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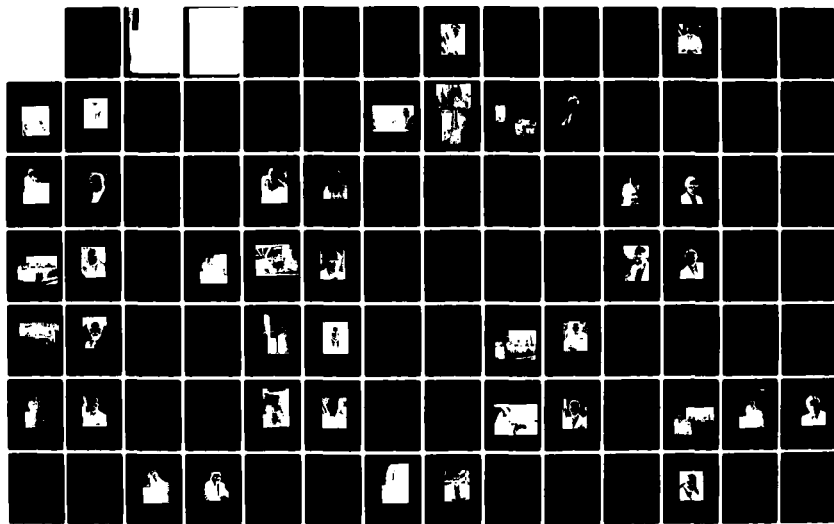
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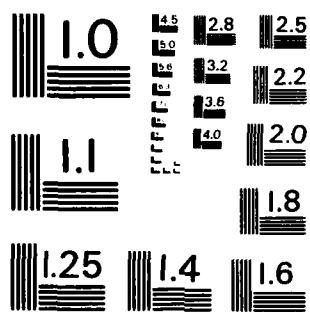
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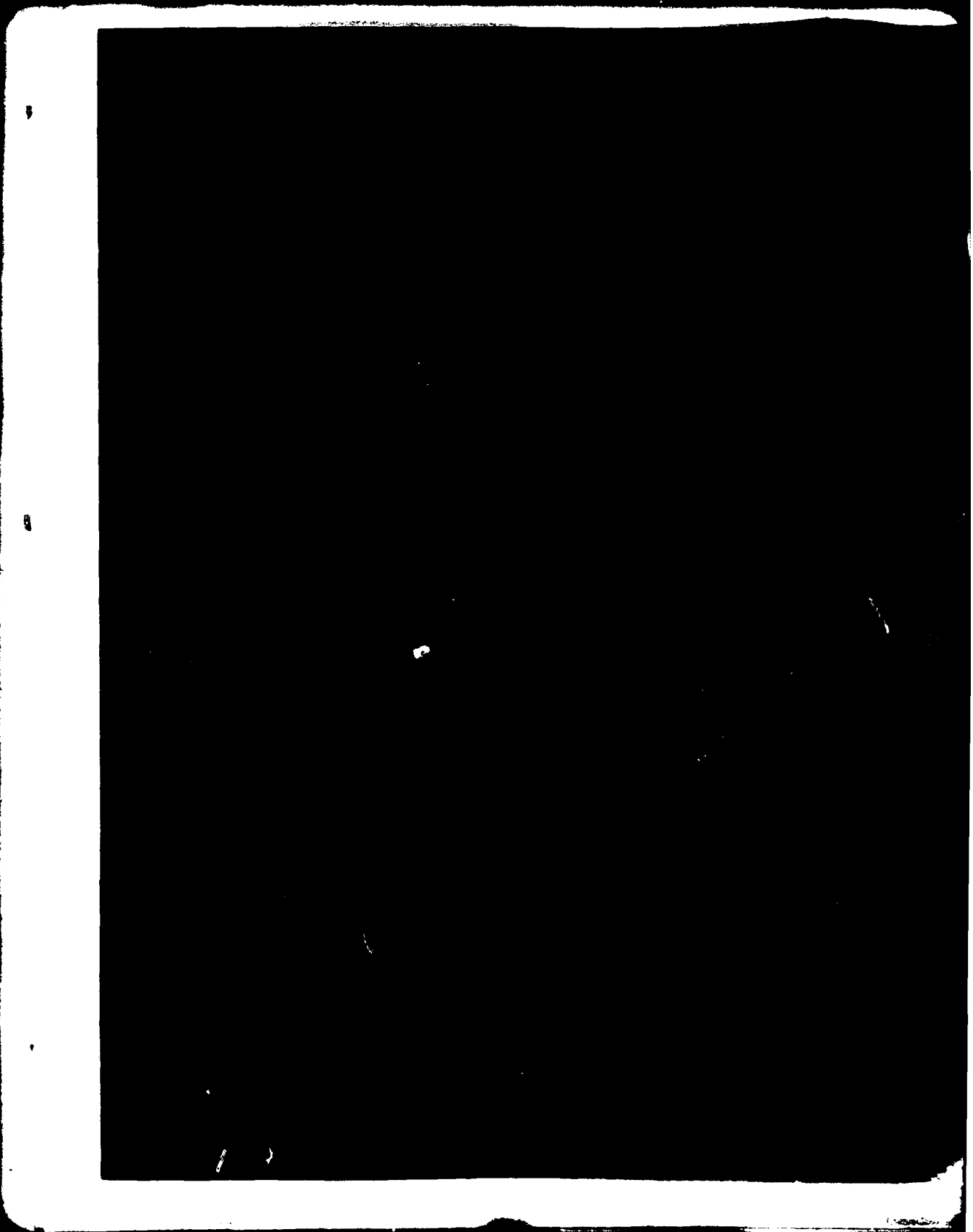
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BOTTOM LINE ACADEMIA CONFERENCE

24 June 1983

28 APRIL 1983

HEALTH AND HUMAN SERVICES BUILDING

NORTH AUDITORIUM

WASHINGTON, D.C.

INTRODUCTION

The conference was held under the sponsorship of the Office of the Secretary of Defense and was hosted by the Defense Logistics Agency. The primary theme was "Education - Key to Quality."

During the conference, top level academicians met with Government officials, industry executives, and professional quality consultants to explore initiatives which the academic community could take to meet industry and DoD needs for the improved application and management of the quality function. Highlighted was the necessity of improving the image of quality in industry for both competitive and economic reasons, thus assuring the readiness of our defense forces. The roles academia could play in restructuring curricula to include more quality management courses in preparing our future industrial leaders were discussed as being the possible catalyst in returning America to the forefront again in quality.

I am grateful for the excellent presentations made by all the speakers, and I sincerely appreciate the interest displayed by all who participated in the conference.


E. A. GRINSTAD
Vice Admiral, SC, USN
Director



Rear Admiral Frank C. Collins, Jr.

**Executive Director
Quality Assurance
Defense Logistics Agency**

EXECUTIVE SUMMARY

BY REAR ADMIRAL FRANK C. COLLINS, JR.
EXECUTIVE DIRECTOR
QUALITY ASSURANCE
DEFENSE LOGISTICS AGENCY
CAMERON STATION
ALEXANDRIA, VA 22314

The Bottom Line Academia Conference was held on 28 April 1983 in the North Auditorium of the Health and Human Services Building on Independence Avenue in Washington, DC. Over 300 representatives from academia, industry, engineering and educational societies, Department of Defense (DoD), and government attended the conference. The theme of the conference was "Education - Key to Quality." Opening remarks were made by Vice Admiral Eugene A. Grinstead, SC, USN, Director of the Defense Logistics Agency (DLA), which hosted the DoD-sponsored conference. Vice Admiral Grinstead urged academia, industry, and government to explore initiatives which the academic community could take to meet industry and DoD needs for the improved application and management of the quality assurance function. The Honorable Paul Thayer, Deputy Secretary of Defense, gave the keynote address, stressing the necessity for getting quality back into industry for both economic reasons and the readiness of the United States Armed Forces. He pointed out the paucity of sorely needed engineers our educational system was graduating at this time and the acute need for them in this highly technical age. Rear Admiral Frank C. Collins, Jr., USN, Executive Director of Quality Assurance for DLA, moderated a slate of 17 distinguished speakers serving on four panels. Admiral Collins closed the conference with a short summary of each speaker's presentation. Presentations made by the panel moderators and abstracts of speaker presentations are contained within these proceedings.

Panel 1, Education's Impact on Quality, addressed the commitment that the United States must make to education. The National Commission on Excellence in Education's report, "A Nation at Risk--the Imperative for Educational Reform," states the need for rigorous course offerings and higher performance expectations for this nation's schools, colleges, and universities. In this age of information, an individual's contribution is one of knowledge rather than labor. Our educational systems must accept the challenge and responsibility for preparing managers and engineers thoroughly schooled in quality. The panel stressed the need to develop and expand interdisciplinary curriculums for the quality sciences. Quality must also be included as a dimension of managerial performance. Quality is the key to higher productivity. This reestablishment of this relationship can result in the revitalization of the American economy. Regretfully, technology is moving much faster than our mainstream education processes. Action on the part of academia, industry, and government is necessary to improve and strengthen the educational processes and institutions of this nation. Although academic preparation is no guarantee of success, individuals, companies, and this nation may find it impossible to successfully compete without this foundation.

Panel 2, Quality's Impact on Productivity and the Economy, focused on the emergence of quality as both a national and corporate strategy, and the profound effect that a commitment to that strategy will have on our economy. The panel concentrated on the central role played by top management. An organizational approach with participation by upper management in policy formulation with respect to and resource support of quality is essential to improvements in quality and, in turn, to productivity. Executives must create an environment where quality is recognized as important to competitiveness and even survival. In addition to productivity gains, quality brings about improvements in the corporate image and market shares. Quality is also the critical factor in taking technology out of the laboratory into the manufacturing and marketing of high-technology products. This is particularly true with respect to computer integrated manufacturing. We cannot allow other nations to be the chief beneficiaries of the technologies we develop. If we are to take advantage of our technology and the opportunities for productivity increases it offers, quality must be present throughout a firm's operations. We must renew our efforts to manufacture excellent products through the use of established techniques emphasizing quality improvements in design, manufacturing, and support services. Quality is fitness for use by the customers. As a nation, we must pursue perfection in the products and services we provide and use.

Panel 3, Quality's Impact on Defense Readiness, centered on the criticality of quality and reliability to the defense readiness of this country. The United States has built its defenses on the concept of technologically superior weapons and systems. Our lead in the development and application of technology is of little use in the defense of this nation unless weapons and weapon systems perform on demand. Quality problems show aborted missions, increased weapon system costs, and lost credibility. The military strength of the United States is dependent not only on expenditures, but also on the quality and reliability of weapons and weapon systems. Quality weapon systems save funds which can provide increased capabilities from the defense budget. The quality and reliability of a weapon or weapon system is important to its deterrent capabilities. A commitment to quality helps to assure that possible aggressors are not encouraged.

Panel 4, How Can Academia Positively Impact Quality, Productivity and in Turn, Readiness?, concentrated on the need for greatly increased cooperation among academia, industry, and government. Academia faces a great challenge in providing industry with people trained in quality; people can make a difference in a firm's bottom line and survivability. A knowledgeable work force and an industrial base current with today's technology are essential to our defense readiness. The quality graduating students will determine our ability to prosper economically. It is extremely important that academia become much more knowledgeable about quality and adjust curriculums to satisfy the needs of industry and DoD. Curricula changes must be expedited to attract outstanding talent to the quality sciences and to assure that the United States remains competitive in markets which expect quality products and services. Our formal education processes should include quality management concepts and quality technical tools. A commitment to quality by academia and industry is necessary if the United States is to lead the industrial countries' economic growth.

Admiral Collins began his Navy career in 1945 as an enlisted man. Upon release from active duty in 1946, he attended Louisiana State University, graduating with a B.A. degree in 1949. Recalled to active duty in 1951, Admiral Collins entered the Naval Officers Candidate School and was commissioned the same year. Admiral Collins has been a gunnery officer, the Commander of many Destroyers and later as Commander, Destroyer Squadron Nine. His valuable and significant contributions to the Navy while serving in these capacities in the Pacific and off the coast of Viet Nam have earned him some of the services' highest awards. Selected to flag rank in 1978, Admiral Collins was assigned as Chief Navy Section, ARMISH-MAAG, Iran in Tehran. He served as Chief Advisor to the Commander in Chief, Imperial Iranian Navy. He introduced a new "management by objectives and results" system for FMS/Special Project Management. Before the fruits of many of his projects could materialize, a pseudo people's revolution brought down the Shah's government and caused dissolution of the military. Admiral Collins was instrumental in the evacuation of some 40,000 Americans plus other foreigners from the country. For his leadership in that effort, Admiral Collins was duly recognized by the Navy and also received the Humanitarian Service Medal. Admiral Collins came to the Defense Logistics Agency in 1981 as Executive Director, Quality Assurance. There he began a concerted effort to educate government and industry on the value of building quality into manufactured goods. He was the proponent of using a "Systems Approach" to Quality Assurance. His efforts in two years as Executive Director of Quality have taken him to 205 contractor plants in the continental United States and overseas. Admiral Collins is a frequent lecturer on the cause and effect of the revolution in Iran and Quality Assurance. He is an ardent supporter of physical fitness, a dedicated member of the Christian Reformed Church, and a lay preacher.

"Quality is not costly it's priceless."

Rear Admiral Frank C. Collins, Jr.



Vice Admiral Eugene A. Grinstead
Director, Defense Logistics Agency

OPENING REMARKS

BY VICE ADMIRAL E. A. GRINSTEAD
DIRECTOR, DEFENSE LOGISTICS AGENCY
CAMERON STATION
ALEXANDRIA, VA 22314

Good Morning, Ladies and Gentlemen!

Welcome to the Bottom Line Academia Conference.

I want to sincerely thank you for contributing your time and resources to address a topic of national importance. The quality of materials and products manufactured in the United States has become a major concern to top managers in industry, the Department of Defense, and particularly the user. The quality of America's products is in many respects being outpaced by quality improvements in other countries. The Japanese success has often been attributed to top management personnel, technicians, engineers, and production workers, all being trained in the quality disciplines.

We made contact with colleges and universities to determine if curriculum changes in management and engineering could contribute and maybe provide the seed for a national solution. As a result of this exchange, we are gathered here today.

Someone said that human history becomes more and more a race between education and catastrophe. Your gathering here today can help education win over catastrophe. We representatives of the Federal sector, the academic community, and industry may well be in a three-legged race against catastrophe. The health of this country dictates that we must communicate freely with each other so as to stride forward--and not stumble.

There are many roadblocks in the path of our race. For example, in the Federal sector:

- o Can Federal funding be obtained to support new initiatives in the quality area?

And in the industrial setting:

- o Can we achieve the team approach needed to cope with and surpass challenges from other industrial sectors of the world?

- o Will manufacturing engineering and production processes keep pace with emerging technology?

And in the academic community:

- o Can quality assurance knowledge best be transmitted as a management science, or as an engineering discipline?

- o How can faculty vacancies be filled with our best educators?

There is even another, much broader issue. Bright engineering graduates tend to avoid entry into manufacturing engineering, which of course includes quality, or product assurance. The Society of Manufacturing Engineers estimates that there are 9.2 million engineers in the workforce. The same data indicate less than 20 percent are in manufacturing engineering. In many Japanese companies, manufacturing engineers outnumber those in design and other engineering disciplines. It is apparent that many problems we face are caused in part by an inadequate number of creative engineers in manufacturing. Despite recent trends toward a services-oriented economy, our success in international competition as well as our national security depends on manufacturing. Our technology and design activities are superior, reflecting the top quality of our scientists and engineers. The question is: For the long haul, will we have the capability and capacity to manufacture what we create in laboratories? We seem to stumble in quickly meeting competition with new products, while keeping costs down and our quality high.

The glamour, and maybe the compensation, of development and engineering design seems overwhelming for the engineering student and graduate. Today high technology is moving rapidly to the factory floor. Do we have the manufacturing engineering resources at entry and advanced levels to cope with this thrust? Producibility considerations during design and the CAD-CAM systems will help, but it may not be enough. Academia, supported by industry, must contribute. One encouraging sign is that both academia and industry are forming staff and study programs in manufacturing and productivity, but many challenges remain ahead. We believe that university educators need to acquaint future engineers in their formative college years that modern manufacturing is also a creative and challenging field. University programs must be expanded. More academia and industry cooperative programs are necessary to spur greater progress in manufacturing engineering.

Gail Sheehy summed up our situation best in her book Pathfinders. She said, "Something is wrong when a society cannot count on its helicopters to rescue hostages, or command its computers to send up spaceships on time, or make its cars and appliances and war planes work reliably. A society that thinks all it needs to do is market well and manipulate accounting methods is losing sight--and possibly grasp--of the future."

Many challenges, opportunities and new ideas concerning our future will be discussed today, which is why we are assembled. We must use these exchanges as aids in hurdling the barriers in our path. We must set joint goals for the future--if we are to be winners. I think we can work together. I look forward to a successful day.

Thank you!

Admiral Grinstead's naval career began in December of 1942 when he enlisted as an Apprentice Seaman in the U.S. Naval Reserve. He received his commission in August of 1944. He had training in mine disposal and recognition and subsequently served on three different Naval Underwater Demolition Teams. He later attended the Navy Supply Corps School, then had duties as Supply Officer aboard ships and land base commands where his contributions have earned him some of the Navy's highest awards for his enlightened leadership, unequaled knowledge of logistics and outstanding managerial abilities in modernizing and transforming the U.S. Navy Supply System. Admiral Grinstead attended the University of North Carolina, the Armed Forces Staff College, and the Harvard Advanced Management Program. Admiral Grinstead became the seventh Director of the Defense Logistics Agency in June of 1981, after being appointed by President Reagan and confirmed by the Senate.



