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administrative marker by the George Bush Presidential
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Record Group/Collection: George H.W. Bush Presidential Records
Collection/Office of Origin: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: General Science Files

OA/ID Number: 62037
Folder ID Number: 62037-003

Folder Title:
Industrial: Manufacturing [1991]

Stack:

Row:

Section:

Shelf:

Position:

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"Document Control"

TYPE: INFORMATION

ORIGINATOR: 02

STATUS C

DOCUMENT NUMBER: 9125279

DIRECTORATE STATUS

FROM: LIKINS, Peter: LEHIGH UNIVERSITY

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 12/20/91

SUBJECT: HE IS FORWARDING A COPY OF A REPORT REGARDING "AGILE
MANUFACTURING".

DIRECTORATE
ASSIGNED: STAFF
ASSIGNED:

ACTION
REQUIRED: STAFF
ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:

OSTP RECEIVED: 12/31/91 DEPT RECEIVED:
FILE: P-INDUSTRIAL-MANUFACTURING

CENTRAL FILES:

Lehigh University



Peter Likins, President

Alumni Memorial Building 27
Bethlehem, Pennsylvania 18015
telephone (215) 758-3155

RECEIVED
OSTP
MAIL ROOM

December 20, 1991

Dr. D. Allan Bromley
Assistant to the President
for Science and Technology
Executive Office of the President
Office of Science and Technology Policy
Old Executive Office Building, Room 360
Washington, DC 20506

Dear Allan,

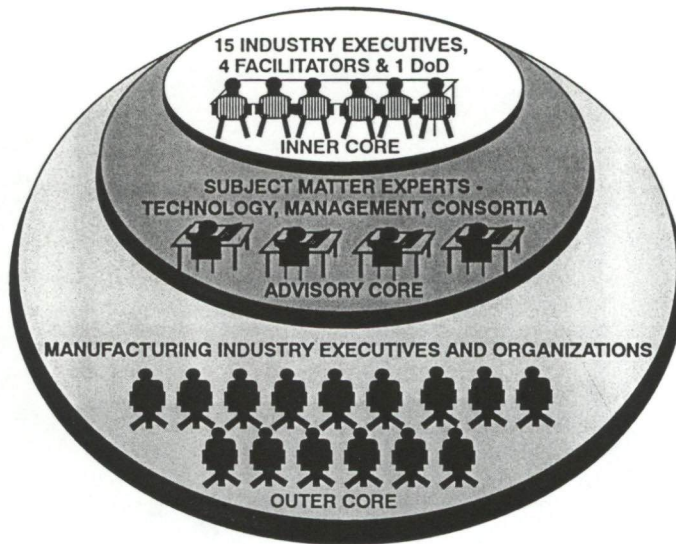
The enclosed reports introduce the topic of "agile manufacturing," which phrase implies extreme forms of commitment to lean operations with remarkably fast response times, often achieved through networking and partnering.

This work was generously commissioned by the DOD, which seems now to be both pleased with the product and uncertain as to what to do with it!

Warm Regards,

PL/lg

enc: 2 reports, Vols I & II



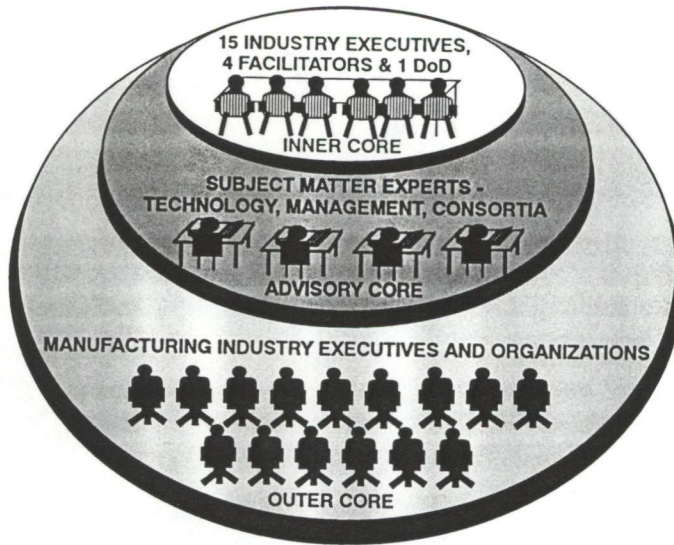
21st Century Manufacturing Enterprise Strategy

Infrastructure

Volume 2
November 1991

Pre-Release
Copy

Not For Distribution



21st Century Manufacturing Enterprise Strategy

An Industry-Led View

Volume 1
November 1991

Pre-Release

CONFIDENTIAL

THE WHITE HOUSE

January 3, 1992

Dear Peter:

Many thanks for the material on the
21st Century Manufacturing Enterprise
Strategy. I expect that our new FOCSET
cross cut next year will be on advanced
manufacturing and this will be very
helpful in part.

Best wishes for the new year Sincerely
Alan

"Document Control"

TYPE: INFORMATION DOCUMENT NUMBER: 9125206
ORIGINATOR: 02 STATUS C DIRECTORATE STATUS

FROM: WHITE, Robert M.: NATIONAL ACADEMY OF ENGINEERING

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 12/18/91

SUBJECT: HE IS PROVIDING DR. BROMLEY WITH A COPY OF THEIR
MOST RECENT MANUFACTURING STUDY ENTITLED
"MANUFACTURING SYSTEMS: FOUNDATIONS OF WORLD CLASS
PRACTICE".

DIRECTORATE STAFF
ASSIGNED: ASSIGNED:

ACTION STAFF
REQUIRED: ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:

OSTP RECEIVED: 12/23/91 DEPT RECEIVED:
FILE: B-INDUSTRIAL-MANUFACTURING
CENTRAL FILES: Pres

5206 I
NATIONAL ACADEMY OF ENGINEERING



2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Office of the President

RECEIVED
91 DEC 23 2 3 50
(202) 334-3200 / Fax (202) 334-1680

December 18, 1991

OSTP
MAIL ROOM

Dr. D. Allan Bromley
Assistant to the President for
Science & Technology & Director
Office of Science and Technology Policy
Old Executive Office Building
17th & Pennsylvania Ave., N.W.
Washington, DC 20500

Dear Allan:

I am pleased to enclose a copy of *Manufacturing Systems: Foundations of World-Class Practice*. I thought you might be interested in our most recent manufacturing study.

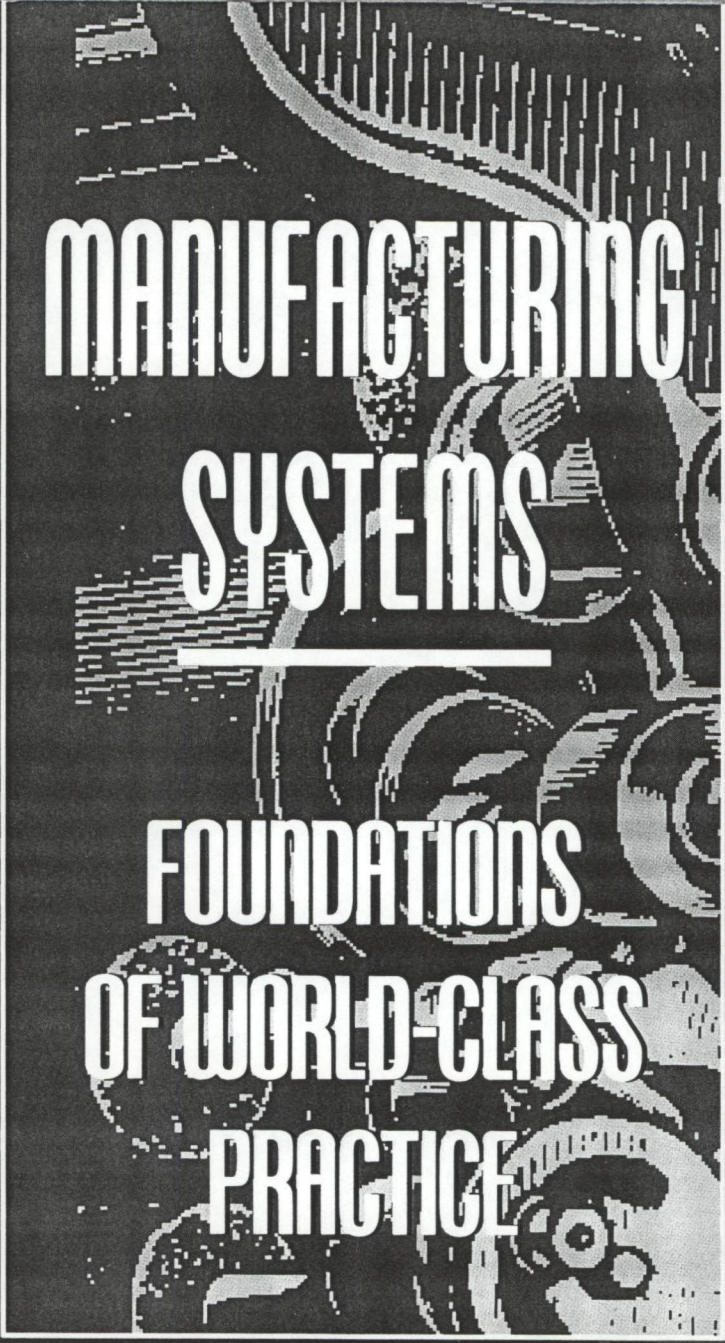
The report focuses particular attention on the importance of adopting a systems perspective when considering the design, analysis, and management of manufacturing operations and identifies several of the foundations, or underlying principles, that characterize world-class manufacturers. It encourages U.S. firms that wish to become economically successful participants in an expanding global marketplace to embrace these foundations as essential elements of their competitive strategies.

I would welcome your comments.

Sincerely,

Robert M. White
President

RMW/jh/mk



MANUFACTURING SYSTEMS

FOUNDATIONS OF WORLD-CLASS PRACTICE

NATIONAL ACADEMY OF ENGINEERING

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9125054
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: REDDY, Leo: NATIONAL COALITION FOR ADVANCED MANUFACTURING

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 12/02/91

SUBJECT: HE IS FORWARDING A COPY OF HIS LETTER TO PRESIDENT
BUSH INVITING THE PRESIDENT TO ADDRESS THEIR ANNUAL
CONFERENCE. HE REQUESTS DR. BROMLEY'S ASSISTANCE IN
SECURING HIS ACCEPTANCE.

DIRECTORATE STAFF
ASSIGNED: D. Allan Bromley ASSIGNED:

ACTION
REQUIRED: AS APPROPRIATE STAFF
ACTION:

SENDER'S DUE DATE: 12/09/91
OSTP DUE DATE: 12/09/91 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS: PLEASE NOTE OSTP DID NOT RECEIVE THIS UNTIL 12/06/91.

CLOSED

OSTP RECEIVED: 12/06/91 DEPT RECEIVED:
FILE: P-INDUSTRIAL-MANUFACTURING

CENTRAL FILES:

*close out - overtaken
by events - note
dates! DH
12/10*



50574

The National Coalition for Advanced Manufacturing

RECEIVED

Monday December 2, 1991

91 DEC 6 A10:33

Dr. Allen Bromley
Science Advisor To The President
Old Executive Office Bldg.
17th & Penn. Ave., N.W.
Washington DC 20506

OSTP
MAIL ROOM

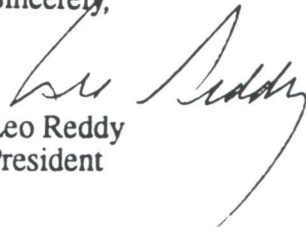
I am attaching a copy of a letter I sent to the President today inviting him to address the Annual Conference of the National Coalition for Advanced Manufacturing (NACFAM) at the Omni-Shoreham on December 9-10. We are expecting a large turnout.

