. The airplane will be attacked as too expensive, unnecessary and technically flawed. No matter how successful the machine, the headlines tell the public that it is an expensive failure.

In such an atmosphere, it is hard to fault management for refusing to make an investment. If a program is more likely to be canceled than to survive, it is not worth the investment it takes to win the contract. The interesting assignments are few and far between. Modifying 40 year-old airframes to carry new avionics does not inspire.

There is a pervasive atmosphere of cost-cutting. Job security is a thing of the past. The short-term focus makes any thought of a career with a single company and a pension a bitter joke for anyone under 45.

Respect has also gone. Engineers have been de-professionalized. They are treated as disposable, hourly workers. Layoffs are common. Past service to the company means little. Medical benefits, time off for personal business, paid sick leave and similar benefits have been progressively reduced.

The only vestige of professionalism that remains is the expectation that engineers work unpaid overtime when project schedules get tight. This is called "green time" because it was once recorded on a green-tinted column on timecards. It used to have some value to the individual since it would be rewarded at raise and promotion time. Now, by accelerating the end of the project, it is more likely to hasten a layoff than a promotion.

The young people of today who are intelligent enough to be good engineers are perceptive enough to see all this and stay away. The universities will respond to falling enrollment by eliminating or drastically cutting aerospace engineering departments and faculty. We may soon lack both new engineers and the ability to train them.

American aerospace once dominated the world. Foreign competition is threatening this domination. Sadly, their biggest allies are the short-sighted policies of American aerospace management and the U.S. government.

A wise manager once said, "Never bring up a problem without proposing a solution." Solving this problem will not be easy; as it gets worse and engineering schools are forced to downsize because of lack of interest, the effect will be felt across all of American industry.

At the moment, this is an aerospace problem. If it's allowed to continue, it will become an American problem. Already, the high-tech electronics industry is having to import foreign engineers. It's another case of short-term planning causing long-term problems.

We don't have a lot of lead-time to effect a solution. Americans, look around. We, who have always been proud of our technological superiority, have a technological shortfall headed our way. If we don't want it to push us off the industrial map, we had better do something about it right now.

The fundamental answer is commitment and investment. Long-term success requires investment, both intellectual and financial. To stay successful, we must make the commitment to maintain our ability, even if it costs a bit more in the short run.

[Editors' note: in the interest of maintaining employment in an industry that he says "... is not known for its sense of humor," our guest columnist requested anonymity. We at Flight Journal agreed and felt that his message should be heard.]