"Many challenges, opportunities and new ideas concerning our future will be discussed today----We must use these exchanges as aids in hurdling barriers in our path. We must set joint goals for the future--if we are to be winners."

Vice Admiral E. A. Grinstead



THE HONORABLE PAUL THAYER
DEPUTY SECRETARY OF DEFENSE

BOTTOM LINE ACADEMIA CONFERENCE

KEYNOTE ADDRESS

BY THE HONORABLE PAUL THAYER

DEPUTY SECRETARY OF DEFENSE

PENTAGON

WASHINGTON, DC 20301

I am delighted to have the opportunity to join you today to discuss the important challenge we face together--improving the quality of the equipment we build for our nation's defenses.

In talking about the effects of quality on our defenses, you are addressing one of the most important and difficult problems facing our nation's security today. There can be no product recalls on the battlefield; no time for warranty work. The lives of American servicemen and women are on the line.

Too often debates about national security revolve around strategic issues or military hardware. They miss the most important variable in the national security equation -- people. Lessons learned in the recent conflicts in the Middle East and the South Atlantic, as well as on battlefields down through history, all teach us that human rather than material factors provide the margin of victory. That's why I am glad that you have chosen a conference theme that addresses human needs -- "Education - Key to Quality."

Today I want to talk about some recent successes the Defense Department has had in improving the quality of its personnel force, and I want to address some further challenges our nation faces if we are to continue to maintain our technological leadership.

Occasionally, when a representative from the Defense Department testifies in Congress about the requirements of the defense program, some Congressman will ask him if he would trade places with his counterpart in the Soviet Union. The answer is always no. But not because we do not envy the material resources available to our Soviet counterparts, for the Soviets have invested enormous sums to provide their military with a large inventory of weapons. But the Soviet Union cannot come close to matching the motivation, intelligence, and initiative of the men and women in the ranks of our armed forces and the dedicated civilians working for our Defense Department. Of that, every American can be justly proud.

Unfortunately, in the 1970s America tended to take our manpower advantage over the Soviet Union for granted. By failing to adequately compensate our servicemen and women and to offer them the dignity and quality of life that they deserve, we allowed the foundation of the all-volunteer force to crumble. We were unable to recruit sufficient numbers of top quality people; our reenlistment rates plummeted as military personnel left the service at the end of their obligated tours; morale in our units worldwide was at a low ebb.

As part of President Reagan's pledge to restore America's defenses, he gave first priority to correcting those deplorable personnel conditions. A large part of the increase in the Defense budget that he asked for in his first year was used to raise salaries, pay reenlistment bonuses, and improve the quality of life of the military.

We see clear evidence that those quick corrective measures worked. Now all the armed services are recruiting over 100 percent of their objectives, and they are able to obtain better educated young Americans. In the last full fiscal year before President Reagan took office, only 68 percent of our recruits had high school diplomas; now 82 percent are graduates. That additional 14 percent provides the essential margin of vitally needed skilled manpower to operate and maintain our modern equipment. That means our military hardware will work better and break less. The obvious fact is that top quality equipment gives the best service if you have top quality people operating and maintaining it.

Pay increases, reenlistment bonuses, and other benefits have also helped us to retain the services of our experienced personnel after their terms of service expire.

The Soviet Union is far less concerned about recruiting, pay and quality of life, or retention. While we spend about 50 percent of our defense budget for personnel, only about 15 percent of the Soviet defense budget is allocated for personnel costs. About 75 percent of the Soviet armed forces are conscripts; pay is extremely low and living conditions are abysmal. It is no surprise that the reenlistment rate of the conscripts is less than 2 percent and the Soviets have only a 25 percent career force of mostly officers.

On the other hand, the Soviet armed forces outnumber ours by a ratio of two to one. We have tried to counterbalance that by providing our armed forces with more advanced equipment. Technology can be a great force multiplier.

Today there are fewer soldiers in arms for each combat division than at any time since before World War II; but today's division has ten times the firepower of a World War II division. Our Navy is building ships which are not only more powerful than their predecessors, but far more efficient. New antimissile cruisers have highly sophisticated weapons of far greater range and much improved reliability; and they are manned by a crew of 319 while the cruisers they replace had crews of 1600.

For the Air Force, the leverage on manpower efficiency provided by its modern aircraft and ordnance is equally impressive. During August 1944, as Allied forces broke out of Normandy, 3,000 heavy bombers of the 8th Air Force flew more than 18,000 sorties. Something like 30,000 aircrew members were required for this effort. Today, 800 F-16 fighters, manned by just 800 pilots, could deliver the same tonnage of bombs over comparable distances, but much more accurately.

The Soviets also recognize the tremendous military advantages of modern technology and are modernizing rapidly. In some cases they have already begun to supplement their quantitative superiority over us with a qualitative edge. Our great concern is that the United States must be able to maintain its technological lead -- and that is a problem that we in the Defense Department cannot solve alone.

We need the help of the education community and industry to correct a nationwide technical illiteracy that is weakening our defenses. Even the most well designed and cost effective weapons system program is useless without skilled craftsmen building top quality military equipment in our factories....without a military trained to operate complex modern gear....and without technically qualified personnel, military and civilian, to keep our equipment in good repair. Meeting those needs will not be easy. That's why this conference is so important to the Defense Department -- and to the nation.

For years our lead in technology and productivity was unchallenged. That is no longer the case. While other nations embarked on crash programs to harvest the fruits of modern technology, the priorities of American society shifted elsewhere. A recent statement by a Japanese economist illustrates my point:

"You in the United States have in the last ten years doubled the number of people in law schools, while you barely even maintained the number of people in engineering schools. We in Japan have not increased the number of lawyers, but have doubled the number of engineering students. Lawyers are concerned with dividing the pie, engineers with making it larger."

He is right. U.S. patents issued to foreign nationals grew from 17 percent of the total U.S. patents issued in 1960 to 38 percent in 1979. In the same 20 year period, the foreign controlled portion of the U.S. consumer electronics market increased from 5.6 percent to 50.6 percent and the foreign market position for metal-working machine tools grew from 3.2 percent to 28 percent.

I need not tell this audience of the severe shortages of manpower in many technical occupational fields caused by the shift in national priorities. The Defense Department has compiled a list of 15 skilled fields, from riveters to electrical engineers, that must have an annual growth rate of over 3.8 percent if we are to meet our peacetime defense needs between now and 1989. One field, shipfitters, must grow 16.4 percent annually. The quality of the products of our defense industries is bound to deteriorate if we do not find a way to train the workers we need quickly.

The Soviet Union has a strong head start. While only 50 percent of American students study any science or mathematics beyond the 10th grade, all Soviet high school graduates have had two years of algebra and geometry in elementary school and four years of algebra and calculus in high school. Not surprisingly, the Soviet Union graduates from college almost five times more specialists in engineering fields than the United States, and the Soviet military has unlimited access to the best of those graduates.

In the United States, with a dwindling pool of engineers and technical specialists, the situation is reversed. The military must compete with industry for skilled workers; defense industries must compete with industries serving lucrative civilian markets. Because the military usually cannot match civilian salaries in scarce skills, and because defense business is often less attractive than commercial business, defense is usually the loser in any competition for skilled manpower with the civilian sector in the United States.

What we need to do is not halt that competition by giving all priority to the defense sector as the Soviets have done. We need to make the pool of technically skilled manpower available to defense and industry bigger. That we can do best through education -- and that is why the theme of your conference is so appropriate.

So the academic community has its work cut out for it in reversing the deterioration in our technical manpower base -- the very segment of our society that is most immediately responsible for the quality of the goods we produce. But, ultimately managers have the final responsibility in assuring quality. If we are going to develop and produce better quality military gear, government and industry are going to have to do a better job.

We in the Defense Department are trying to do just that. Besides putting emphasis on quality and reliability during the design, development, and production stages, we are also paying much more attention to evaluating the finished product for reliability during the testing stages.

We have also instituted a number of management reforms to make our weapons acquisition process more economical and more efficient. They include more realistic budgeting to avoid cost overruns in the future; planning and budgeting for all the spares and tools that will be needed when a new weapon is put in the hands of troops; enhancing competition among contractors; contracting on a multiyear basis; producing equipment at more economic rates; and improving the stability of our programs so they are done on time and on budget.

Since all of our reforms will improve the stability of our defense industries as well as lead to economies for the taxpayer, I am confident that they can lead to better quality products for us -- if managers from private industry cooperate with us. For example, our initiatives in multiyear procurement of certain weapons mean that now we can make firm commitments for several years of purchases and provide defense contractors with up-front funds to make capital investments. Our hope is that those investments will be used to rehabilitate the deteriorating machinery in many of our defense plants. Then we can once again demonstrate to our workers that we really care about the quality of the products they build.

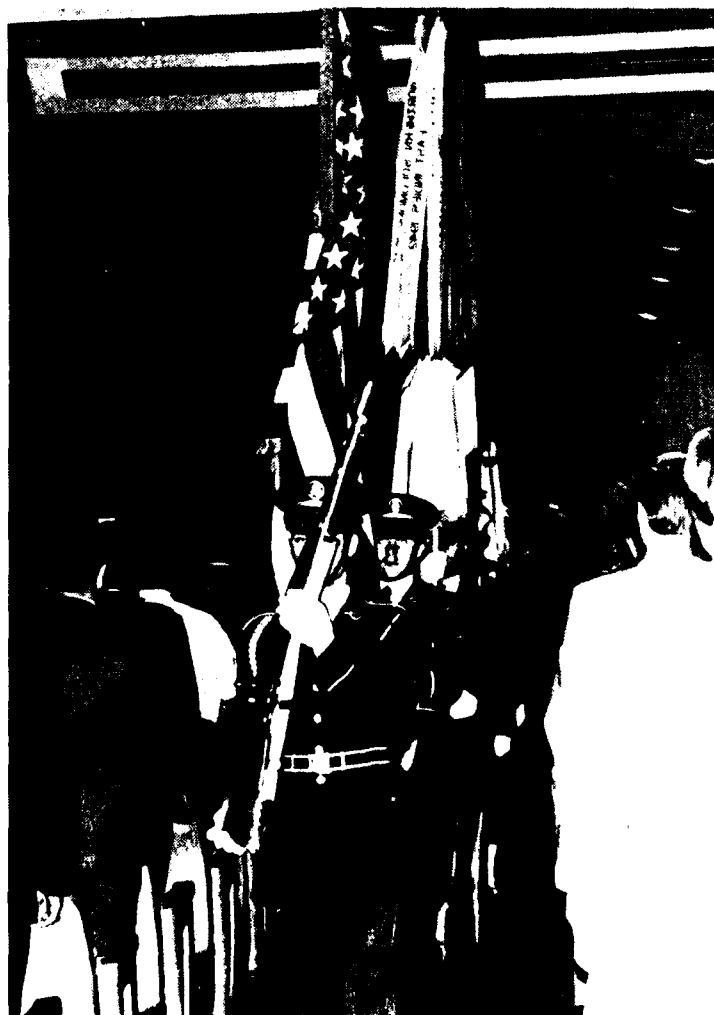
If we are to restore the standards that made our military equipment the best in the world, we are going to have to work together -- American industry, academic institutions, and the Defense Department. It is a worthwhile endeavor...an essential effort...for it will guarantee America's future, it will assure us of the strength that we require to preserve peace with freedom.

Mr. Thayer is a graduate of the University of Kansas. Prior to Pearl Harbor, he enlisted in the Navy's Aviation Cadet Program and continued on to become a combat ace. His tally record as a fighter pilot was six enemy planes shot down, four other probable kills, and nine more destroyed on the ground. He was pilot (1945-1947) for Trans World Airlines; later joining Chance Vought Aircraft in 1948 as a production test pilot. In 1950, he became chief experimental test pilot for Northrop Aircraft and worked there for five years before returning to Chance Vought where his career began to spiral taking him up the corporate ladder to Chairman of the Board and Chief Executive Officer of LTV Corporation, the successor to Chance Vought. Mr. Thayer was Chairman of the Board of Directors for the U.S. Chamber of Commerce and Chairman of the National Explorer Scout Committee. He is a member of the Society of Experimental Test Pilots.



"We need the help of the education community and industry to correct a nationwide technical illiteracy that is weakening our defenses. ---That is why this conference is so important---."

The Honorable Paul Thayer



PANEL 1: EDUCATION'S IMPACT ON QUALITY

MODERATOR: The Honorable C. Ronald Kimberling, Deputy Assistant Secretary for Higher Education Programs, Department of Education

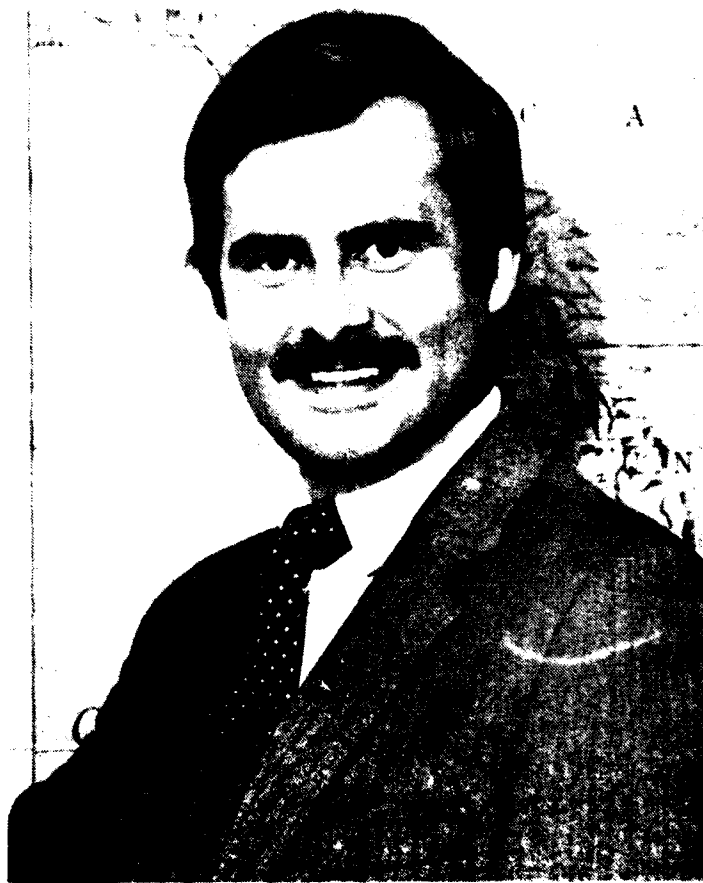
MEMBERS: Dr. Glenn E. Hayes, Professor, California State University

Dr. Joseph L. Hood, Assistant to the Director, Federal Acquisitions Institute

Dr. Edward W. Davis, Professor, Colgate Darden Graduate School of Business Administration, University of Virginia



Pictured from left to right: Dr. Kimberling, Dr. Hayes, Dr. Hood and Dr. Davis.



THE HONORABLE C. RONALD KIMBERLING

DEPUTY ASSISTANT SECRETARY
FOR HIGHER EDUCATION PROGRAMS
U.S. DEPARTMENT OF EDUCATION

EDUCATION'S IMPACT ON QUALITY

BY THE HONORABLE C. RONALD KIMBERLING
DEPUTY ASSISTANT SECRETARY FOR HIGHER EDUCATION PROGRAMS
UNITED STATES DEPARTMENT OF EDUCATION
400 MARYLAND AVENUE, SW
WASHINGTON, DC 20202

TEXT

I am delighted to represent Secretary Bell who, as the Admiral noted, is on a treadmill here in Washington and around the country this very week. He is explaining some of the findings of the National Commission on Excellence in Education which issued its report to the nation this past Tuesday. A little bit later in my remarks I'll share with you some of those findings. One of the advantages of being the moderator of the first panel on today's agenda is the opportunity to help set the tone for the conference. Since my training is in English in the field of rhetoric, linguistics, and literature, and as someone who has spent the last 16 years of his life in higher education, I'd like to start us all off on a little bit of a philosophical note. We are gathered here today to discuss the concept of quality. Quality is seen as a positive value that needs to be better understood and better institutionalized in our educational curricula and our industrial system of production. The timeliness of this conference is borne out by the release of the National Commission on Excellence in Education report just two days ago. The report was titled "A Nation at Risk--the Imperative for Educational Reform," and I'd like to share with you some of the commission's findings.

In a hearing across the nation, this distinguished panel, chaired by David Pierpont Gardner, the President of the University of Utah, newly named as the President of the University of California's system, gained input from a number of distinguished citizens. They were looking at the entire spectrum of education from kindergarten, elementary school, all the way up through graduate degree programs. They did some comparisons of student achievement on the international scene. They looked at a report already a decade old that revealed that on nineteen tests of academic ability, American students not once scored first or second and, in fact, in comparison with other industrialized nations, we were last seven times out of the nineteen. The average achievement of high school students on most standardized tests is now lower than 26 years ago when Sputnik was launched. The well known scholastic aptitude test scores have been in a virtually unbroken decline from 1963 to 1980. During this time, average verbal scores fell by more than 50 points. An average mathematics score dropped nearly 40 points. The commission found that many of our 17-year-olds do not possess the higher order of intellectual skills that we should expect. Nearly 40 percent cannot draw inferences from written material. Only one-fifth of our 17-year-olds can write a persuasive essay. Only one-third can solve a mathematics problem that requires multiple steps to find the solution. Some 23 million American adult citizens are functionally illiterate by the simplest test of everyday reading, writing, and comprehension. About 13 percent of all our 17-year-olds can be considered functionally illiterate. Functional illiteracy among minority youth, by some estimates, runs as high as 40 percent. We find business and military leaders complaining that

they are required to spend millions of dollars on costly remedial education and training programs in the most basic of skills: reading, writing, spelling, and computation. The Department of the Navy reported to the Commission on Excellence that one-quarter of its recent recruits could not read at ninth grade level. This is the minimal needed simply to understand written safety instructions. Without remedial work, these recruits could not even begin, much less complete, the sophisticated training that is essential in the modern military.