I wanted to apprise the President of this opportunity in case he wishes an appropriate forum to make some remarks about the economy before Christmas and in anticipation of his State of the Union Address. Especially given the public prominence that will be given to the Congressional hearings on tax policy during this period, an appearance at the NACFAM conference would be well timed.

In the field of tax policy, you should be aware that NACFAM has been a staunch advocate for over a year for a targetted investment tax credit for machinery and equipment. FYI, I am enclosing a copy of our testimony to the House Ways and Means Committee on September 12 on this subject. Given the fact that leaders in both parties are now suggesting an investment tax credit, the President might consider adding this to his package of measures. This would not only help stimulate the economy at the present time, it would lead to a surge of capital investment that would revitalize American manufacturing throughout the 1990's. If the President wishes to refer to the investment tax credit, the NACFAM Conference would provide the ideal forum.

If you agree with me that this conference offers a good opportunity for the President, I would be grateful if you would express this sentiment to him.

Sincerely,



Leo Reddy
President



December 2, 1991

The Honorable
George H.W. Bush
President of the United States
The White House

Dear Mr. President:

On behalf of the National Coalition for Advanced Manufacturing (NACFAM), I am most pleased to invite you to address our annual conference at the Omni Shoreham Hotel in Washington, D. C. at any time convenient to your schedule on December 9-10, 1991.

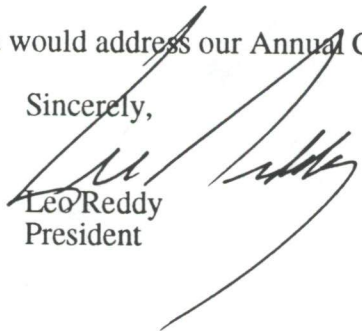
This is a late date for an invitation, but, in light of deepening public concerns over the state of the economy and the decision of Congress to hold hearings this month on tax policy, we wanted to make you aware of this forum. This would be an ideal setting for you to preview your strategy for economic growth before Christmas and in anticipation of your State of the Union address.

NACFAM is a non-profit, private sector organization committed to enhancing the productivity, quality, and competitiveness of U.S. manufacturing--including the some 360,000 small to medium-sized firms with fewer than 500 employees--through the accelerated development and deployment of advanced manufacturing technologies and related business-financial and education-training strategies. Our coalition consists of 35 firms, including several Fortune 500 companies; 136 centers of manufacturing technology research, education, training, and extension; and 20 national trade and technical training organizations, representing between them over 80,000 companies and 47,000 technical training organizations. Over 250 senior officials, including several CEO's and Presidents from these organizations, will attend our conference.

Over the past two years, NACFAM has been developing a strategy for national action to modernize America's industrial base. Our recommendations for the federal role in that strategy is contained in our October 1990 White Paper, Industrial Modernization: An American Imperative, which suggests a number of specific steps in the fields of leadership, technology, technical training, and fiscal and monetary incentives. NACFAM is the spearhead in the private sector for the advanced manufacturing technology legislation proposed this year by Senators Bingaman and Hollings--which includes the creation of a national industrial extension program akin to the Agricultural Extension Service. NACFAM is also a strong advocate for a targetted investment tax credit for machinery and equipment and for a stronger national focus on technical education and training.

NACFAM would be honored if you would address our Annual Conference.

Sincerely,


Leo Reddy
President

NACFAM '91

SUNDAY, DECEMBER 8

- 5:00 p.m. **Early Registration Opens**
 Hospitality and Greeting
- 7:30 p.m. **Early Registration Closes**

MONDAY, DECEMBER 9

- 7:00 a.m. **Registration Opens**
- 7:30 a.m. **Continental Breakfast**

- 8:15 a.m. **NACFAM Annual Business Meeting**

Welcome:

Michael Kelso, President, ELS; Chairman, NACFAM Board of Directors

Secretary's Report:

Ralph Schlenker, Executive Director, Systems Research Center, University of Maryland

President's Report:

Election of Board of Directors

Any Other Business

- 9:00 a.m. **Opening of First Session of Conference (Policy Day)**

Theme and Purpose of Conference:

Leo Reddy, President, NACFAM

Introduction by Chairman of First Session:

John Klein, Director, Manufacturing Products Laboratory, IBM;

Chairman, Industrial Automation Division, National Electrical Manufacturers Association

- 9:15 a.m. **Leadership Issues Panel**

Moderator: Jerry Jasinowski, President, National Association of Manufacturers

David Conklin, President,
Merck Chemical Manufacturing
Eric Mittelstadt, CEO
GMF Robotics

Gene Wong, Associate Director
Office of Science and Technology Policy The White House
H. Graham Jones
Chairman, Science and Technology Council of the States,
National Governors Association

Question and Answer Session

- 10:30 a.m. **Coffee Break**

- 11:00 a.m. **Technology Panel**

Moderators: Co-chairs, NACFAM Technology Committee

Robert Henderson, President, South Carolina Research Authority;

Edith Ritter, Executive Director, Manufacturing Services Extension Center

Ed Miller, President,
National Center for Manufacturing Sciences
Joseph Shuster, CEO,
Teltech

John Lyons, Director
National Institute of Standards and Technology
Brad Bergmann, Director -
Manufacturing Modernization, Office of Assistant Secretary of
Defense (Production & Logistics), Department of Defense
Ms. Cherri Langenfeld, Director
Office of Technology Transfer, Department of Energy

Question and Answer Session

CONFERENCE PROGRAM

12:30 p.m. **Keynote Speaker:**
James D. Watkins, Admiral, USN (Ret.), U.S. Secretary of Energy

1:00 p.m. **Luncheon**

2:00 p.m. **Human Resources Panel**

Moderator: Joseph Oakey, President, Autodesk Foundation
Chairman, NACFAM Human Resources Committee

Matt Coffey, President, National Tooling and Machining Association	Hon. Betsy Brand, Assistant Secretary of Education Department of Education
David Pierce, President, American Association of Community and Junior Colleges	Hon. Robert Jones, Assistant Secretary of Labor Department of Labor
	Carol Marsalis, Director, Technical Training, Tennessee Valley Authority

Question and Answer Session

3:15 p.m. **Coffee Break**

3:45 p.m. **Modernization Incentives Panel**

Moderator: Al Moore, President, NMTBA,
Association for Manufacturing Technology

Don Dancer, Sr. Vice President, GE Fanuc	Hon. Glenn Hubbard, Deputy Assistant Secretary of Treasury for Tax Policy
Ricard Iverson, President, American Electronics Association	Congressman Robert Matsui (D-CA)
William Devaney, President and Chairman, Materials Handling Institute	Member, House Ways and Means Committee* Congressman Bill Zeff (R-NH)

Question and Answer Session

5:00 p.m. **Special Presentation**
"New Manufacturing Paradigm,"

Developed Under the Auspices of the U.S. Department of Defense
Presented by Roger Nagel, Iaccocca Institute, Lehigh University

6:00 p.m. **Reception**

7:00 p.m. **Dinner**

7:30 p.m. **Program**

Welcome:

David Conklin, Chairman NACFAM Board of Directors and President,
Merck Chemical Manufacturing Division

Introduction of Keynote Speaker:

Ralph Richardson, Group Publisher, Thomas Publications

Keynote Speaker:

William Fife, CEO, Giddings and Lewis, Inc.

TUESDAY, DECEMBER 10

7:30 a.m. **Continental Breakfast**

Keynote Speaker: *Senator Jeff Bingaman (D-NM)*

- 8:00 a.m.** **Opening of Second Session of Conference (Program Day)**
Introduction by Chairman of Second Day's Session:
Hon. Robert White, Under Secretary of Commerce for Technology; Chairman, Committee on Industry and Technology, Federal Coordinating Council for Science, Engineering and Technology.
Industry Commentator:
Allan Rose, Director, Office of Technology Development, Corporate Headquarters, Johnson & Johnson
- 8:45 a.m.** **Department of Commerce Programs**
Intelligent Manufacturing Systems (IMS), Metric System: Hon. Deborah Wins-Smith, Assistant Secretary of Commerce for Technology Policy

Advanced Technology Program (ATP): George Uriano, Director, ATP
National Institute of Standards and Technology

Manufacturing Technology Centers (MTC) and Other Extension Programs:
Phillip Nanzetta, Director, MTC Program, National Institute of Standards and Technology
Question and Answer Session
- 10:15 a.m.** **Department of Defense Programs**
Office of the Assistant Secretary of Defense (Production and Logistics)—Manufacturing Technology Program, Brad Bergmann, Director, Manufacturing Modernization
Question and Answer Session
- 11:30 a.m.** **Department of Energy Programs**
Manufacturing Technology Transfer at National Labs—Tech Transfer Policy; Cooperative Research and Development Agreements; Work with State Extension Services:
Warren Chernock, Deputy Science Advisor, Office of Defense Programs, Department of Energy

Question and Answer Session
- 12:30 p.m.** **Luncheon**
- 1:00 p.m.** **Keynote Speaker:**
Hon. Rockwell Schnabel, Deputy Secretary of Commerce
- 2:00 p.m.** **NASA Programs**
Manufacturing Technology at NASA—NASA Regional Tech Transfer Centers:
Robert Schwinghamer, Deputy Director, Space Transportation Systems - Science and Engineering
Question and Answer Session
- 2:45 p.m.** **National Science Foundation Programs**
Advanced Manufacturing at the National Science Foundation
Louis A. Martin-Vega, Division of Design & Mfg System
Lynn Preston, Engineering Centers Division
Question and Answer Session
- 3:30 p.m.** **Coffee Break**
- 3:45 p.m.** **Department of Education/Department of Labor Vocational- Technical Programs**
James D. Van Erden, Administrator, Office of Work-Based Learning, Department of Labor
Winifred Warnat, Director, Vocational-Technical Education Division, Department of Education
Question and Answer Session
- 4:30 p.m.** **Department of Agriculture**
Agricultural Extension Service—Lessons Learned; User-driven Approach to Tech Transfer; Agriculture-industry Overlaps in Manufacturing: Mitch Geasler, Associate Administrator, U.S. Department of Agriculture Extension Service

Question and Answer Session
- 5:15 p.m.** **Next Steps**
Leo Reddy, President, NACFAM
- 5:30 p.m.** **Conference Concludes**



UNITED STATES DEPARTMENT OF
COMMERCE
NEWS

WASHINGTON, D.C. 20230

OFFICE
OF THE
SECRETARY

STATEMENT BY SECRETARY OF COMMERCE SECRETARY MOSBACHER
JULY 20, 1989

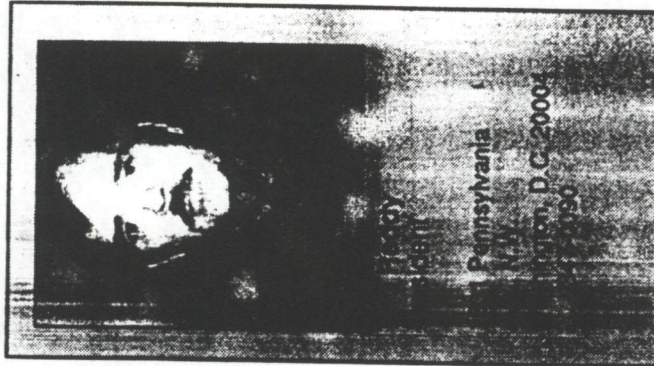
"For the past several months, I have been stressing the importance of private sector-led initiatives and industry-government partnerships to advance our international competitive position. The efforts made by the National Coalition for Flexible Automated Manufacturing in quickly attracting key people and organizations to speed the application of automated manufacturing, especially to small- and medium-sized firms, is exactly the kind of initiative that this country so sorely needs. I am especially delighted that your efforts have been aided by my department, and pledge our continued support for your success."

#

MOVERS

June 13, 1991

National Coalition for Advanced Manufacturing: Reddy Revs It Up



As president of the two-year-old National Coalition for Advanced Manufacturing (NACFAM), Leo Reddy's high-power, low-profile approach allows the former ambassador to work Washington with an effectiveness rarely mirrored.