Well, the Commission came forth with recommendations. I might point out that when this commission was appointed for an 18-month life by the President of the United States and by the Secretary of Education, it was charged with sharing its findings and sharing its recommendations with the American public. So this Commission's report is not a report to the Congress, or to the President, or to the Federal bureaucracy. It's a report to the public so that we might, as citizens, take some of these findings and recommendations to heart. One of the strongest recommendations is that state and local authorities in the elementary and secondary schools reinstitute basic education and that they put into the mandated curriculum of the nation's high schools what the Commission terms "the five new basic skills." And they're not so new. I am part of the post-war "baby boom" generation myself, and yet I'm already beginning to find a generation gap because many of these requirements were in place when I was in high school. And I was saddened to find that they had been dropped. But indeed they have. Well, these five "new-old" basic skills include four years of English with an emphasis on composition and grammar, three years of mathematics--something beyond the general mathematics that many students "max out" at high school--three years of science, three years of social studies, and at least a half year of computer science at the high school level. The commission also recommended a sixth skill for those contemplating entering postsecondary education, and that's two years of foreign language as a minimum, taken at the high school level. The Commission recommended schools, colleges, and universities to adopt more rigorous and measurable standards and higher expectations for academic performance in student conduct, and that four-year colleges and universities raise their requirements for admission. For those of us in education, we know this is going to be a little bit of "chicken and the egg" problem, but it's important that at the secondary level, and at the postsecondary level, our expectations for student achievement begin to rise, because only then will performance begin to rise along with those expectations. In terms of time-on-tasks on which the National Institute of Education has conducted considerable research, it was revealed that something as simple as time spent on tasks is a key to how much is learned, particularly in the lower grades. The Commission recommended that the school day be increased from six to seven hours on average, and that state and local education officials consider expanding the school year from the present 180 days--by the way, that compares with 240-day school year in Japan--to at least 210-220 days.

So these are some of the major recommendations.

We get back to the theme of this conference--quality. The term "quality" implies a value judgment: some things good, some things bad. Sometimes

this concept is very easy to grasp and easy to articulate. We can look at a machine part with so many micrometers thicker than tolerance and say "It is poor quality." Sometimes the concept of quality is harder to grasp. "Engineer Andrea is better than engineer Bill." In a complex society such as ours, it is easy to focus on the narrow issues. This conference could well proceed all day long without any one of us in this room reflecting on a key theme. The fact is that the social and intellectual climate of the last two decades has focused mainly on issues of choice and freedom at the expense of values and self-discipline. As a culture, we're in danger of forgetting some basic principles that almost every primitive tribal society knows quite well--that good and bad can in fact be distinguished.

In a nutshell, and at the heart of the President's Commission on Excellence is a basic truism that can no longer be ignored. There are in fact, people in every society, and in particular a highly technological society, who are properly credentialed on the basis of training, experience, and knowledge, to be able to make quality judgments. And there's nothing wrong with that. The area of quality control is precisely the area where I think the benefits of the traditional liberal arts disciplines have carryover value for our nation's future managers, research scientists, and engineers. The value of training in the technical disciplines is a stress upon precision and upon disciplined, analytical thinking. In the jargon of contemporary neuropsychiatric researchers on cerebral hemisphericity, we might say very broadly that our scientific and engineering training is geared to train the left hemisphere of the brain, the analytical hemisphere. But as a complement to this, we might view training in the liberal arts as "right hemispheric" with the emphasis on the student learning how to see the "big picture." The big picture in history, the whys and wherefores of what has happened in the past--the big picture in Hawthorne's novels, the motivations of characters, the twists and turns of plots--the big picture in cultural anthropology, the relative values we find in different societies, and the way those values infuse complex social structures and make them successful or unsuccessful societies, and so on. Both types of skills, the analytical skills that enable us to focus on a narrow task and to get that task done well--and the ability in the abstract to focus on a complex of events of human motivations, of processes, in order to see the big picture--both of these skills are important if we're to witness improvements in quality in our industrial production.

Managers and engineers have to be able to engage in what creative researchers call "matrix hopping." This is a kind of creative thinking which allows one to move from the "abstract general" to the "concrete specific" and back again. One very vital element missing from the curriculum in our nation's schools of business and schools of engineering is the fact that business managers are not exposed at all, or practically not at all, to what engineers do and vice versa. And yet when you get into the real work of the private sector, corporations, managers, engineers all have to deal with one another. The best engineers usually wind up becoming managers and are starting up the career management ladder without any formal training whatsoever. And, of course, many managers find themselves schooled in marketing, schooled in finance, schooled in personnel matters, and they don't know anything about engineering, and they go to corporations where they have to deal with engineers all day. Wouldn't it help productivity and quality if universities and colleges began to require

just a little bit of management course work for the engineering students, and just a little exposure to engineering for the business students? I think this is an idea that ought to be seriously discussed, a very modest curriculum change.

In the long haul, however, I think America cannot begin to expect to make gains in quality and productivity until we begin to apply a kind of return-on-investment or cost-benefit analysis to issues of quality. Many American managers still operate with the mistaken assumption that a focus on improved quality is also costly. This is far from the truth. We find that there are real costs to poor quality, real costs in high maintenance and repair, real costs in the need for remanufacturing products, in waste of raw materials. There are psychic and lost opportunity costs in areas such as low employee morale and high turnover and consumer dissatisfaction. In fact, you might say that as the principal sponsor of this conference, the Department of Defense is a dissatisfied consumer. The Department of Defense realized the need to upgrade the quality of the goods and services it purchases with our tax dollars. It is sensitive to public criticism about cost overruns and waste, and by sponsoring conferences such as this, it is demonstrating its commitment to doing something about the problem. Those of you who come from academia can help America move towards two desirable goals by your thoughtful participation in today's conference--the goal of achieving excellence in education, and the goal of helping to rebuild the American economy and restore our products to their premiere position in the world marketplace. Thank you.

Prior to his appointment as Deputy Assistant Secretary, Dr. Kimberling held other executive positions in the office of the Secretary of Education. He is former Director of Enrollment Services, University of Southern California, Los Angeles, having served as a news reporter and editor for City News Service/Radio News West and as a News Director of Radio Station KCSN. Dr. Kimberling served as Assistant Professor of Journalism at Cal State, Northridge. He also taught at Bowling Green University and the University of Southern California. Dr. Kimberling received his Ph.D. in rhetoric, linguistics, and literature. Dr. Kimberling has authored one book as well as numerous articles on politics, popular culture and education.



"Those of you who come from academia can help America move towards two desirable goals by your thoughtful participation in today's conference-- the goal of achieving excellence in education, and the goal of helping to rebuild the American economy and restore our products to their premiere position in the world marketplace."

The Honorable C. Ronald Kimberling



DR. GLENN E. HAYES

PROFESSOR
CALIFORNIA STATE UNIVERSITY

EDUCATION'S IMPACT ON QUALITY

BY DR. GLENN E. HAYES

PROFESSOR

DEPARTMENT OF INDUSTRIAL TECHNOLOGY

CALIFORNIA STATE UNIVERSITY

LONG BEACH, CA 20380

ABSTRACT

We have three major phases of product assurance or quality assurance: the development phase, the build phase, and the user phase. Clearly, quality is broad in scope. The management hierarchy must be involved in quality through knowledge, commitment, and involvement. The design engineering people have a critical link to quality in product development and improvement. Procurement agents are responsible for assessing supplier integrity. We also have the human resources aspect, the personnel people. Then we have the industrial engineering and the manufacturing people who buy equipment, budget for it, select the proper equipment to do the job, and production personnel who build it to design requirements. The finance people are involved in it because there is the cost aspect of quality. Finally, marketing personnel must consider the effect of product quality on market shares.

The Japanese advantage is one of few barriers, an advantage enjoyed from the fifties. Our present situation, the American disadvantage, is that we're trying to penetrate barriers of tradition, bias, social constraints, and a management philosophy that is not conducive to quality.

I've developed a ladder to give you a perspective of the five steps in the quality maturity. First of all, some companies treat quality as an obstacle course. The next step in the ladder is defined as a state of confusion, and we have a lot of companies in that category now. The third step is in enforcing transition. Companies are making quality fashionable. Still, a lot of people in industry still don't believe in quality.

The next level is what I would call the "preventive maintenance strategy." This has to do with up-front quality--designing it and doing all the things up front before you start producing defectives. Then the last level, one that some companies are rapidly approaching, is the team approach. This is where the individual people of the company are getting involved in the team effort; they know what quality is all about--now they're working to meet that objective.

Level one, the obstacle course, is characterized by a coercive style of management, little understanding about quality and productivity; the schedule and cost are all important. These firms typically have high rework and scrap rates, low productivity, and obsolete equipment.

This is in contrast with the preventive maintenance strategy which emphasizes up-front quality, a reduction in quality costs, improvement in productivity, the use of the state of the art equipment, and a strong commitment to education and training. The preventive maintenance strategy is followed by the team approach, the top level, and involves open communication, strong generic commitment to quality, the leadership of people, long term strategy, and the systems approach to quality.

Why is education important? The new technology is moving much faster than our educational processes. Concern and attitudes about quality can be influenced early in one's life. During the formative years, values of workmanship and quality need to be engendered in young people's lives. This can be first accomplished by incorporating courses of quality in liberal arts as well as engineering curricula, so that future teachers will more fully comprehend the meaning of the quality ethic. Then these disciplines can be passed along to students at the elementary and secondary levels. It is especially important that credentialing and accrediting agencies of college programs be convinced of this need, so that such academic "standards" will not only embrace, but also require quality oriented subjects.

Meanwhile, industry must become more proactive on college advisory boards of Business, Engineering and Technology programs--a position from which pressure can be exerted to incorporate various quality courses. This should be followed up by ongoing involvement with both universities and the community. People need to be more aware of not only what quality is all about, but also its impact on our economy.

In higher education from engineering to management we generate curricula that fail to utilize a cross-discipline approach. Our concept of a quality assurance curriculum at California State University, Long Beach is an interdisciplinary program. A number of major subject areas are wrapped up in quality assurance, and I believe a good B.S. degree program will address both laboratory, activity and lecture needs. Industry and education must cooperate better in these endeavors.

Dr. Hayes is a professor in the Industrial Technology Department at California State University at Long Beach where he coordinates the Bachelor of Science degree program in quality assurance. Dr. Hayes received his baccalaureate and masters degrees from California State University, Long Beach, and his doctorate from the University of California at Los Angeles. He is the author of the textbook, Quality Assurance: Management, and Technology and the co-author of Modern Quality Control.



"Our present situation, the American disadvantage, is that we're trying to penetrate barriers of tradition, bias, social constraints, and a management philosophy that is not conducive to quality."

Dr. Glenn E. Hayes



DR. JOSEPH L. HOOD

ASSISTANT TO THE DIRECTOR
RESEARCH, PROGRAM EVALUATION,
AND TRAINING
FEDERAL ACQUISITION INSTITUTE

EDUCATION'S IMPACT ON QUALITY

BY DR. JOSEPH L. HOOD

ASSISTANT TO THE DIRECTOR

RESEARCH, PROGRAM EVALUATION, AND TRAINING

FEDERAL ACQUISITION INSTITUTE

ROOM 5208

NEW EXECUTIVE OFFICE BUILDING

WASHINGTON, DC 20513

TEXT

Quality Assurance: A discipline vital to the economy and effectiveness of the federal acquisition process in support of national security.

Pleased that the quality assurance community recognizes the importance of an academic foundation for professionalism in the discipline.

In the last decade, the procurement community, under FAI leadership, took steps to establish an academic foundation in procurement. Let me share with you FAI's strategy and the results.

Quality, as a field of knowledge today, is where procurement was in 1972.

- Formal education programs in quality sciences largely unavailable.
- Support disciplines are taught--finance, marketing, law, etc.
- But no educational foundation for quality as professional field.
- All of this is true of procurement in 1972.
- Public concern became the demand for competent, professional work--professionalism.
- A systematic body of knowledge is one of the attributes of a profession and academia has traditionally performed the systematizing function.

FAI's first goal: Established a procurement body of knowledge.

- FAI established 1976.
- FAI the focal point for the Government-wide efforts to plan and promote undergraduate and graduate programs in procurement.

Overview of FAI's strategy:

- First, find out where we are with respect to the work force's educational profile and the colleges'/universities' receptivity/resistance to the procurement field of study.

- Next, develop and market model programs that mutually accommodate the interests of both the work force and the colleges and universities.
- Finally, engage in reinforcement/support activities.

Results from implementing the strategy:

- Where we are:
 - Inventory work force (1976-1978):
 - Surveyed 20,000
 - Demographics, tasks, skill, and knowledge requirements
 - Work force fast approaching retirement
 - Average age 45
 - Average years of service 18
 - Most less than 10 years' procurement experience
 - Most no college background in procurement
 - Two-thirds lack degree in any field
 - Few with degrees in contracts
 - Most have had little formal training in procurement
 - Seventy percent no course in negotiations
 - Sixty percent no course in contract administration
 - Fifty percent no contract law
 - Forty percent no cost and price.
 - Forty percent no basic course (not even GSA's one-week version)
 - Even fewer have attended any advanced training in these areas
 - Bottom line: College level academic programs in procurement are needed--upgraded existing work force
 - Inventory of colleges and universities (1978)
 - Used listing from American Council on Education
 - Initial listing:
 - Single course on procurement
 - Degree Curriculum
 - Continuing education/certification programs
 - Mostly special courses on limited basis
 - Less than 30 schools indicated any kind of effort
 - Lack of text materials
 - Model programs developed and marketed
 - Developed detailed models of procurement core courses; guidance to schools on how to install the model undergraduate procurement programs (1977-1980)
 - Academic program plans and instructional guides developed and issued
 - Market analysis
 - Outlines of graduate and undergraduate curricula
 - Detailed guidance on five core courses in procurement
 - Lesson plans for the five core courses in procurement
 - Academic programs plans and instructional guides pilot tested at American University

- Developed a model MBA/MPA procurement program (1978-1979)
 - Focused on authority of the principal accrediting associations
 - National Association of Schools of Public Affairs and Administration (NASPAA)
 - American Assembly of Collegiate Schools and Business (AACSB)
 - Formed Deans' Committees and Education Interagency Working Group composed of the following schools and agencies:
 - AACSB Committee: UCLA, Colorado State, George Washington, American, Miami, Lehigh, VPI
 - NASPAA Committee: Carnegie-Mellon, Arizona State, USC, Indiana, Florida State, Harvard, Syracuse
 - Education Interagency Working Group: FAI, CSC, OMB, Navy Postgraduate School, HEW, OFPP, Energy, AFIT
 - Product: National Model Curriculum in Procurement and Assistance
 - Designed to meet AACSB and NASPAA standards
 - Model programs presented to standards committees of AACSB and NASPAA for endorsement
 - Model programs approved by the associations
 - Associations' approvals communicated to their 700 member schools
- Marketed the model programs to colleges and universities (1979-1983)
 - Identified metropolitan areas with largest procurement staffs
 - Used data on dimensions of government need for academic program in each locality
 - Worked closely with local chapters of professional associations
 - Visited universities hand-in-hand with professional associations
- Support and reinforcement activities
 - Advised colleges during startup (1979-1983)
 - Published directory of colleges, universities, and government schools offering the programs and courses (1981)
 - Established academic review committee and local area committees (1982-1983)
 - Communicate government needs to colleges
 - Ensure academic offerings satisfy government requirements
 - Provide government with data to certify equivalency to mandatory courses

What are the results?

- In 1972, nine colleges offered procurement course work
- In 1980, 43 colleges offered courses and programs

- Today, close to 300—on an investment of virtually no \$ (most degree programs)
- In 1981 directory published of institutions providing procurement and procurement-related education programs and courses
- Graduates in high demand by industry and government

How government is making use of the new programs in procurement:

- Executive Order 12352 calls for a professional work force
- Schedule B authority for on-campus recruitment
- New qualification standard to give extra credit for procurement course work in hiring college graduates
- Co-op agreements with colleges to give jobs to college students majoring in procurement
- Intern programs in DoD and civil agencies
- Equivalency for DoD-mandatory training requirements

Quality, as in academic field, not neglected by FAI:

- FAI marketing the whole range of acquisition disciplines to colleges, not just procurement
- Many colleges in our directory also provide courses in quality
 - Xavier
 - Texas A&M
 - San Francisco State
- Example: Weber State
 - Utah
 - In association Ogden A.F. Logistics Center
 - B.S. in Logistics Management
 - Eight core courses in Quality
- Our network is your network
- Now that procurement core curriculum is successfully implanted at colleges throughout nation, ready to focus on quality

FAI willing to help as resource:

If anyone needs any of the information described, please telephone (202) 395-7300. Ask for Dr. Bill Hunter.

Dr. Hood has been with the Federal Acquisition Institute since 1977. His concentrations have dealt with higher education programs in procurement acquisition; development of training material to facilitate the implementation of new procurement policies; and evaluation of civil agency procurement training courses. Dr. Hood played a vital role in the OFPP's Proposal for a Uniform Federal Procurement System. Prior to joining the

FAI, Dr. Hood was on the faculties of the Defense Systems Management College, the Air Force Institute of Technology (AFIT), and the Defense Management Center, Ohio State University. He has served as program manager and Contracting Officer for the U.S. Air Force. Dr. Hood holds a B.A. degree from Georgetown College (KY), an M.B.A. degree from the University of Louisville, and a Ph.D. degree from Ohio State University. Dr. Hood has won awards for some of his publications in the areas of Cost-Benefit Analysis and Procurement and Acquisition Training.