Reddy joined NACFAM last year, after serving a stint as Senior Fellow and Diplomati-in-Residence at the Center for Strategic and International Studies. He previously was a member of the Senior Foreign Service and one of the State Department's leading experts on NATO, arms control and defense policy.

In 1985, Reddy became the State Department representative for the U.S. at the Intermediate Nuclear Forces Negotiations in Geneva, and in 1987, Reddy moved over to direct the INF Treaty Ratification Task Force.

In addition, Reddy was assigned to the negotiations on conventional force reductions in Europe, the U.S. Mission to NATO, the NATO Desk at the State Department, the

executive secretariat at State and the National Military Command Center at the Pentagon.

Last week, Reddy put yet another feather in his cap when he and Democratic Sens. Ernest Hollings, S.C., and Jeff Bingaman, N.M., unveiled a national effort to modernize the nation's industrial base. Hollings and Bingaman plan to introduce bills this month on advanced manufacturing technology, following Reddy's October report: "Industrial Modernization: An American Imperative."

One bill aims to create a coherent federal strategy to accelerate development of advanced manufacturing technology by diverting federal R&D funds away from big science projects such as the Superconducting Supercollider or Space Station Freedom.

The second bill would speed the deployment of new and off-the-shelf manufacturing technology through federal matching funds for state and local industrial modernization programs. Rapid deployment is critical for

the survival of the nation's 358,000 small- to medium-sized manufacturing firms (less than 500 employees) that represent 98.5 percent of the nation's total manufacturing firms.

NACFAM plans to identify key programs and push for realignment of R&D spending. Science programs such as Man to Mars are a "boondoggle," he says, while the Space Station is an "ill-defined lummoX without any clear justification in terms of tax support."

NACFAM favors reallocating up to 10 percent of federal R&D funds for technology, compared to about 5 percent currently.

"Our concern [is] unless we take measures to make sure the industrial base is strong, we are going to find ourselves increasingly [producing] lower quality and basic products [for] more affluent sectors—the Brazilianization of America. The country's well-equipped to respond, but we need leadership if we are going to arrest this decline," Reddy says.

—Lucy Reilly

WASHINGTON

CURRICULUM VITAE

Leo Reddy

Leo Reddy is an active public policy figure in Washington, D. C. He is currently President of the National Coalition for Advanced Manufacturing (NACFAM). NACFAM is a non-partisan, public interest, non-profit organization committed to action at the national level to facilitate industrial modernization at the corporate, state and local level.

As Senior Fellow and Diplomat-in-Residence at the Center for Strategic and International Studies (CSIS) in Washington in 1988-89, Mr. Reddy directed a research project entitled "Defense Reductions and Economic Adjustment." Mr. Reddy continues to write and lecture on defense industrial base issues and serves as a member of a high-level Steering Group for a two-year CSIS study, "Integrating Commercial and Military Technologies for National Strength."

Before entering the private sector in early 1990, Mr. Reddy was a member of the Senior Foreign Service and one of the State Department's leading experts on NATO, arms control, and defense policy. In March 1985, he joined the U.S. Delegation to the INF Negotiations in Geneva as the State Department Representative and, following signature of the Treaty by President Reagan and President Gorbachev in December 1987, served as Director of the successful INF Treaty Ratification Task Force.

In government, Mr. Reddy had extensive experience in international negotiations and national security policy. His Foreign Service assignments included service as a member of the U.S. Delegation to the negotiations on conventional force reductions in Europe, the U.S. Delegation to the Conference on Security and Cooperation in Europe, the U.S. Mission to NATO, the NATO Desk at the State Department, the Office of European Research at the U.S. Information Agency, the Executive Secretariat at the State Department, and the National Military Command Center at the Pentagon. He chaired several interagency studies and programs on East-West negotiations, NATO burdensharing, arms control, European public opinion, NATO defense planning, and security in the Mediterranean.

A prolific writer, Mr. Reddy has published Burden Sharing: The Wrong Issue (CSIS, March 1989, co-author), Diplomatic Annals, 1989-90 (Westview Press, December 1989, co-author), and How U.S. Defense Industries View Civilian Diversification (CSIS, February 1991). His most recent articles have appeared in The New York Times, The Washington Quarterly, the Atlantic Community Quarterly, Washington Technology, and the Foreign Service Journal. His "White Paper," Industrial Modernization: An American Imperative, written for NACFAM, was published by Thomas Publications in October 1989. A graduate of Georgetown University (BA and MA) and a former Naval Officer, Mr. Reddy has received several awards for his contributions to U.S. foreign policy, including a Presidential Meritorious Service Award in 1988.



NACFAM

*Changing the
Advanced Manufacturing
Environment
in the '90s*

NOW

THE NATIONAL COALITION
FOR ADVANCED MANUFACTURING

*Federal Role in Fostering Advanced Manufacturing
Technologies*

*Testimony by Leo Reddy
President, National Coalition for Advanced Manufacturing*

*Before the United States Senate Committee on Commerce,
Science, and Transportation, Washington, D.C. June 19,
1991*

NACFAM

*Changing the
Advanced Manufacturing
Environment
in the '90s*

NOW

THE NATIONAL COALITION
FOR ADVANCED MANUFACTURING

Targeted Incentives for Industrial Revitalization

*Testimony by Leo Reddy
President, National Coalition for Advanced Manufacturing*

*Before the United States House of Representatives
Committee on Ways and Means, Washington, D.C.
September 12, 1991*

NACFAM

*Changing the
Advanced Manufacturing
Environment
in the '90s*

NOW

THE NATIONAL COALITION
FOR ADVANCED MANUFACTURING

NACFAM Membership as of 9/16/91

Association Supporters

Aerospace Industries Association of America	National Computer Graphics Association
American Assembly of Collegiate Schools of Business	National Electrical Manufacturers Association
American Association of Community and Junior Colleges	National Federation of Independent Business
American Electronics Association	NMTBA The Association for Manufacturing Excellence
American Gear Manufacturers Association	National Screw Machine Products Association
American Vocational Association	National Tooling and Machining Association
American Welding Society	Precision Metalforming Association
Anti-Friction Bearing Manufacturers Assoc.	Robotics Industries Association
Association of Small Business Development Centers	Small Business Legislative Council
National Association of Manufacturers	Vocational Industrial Clubs of America

Corporate and Other Organizational Membership

Advanced Systems Research Inc., CA	Higbie Gaskets, NY
American Supplier Institute, MI	IBM, Inc., FL
Arkansas Industrial Development Comm., AR	Johnson & Johnson, NJ
Autodesk, CA	Merck and Co., NJ
Automation Enhancements, CT	NAMCO Controls, OH
Ben Franklin Fund, Office of Economic Development, PA	National Center for Manufacturing Sciences, MI
Center for Strategic & International Studies, D.C.	Neurobotics, WA
Coopers & Lybrand, NY	Profitkey Intl., NH
Cummins Engine Co, IN	Rath & Strong, MA
Dravo Automation Sciences, Inc., PA	Technology Acceptance Group, NJ
Elox Corporation, SC	TelTech, MN
ELS Inc, VA	The Automotive Supplier Cooperative, MI
F&F Associates, VA	The Greater Minnesota Corp., MN
G.E. Fanuc, VA	Thomas Magazine Group, NY
G.M. F. Robotics, MI	Valez Aerospace Systems, Inc., CA
Harold Corner Associates, FL	Westinghouse, MD

NACFAM Center Membership as of 9/16/91

Center Membership

Advanced Manufacturing Institute, Kansas State University, KS	Center for Integrated Manufacturing Studies, Rochester Institute of Technology, NY
Advanced Manufacturing Technology Center, Auburn University, AL	Center for Industrial Services, The University of Tennessee, TN
Advanced Technology Center, Hagerstown Junior College, MD	Center for Industrial Innovation, RPI, NY
Advanced Technology Center, El Paso Community College, TX	Center for Industrial Research, SC
Alabama Center for Quality and Productivity, Decatur AL	Center for Innovative Technology, VA
Alfred University, NY	Center for Production, University of Baltimore, MD
Alliance for Manufacturing Productivity (30 centers)	Center for Robotics, University of Alabama at Huntsville, AL
ARAC, IN	Center for Technology Transfer, University of Maine System, ME
Arkansas Center for Technology Transfer, University of Arkansas, AR	Center for Technology Transfer and Economic Development-University of Missouri, MO
Automation and Robotics Research Institute, University of Texas at Arlington, TX	Cleveland Advanced Manufacturing Program, OH
Boise State University, Boise ID	Computer Integrated Manufacturing Lab, Lehigh University, PA
CIM Center, Saint Louis MO	Computer Integrated Manufacturing Systems, Georgia Institute of Technology, GA
Catonsville Community College, MD.	Delaware Valley Industrial Resource Center, PA
Center for Advanced Food Technology, Rutgers University, NJ	Des Moines Area Community College, IA
Center for Advanced Manufacturing, Macomb Comm. Co., MI	EDA Technical Assistance Center, Marshall University, WV
Center for Advanced Manufacturing, OH	Edison Materials Technology Center, OH
Center for Applied Technology, MA	Edison Welding Institute, OH
Centers of Excellence Corp., MA	Electronics Manufacturing Productivity Center, IN
Center for Automation Technology, Drexel University, PA	Environmental Research Institute of Michigan, MI
Center for Business and Economic Devel., Salt Lake Community College, UT	ERC/NSM, The Ohio State University, OH
Center for Industrial Engineering Technology, Central CT. State College, CT	Everett Community College, WA
Center for Industrial Research, SC	Henry Vogt Center for Computer-Aided Engineering and Factory Automation, University of Louisville, KY
Center for Industrial Research & Service, Iowa State University, IA	Honolulu Community College, HI
Center for Intelligent Manufacturing Decision Systems, PA	IIT Research Institute, IL

Industrial Affiliates Program, University of Massachusetts, MA	South Carolina Research Authority, S.C.
Industrial Technology Institute, MI	South Dakota School of Mines & Technology, SD
IMSE Institute, N.C. State University, NC	Southern Arkansas University-Technical Branch, AR
Intelligent Systems and Automation Laboratory, University of Kansas, KS	Southern Growth Policies Board, SC
Institute for Manufacturing and Automation Research, CA	Southwestern Pennsylvania IRC, PA
Institute of Advanced Manufacturing Science, OH	Spokane Intercollegiate Research & Technology Institute, WA
Lansing Community College, MI	Systems Research Center, University of Maryland, MD
Manufacturing Engineering Applications Center, Worcester Polytechnic Institute, MA	Technology Commercialization Program, University of Illinois, IL
Manufacturing Service Extension Center, PA	Technology Services Center, Indiana University, IN
Manufacturing Systems Engineering, VPI and State University, VA	Tennessee Technology Foundation, TN
MIT Laboratory for Manufacturing & Productivity, MA	Texas A&M University, TX
National Coalition of Advanced Technology Centers (NCATC)	Texas Center for Productivity and Quality of Work Life, Texas Tech University, TX
NIAC, PA	Texas State Technical College, TX
National Center for Excellence in Metalworking Technology, PA	The Beville Advanced Manufacturing CTR, AL
National Institute for Flexible Manufacturing, Meadville PA	The Center for Manufacturing Technology, OH
New Mexico Business Innovation Center, Albuquerque, NM	The Productivity Center, University of Minnesota, MN
New Mexico State Univ., DEMAFAAC, NM	The Robotics Institute, Carnegie Mellon University, PA
New York City Industrial Technology Assistance Corp., NY	Trident Technical College, SC
New York State College of Ceramics, NY	University of Maine, ME
New York Institute of Technology, NY	University of Pittsburgh, PA
Norris Institute (AIMCP) Saint Paul, MN	University of Southwestern Louisiana, LA
Pacific International Center for High Technology Research, Honolulu, HA.	Western Massachusetts Center for Advanced Technology, Springfield Tech., MA
Penn State University, Office of Research and Technology Transfer, PA	West Virginia University, WV
Pennsylvania College of Technology, PA	Worker Owned Networks, OH
Pikes Peak Community College, Colorado Springs, CO	Venture Network Inc. Morgantown, W.V.
Riotech of New Mexico, NM	
Robotics, Manufacturing & Logistics - Univ. of TX-Austin, TX	
Rock Valley College Technology Center, Rockford IL	
SW Center for Manufacturing Technology Transfer, University of New Mexico NM	

NACFAM PERFORMANCE RECORD

NACFAM opened its offices in Washington, D. C. in November 1989 as a broad-based coalition committed to **action** at the national level to facilitate industrial modernization and advanced manufacturing at the corporate, state, and local level. Some data points on NACFAM's performance since that time are listed below.