"Pleased that the quality assurance community recognizes the importance of an academic foundation for professionalism in the discipline."

Dr. Joseph L. Hood



DR. EDWARD W. DAVIS

PROFESSOR
COLGATE DARDEN SCHOOL OF BUSINESS
UNIVERSITY OF VIRGINIA

EDUCATION'S IMPACT ON QUALITY

BY DR. EDWARD W. DAVIS
PROFESSOR, COLGATE DARDEN GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
UNIVERSITY OF VIRGINIA
CHARLOTTESVILLE, VA 22906

ABSTRACT

I assume I'm here as a representative of the Masters Degree Programs in the United States. At the Colgate Darden School of Business Administration, our students come from many walks of life, with an average of three to four years of industry, government, or business experience. About 35 percent are women. We use the case method in both our MBA program and our Executive Education Programs.

The graduate education programs in management in this country have done an extraordinarily poor job of preparing our graduates dealing with product quality issues. We've turned out succeeding waves of bright, aggressive, articulate graduates who have been oriented towards finance and marketing and know almost nothing about the management of product quality except that every company has a quality control department that's filled primarily with inspectors and that's supposedly what quality control is all about.

Our students go through about 600 case studies in a two-year period. Classes are structured so that there is heavy emphasis on participation and a typical course grade in our MBA program courses is dependent upon student contribution. There's heavy emphasis on developing students in their power of speech and expression. About 20 percent of our students coming in are engineers. However, only in the last three years we've begun to focus on quality and management of quality issues in our courses. We can land our astronauts on the moon, but we have trouble turning out consumer products that last and give value for the money paid. This is not a new problem. This is a problem that we've been aware of for more than a decade now.

Our students are some of the future managers and executives in this country who are going to have primary responsibility in helping overcome these problems. In trying to sensitize them as future managers, one of the first things we do is to have them learn through reading some of the differences between the approaches to quality control that the Japanese have taken and quality control practices of American industry. We use some of Dr. Juran's work. It's been very effective in alerting our students who have no knowledge whatsoever, no background in this area, to the differences. We also make the point in our educational efforts that in Japan the line worker bears a great deal of responsibility for the quality effort. So many of our business executives have forgotten that the Japanese learned much of what they're practicing so well, from us.

Also, we try to expose our students to some very basic concepts in statistics for again, sensitizing.

The Japanese have made inroads on our markets through the dimension of quality which we have not pursued as diligently as we should. In past years we taught quality as being desirable. But we failed to relate the close relationship between quality and higher productivity. As one manager said, "Quality has to be an attitude that starts with people of the upper levels and filters down to the group." You are beginning to see articles depicting quality and productivity in the same theme as being one possible solution in the drive towards America's revitalization. As an example, Ford is now making quality very prominent in their advertising.

We're trying to make quality as important in the measurement of general management as market shares, profit, and cash management. There's so much which is abstract about quality that, unless you can put it in profit and loss terms, it isn't as motivating. I think that differentiates our educational attempts in this area from what we tried to do in the past which was focused almost entirely on statistical techniques and details. If we'd done a better job in our education programs, perhaps we would not be in the situation we are in today. However, I think that in our education programs, at least in the Masters of Business level, we are reacting to what business wants today. In the past we have not included quality as a dimension of management performance. But I am also happy to report that the surveys that have just been published recently show that this is changing.

Dr. Davis has taught at the University of North Carolina, Chapel Hill; the Sloan Management School, M.I.T.; and the Harvard Business School. His formal education includes a Bachelor of Science in Mechanical Engineering, a Master of Science in Industrial Engineering, graduate study in the Swiss Federal Institute of Technology in Zurich, and a Master of Philosophy and Ph.D degree from Yale University. His publications include articles in the Harvard Business Review, Industrial Engineering, Production and Inventory Control, and other journals. He's the editor of Case Studies in Materials Requirements Planning, co-author of Project Management with CPM and PERT, and editor of Reading in Project Management, published by the American Institute of Industrial Engineers.

"We've turned out succeeding waves of bright, aggressive, articulate graduates who have been oriented towards finance and marketing and know almost nothing about the management of product quality---"

Dr. Edward W. Davis

PANEL 2: QUALITY'S IMPACT ON PRODUCTIVITY AND THE ECONOMY

MODERATOR: The Honorable Robert G. Dederick, Under Secretary of Commerce for Economic Affairs

MEMBERS: Dr. J.M. Juran, Chairman, Juran Institute

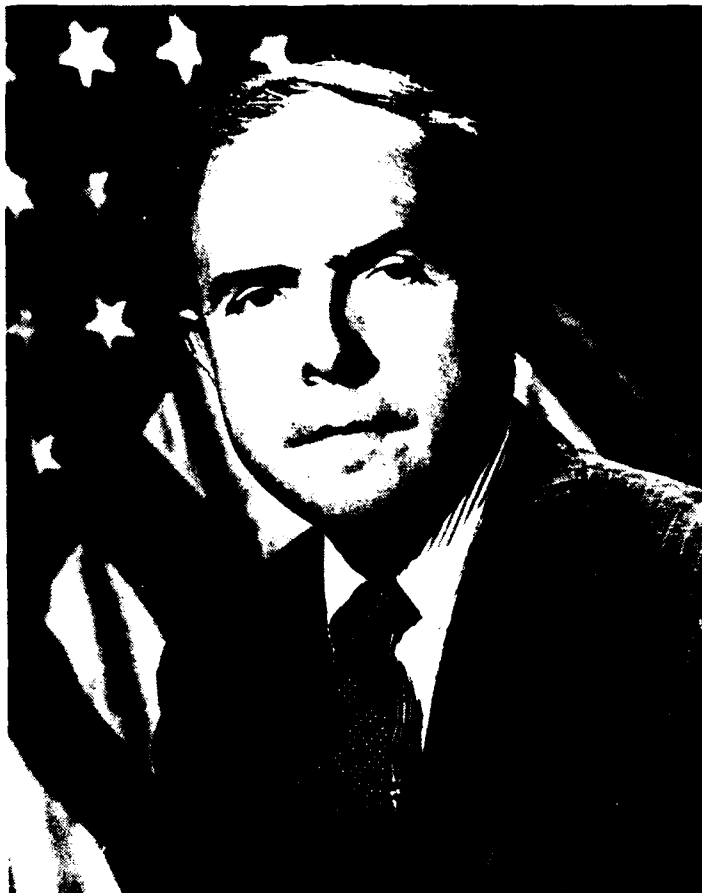
Dr. Alvin O. Gunneson, Chief Executive, Gunneson Group International

Dr. Leo E. Hanifin, Director, Center for Manufacturing Productivity and Technology Transfer, Rensselaer Polytechnic Institute

Mr. Jack Germain, Vice President and Director of Quality, Motorola



Pictured from left to right: Dr. Juran, Dr. Dederick, Dr. Gunneson, Dr. Hanifin and Mr. Germain.



Honorable Robert G. Dederick

Undersecretary of Commerce
For Economic Affairs

QUALITY'S IMPACT ON PRODUCTIVITY AND THE ECONOMY

BY THE HONORABLE ROBERT G. DEDERICK
UNDERSECRETARY OF COMMERCE FOR ECONOMIC AFFAIRS
DEPARTMENT OF COMMERCE
WASHINGTON, DC 20330

TEXT

It is time for panel #2 by my watch; in fact, it's well beyond time for panel #2 by my watch, which isn't of very high quality. But, in any event, our subject is quality's impact on productivity and the economy, and my name is Robert Dederick. I have been permitted to introduce the group on one condition--that I not talk much myself.

Being an economist, though, I can't help but say a few words. After all, even though we economists may not be known for quality ourselves, at least when it comes to our forecasts, we do appreciate its importance. Now I had some rather scholarly remarks which I was going to give in my allotted five minutes, but I ran into Secretary Baldrige just before coming over here. That's a polite way for saying that he ordered me to come up to his office. So I went up. I said I can't stay very long, though, because I am going to moderate a panel that begins at 10:30, and so I am going to have to leave you. So he said, what's the subject, and I said, it's quality control. He said, OK, well here's what to tell them. And so that was the end of my remarks.

Basically he said, tell them this: the problem in quality, at least part of it, is that today's managers don't have experience on the shop floor. Secretary Baldrige did work there. He did not wear a white shirt, he tells me, until he was age 28. And he thinks that is very important. It is his experience that two generations of managers have gone directly from business school over into those more rarified quarters where white shirts are in style, they completely bypass the work area. And, as he sees it, this means that they miss a very valuable experience, something which really penalizes them the rest of their lives. He said they do not understand workers; they really cannot speak with workers.

We see the results in lower quality over time caused by poor labor-management relations. Well, I pass on that message. Secretary Baldrige has certainly done very well himself, and so I am sure that it's right. I, regrettably, am one of those people who never saw the shop floor, and that is why I am working for him rather than having him work for me, I suppose. So, now I have a number of people to introduce. Invocation is over, you will be happy to know. We have four experts with us today along with this non-expert. They are only going to get one introduction today in the interest of productivity, and I'll give that now. Then, when it's time for them to speak, I'll just give their names. In another way of being productive, they don't have to take the time to work their way up from the table to the microphone and back. They can do their speaking from the table. I owe that suggestion to one of our panelists. I didn't have that idea myself.

Prior to being nominated to his present position by President Reagan, Dr. Dederick held corporate positions in the banking and insurance industries. He was Senior Vice President and Chief Economist of the Northern Trust Co. of Chicago. He served as an economic research manager for New England Life Insurance Company. Dr. Dederick has taught economics at Harvard, Cornell, and Boston Universities. Borne in Keene, N.H., he received a Ph.D in economics from Harvard University. Dr. Dederick is a fellow and former president of the National Association of Business Economists. He has held offices in many professional and business organizations that include the U.S. Chamber of Commerce, the American Economic Association and The American Bankers Association.



"--even though we economists may not be known for quality ourselves, at least when it comes to forecasts, we do appreciate its importance."

Dr. Robert G. Dederick



Dr. Juran with luncheon party



DR. J. M. JURAN

CHAIRMAN
JURAN INSTITUTE, INC.

QUALITY'S IMPACT ON PRODUCTIVITY AND THE ECONOMY

BY DR. J. M. JURAN

CHAIRMAN, JURAN INSTITUTE, INC.

866 UNITED NATIONS PLAZA

NEW YORK, NY 10017

ABSTRACT

THE IMPACT IS HUGE

The most dramatic public evidence of this impact is the stunning setback we have had in product salability in the world markets. Well known examples include: automobiles, steel, electronic components, machine tools.

Less obvious to the public but well known within the industrial companies is the visible chronic waste: scrap, rework, product recalls. It runs to about 15 percent of sales in our manufacturing industries, and it runs on and on. That 15 percent is an immense sum. We don't know what is the figure for our service industries, but we suspect the worst.

Least obvious but most ominous is the threat to continuity of our industrial civilization - continuity of essential services: power, communication, transport, data processing; protection of human safety and health; protection of the environment. Our protective dikes consist of the quality of the goods and services which make our industrial civilization possible.

Let's now look at several major deeds we can do to reduce the damage done by these impacts.

1. Revise the process of bringing new products to market. The present process all too often results in costly design changes, serious delays, and much product dissatisfaction in the market place.

Before we can revise this process we must first carry out a study of history - a review of prior launchings of new products. During this historical review we log the numerous problems encountered, their causes and their remedies. We are then able to identify the "vital few" among the recurring problems - those which have done the most damage. Finally, we can devise changes in policies and practices to get rid of these vital few recurring problems, and thereby to improve dramatically the launching of new products.

I am dismayed at how little of this type of historical analysis is being done. The need extends beyond the launchings of new products and processes. There is also the need for:

Improving the systematic approach to procurement of goods and services.

Improving the quality of software.

Improving the quality of support operations, e.g., order editing, warehousing, etc.

I propose to give this concept of historical analysis the name: "The Santayana Principle," in honor of the philosopher who told us that "Those who do not study history are doomed to repeat it."

2. Reduce the carry over of failure prone features of old designs.

A major cancer eating away at product salability is failure proneness. The usual scenario is as follows:

A new product, embodying novel and useful features, meets with good acceptance in the market place. So far, so good. The product also turns out to be failure prone, so the manufacturer sets up a field service force to give good service. Then as new models are launched, the manufacturer is faced with a critical choice:

a. Go back to the drawing board and get rid of the failure prone features, or,

b. Carry over the failure prone features into the new models, but enlarge the field service force.

Our companies have generally chosen option b, with disastrous effects on their share of market.

What is really at issue here is who decides how to allocate a major company asset - the product development department. Right now that decision is made mainly by various project and marketing managers, each trying to carry out his mission of creating new sales. Each urges the design managers to come up with designs for new models with new salable features, or models which can be sold for new applications. These overtures do result in new sales but they also result in carryover of the failure prone features - these cancers - into the new models. The cancers then kill the entire product line.

The time has come for upper management to become personally involved in the decision of allocating the efforts of the product development department.

3. Institute annual quality improvement to reduce that immense chronic waste due to cost of poor quality - the scrap, rework, product recalls, etc.

The limiting factor here is not lack of propaganda, exhortation and slogans. The limiting factor is the lack of an organized approach to annual quality improvement. Such an approach requires that we:

a. Secure nominations from all sources, inside and out, as to what are the opportunities for improvement.

b. Screen these nominations and select the most rewarding to become the improvement projects to be tackled.

c. Establish teams with clear responsibility to carry these projects to a conclusion.

d. Establish progress reports to enable upper management to follow progress and to provide support to the teams.

e. Revise the system of evaluating managers to include performance on improvement projects.

This structured approach is similar to that followed in establishing the annual operating plan. Such similarity is worth some study since our record in meeting the annual operating plan is much better than our record in making annual improvements.

The most essential part of annual improvement is to institutionalize it so that it takes root and grows year after year. Right now we have companies, e.g. in automobile manufacture, which are making improvements at a pace unprecedented in their history. Yet unless they succeed in institutionalizing annual improvement the whole thing will give way during the next upturn in business.

These are just three of the major directions we should take. Now let me turn to the relation of all this to academia, government and industry.

With respect to academia let me note that we need a massive increase in training in the quality disciplines - the concepts, tools and skills associated with creating, improving and controlling quality. To date this training has been concentrated in the quality departments of the industrial companies. Those departments contain about five percent of the management hierarchies. We need to extend this training to the entire management hierarchy. That requires more than an order of magnitude of increase. Such an increase will impact millions of managers, supervisors and specialists.

I have been working in this field for nearly 60 years. At no time have I seen so favorable an opportunity for massive training.

In the past four years I have been a participant in nearly 200 meetings with upper managers who have cleared a day to talk about quality. They chose to spend that time because they are groping for new directions. They need to chart a new course for the company but they lack the special training associated with navigation for quality - training in the quality disciplines. Their subordinate middle managers also lack such training.

Extending training in these quality disciplines from that five percent in the quality department to the entire management hierarchy does require an order of magnitude of increase.

To date the degree granting sector of academia has remained mostly aloof from all this, except in the area of statistical methodology. This exception has been helpful but minor in relation to the total needs.

There have also been some examples of useful collaboration at the local level. Typically these have involved joint committees of quality managers and community college faculties to design special curricula for training supervisors and specialists in specific aspects of the quality disciplines.

Until now those of us in active practice in the field have not paid much attention to the possibility of academia playing more than a minor role in our needed revolution in quality. Our business schools have virtually ignored the subject. So have our engineering schools with the possible exception of the industrial engineering curricula. It would be welcome news indeed if this conference were to stimulate some new level of academia's participation in the needed revolution.

As to the role of government, I plan to discuss this at the Bottom Line II Conference in June, especially with respect to the Defense Department. At this present conference I can only observe that many years we have endured an adversary relationship between government and industry. Some degree of this is needed. However a series of prior administrations went well beyond this need and thereby did a lot of damage to the economy. I commend the present administration for its efforts to strike a more sensible balance.

The central role must be played by industry and specifically by the upper managers in industry. In every one of the cases I have discussed (and in others I have not discussed) the remedies require that upper management personally participate in policy formation, establishment of goals, planning, organizing, following progress, assuring that goals are met.

As yet our upper managers are not fully able to do all this, mainly because they lack training in the quality disciplines. It is essential for our upper managers to acquire this missing training. They can do this through:

- Participation in quality improvement projects

- Conduct of quality audits within the company

- Training by the book

I elaborated on this thesis during my remarks at the Bottom Line Conference last year, and respectfully refer you to the proceedings of that conference.

Dr. J. M. Juran has since 1924 pursued a varied career in management as engineer/industrial executive/government administrator, university professor, impartial labor arbitrator, corporate director, and management consultant. Dr. Juran is a worldwide authority in the specialty of management of quality control. He has authored books on quality control management that have collectively been translated into thirteen languages and has published over 200 papers. In the field of management, Dr. Juran has authored books that

cover the principles of breakthrough (beneficial change) and control (preventing adverse change) for managers as well as a publication which generalizes the work of the Board of Directors. A holder of degrees in engineering and law, Dr. Juran maintains an active schedule as author and international lecturer. He has been honored by professional and honor societies world wide. Of special interest is the Order of the Sacred Treasure, awarded by the Emperor of Japan.



"The most dramatic evidence of this impact is the stunning setback we have had in product salability in the world markets."

Dr. J. M. Juran



DR. ALVIN O. GUNNESON

CHIEF EXECUTIVE
THE GUNNESON GROUP INTERNATIONAL

QUALITY'S IMPACT ON PRODUCTIVITY AND THE ECONOMY

BY DR. ALVIN O. GUNNESON
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ABSTRACT

I hope today will result in a vision of what can be and a consensus of some practical steps which can be taken for quality improvement.

Our friends, the Japanese, have developed, through quality productivity, the most intense competition we have ever faced. Japan has prepared for this market assault for over a decade. While it will not take America a decade to recover, it will take attention and investment over the long term. The consequences of our inattention to quality has been severe, but it has raised our awareness of the importance of quality, in image, in market share, and in profit. It has also raised the quality of our products because America's executives are paying more attention to quality than ever.

Some executives have developed the courage to measure the cost of poor quality in their operations and found it to be staggering in its enormity. Cost of poor quality typically runs from 15 percent to 30 percent, while it should be 2 to 5 percent of operating costs. In addition to savings that can be accrued, quality and image improvement result in greater market share.

Some executives have learned that they must lead quality improvement. They have learned that the quality function needs their skills as well as their support. Some have learned that we can no longer inspect quality into products. We must build quality into them. Others realize that hasn't worked either because designers want to build quality into the designs while workers want to build quality into the products. Unfortunately, they run into a solid wall called senior management, saying, "it's good enough--ship it." The term, "we must build quality into our products," has become obsolete and many are now saying quality must be managed into the products and services of America.

Let's explore the situation: purchasing people are purchasing products without proper specifications; goods are being checked by inspectors at receiving who have not had proper training, using equipment that is not calibrated; products are being produced by workers who have not had formal training, who do not have written procedures and using equipment that is obsolete or malfunctioning. They have asked for improvements for years, their requests have fallen on deaf ears. In spite of the handicaps, they still produce some fine products of which America can be justly proud.

What should we do to move quality forward?

1. We must expand its meaning and its disciplines beyond products and services to include management actions as well.
2. We must also expand quality to include equipment and facilities.

3. Workers must be held accountable for performing to established requirements.
4. Executives must create an environment where quality is perceived as important. The rhetoric for quality is loud and clear. However, when they need billing, just about anything short of disaster is "good enough." Until this is reversed, the worker's heart and mind will not be dedicated to producing quality products.
5. There must be a formal organization for improvement.
 - a. There must be an effective quality policy with responsibilities assigned and resources allocated.
 - b. Quality improvement teams must be formed.
 - c. Goals must be set and improvement action must be set in motion.
6. There must be extensive training.
 - a. Management must be briefed on the effect of poor quality on market share, productivity, image and profit.
 - b. The blue collar worker must be given the tools to do the job, formal job training, and training in quality requirements.
 - c. Colleges and universities must react to this problem. We should seek to have everyone develop quality as an additional skill to facilitate correct performance in all careers.

In closing, America will not achieve quantum quality by building large technical quality assurance departments. We can do it by teaching everyone about quality skills and responsibilities. We can do it through executive participation and active involvement. We can do it by setting 100 percent error free work as the only acceptable standard. Thank you.

Before forming his own company, in Flanders, New Jersey, which assists U.S. multinational corporations implement formal quality and productivity improvement programs, Dr. Gunneson was Vice President for Quality worldwide for the Revlon Corporation. He was former Director for Quality with the General Instrument Corporation and has held executive positions with ITT and Bendix Corporations. He is Chairman of the National Advisory Council for Quality. Dr. Gunneson has undergraduate degrees in engineering and industrial psychology and graduate degrees in management, international business, and finance.

"I hope today will result in a vision of what can be and a consensus of some practical steps which can be taken for quality improvement"

Dr. Alvin O. Gunneson

"... the New York State government has been very cooperative. We have received a \$30 million, 40-year interest-free loan. . . . It is a real example of how industry, academia, and government can work together to solve the productivity and quality problems faced by the United States."

Dr. Leo E. Hanifin



Dr. Hanifin (left) looks out from control booth



Dr. Leo E. Hanifin

Director, Center for Manufacturing
Productivity & Technology Transfer
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QUALITY'S IMPACT ON PRODUCTIVITY AND THE ECONOMY

BY DR. LEO E. HANIFIN
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ABSTRACT

I am going to speak to the interrelationships between technology, productivity, and quality as they embody advances in productivity in this country, and how quality impacts technology and productivity. First, I would like to discuss the Center for Manufacturing Productivity and its purpose because they relate to the academic focus of the conference. We exist totally for the development of engineers and technologies for manufacturing. The center is within the School of Engineering, at the level of an academic department. The center conducts industrial sponsored research and development projects in areas of advanced manufacturing technologies. Extensive research has been completed in robotics, microprocessor control systems, sensory systems, process simulation and the application of interactive computer graphics. We are involved in the application of technology in manufacturing as it relates to productivity and quality. We have nine full-time project managers, all with industrial experience and at least a masters degree. They manage over 80 students working on advanced technology projects.

The name of the game today is computer integrated manufacturing. The advantages of integrating manufacturing technologies are great; decreased cycle times, inventories, time to market, and time for engineering changes. Industry's application of these technologies does not just decrease the levels of the above factors. It brings about changes of orders of magnitude. The advantages of the technologies associated with computer integrated manufacturing are being fully recognized by the top levels of American management.

The significance of these technologies to quality is also measured in orders of magnitude. Product is traceable with regard to the introduction of engineering and process changes, as well as product movement through the plant, distribution channels, and end users by part number and serial number. This facilitates the analysis of and development of solutions to quality problems in a timely manner. Low inventories and short cycle times result in very short pipelines that can be quickly purged if there are quality difficulties. The system can be quickly changed to implement corrective action. Furthermore, programmable sensors and automated inspection technologies are extremely responsive. This allows the elements of flexibility, automated inspection, and low inventories to reinforce each other.

An information system is at the center of computer integrated manufacturing. Product moves through the plant as an embodiment of data.

In order to drive the system, data must be transformed and transmitted from a design data base to the manufacturing floor. These transformations have to be accurate or else bad designs and bad processes will quickly be driven to the floor. You must have complete integrity of data and be able to test products and processes in such a way that only accurate, verified programs are presented to the production process. As you drive the minimum order quantity to one, the minimum design quantity can follow; totally verified programs controlling programmable processes on the floor are an absolute need, or else you are going to end up making more test parts than production.

COMMENTS DURING CASE STUDIES:

To take advantage of computer integrated manufacturing, a firm must have impeccable integrity in the system's data base and the transformations that occur as the data flows from design to manufacturing. There is also a need for imbedded process models to perform improvement/problem analysis. Another need is to go beyond off-line robot programming, to automated robot programming. These are all important because, if manufacturing is driven directly from the design data base, the translation itself is what ensures the quality of the product. You can compare the finished product to the design data base automatically to determine conformance.

In conclusion, I would like to say that computer integrated manufacturing systems will have an enormously positive impact on quality and productivity. Still, we must guard the integrity of the process, not with the traditional tools, but with very fast, accurate, and flexible noncontact inspection systems. We also have to guard data integrity and intelligent transformations with automatic verification. It is a big job. We have had help in doing our job from industry. Since this is a coming together of industry, academia, and government, I would like to tell you that the New York State government has been very cooperative. We have received a \$30 million, 40-year interest-free loan for the Center for Industrial Innovation to be completed in three years. This is the largest such grant by a state to a private institution. It is a real example of how industry, academia, and government can work together to solve the productivity and quality problems faced by the United States.

Prior to Dr. Hanifin's position at the Center for Manufacturing Productivity and Technology Transfer, he held managerial positions at Chrysler Corporation at both corporate and operations levels. Dr. Hanifin also has had extensive experience in the metallurgy and structural analysis areas at the Chrysler Engineering Division, Hughes Aircraft, and Aerojet General Corporations. Dr. Hanifin's dissertation work at the University of Detroit involved the simulation of large manufacturing systems.



"You and I in America cannot afford to be "good enough" in this growing, competitive market place. It is better to aim at perfection and miss, than it is to aim at imperfection and hit it."

Mr. Jack Germain



Mr. Jack Germain

**Vice President & Director
Of Quality
Motorola, Inc.**

QUALITY'S IMPACT ON PRODUCTIVITY AND THE ECONOMY

BY MR. JACK GERMAIN
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ABSTRACT

There is a myth in our country today about the seeming invincibility of Japanese industry. This ideology is supported, in fact, by good performance by many Japanese companies and by a very well coordinated public relations program. Together, they describe the increasing competitiveness by Japanese industry and one we, at Motorola, call the Japanese Challenge.

In early August of 1981, Motorola initiated a major corporate communications program to refute the notion that Japanese companies are invincible and that they somehow possess some mystique of superiority in whatever markets they choose to enter. There is no doubt that the Japanese are good competitors, especially in certain selected markets. They are creative, innovative and competent. They make excellent products with high manufacturing skill, good quality, and fine marketing. And they work hard at it.

The Japanese are a force to be reckoned with in world trade, but they are not invincible! If we are to keep pace with their very rapid advancement, it is we who must work harder, renew our dedication and sharpen our focus on well established techniques emphasizing quality improvements in design, manufacturing and support services.

In the 1980's, one of Motorola's most demanding tests will be, of course, to outpace the Japanese Challenge. Survival in the electronics marketplace depends more and more on the extent to which companies can respond with even more advanced, higher quality products. That is why quality has become our number one operational objective. At Motorola, quality is not an intangible standard of excellence, but a company-wide operational issue affecting every function. Quality is everyone's responsibility with management responsibility the key ingredient. After all, management runs the company. It sets the tone of the company and balances investment in R&D, distribution, manufacturing and ultimately customer satisfaction for the business.

Here, I believe, is an opportunity for our management schools to participate in this crusade and meet the Japanese Challenge. They should evaluate a rebalance of their curriculum and recognize that reliability and quality assurance issues are as much a part of modern business success as are profits, sales, and market share. We need to increase our management focus on diagnosing system faults and to plan up front all processes that will assure the customer's expected response to a business' product or service. We must recognize the importance of life cycle costs as a part of this process. We must avoid systems that permit sporadic outbursts of poor quality and the need for "fire-fighter" solutions.

Through my membership on the University of Illinois College of Engineering Industrial Research Advisory Board, I have learned about efforts to offer manufacturing options at the graduate engineering level. This is the right direction. More schools should consider offering quality and manufacturing courses as part of an engineer's education. In Japan, where quality concerns rank very high, nearly 21 percent of bachelors' degrees are granted in engineering, while here in America, that number is close to 6 percent. Continuing that status quo is going to make meeting the Japanese Challenge that much harder. Here's an opportunity for our academia to participate.

We, at Motorola, have recognized the critical need for a shift in management thinking. Our management at all levels gets involved through membership in management quality steering committee and awareness programs. It all adds up to integrated or system approach to quality improvement. The fundamental objective is the long term pursuit of perfection. It's a process all managers, all companies, must sign up for--to survive the complex years ahead. There is no longer room for the "that's good enough" attitude in what we make or what we do. The "good enough" philosophy limits the extent of our success. By the mere statement, "that's good enough," we have told ourselves to stop. Do not reach for further excellence. You and I in America cannot afford to be "good enough" in this growing, competitive marketplace. It is better to aim at perfection and miss, than it is to aim at imperfection and hit it.

We at Motorola have strengthened our determination and commitment to win--and winning means running our business better than the Japanese runs theirs. It means excellence of quality from managers to front line workers. It means planning, budgeting, and execution of sound improvement programs. It means righting the misperception that Japanese competitors are invincible and inevitable winners in any economic contest.

So, at Motorola, our goal is the pursuit of perfection. And that is, of course, the ultimate response to the quest for total customer satisfaction. It is our true definition of what quality is all about.

Mr. Germain is Vice President and Director of Quality of Motorola, Inc., Schaumburg, Illinois. Mr. Germain holds a bachelor's degree in electrical engineering from the University of Connecticut (1950) and did additional graduate study at Northwestern University, Evanston, Illinois. He holds five patents in the field of Land Mobile Communications, is a member of Electronic Industries Association's Land Mobile Policy Committee, and an active member of the Institute of Electrical and Electronics Engineers. In addition, Mr. Germain belongs to Tau Beta Pi Honorary Engineering Society and Eta Kappa Nu Honorary Electrical Engineering Society.

PANEL 3: QUALITY'S IMPACT ON DEFENSE READINESS

MODERATOR: General Robert T. Marsh, Commander, Air Force Systems Command

MEMBERS: Admiral John G. Williams, Jr., Chief of Naval Material

Lieutenant General Donald M. Babers, Deputy Commanding General for Materiel Readiness, U.S. Army Materiel Development and Readiness Command

Lieutenant General Harold A. Hatch, Deputy Chief of Staff for Installations and Logistics, U.S. Marine Corps



Pictured from left to right: Adm. Williams, Gen. Marsh, LTG Babers & LTG Hatch



GENERAL ROBERT T. MARSH

COMMANDER
AIR FORCE SYSTEMS COMMAND

QUALITY'S IMPACT ON DEFENSE READINESS

BY GENERAL ROBERT T. MARSH

COMMANDER, AIR FORCE SYSTEMS COMMAND

ANDREWS AIR FORCE BASE

WASHINGTON, DC 20334

TEXT

I am honored to participate in the second Bottom Line Conference, and I am especially pleased to join this distinguished group of defense leaders here on the panel. I have chosen to wait and introduce them just prior to their speaking. Our format is going to be to give you our views first and then take questions and answers after all of us have had a chance to speak.

The last year's event was a rousing success and I'm sure the same will be said of this gathering. Admiral Grinstead and DLA, I think, are to be congratulated on their foresight and commitment to giving the issue of quality the attention it so badly needs. It's most appropriate that academia is so well represented. I think there is much that you can do to help improve the quality of our weapons. The purpose of this panel is to give you some appreciation for the role of quality in defense and its impact on our readiness.

Well, said as simply as possible, product quality has an immense and wide-ranging impact on defense readiness. First and foremost, our weapons must function correctly wherever and whenever they are called upon. The United States has built its defense on the concept of technologically superior weapons. And, although we are faced by adversaries possessing numerically superior forces, we responded with fewer but relatively more capable high quality weapons. If this defense philosophy is to continue to be effective and deter aggression and conflict as it has done for so many years, we must have supreme confidence in the capability of our weapons.

Equally important, the other side must perceive that our weapons are effective and thus fear to confront us on the battlefield. Now this is a delicate balance, one that can be undone by quality problems in our weapons. Imagine the consequences, if you will, should a hidden flaw suddenly show up in the guidance system of the country's strategic missiles. Fortunately, the United States has never experienced such a situation, but there have been instances of an entire fleet of our combat aircraft being grounded temporarily while modifications were made to correct problems that never should have gotten by the designer, much less through the factory door. We've weathered these problems, but what if they had surfaced during wartime or during a crisis?

Quality problems impact defense readiness in less dramatic ways as well. To maintain a high state of readiness in peacetime, we exercise our forces constantly, under realistic wartime conditions. As a result, our armed forces constantly operate in a most demanding and often dangerous environment. When one of our pilots goes up on an operational training or test mission, he and his machine are stressed to the limits of their capability. And the integrity of every single component counts. Quality problems show up as aborted missions, ineffective training and even, unfortunately, with life threatening consequences.

Lastly, quality impacts readiness through its effects on weapon system costs. In today's economic climate, this is of significant importance. We must make every single dollar of defense funds pay off in actual combat capability. And every dollar spent to find and correct quality problems in a weapon means a dollar's worth of capability lost forever, at least a dollar's worth. If you include the intangibles, such as a loss of confidence by the Congress or the public that we are spending their money with minimal waste, the loss of capability may be a lot more than one for one. We are not talking about trivial sums. A rather informal look at Air Force contracts, the year before last, revealed that at least \$570 million was blown away by scrap, rework and and repair, funds that never would have been wasted had quality been designed-in from the start.

And herein lies the thrust of my concern. We must change our way of thinking. We must concentrate on preventing quality problems rather than relying on costly inspections to find the flaws and fix or discard components. I am confident that my colleagues and I share the same concerns about quality and readiness. In our respective services, we are responsible for new weapon systems from their infancy, as concepts in the planner's mind, through the years of their operational use. We receive requirements from the operating commands, the commands that will actually use the weapon in peacetime or war, and translate those requirements into technical specifications. Operating through civilian contractors, we then oversee and manage the actual design, production and testing of the weapon. After successful testing, the system goes to the user.

But our responsibility does not end at that point. In Air Force Systems Command, we like to think of our role much like that of an auto manufacturer; we must provide a warranty, but not for five years or 50,000 miles, whichever comes first. Defense does not have the luxury of trading airplanes in at 50,000 miles. Look at the B-52; it's been flying for nearly 30 years. It's this long term commitment aspect of my job that is one of the prime drivers of my concern for quality. I must concentrate on giving the Air Force the best new weapons. I do not want to dilute that goal by having to fix things that I didn't do right the first time.

In AFSC we are stressing to our managers that up-front quality saves money and effort. We estimate that one dollar spent in the early design phases of a program avoids spending ten dollars or so during later development to fix the problem. Fixing the same problem during production can cost a hundred dollars. Wait until after the weapon is in service and the job can cost a thousand. A thousand to one payoff should impress anyone and convince them to concentrate on quality from day one. When you find that 95 percent of the total lifetime cost of a weapon is locked up, built in, before it completes the development phase and enters production, you really sit up and take notice.