Coalition-building: NACFAM has grown rapidly in membership. It presently has 189 institutional members: 20 national trade and technical education associations; 137 centers of manufacturing technology research, education, training, and extension; 32 organizations, including several Fortune 500 manufacturing firms. Through its association members, NACFAM can reach out to 80,000 companies and 47,000 education-training institutions.

Platform: To define what its members believe the federal role should be in an overall national effort to revitalize U.S. manufacturing, NACFAM published a White Paper in October 1990, Industrial Modernization: An American Imperative. This paper contains a series of specific recommendations in the fields of leadership, technology, human resources, and modernization incentives. NACFAM has created national committees in each of these fields and, as an action organization, works to **implement** every measure recommended in the White Paper.

Leadership: In this field, NACFAM has:

- *Briefed leadership levels in the Administration and Congress on the White Paper*
- *Included in Senate legislation (S. 1330) the goal that the U.S. will be second to no other nation by the Year 2000 in the development and use of advanced manufacturing*
- *Stimulated a new House bill that would create a "U.S. Manufacturing Week"*
- *Built a network of contacts with highest policy levels in the Administration and in Congress on advanced manufacturing issues*

Targetted Modernization Incentives: In this field, NACFAM has:

- *Included in the Federal Technology Strategy Act of 1991 a requirement for a comprehensive report to Congress on new incentives and accounting changes and short and long-term investment capital to stimulate the acquisition of advanced production equipment*
- *Established a Modernization Incentives Committee, including tax and cost of capital experts, to examine changes in federal policies to provide a series of tax, loan, and accounting incentives to increase the levels of investment in new and refurbished manufacturing machinery and equipment, hardware and software*
- *Formally presented to Dan Rostenkowski (D-Ill.), Chairman of the House Ways and Means Committee, NACFAM's tax policy proposals in September 1991 to*

incentivize factory modernization, including a 10% investment tax credit exclusively for industrial machinery and equipment

- *Advocated these measures in personal meetings with some of the Administration's top economic policymakers, with relevant Congressional committees, and with selected Senators and Congressmen*
- *Worked with the Small Business Administration to identify the legislative mechanisms through which the Section 504 loan program could be amended to authorize SBA loans for new manufacturing equipment purchases*
- *Become an active participant in a group of associations promoting a revision of anti-trust legislation to facilitate joint production consortia.*

Technology: In this field, NACFAM has:

- *Provided the blueprint for landmark advanced manufacturing technology legislation that will be introduced in mid-June by Senators Hollings and Bingaman. These bills are moving successfully through the legislative process, with most of the funding for the Bingaman bill programs beginning in FY 92 and for the Hollings bill programs in FY 93. The programs to be established under these bills include the following:*
 - *a national industrial extension service program (\$50 million)*
 - *an advanced manufacturing technology R&D partnerships program (\$25-50 million)*
 - *a "manufacturing managers in the classroom" program (\$5-10 million)*
 - *manufacturing engineering education grants (\$30 million)*
 - *a "Satellite Centers" program (\$60 million) tied to the present Manufacturing Technology ("Hollings") Centers*
- *Successfully lobbied the White House for giving high priority to advanced manufacturing technologies in the April 1991 list of 22 "national critical technologies"*
- *Helped draft language in FY Defense Authorization bill creating a \$50 million program at the Pentagon to develop a strategy for developing and transferring advanced manufacturing technologies to defense contractors*
- *Joined like-minded associations in successfully pressing for increased funding for the Advanced Technology Program (ATP), Manufacturing Technology Centers ("Hollings Centers"), and State Technology Extension Program (Boehlert-Rockefeller) at the National Institute of Standards and Technology (NIST)*
- *Backed a new five-state Technology Access Service pilot project under the Small Business Administration to provide to interested small firms data bases of leading experts on manufacturing technologies (\$1.5 million in FY 92)*

Human Resources: In this field, NACFAM has:

- *Worked to create a \$61 million "Tech Prep," Two-Plus-Two program--an innovative approach to developing highly skilled technicians--within the Perkins Vocational Education Act of 1990 (expected funding for FY 92: \$100 million)*

- *Served as a leading industry advisory group to the Senate Labor and Human Resources Committee in the drafting of the "High Skills, Competitive Workforce Act" introduced in the U.S. Senate and House on October 1 (\$580 million)*
- *Supported the U.S. Department of Labor on ways to expand their model "Work-based learning" programs, patterned on the German apprenticeship system*
- *Started planning discussions with the National Governors Association, the Vocational Industrial Clubs of America, and the American Vocational Association for national awards for achievement in technical training.*

Outreach: Through its data base of over 1100 media representatives in the business and manufacturing field, frequent public addresses, TV and radio appearances and other public relations activities, NACFAM has worked continuously to raise governmental and public awareness of the importance of industrial modernization for the nation's economic strength, standard of living, and security. NACFAM's role in fostering industry-government cooperation was recognized in the Spring-Summer 1991 Special Issue of Fortune, "The New American Century." NACFAM's work has been reported extensively, including in The Wall Street Journal, Industry Week, Washington Technology, Investor's Daily, Inc. Magazine, Managing Automation, Technology Access Report, Engineering Times, The National Journal, and New Technology Week.

Growth: Starting as an unfunded, all-volunteer, grass-roots organization, NACFAM has quickly established itself as a focal point in Washington for public policy related to manufacturing and industrial modernization. In two years, NACFAM has raised nearly \$400,000 in membership dues and now has a full-time, professional staff of four persons in its downtown Washington, D. C. location.

Nov. 1991

Program update: Energy Secretary Watkins is confirmed as a
keynoter.

HOTEL REGISTRATION DISCOUNT RATE HAS BEEN
EXTENDED THROUGH NOVEMBER 27

SPECIAL ISSUE

SPRING/SUMMER 1991

53

FORTUNE

THE NEW



THE PEOPLE,
IDEAS, AND TECHNOLOGIES
MAKING THE U.S.
MORE COMPETITIVE NOW—
AND FOR THE YEAR 2000

AMERICAN CENTURY





THE THAW IN WASHINGTON

There's a truce in the conflict between business and government. The White House is mapping out a partnership that stops short of heavy-handed industrial policy. ■ by Edmund Faltermayer

OH, TO BE a businessman in Japan or Germany. In those juggernauts, it's commonly said, government and industry collaborate over green tea and Rhine wine, with results that may yet reduce America to a hollowed-out branch-office backwater. As for the U.S., listen to CEO George Hatsopoulos of Thermo Electron, which operates in all three countries: "If anything, the U.S. government shows animosity toward industry." Or an economist from Munich at a recent symposium in Washington, who says he can't understand why the American political system "hates" corporations.

George Bush may be getting the message. His "technology policy" unveiled last September, the first ever from a U.S. President, aims to safeguard American industry's imperiled technological lead. Washington has traditionally poured its huge research and development budget (\$67 billion this year) into defense, space, medicine, and basic science, including megaprojects designed to benefit all humanity—a superconducting supercollider, a human genome inventory, someday even a voyage to Mars.

Here on earth, companies in the commercial sector, including those with leading-edge technologies that generate good jobs, were on their own. But now the Administration is willing to sprinkle a little money on corporations and consortiums to determine whether new technologies can be turned into products. "In this way," the President said recently, "we can help leverage the R&D of the private sector, helping whole in-

The U.S. wants to nurture such technologies as high-definition flat-panel displays. That's a 60-inch monochrome screen at Photonics in Ohio, which also has a 19-inch color version.



dustries advance in an increasingly competitive global market."

Can this be the same George Bush who recoiled from anything resembling industrial policy? The same Administration that torpedoed a proposal to help revive the consumer electronics industry? The same President whose chief economic adviser, Michael Boskin, used to say it makes no difference whether the country turns out computer chips or potato chips?

In words, at least, the Administration has crossed a divide. A special White House panel of experts from industry, academe, and government has just released a list of 22

technologies "essential to national defense as well as economic prosperity." Among them: composite materials, flexible computer-integrated manufacturing, and high-definition electronic displays. The list is meant to guide the Critical Technologies Institute, mandated last year by Congress and directed by D. Allan Bromley, assistant to the President for science and technology and mastermind of the new Bush policy. One of the institute's tasks, Bromley says: "To do long-range strategic planning, working very closely with the private sector to develop these technologies."

What induced the change? Concerned

lawmakers played a part. So did industry-supported study groups that have raised more alarms about the nation's technological slide than a whole posse of Paul Reveres. Among them:

■ The National Coalition for Advanced Manufacturing has called for a revived investment tax credit and "a major national effort" to make U.S. factories worldclass.

■ The National Advisory Committee on Semiconductors (NACS) has characterized the problems facing U.S. chipmakers as "serious and growing worse." In a 1991 report it advocates federal help in creating high-volume electronics markets that would lift demand for American-made chips.

■ The Computer Systems Policy Project, supported by 11 American computer makers, has urged Washington to shift its R&D spending to "technologies with known commercial relevance."

■ The Council on Competitiveness, a coalition of CEOs, educators, and labor leaders, has called for government-supported "pre-competitive" research by industry, just as the President now wants.

WASHINGTON, of course, has long maintained industrial policies for agriculture and housing. It has also supported R&D that helps commercial aviation. Heavy spending on medical science partly accounts for the strength of the U.S. pharmaceuticals industry. But in other areas America's Niagara of basic research, most of it freely available to the world, yields a comparative trickle of new American products.

It can take years to prove the practical usefulness of a discovery, such as high-temperature superconductors or the ability of light-sensitive crystals to store immense amounts of computer data in holographic form. U.S. corporations, goaded by Wall Street to keep earnings on the rise, are often loath to stay the course. So are startup companies. As a rule, unless their venture capital backers foresee handsome returns in a few years, nothing is ventured.

So why not put a dollop of government money in the neglected zone between pure research and product development? The principle of competition would not be compromised, because the object would be the development of "generic" or "enabling" technologies useful to several companies or industries. Rivals that normally battle for

REPORTER ASSOCIATES Rosalind Klein Berlin
and Alicia Hills Moore

PHOTOGRAPH BY MICHAEL ABRAMSON



customers could collaborate peaceably until, as the Council on Competitiveness puts it, "technical uncertainties are sufficiently reduced to permit preliminary assessment of commercial potential." At that point, each participant would design its own widget and come out swinging.

That's how it has worked in Japan, where cooperative industrial research with government support helped spark successful global offensives in chips and computers. Europe is also on the consortium bandwagon (see table). Short of a world in which all governments agree to keep hands off civilian high-tech industries—an ideal still worth pursuing—the U.S. has little choice but to do likewise. Too many high-value-added North American jobs are at stake.

So is America's world leadership role. Amid the euphoria over operation Desert Storm, it has sunk in that most weapon innovations now feed off commercial R&D, not vice versa. In the 15 years it took to develop the Patriot missile, memory-chip makers raced through four product cycles. Says George Fisher, chairman of the Council on Competitiveness and CEO of Motorola: "Much of the electronics used in Gulf war weapons is not at the leading edge of technology today."