Unfortunately, we seem to have a long way to go before this conclusion becomes ingrained in our technicians, managers and engineers and affects their way of thinking. Frequently, we have found that quality did not receive enough emphasis as our program managers and technical people pursue their education. It basically received attention in manufacturing and industrial engineering courses, which focused on the inspection aspects of quality. The result of this lack of quality emphasis is a generation of

many managers and engineers who don't really understand quality. They seem to think of it as the responsibility of someone else's department, when in fact, it is everyone's responsibility. They don't look at designed-in quality as a tool to reduce cost and schedule, and improve performance.

So, what can we do to turn things around? We can concentrate on management emphasis and force quality considerations into the early phases of our programs; assure that designers, materials, and process experts and production specialists are all pulling in the same direction. We can let our prime contractors know that we won't tolerate paying for poor quality and incentivize them to pass this discipline down to their subs, suppliers and vendors. And we can establish dollar incentives for top quality performance.

We're doing all of these things in DoD. Further, many of the defense contractors have active internal initiatives to improve the quality of their product. As a result, we see some grudgingly slow progress and there seems to be a growing awareness of the issue; but I must say the types of efforts I've described are very much in the model of teaching an old dog new tricks. We need to move quality out of the squeaky wheel school of management and into our daily business practices.

There's a lot of potential in this room to get things moving in the right direction. If we produce engineers and managers with a solid appreciation for quality's relationship to their speciality, we'll build the proper foundation. Engineers must have enough practical understanding of manufacturing methods, processes and problems to permit them to make intelligent design trades that avoid downstream problems. Production managers need sufficient technical expertise to spot problems in designs and provide feasible input to the designer to enhance quality production. In short, they need to have some of their focus moved off quality control inspection and more to methods to reduce the need for such inspection. Managers must be given an appreciation for the role of quality in their decision making. They must recognize the cost impact of poor front-end design so they will give quality the emphasis it needs in early program planning and decision making. And a key point for new managers is an awareness that managing quality doesn't simply mean an occasional session with the chief of quality control inspection followed by a carpet session with the production manager. Managers must take responsibility for making sure that designer, planner, controller and production specialist work as a team to give quality the proper treatment throughout a product's development.

When we produce graduates with these skills and thought patterns, I believe we will find quality problems become things of the past. I would not pretend to know how to structure specific curricula to achieve these goals, but I am greatly encouraged that academia is well represented here today. Your concern and interest in this issue have already made progress on this front. I am confident the momentum will not be lost.

I look forward to hearing your ideas either during the question and answer period or after you have had time to return to your institutions and consider what you have heard here at this conference. This problem needs the best thinking we can offer and our national defense will benefit greatly. Every dollar of cost we avoid through better quality will mean one more dollar that can provide meaningful capability from the defense budget.

Thank you very much.

General Marsh was inducted into the U.S. Army Air Force in 1943. In 1945, he received a regular army appointment to the U.S. Military Academy, West Point. He graduated in 1949 and was commissioned into the U.S. Air Force. Subsequently, he earned his M.S. degree from the University of Michigan in Instrumentation and Aeronautical Engineering. General Marsh was project officer in the NAVAHO and the Matador/Mace weapon systems project offices. He has served as a staff officer in the Directorate of Reconnaissance and Electronics Warfare. He later became chief of Project Division in the Directorate of Space. In his first assignment to the Air Force Systems Command Headquarters, General Marsh served as deputy chief of staff for development plans. He later became deputy chief of staff for systems and was appointed vice commander in August 1975. General Marsh later became commander of the Electronics Systems Division, Hanscom Air Force Base. He assumed his present command in February 1981. General Marsh's experience is in both aircraft maintenance and aerial gunnery; atomic weapons and radiological safety; atomic weapons assembly, and storage; armament and electronics; and, missile and space systems. General Marsh has received many military decorations and awards including the Distinguished Service Medal, the Legion of Merit, and the master missile badge.



"Defense does not have the luxury of trading airplanes at 50,000 miles."

General Robert T. Marsh



ADMIRAL JOHN G. WILLIAMS

CHIEF OF NAVAL MATERIAL

QUALITY'S IMPACT ON DEFENSE READINESS

BY ADMIRAL JOHN G. WILLIAMS, JR., U.S. NAVY
CHIEF OF NAVAL MATERIAL
NAVAL MATERIAL COMMAND
WASHINGTON, DC 20360

ABSTRACT

Quality means something different to all of us. My definition of quality is that a product works when it is supposed to work, it does what it was intended to do, and it endures. This definition gets to be particularly demanding in the Navy. We operate in all of the mediums: air, surface, and subsurface. Thus, quality is very important to us. Quality involves people, processes, and facilities. Among these, the active element is people. They, in fact, influence and provide for quality control of processes and facilities. So when we talk about quality and quality control, we must know that the attitude is toward quality, and what level of performance we can expect.

This begins with our own level of performance. This concept certainly applies to academia. We read much these days in the newspapers and magazines about the fact that we are turning out scientific illiterates from our colleges. In the business of high technology, if that in fact is the beginning, then quality, obviously, has no chance. We in the Naval Material Command go through a series of stages in our process of doing things to buy and support the instruments necessary for the conduct of war at sea.

First is the decision stage. This involves carrying the idea to a workable prototype. The people in our organization who are involved in this part of the process tend to be led by the engineers and scientists in our research and development centers. Ideas know no institutional boundaries, and it is our task to keep the quality of our people high.

After the decision process comes the product development. It is in this stage that our program managers in our systems commands, working with our research and development center engineers as a team, contract with industry for production. This is the most critical stage in the entire process. At this stage you know the what of performance, but you don't know the how-to. Thus, it is hard to judge a how-to competition. All the development history within the Naval Material Command indicates to me that the best way to ensure a quality product in the development phase is to have an in-house capability with enough experience to adequately judge the product of industry.

After the development phase comes testing. This stage brings our operational task forces in the act. Testing for quality involves a combination of things. First, of course, the product must be tested against objective and specified standards. Testing to specifications is the easy part. Incorporating the subjective human element and the projection of ultimate utility in war is the tough part. The ultimate testing of our weapons is like testing our parachutes--if the first try doesn't work, there are no second chances. We are back to the integrity

After testing, the next stage in the process is the actual production. The criteria for quality at this point shifts from performance to reliability. The incentive for the actors shifts from meeting the design of conformance standards to turning out a product at the lowest cost. This force in function of costs and profit competes with concern for quality. There are tremendous demands placed on the program manager and his industrial counterpart to not let the quality of the product that has flowed through the research and development and testing phases fall apart now at the manufacturing stages. The dominant player in this part of the process is industry.

The next stage of the process within the Naval Material Command is the installation and deployment with the follow-up to that being support. Once we have gotten an idea, developed it, tested it, and produced the product, the long-haul, the unglamorous things begin. Quality consists of seeing that the equipment can be maintained, operated, and fixed when it breaks. It deals with the people who work on the gear we produce. It involves the morale and attitude of the users as much as the efficiency of the process. It is this continuous lifetime of deployment tasks of support that, to me, drives the bottom line of quality. Will it work when it's needed, will our parachute open when we jump, will the submarine resurface after a dive?

In summary, I have told you that in the Naval Material Command we divide our process into phases, and quality takes on a different perspective at each of these phases. If you skip quality in one phase, you cannot put it back in another phase. You cannot test in quality. Finally, I've emphasized that in all phases, the key is people and their adherence to quality, standards which are absolute, not relative. With practice, I believe this philosophy will take us from the practice of talking about quality to getting on with it and producing quality. Thank you.

Admiral Williams is the Chief of Naval Material in Washington, DC. He graduated from the U.S. Naval Academy in June 1946. His key assignments include being Commander of three submarines; Deputy Chief of Staff for Logistics and Management, to the Commander, Submarine Force, U.S. Atlantic Fleet; Chief, Navy Section, Joint U.S. Military Mission for Aid to Turkey; Submarine Group Commander; Director of the Navy Program Information Center; Deputy and Chief of Staff, U.S. Pacific Fleet and Deputy Chief of Naval Operations for Submarine Warfare.

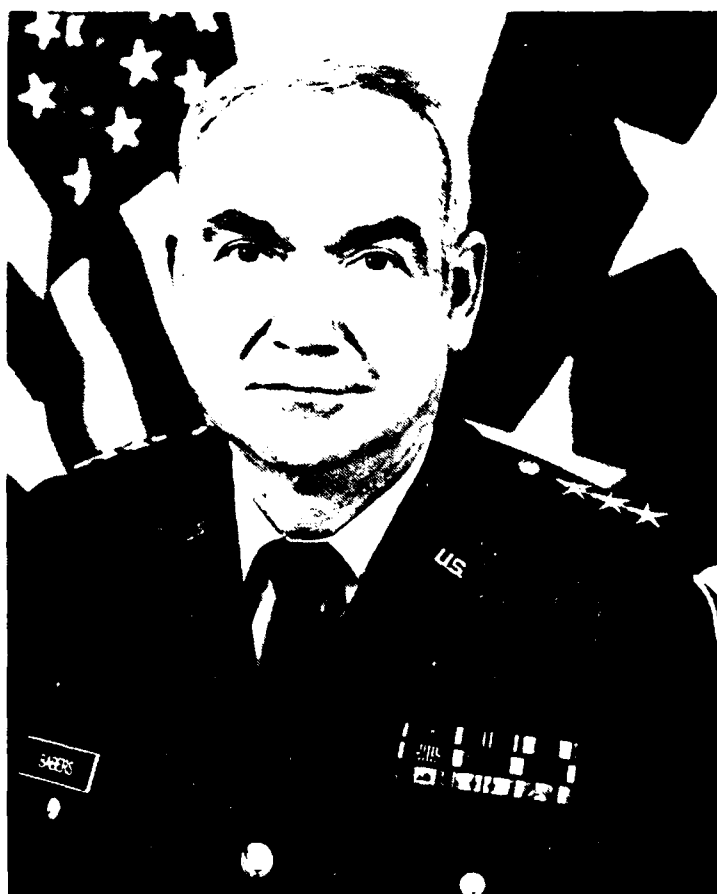
"If you skip quality in one phase, you cannot put it back in another phase."

Admiral John G. Williams



"Our soldiers, sailors, and airmen become captive to the goods that industry sells us."

Lieutenant General Donald M. Babers



LIEUTENANT GENERAL DONALD M. BABERS

DEPUTY COMMANDER
U.S. ARMY MATERIEL DEVELOPMENT
AND READINESS COMMAND

QUALITY'S IMPACT ON DEFENSE READINESS

BY LIEUTENANT GENERAL DONALD M. BABERS
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ABSTRACT

The Army has one command that manages both research and development and field support--DARCOM--the Materiel Development and Readiness Command. General Keith, DARCOM Commander, has two Deputy Commanders. Lt. General Lunn is responsible for research and development, and my responsibilities include procurement and field support and contract production. I have been involved in Army Logistics for most of the last 25 years, including assignments as program manager for the M60 and M1 tanks and a major truck program.

During my first assignment as a program manager we were asking the same questions we are asking today: Why weren't we designing in up-front quality? Why weren't we designing in producibility? Why didn't the quality assurance people have enough stature and prestige? Did our engineers know what was occurring on the production floor? I'm sure you've heard these before, so it's not that the problems haven't been recognized in the past; it's a fact that all of us in this institution, this body, academia, Government, and industry have not attacked or resolved the problem.

Let me describe the environment in which we operate. Each year within our command, we obligate billions of dollars for hundreds of thousands of contracts to tens of thousands of contractors. We have a number of quality assurance people, including key inspectors, who work with Government people in plants to ensure that we're getting what we're paying for.

Some of those Government people belong to the Services, some belong to Admiral Grinstead in the Defense Logistics Agency. But, at any given time, for these hundreds of thousands of contracts and billions of dollars worth of undelivered goods, we probably have less than 10,000 total inspectors. It costs money to inspect--it costs too much money. But it doesn't cost nearly as much as having that tank let you down when you're in battle. It doesn't cost near as much as it does to ground a fleet of airplanes or helicopters or tanks. We must ensure that we don't push hardware out the door, give it to our soldiers, and make them the final inspectors.

Our environment is different than private industry's. If they don't like what Motorola sells them, they can go to some other competitor here in the United States. They can go to Japan. But our soldiers, sailors, and airmen become captive to the goods that industry sells us. Whether it's good or bad, they have no choice but to live with it. The Defense Department recognizes this, and I believe that over the past two years we

have seen a greater commitment to improving the total product assurance process than at any given time during my involvement in this business.

A big push has been on within the Defense Department and Congress to "incentivize" industry to spend more money, to buy updated machines and tools/equipment that will hold tolerances more closely and reduce some of the human errors contributing to quality problems.

I like what Mr. Baldrige said this morning, "Let's make sure that the people on the drawing board understand what goes on the factory floor." I believe this means that the quality engineer ought to have some idea of what goes into producibility and what goes into the final inspection of an item. And I believe people within all disciplines, whether finance, engineering, logistics, management or procurement need to know what goes on in the environment where the product is going to be fabricated, built, or constructed. And I think it helps to know the environment where it's going to be used.

I stress the need for "cross-fertilization" in developing a course of instruction, in producibility, whether it be an MBA program or an engineering program. This has to take place, and to the extent that it cannot be done within academia, those of us in the institutions who are going to make use of those professional people must assume the responsibility. Within industry, training programs must be established including the quality producibility aspect. Within the Army, Navy, Air Force, and Marines there must be that cross-fertilization, so that managers at each level know how the product is going to be used and where; how it is going to be built.

We in the Army deal with tens of thousands of firms, and some of them are doing a great job in terms of quality. But we shall have quality problems. Jointly we all have them. The problem pervades all commodities, all industries.

All of us have work to do. Let's work on quality together. Let's do it now.

Lieutenant General Babers is the Deputy Commanding General for Materiel Readiness, US Army Materiel Development and Readiness Command. Since receiving his commission in May 1954, his key military assignments have included Battalion Commander; Military Assistance Command in Vietnam; Commander, 126th Maintenance Battalion; Project Manager, M561/XM705 Truck Vehicle Program; Director for Procurement and Production, US Army Tank-Automotive Command, Warren, MI; Project Manager, M60 Tank Production; Project Manager, XMI Tank Systems; and Commander, US Army Communications-Electronics Command, Fort Monmouth, NJ. He holds a Master of Business Administration degree from Syracuse University and is a graduate of the US Army Command and General Staff College and the Industrial College of the Armed Forces.

"Training to us means readiness, readiness means being able to leave this afternoon, not tomorrow, not next week. We go with what we have."

Lieutenant General Harold A. Hatch



General Hatch (center) enjoying lunch



LIEUTENANT GENERAL HAROLD A. HATCH

DEPUTY CHIEF OF STAFF
FOR INSTALLATIONS AND LOGISTICS
HEADQUARTERS, U. S. MARINE CORPS

QUALITY'S IMPACT ON DEFENSE READINESS

BY LIEUTENANT GENERAL HAROLD A. HATCH
DEPUTY CHIEF OF STAFF FOR INSTALLATIONS
AND LOGISTICS, UNITED STATES MARINE CORPS
HEADQUARTERS, U.S. MARINE CORPS
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ABSTRACT

I am very happy to be here with this distinguished group. I am a member of the Joint Logistics Commanders representing the Marine Corps and I always end up speaking last. As a result of speaking last, I've believed that you don't necessarily depend on the notes or the outline that you previously had or you may in fact say what the guy in front of you just said. I decided the easy way out is to talk about the Marine Corps.

There is no way I can tell you about the Marine Corps in ten minutes. So, I am going to take three small areas and perhaps encompass the entire Marine Corps: people, training, and materiel. We are doing real well in the Marine Corps in the first two.

We decided seven years ago we would have quality in the Marine Corps whether we had quantity or not. One of the first things decided was that in the enlisted ranks, we were going to increase by large numbers the percentage of bona fide (meaning four years of high school) high school graduates. We didn't make the 65 percent goal the first year, 1975, but we've been increasing ever since. I think I heard this morning we are above 92 percent today. I feel real good about that. That is doing a lot of things for us.

Training: Even in our dark days, in our lean years, we trained. We might not have had good places to live, may have gone to broomsticks hollering POP! POP! when we trained in the boondocks, but, we kept training. We didn't have enough ships to train on, we didn't have enough planes to fly, we didn't have enough ammunition to shoot, we were using trucks probably older than the men who were driving them but, we continued to train the best we could. Training to us means readiness, readiness means being able to leave this afternoon, not tomorrow, not next week. We go with what we have. However, the quality of our training has always stayed up.

Materiel: We had some poor years in the late seventies in terms of funding, but we kept our materiel readiness above 85 percent. We are now replacing a lot of that stuff that is too old, obsolete, can't buy spare parts for, spending more time maintaining, spending more dollars maintaining than we should and the modernization is coming along well. So the quality of our materiel as we see it today is improving. We have had some problems with the crash fire rescue trucks. We are jointly working with the Air Force in replacing these trucks and I hope better quality assurance efforts are made on replacements. The bottom line is that the product should have been good in the first place. Thank you.

Lt. General Hatch has had a long and distinguished career in the Marine Corps dating back to 1942. He has served at all levels and in all roles within the United States Marine Corps and is today the Deputy Chief of Staff of USMC for Installations and Logistics and a member of the Joint Logistics Commanders.

PANEL 4: HOW CAN ACADEMIA POSITIVELY IMPACT QUALITY

MODERATOR: Mr. Thomas J. Murrin, President, Energy and Advanced Technology Group, Westinghouse Electric Corporation

MEMBERS: Mr. Erich Bloch, Vice President, Technical Personnel Development, IBM

Mr. Willis J. Willoughby, Jr., Deputy Chief of Naval Material (Reliability, Maintainability, and Quality Assurance), Naval Material Command

Dr. David H. Ponitz, President, Sinclair Community College and Representative of the American Association of Community and Junior Colleges



Pictured from left to right: Mr. Bloch, Mr. Murrin, Mr. Willoughby and Dr. Ponitz.



"Academia and it's leadership must become more interested and better informed on the kinds of challenges that we're facing."

Mr. Thomas J. Murrin



MR. THOMAS J. MURRIN

**PRESIDENT
ENERGY AND ADVANCED TECHNOLOGY GROUP
WESTINGHOUSE ELECTRIC CORPORATION**

HOW CAN ACADEMIA POSITIVELY IMPACT QUALITY

BY MR. THOMAS J. MURRIN
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TEXT

It's a pleasure to be with you today and to be part of this distinguished panel. It's also a privilege to be able to talk to you, a most important audience, about the critical subject of quality. I'm very hopeful that such conferences will spur substantial quality and productivity improvement throughout our country.

With me today are three outstandingly qualified gentlemen representing industry, government, and academia. And they'll appear in that order after I make a few comments--Eric Bloch from IBM, Will Willoughby from the Naval Material Command, and Dave Ponitz from the Sinclair Community College. And, time permitting, as has been the case during the day, we'll welcome any questions you may have or comments that you care to make. So let me start with just a few introductory comments which I hope are relevant and are of some interest.

During the past several years, we at Westinghouse have been concentrating a great deal of attention on the subject of quality and productivity. Based on our extensive studies, it is quite clear that quality improvement literally results in productivity improvement and, in turn, contributes substantially to international competitiveness. Therefore, in turn, quality relates importantly in the total sense to our national standard of living, and indeed also to our national security. Recognizing this, we began an intensive effort four years ago toward improved quality and improved productivity. We've set goals throughout the corporation for quality and productivity improvement. We're hopefully making this a way of life.

The results of some of our initiatives are truly exciting and satisfying. In my view, this is the most challenging and promising program that we have ever undertaken in our almost 100 years of existence, and it probably is also the most important. We are convinced that similar efforts must and should be made throughout American industry. American companies can and should do much to improve quality because we do have the technology, the people, and the other resources to be preeminent in this regard.

We are convinced, however, that no matter what we do in our individual companies we need the cooperation and support from government, from labor, and from academia if, in the aggregate, our nation is to compete successfully, particularly with the Japanese in the industrial and commercial arena, and with the Soviets in the political and military arena. Accordingly, quality and productivity improvement must have top priority from all of our leaders, including you in academia. Academia and its leadership must become more

interested and better informed on the kinds of challenges that we're facing. This has not been the case, at least in my experience, as suggested by the virtual absence of substantial information on quality and productivity in most college curricula, and when it exists, if it does at all, it typically is about 15 years out of date. It typically talks glowingly, for example, of our annual national $3\frac{1}{2}$ percent real productivity gains, and unfortunately we have not enjoyed that situation for 15 years. It is extremely important, I think, that academia become much more knowledgeable about our crucial competitors and to adjust curricula accordingly.

I think this is really significant. When on occasion we do teach these subjects, we still tend to promote the concepts and the practice of AQL's or so-called acceptable quality levels, and EOQ's, so-called economical ordering quantities. Those of you who are familiar with Japanese competitors know that both of these American concepts are literally noncompetitive, in fact obsolete. We would be better served not to waste our time learning about AQL's and EOQ's, at least not the way our current texts communicate them.

In the military arena, to assume or assert that Soviet equipment is not reliable or maintainable, as virtually all of our citizenry seem to be convinced is the case, is frightfully misleading. I've been privileged to have a series of classified briefings which indicate to an extraordinary degree that the Soviet military equipment works very well, is readily maintainable, is of surprisingly high quality, and is reliable.

Let me suggest a four C's formula to quality improvement and international competitiveness that we might consider adding to our traditional three R's, which perhaps in turn have to be resurrected after hearing the Commission's report earlier today. The four simple C's I suggest to you are as follows. First, a crisis does exist, it's real and we must effectively respond, and hopefully soon. Second, to meet the crisis, cooperation must greatly increase among academia, government, labor, and business. Third, consulting, in the broader sense of that relationship, should greatly increase among these now quite disparate sectors of our society, and particularly from academia. This I think will benefit all involved. Fourth, and finally, as has already been suggested today, curricula changes must be expedited, not only to assure that we are competitive in the crucial quality and productivity arena but also to promote and popularize involvement in these subjects by our outstanding college students.

Since joining Westinghouse in 1951, Mr. Murrin has held engineering and field management positions in the United States and Europe while working his way up the corporate ladder. Mr. Murrin earned his undergraduate degree from Fordham University and has done graduate work at the University of Pittsburgh, Penn State University, the University of Georgia, and Carnegie-Mellon University. In his present position, Mr. Murrin is responsible for Westinghouse's worldwide operations in aerospace and defense systems such as nuclear reactors, electronic countermeasures, and missile handling and launching. Mr. Murrin is a member and past Chairman of the Board of Governors of the Aerospace Industries Association. He is a member of the Secretary of Defense's Defense Policy Advisory Committee on Trade and a member of the U.S. Army's Science Board. Mr. Murrin's honors are many and include such prestigious awards as the Encaenia Award.



"Academia must examine the educational systems of other industrial nations----We must learn from their successes and adjust our academic offerings to meet the changing requirements and shifting competitive realities."

Mr. Erich Bloch



MR. ERICH BLOCH

VICE PRESIDENT
TECHNICAL PERSONNEL DEVELOPMENT
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HOW CAN ACADEMIA POSITIVELY IMPACT QUALITY

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ABSTRACT

We need not belabor the quality and productivity issues in the United States; enough has been said of these issues to fill libraries. I will summarize the problem in order to set the stage for discussion of how academia can assist in providing a solution.

Productivity and quality did not suddenly get worse in the U.S.; but the rate of improvement has not been sufficient to satisfy requirements relative to customer demands nor has it been enough to satisfy requirements relative to significant gains made by foreign competitors.

The impact of the quality and productivity problem on the United States has been tremendous--balance of payment deficits, eroded reputation, loss of jobs, and a threatened way of life are some of the effects most often cited.

The problem is complex--it has many facets that run deep in our culture and permeate every segment of our society. Lasting solutions will require the synergistic efforts of industry, labor, academia, and government--actually everyone--working together.

The following suggestions will be presented to the panel on how academia can support the quality and productivity thrust.

Academia should examine their own total operational environment to ensure compliance with the principles of quality. Industry has made appreciable progress toward that goal through better people and resource management, product design procedures, process improvement and defect prevention. Academia should take advantage of what industry has learned and assure that their programs are current with respect to requirements and technological advances. Through such a self-appraisal, many new concepts, tools and techniques could be discovered that will be useful to all of us.

Academia must not be concerned with numbers; rather, they should be concerned with the quality of graduating students. They must examine and prescribe the proper cure for our ailing educational systems--top to bottom.

There is a general lack of knowledge and skills regarding quality management and quality technology. Quality concepts and tools must become an integral part of our formal education process. These concepts and tools must be taught to every worker, every supervisor, and every manager.

Academia must begin now to include quality education in every curriculum of every discipline. Business schools must balance their focus on "financial management" with an equal focus on "quality management" as the means to corporate success.

Quality courses should also be a requirement in every technical and engineering curriculum. A viable quality education must go beyond the traditional two or three courses in statistics, probability, sampling and inspection. The focus must be on quality management systems, processes, quality calculus, root cause analysis, failure analysis, defect prevention and preventive maintenance.

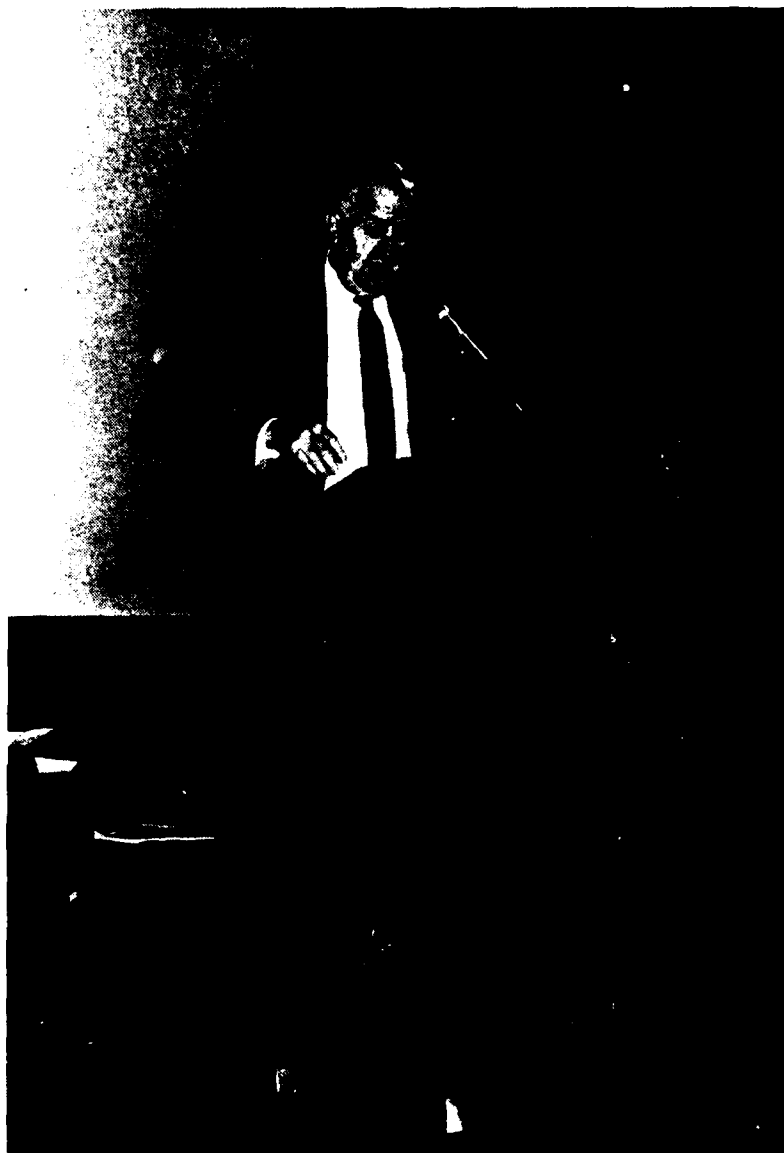
Academia must examine the educational systems of other industrial nations, especially those that have exhibited higher quality awareness and achievements than ours. We must learn from their successes and adjust our academic offerings to meet the changing requirements and shifting competitive realities.

In addition to curricula and teaching techniques, considerable research is needed in areas such as organizational structure, corporate culture, informational flow, and people management and how they might influence quality. Research should also focus on the synchronization of quality technical education, business and financial education and enterprise management.

Academia should play a leading role in the development of tools and techniques for the delivery of instructional material. Better instructional delivery techniques are required for retraining and to help keep graduates up-to-date with rapid advances being made in every discipline.

I believe that by concentrating on the quality issue, we can bring about concurrent productivity gains through more effective use of human resources and reduced costs; and if national quality and productivity improvements are made, certainly one of the benefactors will be our national readiness.

Mr. Bloch received his education in electrical engineering at the Federal Polytechnic Institute of Zurich and his BSEE at the University of Buffalo. Since joining IBM in 1952 as a technical engineer, he was one of the pioneers in the development of the company's first computers. Mr. Bloch has steadily moved up the corporate ladder with IBM while making significant contributions to semiconductor technology and memory components used in most of the company's product line. Mr. Bloch is a IEEE fellow and holds membership in many Engineering groups as well as directorships in the Semiconductor Industry Associations.



"You get what you accept."

Mr. Willis J. Willoughby, Jr.



MR. WILLIS J. WILLOUGHBY, JR.

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HOW CAN ACADEMIA POSITIVELY IMPACT QUALITY

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ABSTRACT

I've always had the policy that centered around one philosophy, you get what you accept. You get what you accept can be seen everywhere in our society. You get what you accept in product quality. Today, the American public accepts the worst level of product quality in the history of this country. But we may be waking up. There is a mirror being held up to us by foreign competition. We have foreign competition to hold up and begin to look at. We have finally decided that Detroit has handed us poor quality, so we are buying foreign.

Today if you buy a consumer product, there is a 40 percent chance that it will have some defect in it. I have visited our plants and at some they had over 50 percent of their products in rework and repair. There is a better way. All you have to do is tell them you don't accept it and then give them a better way. And if the method is forthcoming and it makes sense, it will be adopted every time.

We have people right now who are producing products for the Navy at a 100 percent level, that 2 years ago were some of our worst. We got in and worked with them, showed them how to do it, showed them how to do business, showed them how to work with people. It is not just an equation of machines and investment, it's an equation involving people. We have finally reached the point where we recognize that productivity can be simply described in one word, integrity. Productivity is integrity: integrity of design and integrity of manufacture.

We are now in the business of teaching industry what the fundamentals of design and manufacturing are all about. Somewhere, after I graduated from school, we quit teaching the very basic things in engineering. And we got into the more sophisticated things where a student could set his curriculum rather than somebody saying this is what you will take or else. As a result, we have engineers out there who are so narrow that they are almost useless. You can't have narrow engineering, it won't work. I am tired of engineers saying to me reliability is his job and quality is so and so's job. It's not true. The point of operating life, the point of building to print, manufacturing, quality, whatever you want to call it, is engineering. And when I grew up in the field you did them all. You didn't point to somebody else and say that's his job.

A task force commissioned by ASD (R&E) which I headed, looked into this whole area of engineering. It has just written the final report. The report is nothing but a description of the disciplined engineering approach to life. It says that when you follow this discipline, you will also determine the organizational management that you need, not the other way

around. We write the management and then try to decide what the engineering ought to be. You manage the engineering discipline and it will describe the management program for you. So we now have our awareness of what engineering is really doing and I believe that it's helping. But that is only one piece of a two part equation. I wish it were that simple. I wish all we had to do is educate them and give them the knowledge that they don't have.

The second piece comes in two parts, the first is mediocrity. Our society teaches and rewards individuals for mediocrity. Average work is good enough, average output is good enough. That is not the way our competition is composed. "A" is what they seek, "A" is what they get, "A" is how they win. The second part is mistrust. It destroys teamwork. There is no way you can have teamwork in a society plagued with mistrust. When I travel in foreign countries, I find no level of mistrust like in this country. These two elements, mediocrity and mistrust, if we don't deal with them as a nation, then we're in for big trouble. Teamwork can never be created without it, without teamwork we would have never gone to the moon.

Now you couple this with the current state of the business education curriculum. The so-called graduate school teaches a going-out-of-business-fire-sale is the best way to make a profit. They teach all sorts of things about front-end investments but don't ever worry about what it will look like 3 or 4 years from now. The point is that we teach managers how to manage financially, which looks good on paper, but we are paying the consequences in the area of quality for it today. Our leadership is gone. This country has failed to produce leaders. There are no more Jack Lathrops, Westinghouses, or any of the people who made industry what it was because nobody wants to be bold in this management. I see management without any boldness whatsoever and the only way we are going to win this game is to be bold.

Megatrends by Naisbitt has ten postulates on where this country will be by the year 2000. He says that by the year 2000, according to today's trends, this country will no longer be a producing nation, we will be a service nation. We will be the one that does the software and the architectural work. We will not be in the steel and foundry business and the producing side of us will go away. We have to think of production, production to work the right way. Our educational system has to begin by saying "no" to mediocrity at all levels of education. We have to deal with mediocrity and say "no" to the social pressures that try to make it happen. There are both social and political pressures that are telling us academia standards are not important, and academia is not important.

I think our country is feeling the impact of the lack of bold leadership to the worst degree. We need bold management. By bold management I mean get in there and produce the products that we need produced. An example of bold management is a typical one that I read in the paper just the other day. Toyota has decided to introduce fiber optics in its automobiles. Toyota says that it cannot afford to not introduce fiber optics into automobiles right now. The American industry says it cannot afford to introduce them right now. The exact opposite; you know who is going to be on top in fiber optics in the automobile in a few years? At that time we are going to have another part of the industry chasing around trying to

figure out what they can do to improve the quality of the wiring system in a car. Toyota says there is no way they can be in the market place tomorrow if they don't put fiber optics in today. They actually mean it.

Finally, there is a very important ingredient that applies to all this that I cannot omit since it's part of my lifestyle and to the lifestyle of the founders of this nation, who said "God, country and fellowman, in that order." We as a nation must respect these kinds of things. It's essential that we investigate our problems and work diligently to solve them. We have to return to the basics in education, in the work and market place and in our interpersonal relationships. While we oftentimes fancy ourselves intellectual, Noah Webster, when he published the dictionary said, "The dictionary without the bible is worthless."

Our problems are not insolvable--if we renew our focus on integrity, education, and teamwork, I see no other option if we are to survive. Thank you.

Prior to joining the Navy, Mr. Willoughby served as Director of Apollo Reliability, Quality and Safety for NASA. He was associated for many years as a senior engineer with a consulting engineering firm as Program Manager of Special Programs. Mr. Willoughby's responsibilities with the Naval Material Command encompass all phases of acquisition from conception to production. Mr. Willoughby earned his BS and ME degrees from the University of South Carolina.



DR. DAVID H. PONITZ

PRESIDENT, SINCLAIR COMMUNITY COLLEGE
REP., AMER. ASSOC. OF COMMUNITY AND
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HOW CAN ACADEMIA POSITIVELY IMPACT QUALITY

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ABSTRACT

I am here speaking for the 1,200 community colleges across this nation, and what I want you to understand is some of the magnitudes of what those colleges think they might do to help in development of quality. There are almost 5 million people in two year colleges taking credit courses, and another 4.3 million taking noncredit courses. In fact in any one year, 7 to 8 percent of all adult Americans will be taking at least one class in America's two year colleges. These individuals average 28 years of age, are persons who are mature and want to excel. I suggest that a number of decision makers understand only half of what community colleges are all about. Let me be more specific.