Serious implementation of Bush's new policy has yet to start. Senator Jeff Bingaman (D-New Mexico) complains that the Administration is still dragging its feet. Others see the seed of a sequoia-size boondoggle. Jeffrey Hamilton of Westford Technology Ventures, a New Jersey venture capital firm, trembles at how Congress might distort a technology policy: "They could micromanage and pork-barrel it to death."

A small-scale technology policy need not flout the principles of the free market. A resurrected Adam Smith would find little fault with the U.S. Commerce Department's Malcolm Baldrige quality awards, which cast government in the role of cheerleader and judge. Also beyond cavil are the Commerce Department's programs that disseminate technical wisdom to any manufacturer that asks.

At Kintz Plastics, a 90-person outfit in rural Howes Cave, New

York, for example, cutting the molds for making such items as refrigerator shelves used to take eight weeks. With the help of experts from the government's Northeast Manufacturing Technology Center in Troy, 50 miles away, the company turned to CAD/CAM equipment—and telescoped mold-making time to ten days. The Troy center is one of five around the country, with more planned; meanwhile, technology-diffusion efforts by the states are far more extensive than Washington's (see box).

GOVERNMENT offers other kinds of help. The Bush Administration wants to liberalize a tax credit that rewards companies for increasing their R&D. Washington assists industry export drives, and the President strongly supports the efforts of Trade Representative Carla Hills to pry open closed markets around the globe. Approvingly, he calls her "tough as nails."

But while government can exhort, inform, deregulate, and pound the negotiating table, only business can build competitive goods.

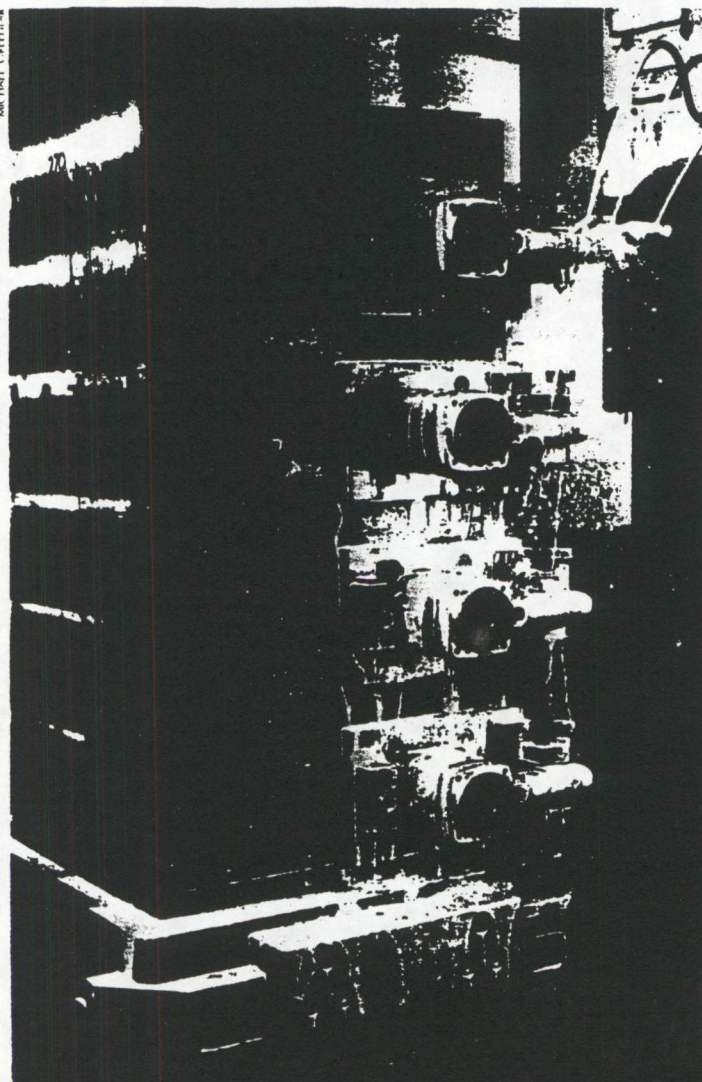
That takes capital, and the country needs far more of it. Nothing short of a White House-led crusade to promote saving, similar to Japan's campaign after World War II, will curb the nation's obsession with consumption.

And what a difference capital makes. During much of the Eighties, Chicago Pneumatic Tool Co. was milked to finance an acquisition spree. Then Sweden's Atlas Copco bought the company in 1987 and gave a green light to modernization. Says Chicago Pneumatic CEO Richard Besser of his overseas owners: "They're enlightened enough to say, 'If you can find the money, invest it. Anything over the dividend requirement, we keep.'" At the company's plant at Utica, New York, productivity has doubled wherever new equipment has been installed.

Hatsopoulos of Thermo Electron, who built his Massachusetts company into a \$708-million-a-year leader in environmental instruments, heart-assist devices, and other high-tech products, believes a dearth of "soft investments" is especially crippling for the U.S. These investments—research, product development, marketing, and employee training—cannot be used as collateral for borrowing and must be financed from corporate equity.

Since the Eighties, Hatsopoulos notes, increased flows of debt capital across borders have brought an "almost complete convergence" of real, after-tax interest rates among countries. But international flows of equity capital remain "insignificant," because stocks are inherently riskier than debt and equity investors prefer familiar companies on native soil.

The anemic U.S. savings rate is the main reason for the high equity costs American business faces, he contends. Just how high has been estimated by Robert McCauley and Steven Zimmer of the New York Federal Reserve Bank, in an analy-



More companies need productivity-boosting equipment like this computerized installation at Chicago Pneumatic Tool in Utica, New York, which performs a series of operations on a batch of housings for air-powered tools. It's part of a \$1 million machining center from Milwaukee's Kearney & Trecker.

sis based on adjusted price/earnings multiples in several countries' stock markets. In 1988, they calculated, the cost of equity was more than 12% in the U.S., vs. 7% in Germany and less than 6% in Japan. (The gap has narrowed, but most experts say it is still substantial.)

"If your competition has to make 6% or 8% but you have to make 12%, can you survive?" Hatsopoulos asks. Thermo Electron has because its P/E multiple is above the U.S. average. But in general, he argues, the high cost of equity dictates the short time horizons for which American managers have been maligned.

Hatsopoulos wants the savings rate to rise. He advocates cutting taxes on long-term capital gains, which he regards as an extra levy on retained earnings that raises the cost of equity. Long-term gains are tax-free in Germany and taxed only lightly in Japan. To avoid an immediate jolt to federal revenues, Hatsopoulos would apply the tax cut only to future gains on assets held at least five years from the day the law passes. That's quite a gesture from an entrepreneur who acquired most of his Thermo Electron stock at 30 cents a share and saw it grow 130-fold.

The Council on Competitiveness has a different solution to the capital problem: faster depreciation in "priority technologies." If any industry qualifies, it's chip-making equipment, the initial link in the huge electronic industry's productive "food chain." With the rise of Japan's semiconductor industry, says G. Dan Hutcheson, president of VLSI Research in Silicon Valley, the U.S. share of the world market for chipmaking gear has fallen from 61% in 1985 to 45% in 1990. Michael Ciesinski of SEMI, the chipmaking equipment and materials trade association, adds that some companies with heavy R&D and expansion needs "are in desperate need of capital."

Bromley and other influential members of the Administration are sympathetic to the notion of faster write-offs, but the proposal highlights a major dilemma for the Bush Administration. By shrinking the federal deficit, it can free up capital for all business. But that will take time. "If you wait until the cost of capital goes down for the whole nation, you may wait forever," says CEO John Young of Hewlett-Packard. A selective tax policy that grants faster depreciation to, say, a half-dozen critical industries would limit the government's cost. But that puts Washington in the game of favoring some sectors over others.

In formulating the new technology policy, Bromley found an elegant way to traverse



White House aide Allan Bromley took the Bush Administration down a new policy path.

this ideological minefield. He has convinced the White House that it can plunge deeper into supporting key technologies without intervening in the market's selection of winners and losers. Once companies reach the point of competing with products and services, Bromley says, customers should decide the outcome.

Still out of bounds is a pet notion of industrial policy advocates: the use of government purchasing power to provide critical mass for new industries. "That begins to

sound like command and control," says Bromley. In 1989 the White House shot down a Pentagon plan calling for military procurement programs to help spawn a civilian high-definition TV industry.

One object of the new technology policy, Bromley says, is to clear up "a fair amount of confusion as to where the Bush Administration really stands" in the wake of that fracas. The HDTV scheme was "unfortunately handled," he says. Had it been put forth not as "a specific application" called HDTV but as several generic technologies with broad potential—high-resolution displays, special integrated circuits, sophisticated software—the White House would have gone along. As it turns out, all three technologies are getting federal support at congressional insistence.

It all sounds reasonable—a pragmatic middle course as befits a pragmatic President. The proposed \$76 billion federal R&D budget for fiscal 1992 would still overwhelmingly support defense, space, and medical research. The only major item related to industrial competitiveness is a \$638 million request for research on high-performance

RESEARCH CONSORTIUMS: EVERYBODY'S GOT THEM

	ORGANIZATION	YEAR FORMED	BUDGET (% from govt.)	AREAS OF INVESTIGATION
U.S.	SEMATECH	1987	\$200 million a year (50%)	Methods, materials, and equipment for making advanced semiconductors
	NATIONAL CENTER FOR MANUFACTURING SCIENCES (NCMS)	1986	\$80 million a year (35%)	Improved machine tools, software, better machining methods, new materials
	MICROELECTRONICS & COMPUTER TECHNOLOGY CORP. (MCC)	1983	\$60 million a year (10%-15%)	Advanced computing, software, computer-aided design, semiconductor packaging
	ADVANCED TELEPHONY PROJECT	1986	\$70 million a year (70%)	Hardware and software for telephones capable of translating languages
JAPAN	SYNCHROTRON ORBITAL RADIATION TECHNOLOGY CENTER (SORTEC)	1986	\$15 million a year (70%)	X-ray lithography for advanced semiconductors; includes development of small atom smasher
EUROPE	OPTOELECTRONICS TECHNOLOGY RESEARCH CORP. (OTRC)	1986	\$7.5 million a year (70%)	Optoelectronic parallel processor, ten-gigabit-per-second switch for communications networks
	EUR. STRATEGIC PROGRAM FOR R&D IN INFORMATION TECHNOLOGY (ESPRIT II)	1987	\$4.2 billion through 1992 (50%)	More than 400 projects in information technologies, microelectronics, computer-integrated mfg.
	R&D IN ADVANCED COMMUNICATIONS IN EUROPE (RACE)	1987	\$1.6 billion through 1992 (under 50%)	Integrated broad-band telecommunications network
	EUROPEAN RESEARCH COOPERATION AGENCY (EUREKA)	1985	\$8 billion committed (30%)	Encompasses 370 industrial technology projects, including a chip initiative called Jessi

Throughout the industrialized world, governments are banding together with corporations to develop commercially promising advanced technologies. In this sampler of consortiums, the heaviest spender is Europe, which is using them to play high-technology catch-up with the United States and Japan.

computing and a fiber-optic network that could become tomorrow's information superhighway.

Ian Ross, president of Bell Labs and chairman of NACS, complains that industrial competitiveness remains an "orphan" in the budget. But huge shifts in federal R&D spending may not be necessary. Since 1984, when Congress relaxed antitrust laws, rival companies in the same industry have felt freer to band together for precompetitive research. Often the economics are so compelling that no government help is needed. When it is, Washington wisely insists in most cases that industry put up at least half the money. Japan's Ministry of International Trade and Industry no longer doles out large sums for industrial research. Says Motorola's Fisher on Japan: "Government-sponsored consortiums don't so much do the research as spell out the direction."

Bromley has big hopes for consortiums in the U.S. Their members, he says, don't have to waste time and money by separately "re-inventing the technological wheel." But pitfalls exist. In individualistic America, will companies share knowledge or withhold it?



The best thing government can do, says Hatzopoulos of Thermo Electron, is spur saving and cut the tax on long-term gains.

Corporations that have chosen to participate are betting that three important government-supported consortiums—for manufacturing, microelectronics, and chip-making—can be made to pay off.

The 120 members of the National Center for Manufacturing Sciences (NCMS), in Ann Arbor, Michigan, range in size from General Motors to family-owned firms. Many projects are in machine tools where, in the words of consultant William Copeland

of Stamford, Connecticut, "companies don't have fat, healthy profit margins to plow back into R&D." All the more remarkable, then, that one participant is a thriving toolmaker that would seem to have the least to gain from joint research.

Giddings & Lewis of Fond du Lac, Wisconsin, spent 10% of sales on R&D last year. "We're a light-year ahead of Germany" in software for flexible manufacturing systems and production cells, and "two light-years ahead of Japan," declares CEO Bill Fife. So why NCMS? Says Jim Simon, Giddings's vice president for engineering who attends the consortium's meetings: "We can't by ourselves keep pace with everything."

Founded in 1986, the consortium gets more than a third of its \$80 million annual budget from the Air Force and parcels out all its research money to outside contractors. President Edward Miller expects the budget to ramp up to \$500 million in the next five years. NCMS has already achieved some real breakthroughs, including a method for hardening cutting tools by coating them with diamond film.

NEW ASSISTANCE FROM THE STATES

★ States have long been notorious for the zero-sum game called smokestack chasing, in which they compete for factories by offering tax breaks and facilities. But the recession of 1982 brought something new: programs that boost the competitiveness of companies already on the scene and hatch new ones.

Such efforts accounted for a sizable chunk of the \$550 million states spent on technology development in 1988. Companies generally pay at least half the cost of participating in the programs, which provide a variety of services: information about new manufacturing technology, links to university experts, "incubators" that offer reduced-cost factory and office space, and even seed money.

Pennsylvania's Ben Franklin Partnership, which operates four industry-university research consortiums, has created 765 new companies and helped 909 others expand since 1983.

Any Georgia company can get up to five days of free manufacturing advice from any of 12 regional offices operated by Georgia Tech, a state school.

Steris Corp. of Painesville, Ohio, was born in 1987 after inventor Raymond Kralovic won a state grant to work with Case Western Reserve University in nearby Cleveland. He had an idea for quick sterilization of the delicate instruments used in new types of endoscopic surgery. Conventional sterilization took hours and required toxic gases. The Steris process does the job in 20 minutes using a proprietary chemical solution. The development money came from Ohio's Thomas Edison Program, which operates eight technology centers around the state.

The U.S. Commerce Department runs a clearinghouse on state programs (202-377-8100). To learn about those in your state, you can also consult its department of commerce or office of economic development.

THE MICROELECTRONICS & Computer Technology Corp. in Austin, Texas, was founded in 1983 partly as an answer to Japan's fifth-generation computer project. The \$60-million-a-year organization has 57 participants, which can pick and choose among 34 projects; federal research contracts account for about 10% to 15% of the budget.

Nothing huge has come out of MCC. But members are pleased with some lesser developments already incorporated into computer-aided design programs, artificial intelligence systems, and "packaging" of semiconductors. By working with MCC, for example, 3M developed an improved method of "tape-automated bonding" for joining semiconductors to surrounding circuitry.

The most promising news about MCC is its new boss, Craig Fields, a whiz who formerly ran the Defense Advanced Research Projects Agency (Darpa). "I want MCC to be the best there is," says Fields, who talks at jet-plane speed. He prefers to undertake projects for their business impact rather than their technological effect. Some should be planned for "shorter time-bites," he says, because member companies' plans often change. And instead of always trying to win by a mile with big breakthroughs, Fields



says, MCC should "try to win by an inch, putting priority on process improvements that can get you that inch ahead in time to market, that inch ahead in price and quality, which lead to much more than an inch ahead in market share."

WASHINGTON, through Darpa, contributes \$100 million a year to Sematech, a consortium of semiconductor manufacturers in Austin. Its 14 member companies match the grant dollar for dollar and lend talent. Robert Galvin, former chief of Motorola, recently became chairman.

One objective of the four-year-old consortium is to shore up the chipmaking equipment industry. CEO James Morgan of equipment maker Applied Materials says Sematech "has developed a much better working relationship between customers and suppliers." Several consortium members have placed big orders with American equipment makers, and Sematech CEO William Spencer, formerly at Xerox, asserts that without the consortium U.S. chipmakers "would have lost their equipment base."

Sematech's other goal is to develop reliable methods for making the world's most densely printed chips, thereby reaching parity with Japan. Spencer says he's confident the consortium can meet its target of 0.35-micron line widths by 1993, using made-in-America equipment at each critical step. That would allow members to manufacture an aspirin-size chip with a 64-megabit memory, an enormous jump from the one-megabit chips that are the standard today.

These consortiums are trying to put existing U.S. industries out front. Could judiciously awarded government grants lead to the creation of entirely new industries? That's one of the aims of the Commerce Department's closely watched Advanced Technology Program (ATP), which recently announced its first \$9 million in grants to 11 consortiums, joint ventures, and individual companies. Among the precompetitive technologies to be supported are holographic memory systems, a handwriting-recognition system for computers, and better ways to make flat-panel displays.

These displays, used in laptop computers, are another U.S. technology that Japan has run with after giant American players gave

up. Only niche companies survive, though they boast some superior techniques that could yet be incorporated into tomorrow's big-screen TV sets. Photonics Imaging, a member of a consortium receiving an ATP grant, sells big, high-resolution monochromatic screens using gas plasma technology to the armed services in the U.S., Britain, Germany, and Japan.

The ATP grant of \$1.35 million to the consortium looks puny. Says Robert Costello, a former Defense Department official now at the Hudson Institute in Indianapolis, who has visited Hitachi, a big Japanese supplier of displays: "They spend far more for R&D in flat-panel displays in that one company than the whole ATP program."

Because of a cascade effect from industry matching and follow-up grants, the ATP's initial \$9 million will trigger \$100 million of research, and the program will grow. The National Institute of Standards and Technology (NIST), which administers it, will

distribute \$36 million next year. Any good idea the applicants come up with has a chance, says NIST director John Lyons: "We let *them* set the agenda."

Sad, but true: Distrust of Japan is one of the forces driving U.S. business and government together. A rational reason for closer ties, says George Heilmeier, head of Bellcore research labs, is to make sure U.S. companies are not dependent on overseas competitors for critical components.

This doesn't mean the U.S. should surround itself with a technological fence. Global tie-ups by business are an unstoppable trend. Bromley says that at some point the U.S. might want to share with other countries what's coming out of consortiums like Sematech. But he adds that in return, "we must be much more aggressive in seeing that we get something of comparable benefit." That sounds like a nation looking to its own interests—something Japan has done for years. 



Consortium research bears fruit in Texas: MCC's technique for automatically mating microchips to connecting circuits on a filmlike backing.



SOURCES OF HELP

RESEARCH ORGANIZATIONS

American Assembly
Columbia University
412 Altschul Hall
New York, New York 10027
212-280-3456

American Productivity &
Quality Center
123 North Post Oak Lane
Houston, Texas 77024
713-681-4020

American Society for Training
& Development
1640 King Street
Alexandria, Virginia 22314
703-683-8100

Berkeley Roundtable on
the International Economy
University of California at Berkeley
2234 Piedmont Avenue
Berkeley, California 94720
415-642-3067

Center for Effective Organizations
University of Southern California
3500 South Figueroa Street
Los Angeles, California 90089
213-743-8765

Computer Systems Policy Project
1735 New York Avenue NW
Washington, D.C. 20006
202-628-1700

Council on Competitiveness
900 17th Street NW
Washington, D.C. 20006
202-785-3990

Defense Science Board
The Pentagon
Washington, D.C. 20301
703-695-4157

Jobs of the Future
48 Grove Street
Somerville, Massachusetts 02144
617-628-6661

MIT Commission on Industrial
Productivity
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139
617-253-5714

National Advisory Committee
on Semiconductors
1555 Wilson Boulevard
Arlington, Virginia 22209
703-522-1683

National Center on Education and the
Economy's Commission on the Skills
of the American Workforce
1341 G Street NW
Washington, D.C. 20005
202-783-3668

Work in America Institute
700 White Plains Road
Scarsdale, New York 10583
914-472-9600

TRADE ASSOCIATIONS

National Association of Manufacturers
1331 Pennsylvania Avenue NW
Washington, D.C. 20004
202-637-3000

National Coalition for Advanced
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INDUSTRIAL MODERNIZATION:

AN AMERICAN IMPERATIVE



A NACFAM WHITE PAPER

THE NATIONAL COALITION FOR
ADVANCED MANUFACTURING

WASHINGTON, DC

OCTOBER, 1990



PUBLICATION SUPPORTED BY THOMAS PUBLISHING CO./
THOMAS MAGAZINE GROUP





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TABLE OF CONTENTS

	Page Number
Acknowledgements	1
Summary	3
Introduction	7
Strategies for Federal Action	13
Leadership	13
Technology Transfer and Development	14
Human Resource Development	17
Targeted Modernization Incentives	20
Conclusions	25
References	27
NACFAM Advisory Board	28
NACFAM Board of Directors	29

Industrial Modernization: An American Imperative

ACKNOWLEDGEMENTS

The National Coalition for Advanced Manufacturing (NACFAM) is a broadly based non-partisan, non-profit organization committed to industrial modernization and the reinvigoration of U.S. manufacturing.

The members of NACFAM strongly believe that manufacturing matters. Only a technologically advanced manufacturing industry, fully capable of confronting the challenges of global competition, can enhance the quality of life and assure the economic well-being of the American people. To that end, NACFAM advocates a broad program of action to facilitate modernization, promote the dissemination of advanced technologies, and improve technical skills and education.

NACFAM's membership embraces companies and organizations directly involved in some aspect of industrial modernization. These include manufacturing firms ranging from the smallest to the largest companies; centers of manufacturing training, research, and manufacturing extension; national industry and education associations; and industrial consultants.

As part of its mission, NACFAM will issue a series of papers devoted to the public policy aspects of U.S. manufacturing. The present paper addresses the need for federal action on behalf of industrial modernization in the United States.

This paper was drafted by Leo Reddy and Jack Fellman, who were aided by helpful recommendations from within the coalition. They would like to acknowledge the particularly thoughtful and comprehensive contributions offered by:

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SUMMARY

A major national effort will be required to modernize America's industrial infrastructure and increase the global competitiveness of U.S. manufactured products. The ultimate objective of such an effort is to regain world leadership in manufacturing productivity and a premier share in world exports of manufactured goods.

It must be recognized that competitiveness and productivity are inextricably related. In advanced industrial societies, manufacturing productivity is the primary engine of economic growth and a prime determinant of a nation's standard of living. Thus, without growth in manufacturing productivity, the standard of living of the American people will markedly decline.

To stoke the engine of economic growth and to leap forward in manufacturing productivity, a massive investment will be required in industrial capital goods, technology, training, and education.

In the early 1980's, impressive advances were registered in U.S. manufacturing productivity when U.S. industry committed major capital resources to investment in advanced manufacturing technology. In recent years, these advances have fallen off sharply from the peak gains realized earlier in the decade.

- *In productivity, the 1989 U.S. output per hour in manufacturing increased by only 2%, a drop of about 60% from the peak gains achieved in 1983-84. This dismal performance left the U.S. behind all but one of eleven other industrial countries in last year's productivity growth.*

- *In contrast, Japanese productivity has increased steadily throughout the decade. Since 1985, Japan has become the undisputed leader in several leading industries including electrical machinery, transportation equipment, basic*

and fabricated metal products, and precision instruments. Sometime late this year or early in 1991, an historic turning point will be reached when for the first time Japanese productivity will exceed that of the United States in overall manufacturing output per hour.