Those of you who watch the various college basketball tournament games may have heard commentators say this team wasn't very good a couple of years ago, but they brought in several "junior college graduates" and now they are playing for the national championship. That's quality, but not the kind of quality I'm talking about this afternoon.

You heard a discussion this morning from the National Commission on Excellence which quoted a University of Texas study of several years ago which indicated that 23 million Americans need remedial help and are functional illiterates. Still others have difficulty dealing with real life situations. Philosophically we don't like that fact, but from a practical point of view, community colleges are very much involved in helping adults learn to read, write, and develop skills in mathematics. We are concerned about this quality issue, but that is not our specific concern today. We wish to draw other matters to your attention.

Community colleges are very well aware that our nation is moving from a national to a global economy, from an industrial to an information society, and from a semiskilled to a high tech workplace. Community colleges are very concerned about the quality questions that have been emphasized over and over today. All of us here must take major responsibilities to define quality and implement it throughout the organizations we serve.

There are thousands of people in America working in semiskilled jobs--jobs which are disappearing. We also need to recognize that the role of the scientist/engineer is changing. A modern day engineer/scientist is one who deals primarily in theory. A review of organizations suggests that there are many individuals that are called engineers, that are paid engineers' salaries, but are performing at the technician level. A technician may be described as an individual who functions between an engineer/scientist and understands mathematics and science and linguistic skills, and uses these skills in relation to both the engineer and the craftsman. She/he

understands electrical, mechanical, thermal, optical, and chemical concepts and performs responsibilities that engineers performed several decades ago--more "hands on" responsibility with lesser basic theory responsibilities.

There are several things that should be done to encourage quality within these guidelines. May I first address the role of two year colleges. A recent study done by Princeton University discussed adult Americans' involvement in self-planned instruction. There are a great variety of individuals who average three study projects per year trying to understand issues of some consequence. They spend long hours studying at home, at work, looking at tapes, or working with their microcomputers. But only 20 percent are enrolled in the colleges. The other 80 percent study on their own and the reason they do is their desire to determine their own learning style.

Too many times those of us in higher education have said, "Students don't come to college because it costs too much, the transportation problems are too difficult, or they have personal problems." Higher education needs to look at high technology quality educational needs but also must spend more time understanding adult learning styles. That's probably true for industries represented here today also.

Others have discussed how new high technology production techniques and quality fit together. We also suggest that there be a division of labor between the engineer, the scientist, the technician, the craftsperson. If we want quality at an economical cost, we need to look very carefully at a revised division of labor among those groups, and develop some new working models. Statistics tell us this country is short thousands of engineers in various commands. This raises the question--should we experiment to determine if technicians can do functions previously performed only by engineers and let the true engineers perform at a higher level? Some discussion with the military revealed that the idea was interesting but you will "mess up" the table of organization. May I suggest that "messing up" the table of organization to solve a problem is not a sound reason for not proceeding with an idea or experimenting with a new concept.

Another issue--there is great confusion over who can hire whom in civil service. Civil service documents, and experience by government personnel officers suggest that government installations can't hire individuals (except at the lowest GS levels) unless they have a four year degree. One group told me of their great interest in hiring two year quality control technician graduates--but couldn't come close to matching the "going rate." They hired four year graduates with lesser qualifications in QC but at a higher GS rating. A careful examination of the real skills of the two year technicians is in order. We encourage the Civil Service to review its technician requirements and pledge the efforts of the American Association of Community and Junior Colleges to assist in that analysis.

Already a number of community colleges have moved aggressively to build partnerships with businesses, with industry and labor to customize educational programs geared to a very specific and emerging need of a vast number of corporations and public employers. The community colleges of America are ready to help you with this quality project. We believe our commitment to quality is like yours and believe that community colleges can help you meet your goals. Try us.

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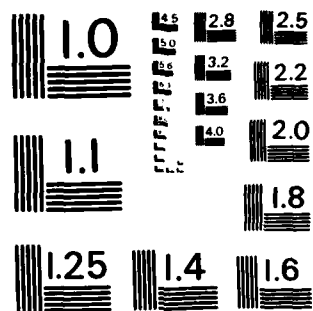
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Dr. Ponitz is president of Sinclair Community College, Dayton, Ohio. He is also a member of the American Association of Community and Junior Colleges; President, Advisory Committee for Association of Community College Trustees and the American Association of State Colleges and University Task Force on Quality. Dr. Ponitz received his BA degree in Political Science and MA degree in School Administration and Business Administration, both from the University of Michigan and his Education degree in Administrative Career Programs from Harvard University.



"We believe our commitment is like yours and believe that community colleges can help you meet your goals. Try us."

Dr. David H. Ponitz

EXCERPTS FROM QUESTIONS, ANSWERS, AND DISCUSSION SESSIONS

MEMBER OF THE AUDIENCE: One of the panelists made the statement that management often acts to block quality type activity, inadvertently or otherwise, but they do. I was wondering if in your experience, what the union role is and what they do. How that implicates or aids or discourages quality operation? The union, how they conduct themselves and what kind of effect does that have on one's ability to turn out quality products.

PANEL MEMBER: The union certainly has a big impact. One of the problems we're having is quality circles and the union. The union membership has been telling our management all the time that they need safety conditions improved, that they need their tools improved, they need training improved and so on. So what does management do? They support quality and they bring in quality circles, give it to our quality manager and they say, here, implement this, getting the workers together again to identify problems that the workers have already told them all about and its fallen on deaf ears. I say the workers are doing a good job in spite of us. We haven't trained them, we don't give them workmanship standards, they have equipment that's inadequate and uncalibrated and so on. Start improvements with the management and we get the management to do the things they are supposed to do. First form improvement teams in the management area, take care of the things that management knows needs to be addressed, in parallel involve the workers on those teams participating not solely workers but participating with them. The union says it's about time that you are doing some of the things that we've asked. Yes, we have had a problem with unions hindering us, but it's turning around when management is learning the right way to have the hourly people participate.

MEMBER OF THE AUDIENCE: I wonder if you could take a few minutes to elaborate on the historical study necessary prior to marketing new designs.

PANEL MEMBER: Let's assume we are going to study the launching of product designs, new designs. We assign a historian, or a team of historians. Their job is to go over previous history. They might find they ran into a thousand problems. What were the causes of these problems? Those problems might have had 50 different causes. On the contrary, there will be 5 or 6 of those 50 causes that will account for two-thirds of those problems. Well, which are those 5 or 6 that will be identifiable? Once we find which are those predominant ones, we look to see how we can change the methodology. Let's assume that one of these predominant causes is that at the time this new design hits the factory it can't hold tolerances, that's probably one of the major causes. We would look to see how can we change that. One of the ways is to look back at the sequence of events we go through. We go through quite a few phases from the time we identify the need for a new product and the "black box" design and filling in the designs and setting the tolerances, designing a model, making it, testing it, and so on. Then we discover at the time of full scale production something that might have been known at the time the engineer put that tolerance on the drawing because if we quantify what the ability of our process is to hold tolerances, and a good deal of that can be done, we are in a position to put a table of that together, give it to the designer and train him how to use it. We can give him a table of processes capabilities. Any tolerance you can put down that can be held by our

present process, feel free to do it and don't ask anybody. That's not going to be a problem, but if it is going to be a problem, then you've got to bring in the people that are going to have to meet that problem and then they will work that out. That will be an example of identifying the major cause and then doing something to act on it. And there'll be a procession of those things whether for study, a process of launching new designs, new process, new something else.

MEMBER OF THE AUDIENCE: We have a problem at colleges of business in the United States. In the last several years, a number of business schools have attempted to introduce courses in productivity and quality. The problem we have is that the students, mostly the MBA students, indicate correctly that the recruiting individual from major corporations is not interested in students who said they had a major in quality or a major in organizational theory, or a major in productivity. They are confronted by recruiters who are out here looking for people who are finance majors or accounting majors. What I find is this fascinating gap, this chasm between very sophisticated CEOs or vice presidents who talk about the need for individuals with much narrower focuses in terms of interest. I think we are going to continue to have this problem producing the sorts of people that the sophisticated CEOs we are fortunate to have here today, want.

PANEL MEMBER: There are a number of ways to answer that question. First of all, I think as far as your basic concern in terms of major corporations recruiting, and they are not looking for people who are disciplined in this area, I think that's a change we are going to see. At my corporation, we have increased our recruiting in this area which is what I call a shift of balance of interest. Above and beyond that, there is another very important aspect of this thing, and that is, major things that drive a lot of our businesses, and certainly my company, is technical people, scientists if you will, the engineers, the accountants, the salespeople who are skilled in distribution, in other words the large population that makes up the whole corporation. These people have to become much more sensitive to their role in this quality crusade.

PANEL MEMBER: I would like to elaborate on what was just said. I think for the short term there is going to be a change in emphasis and there is going to be a greater looking by personnel officers for quality specialists. I don't think that's for long term, I think we are going to make a major change to have the training done in the design department, in the process engineering department, production departments, marketing department, that's the road the Japanese have followed. They don't have people going out looking for quality specialists. They don't have reliability specialists, designers are trained in that stuff. They don't have quality engineers much, the production supervisors are trained in that, so are the process engineers. It's going to be a reversal of this big role for the quality department. They are not going to be like that in another two decades.

PANEL MEMBER: There is a change underway in quality. The quality professional, the scientist, and the departments are always going to be needed and that's going to grow. But the drive is to do away with the inspection department. The quality manager that you could produce out of your university who has the skill of being a cross functional manager,

who understands purchasing and engineering and manufacturing and so on, they would hire them immediately. There is a tremendous shortage of the type of manager that can work at a corporate level and work cross functionally assisting purchasing to help managers who run factories make sure that the systems are correct before the line is run--are the materials correct, are the people trained, is the equipment correct--so when your machines are turned on you don't need quality people. Traditionally, the CEOs have stunted the quality manager at plant level. What we are seeing now is quality transforming into a sort of cross functional manager thing. I think we will have general managers for quality, someone that can manage the overall business. It is going to be very difficult to produce that kind of a manager.

MEMBER OF THE AUDIENCE: In 1982 we measured \$391 million of quality costs and this was partially the result of having forecast and planned \$24 million of quality cost improvements. In 1983 we are planning \$29 million. I have the feeling that quality improvement requires champions in the words as used in the book of excellence. Would you agree that quality improvement is particularly difficult to institutionalize, and would you have any guidance on how that should be done?

PANEL MEMBER: Quality improvement represents a major change in direction. You are asking people, in addition to meeting the annual budget, to also be involved in improvement, have a second budget, which is a budget for improvement, and that budget for improvement requires you to list what deeds you are going to tackle. Assign managers to tackle those, and that's going to add 5 to 10 percent to their workload. It doesn't come free, it requires support, however, the return on investment is enormous. It represents creating a new kind of activity, and until you have accepted that concept at the top, I am going to repeat again that top people must not be cheerleaders, they have to set an example by some of those projects they are to tackle and provide the requirement that everybody else could. They are going to judge managers partly by whether they are good and recognize the effort involved, but also the enormous return on investment. In 5 years, if you go at it properly, you ought to cut that total in two. You can't find a higher return on investment no matter what you are selling.

MEMBER OF THE AUDIENCE: I have a brief question. Academia in engineering is turning out the engineers of the future, and I have heard a lot about initiatives that you are planning between the DoD and contractors. My question is, do you have any planned initiatives directly with academia and the DoD to approve these quality issues. And, if so, what are they?

PANEL MEMBER: The Navy has a plan whereby we encourage people and help them financially in college programs, particularly engineers. It gives us the opportunity to talk to them during the period that they are going off to colleges and universities, and one of the things that we try to give them is the feeling for the importance of quality with the hope when they finish and get their degree they'll come back and be better engineers in that particular area.

PANEL MEMBER: I think this symposium is one of the initiatives to get the dialogue across the broad front and not have it concern itself with an instant contract. In addition to that, I think you'll find that throughout

the services, in the individual commands, there would be different study contracts with members of academia who are working specific problems. I would think that coming out of this would be identification of certain issues that might become the subject of a more formal study and report, should you decide to have this again.

MEMBER OF THE AUDIENCE: This is a question to anyone on the panel. How do you suggest that the colleges get the manpower and funds to develop the curriculum, get the course printed, hardware material and trained instructors for these institutions to start teaching the quality discipline in management, engineering, accounting, math and other related disciplines?

PANEL MEMBER: It seems to me that what we need to do is not have the colleges go alone--opportunity for partnership. That partnership falls into the following categories: First, seems to me that together colleges and industry ought to define very carefully what's needed and that's been going on in a number of colleges across this country already. Most community colleges have all kinds of advisory committees and high technologists that advise them on a regular basis. Second, that industry needs to help that college determine the type of high quality equipment that's needed. Third, I just talked to a gentleman half a minute ago from another college where a major high technology firm has just donated half a million dollars to that particular college to proceed with a high technology center. Fourth, seems to me that the colleges have to work with their legislative body to determine if there are funds available. Fifth, a number of industries have said that they will loan you executives to help get started because we think that's very important because candidly unless they do it, we are not going to be competitive. It seems to me that within that framework there are all kinds of opportunities for those that want to be creative.

MEMBER OF THE AUDIENCE: I have heard the six or seven suggestions that have been made. Let me add a couple more. It's a two-way street, obviously. One other way is essentially the research effort of academia itself, funded by industry. Bringing insights into this area of quality can be gained and the results essentially promulgated, that's another way. Second, an additional way is faculty and industry, on leave of absence, on summer hire and consultants, that gain an insight into what industry requires and needs, what industry approaches are, and then go back with that knowledge and improve it.

MEMBER OF THE AUDIENCE: I would like to pick up on the liberal arts topic. I have a two-part question. Do you perceive any connection between the disappearance of liberal arts that sort of started occurring about 10 or 15 years ago, and this increase in illiteracy and the fact that you have a lot of engineers who just can't write very well. People don't study language or history or ethics any more. They get very steeped in a lot of technical subjects. I was wondering if you see any connection and also what would you say to a graduate who attempted to round out his education, become very heavily steeped in liberal arts, language, history, ethics, and at the same

time try to address the technical field? Do people in liberal arts who study ethics have any future?

PANEL MEMBER: I am sure they have a future. What would I think of an individual like that? I would think very highly of him because I think that's part of the rounding that has to go on between these various categories and disciplines today, because you never know where an individual winds up. In fact, there is a course, and I forgot the name of it, it is masters degree level, in the University of Pennsylvania, that is exactly addressing that problem. It is a masters degree in engineering science, but the entry as a prerequisite is really earmarked to the liberal arts undergraduates. I think that is a very interesting kind of approach to life. And you don't have to go all the way up to the masters, I think it could be additional courses, but I think literacy in general on technical matters, a course in society, is an important thing that you can foster and that is required in the future.

ACTION ITEMS

Following is a list of suggested action items. It is not all-inclusive but is submitted as possible first courses of action in which academe, industry, and Government can achieve the goals of the conference by working together. We enjoin you to try some/all of them and feed back to us your response. In addition, please share any additional suggestions you may have that we can distribute to other conference attendees.

<u>Action Item</u>	<u>Lead</u>	<u>Support</u>
1. Develop "Case Studies" to be used as educational aids in business schools, which emphasize what enhanced quality assurance has done to improve productivity and the profit picture in specific companies.	Academe	Industry
2. Endow "Quality Chairs" at selected engineering/business institutions, e.g. "Juran Chair, Deming Chair."	Industry & Industry Associations	Academe
3. Develop approaches/means to effect an increased emphasis on an integrated "Systems Approach" to quality in all academia programs.	Academe	DLA-Q
4. Explore means of emphasizing the importance of quality professions to high school students.	Industry & Associations	Industry/ DLA
5. Offer to give one or more of your top engineers or management executives a Sabbatical to spend at academe teaching the realities of these disciplines to your future engineers and CEOs.	Industry	Academe
6. Offer to conduct management or engineering seminars at plant facilities for local college/university staffs in those disciplines.	Industry	Academe
7. Develop uniformity in basic QA course content.	Academe	DLA/ Industry
8. Establish standard curriculum for QA engineering field of study.	Academe	Industry
9. Offer/revise continuing education opportunities for working engineers and active management.	Academe	Industry

<u>Action Item</u>	<u>Lead</u>	<u>Support</u>
10. Establish dialogue with state accreditation authorities on your requirements in the area of quality courses.	Industry	Academe
11. Visit local colleges/universities and audit their offerings in quality instruction for both engineers and managers. Let them know what industry's needs are!	Industry	Academe
12. Establish teaching fellowships and scholarships in quality assurance discipline.	Industry & Associations	Academe
13. Take more active role in selling need for enhanced attention to the quality issue to both academe and industry.	ASQC/DLA	Industry
14. Liaison with Department of Education, Department of Defense, and see what funds might be available to establish/support specific courses in Productivity/Quality	Academe	DoD/Dept. of Education
15. Develop quality programs at selected universities similar to Federal Acquisition Institute programs in procurement.	Federal Acquisition Institute	DLA/Industry

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Please use this sheet to send in your additional action items, comments or offer to chair a committee.

Action Item

☐

Offer to Serve

☐

Comment:

Send to:

Rear Admiral Frank C. Collins, Jr., USN
Executive Director, Quality Assurance
Defense Logistics Agency
Cameron Station
Alexandria, VA 22314

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