- *In capital investment, since 1987 Japan has sharply accelerated its expenditures on new manufacturing plants and equipment. In the last three years, the proportion of Japan's Gross Domestic Product (GDP) devoted to investment in manufacturing has risen sharply, increasing almost six times faster than the corresponding rate in the U.S. In 1990, manufacturing investment in Japan will comprise about 5.1% of its total GDP compared with 3.5% for the U.S.*

- *In education, recent surveys indicate that average Japanese students do better than all but the top 3% of U.S. students in twelfth grade mathematics. Vocational and technical training programs are better developed in many advanced industrialized countries than in the U.S.*

These adverse developments must be of concern to all Americans, not just those directly involved in manufacturing. The competitive standing of U.S. industry affects the jobs, the standard of living, and the security of every citizen. Comprehensive action in both the private and public sectors will be required to reverse these trends and reinvigorate American manufacturing.

This White Paper, the first in a series of public policy papers by the National Coalition for Advanced Manufacturing (NACFAM), focuses on a strategy for federal action in those areas of manufacturing competitiveness in which the federal government already has major responsibilities.

Industrial Modernization: An American Imperative

This strategy addresses the nation's industrial infrastructure as a whole. It does not "pick winners or losers". Nor does it substitute government policy for corporate initiatives. It acknowledges that competition in the manufacturing sector is primarily the responsibility of individual companies.

At the same time, this strategy recognizes the responsibility of government to provide a public policy environment in which manufacturers in America have a fair opportunity to match overseas competitors and to ensure a robust industrial base capable of meeting all challenges to national security.

The key contribution which this White Paper seeks to make is to present views from the private sector on specific actions which the federal government should take to facilitate industrial modernization. These actions reflect recommendations from within the broad coalition of organizations - companies, schools, and associations - which comprise NACFAM.

The four areas in which this Paper proposes a strategy for federal action include leadership, technology transfer, human resource development, and modernization incentives.

1. Leadership

In the field of leadership, this Paper proposes that the President play a direct role in the effort to rebuild the nation's industrial infrastructure. Such leadership is the prerequisite for vigorous action by industry and the nation's citizenry in support of that effort. To this end, we recommend that the President:

- *Proclaim the modernization of America's manufacturing infrastructure by the Year 2000 as a national goal.*
- *Undertake a strong and continuing effort to explain the importance of this goal for the entire nation and not just for manufacturing industry.*
- *Create a National Commission to review progress towards that goal on the basis of such indicators as the trade balance in manufactured goods, domestic and world market share for U.S. industry products, R&D funding levels for industrial technology and innovation, workforce skill levels, and rates of adoption of advanced manufacturing technologies and processes.*
- *Designate an annual "U.S. Manufacturing Week" to provide a yearly focal point for the public recognition of achievement in manufacturing and training; for an annual review of progress in attaining industrial modernization; and for a public information effort to stimulate careers in manufacturing, industrial engineering, and applied science.*

2. Technology Transfer

To facilitate the development and transfer of modern manufacturing technologies, this Paper recommends that the federal government:

- *Revise priorities in federal R&D programs to provide for significantly greater proportion of funding for manufacturing technologies and emerging critical technologies.*
- *Assist in funding state and local industrial technology extension programs, particularly those programs which are aimed at diffusing readily available, off-the-shelf, advanced manufacturing technologies and products to small and medium sized enterprises.*

Industrial Modernization: An American Imperative

- *Endow chairs for professionals with industry experience to be established in community colleges, universities, and other manufacturing education centers.*

- *Strengthen all Department of Defense quality manufacturing programs and promote wider use of manufacturing extension programs for defense suppliers.*

3. Human Resource Development

In the field of human resource development, federal actions should include the following:

- *Expand the "Tech Prep", Two-Plus-Two program initiated by the Perkins Vocational Education Act of 1990.*

- *Identify the best human resource programs currently operating at state and local levels in order to facilitate their replication on a nationwide basis.*

- *Strengthen the Labor Department's work-based learning programs to improve workforce quality.*

- *Make a national commitment to win the International Skills Olympics.*

- *Establish a "Charlottesville Industrial Specialist Skills Award" for high school graduates to mark the commitment by the President and the nation's governors at the 1989 Charlottesville Education Summit to raise America's workforce skills to internationally competitive levels.*

4. Targeted Modernization Incentives

In the area of targeted modernization incentives, this Paper recommends the following:

- *In the field of tax policy,*

- (a) *A 10% modernization tax credit for new or refurbished plants and equipment, both hardware and software; an additional 5% credit for this purpose to be granted to small manufacturing firms with fewer than 500 employees; a 5% modernization credit to qualified manufacturing companies which have realized a demonstrable productivity gain of 5% or more during the previous tax year period.*

- (b) *An acceleration of cost recovery for productivity enhancing equipment through the inclusion of all computer-based manufacturing equipment as qualified technological equipment under Section 168 of the Internal Revenue Code and the reclassification of all such equipment as 3-year property; the accelerated expensing of qualified manufacturing process equipment under Section 179 of the Internal Revenue Code, in exclusion amounts not exceeding \$75,000.*

- *The creation of a secondary financial market for industrial modernization investments, on either a purchase or lease basis.*

- *Improved Small Business Administration loan programs for purchasing advanced manufacturing equipment.*

- *Encouragement to the accounting community to revise generally accepted principles of accounting to reflect the benefits of advanced manufacturing and the appropriate norming of IRS regulations to these new accounting methods.*

As an action organization, NACFAM is already actively engaged in pressing for the implementation of each of the federal measures described above to enhance the modernization of the nation's industrial infrastructure.

Industrial Modernization: An American Imperative

INTRODUCTION

For over two decades, America's leading economic competitors have been investing heavily in advanced manufacturing technologies, developing intensive new manufacturing R&D and industrial training programs, and reorganizing their manufacturing management and production control practices. In all these endeavors, they have generally benefited from more supportive public policies than those available to manufacturers in the United States.

Within the context of a favorable public policy environment, our overseas competitors have typically enjoyed greater access to capital and lower interest rates; stronger tax incentives for modernization; a better developed training base; significantly higher proportion of government R&D funding devoted to manufacturing technologies; far reaching industrial extension programs; and widely available loan guarantees for smaller manufacturers.

As a result, manufacturing industries in some of our leading competitor nations have been able to modernize their industrial infrastructure more rapidly than in the U.S., gaining a long lead in many of the most important measures of manufacturing competitiveness, such as:

- *quality of manufactured products*
- *optimization of process technologies and controls*
- *shorter product cycle times*
- *adoption of advanced automation technologies and equipment*
- *technical sophistication of the workforce*

The failure to maintain a competitive standing in all these important respects has been the primary factor for the relative decline of U.S. manufacturing. The result has been a substantial loss in market share in such industries as machine tools, automobiles, consumer electronics, and

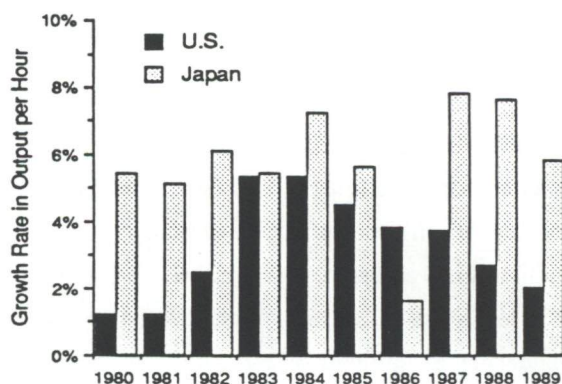
ship building. In general, the U.S. share in world exports of manufactures was significantly lower in 1988 than in 1980 for all manufactured goods, particularly in the following major industry sectors: machinery, transportation equipment, chemicals, and basic manufactures. (1)

The loss in market share can be attributed to many reasons. The most important of these are the perceived decline in the quality of American goods and the gradual erosion of U.S. leadership in manufacturing productivity.

Quality is one reason why American consumers so often select foreign over U.S. made products, and why the U.S. confronts a persistent trade deficit in manufactured goods. It is also an important reason why the U.S. is becoming increasingly dependent upon overseas suppliers of critical defense components.

Another major factor is the steady erosion of U.S. leadership in manufacturing productivity, particularly in relation to Japan. Over the past 20 years, the growth rates of U.S. manufacturing productivity have been consistently lower than Japanese productivity gains. (See Exhibit 1.)

Exhibit 1: Productivity Growth Rate Comparison, Japan v. US

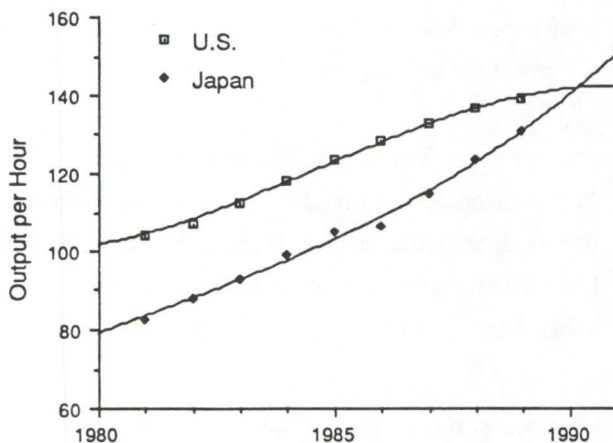


Source: International Productivity Center, U.S. Dept. of Labor

Industrial Modernization: An American Imperative

Since 1985, in many advanced technology, export-intensive industries, Japan has been the undisputed champion in manufacturing productivity. These industries include such export-intensive sectors as electrical machinery, transportation equipment, basic and fabricated metal products, and precision instruments. Most recently, Japanese leadership in manufacturing productivity has been extended to most other industry sectors, high and low technology alike. Indeed, by one leading index, an historic turning point will be reached when Japan overtakes the United States in overall manufacturing productivity some time late this year or in early 1991. (See Exhibit 2.)

**Exhibit 2: Manufacturing Productivity,
Japan v. US**



Source: International Productivity Center, U.S. Dept. of Labor

The driving force behind Japan's remarkable strides in manufacturing productivity has been a massive investment in industrial technologies, particularly in modern machinery and equipment. (See Exhibit 3.) For example, since 1987 Japan has sharply accelerated its expenditures on new manufacturing plants and equipment. In the last three years, the proportion of Japan's Gross Domestic

Product (GDP) devoted to investment in manufacturing has risen sharply, increasing almost six times faster than the corresponding rate in the U.S. In 1990, manufacturing investment in Japan will comprise about 5.1% of its GDP compared with 3.5% for the U.S. (2)(3)(4)

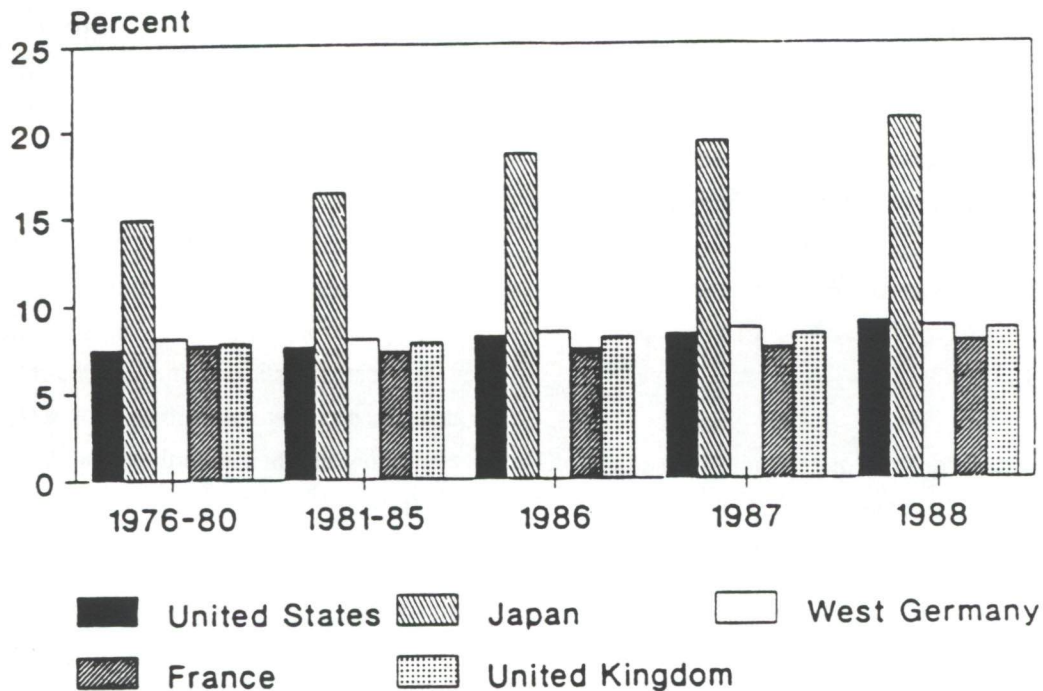
As a direct consequence of the relatively low rate of U.S. capital investment in manufacturing, the capital stock of American industry is increasing at a marginally slow rate. In the long run, the American standard of living will bear the full brunt of our failure to stimulate the rate of increase of capital stock to the level required by world class manufacturing. Undoubtedly, the relationship between the standard of living and the growth rate of industrial stock is not regarded by most people as one of the defining issues of our time. Yet, in fact, that interrelationship is direct and immediate. Perhaps the most graphic demonstration of the close nexus between the growth in capital stock and the standard of living has been furnished in a recent study published by the Federal Reserve Bank of St. Louis. As that study clearly established, the failure to increase the investment ratio in capital stock beyond the current rate will result in a stagnant standard of living well into the middle decades of the 21st century. (5)

In fact, if we wish to maintain the historic improvement of our standard of living at the trend rates prevalent since the Second World War, *we will have to triple our net real investment in capital stock relative to the real GNP by the year 2010.* Even the much more modest goal of a gradual rise in the standard of living, but at a much slower pace than heretofore, will still require almost a doubling of the investment ratio by the year 2010.

The impact of investment on manufacturing is even more direct. High rates of investment in advanced manufacturing have accelerated the pace of industrial modernization in many of our leading global economic competitors. In

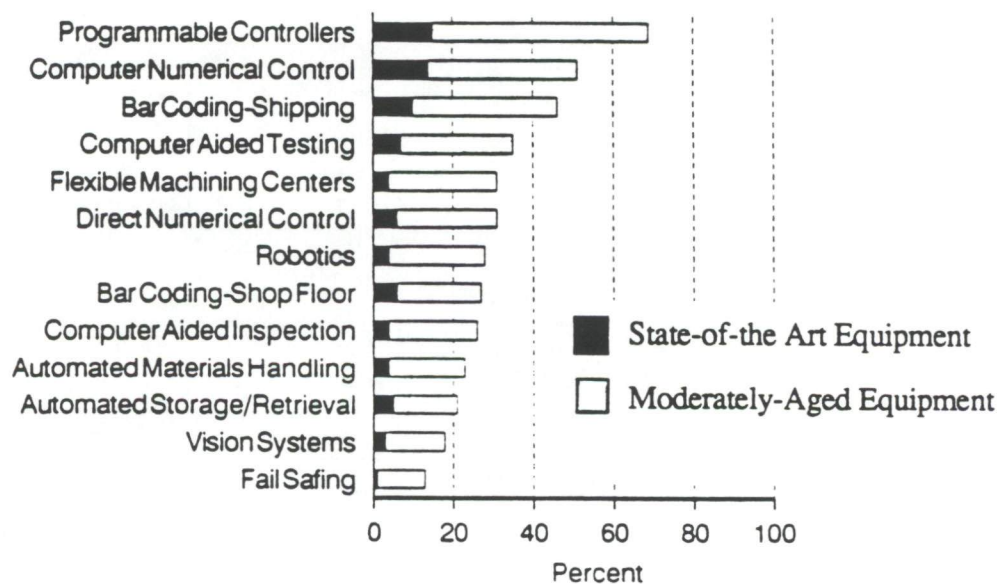
Industrial Modernization: An American Imperative

Exhibit 3: Fixed Investment in Machinery and Equipment as a Percentage of GNP/GDP



Source: Office of Technology Assessment, February 1990

Exhibit 4: Application of Advanced Production Technologies by US Manufacturers



Source: Deloitte & Touche, Making the Grade in the 1990's

Industrial Modernization: An American Imperative

contrast, the relatively slow rates of modernization in the United States have affected adversely the competitiveness of U.S. manufacturing.

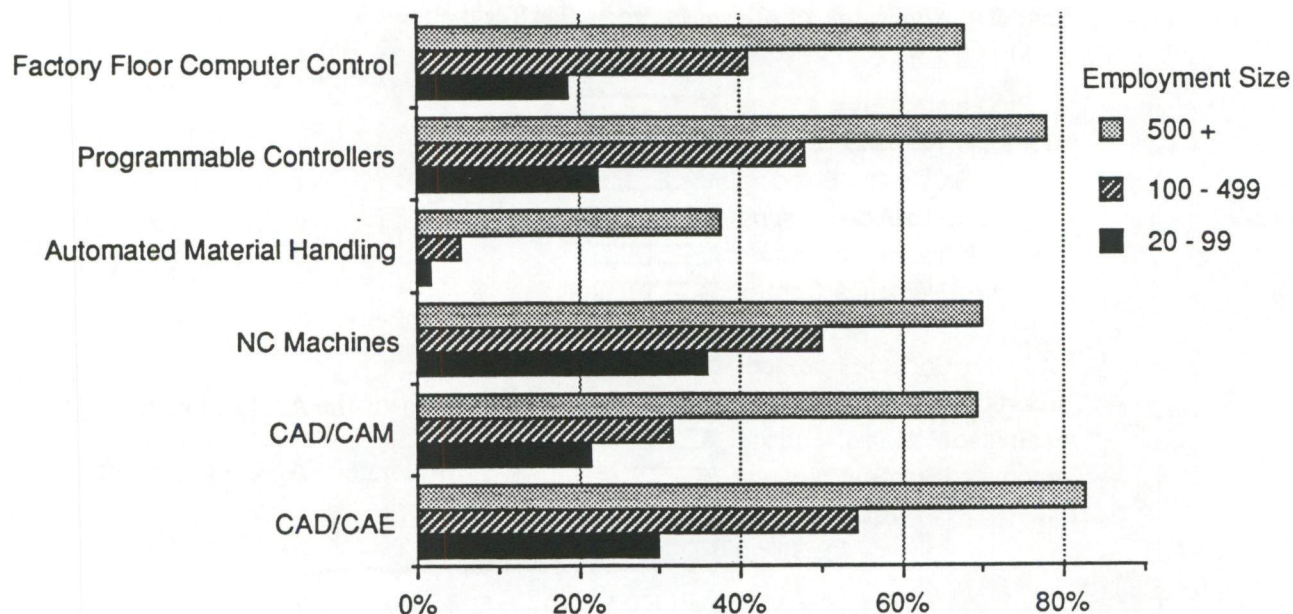
The relative decline of U.S. manufacturing is not confined to just a few industry sectors. It affects the entire manufacturing infrastructure and impacts firms of all sizes. In general, the rates of adoption by U.S. manufacturing for advanced production technologies have been remarkably low, particularly for state-of-the-art equipment. (See Exhibit 4.)

The failure to modernize rapidly has already had a significant impact on the economic viability of the nation's approximately 350,000 small manufacturers, those with

fewer than 500 employees. Large differences have arisen between large and small companies, as smaller establishments have fallen increasingly behind in the implementation of advanced technologies. (See Exhibit 5.)

The relative productivity and earnings of these smaller firms have declined steadily throughout the 1980's. This is an acute problem for small and large companies alike, because large manufacturers increasingly rely upon outside suppliers for parts and components. In addition, these smaller companies have generated the majority of new jobs created in manufacturing during recent years, and they account for about a third of the value added in U.S. manufacturing. (6)

Exhibit 5: Implementation of Advanced Manufacturing Technologies by Employment Size



Source: U.S. Bureau of the Census, Current Industrial Report, Manufacturing Technology, 1988

Industrial Modernization: An American Imperative

American industry recognizes that the state of U.S. manufacturing is far from satisfactory. A recent survey showed industry executives giving themselves a poor "report card" for overall performance and assigning an overall grade "D" for the adoption of advanced manufacturing technologies. (See Exhibit 6.)

According to another recent survey, 67% of 250 top executives agreed that American manufacturing uses too little automation, with fewer than half of the reporting firms using flexible manufacturing methods. (See Exhibit 7.)

Fortunately, many U.S. corporate executives have begun to recognize the importance of manufacturing in the global marketplace. For example, a recent survey (Spring, 1990) asked executives in the mid-Atlantic re-

gion to rank the three top business functions for competitive edge. Just over 60% indicated that manufacturing processes should be given top priority. (See Exhibit 8.) The replies to that survey are an encouraging indication that industry executives perceive advanced technology as a key factor in the struggle to regain U.S. competitiveness.

The past failure to proceed rapidly with industrial modernization means that the United States will be increasingly hard pressed to restore its overall leadership in manufacturing. Our competitors have sustained a major commitment over many years to building up their industrial infrastructure and have pursued long-term strategies for gaining market share. As new processes develop at an accelerating pace, the gap between aggressive and sluggish manufacturers will grow.

**Exhibit 6: Manufacturing Technology Report Card
(Industry Self-Assessment)**

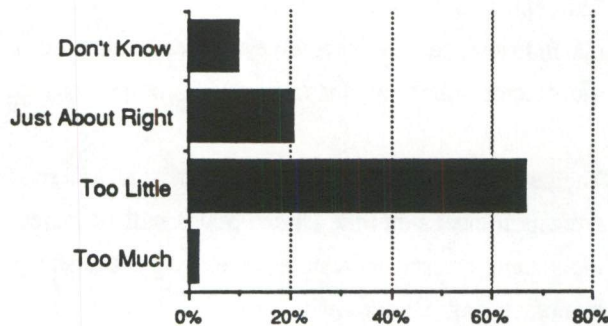
Technology Application	Food	Basic	Fab. Metal	Machine Tools	Electronic	Transp./ Auto	Aircraft/ Aerospace
Product and Process Design	D	D	D+	D+	C-	C-	C
Production Process	D	D	D	D	D+	D+	C-
Expert Systems Application	D	D	D	D	D	D	D+
Manufacturing Planning & Control	D+	D	D	D	C-	C-	D+
Information Technologies	D	D	D	D	D+	D+	C-
OVERALL GRADE	D	D	D	D	D+	D+	C-

Grading Scale
A = State of the Art
B = Substantial
C = Moderate
D = Little
F = No Experience

Source: Deloitte & Touche, Making the Grade in the 1990's

Industrial Modernization: An American Imperative

**Exhibit 7: The State of Automation
(A Survey of American Manufacturers)**

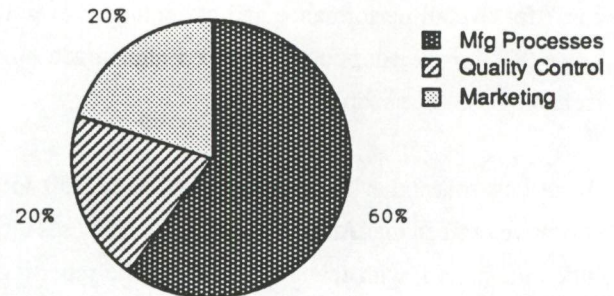


Source: Grant Thornton Survey of American Manufacturers, Automation & Technology, June 1990

If the U.S. falls farther behind in the race to adopt new manufacturing technologies and processes, the consequences will be severe. As America continues to lose market share in manufactured products, it will run the risk of becoming primarily an exporter of raw materials and low-technology components and an importer of finished technologically advanced goods. Our trade posture will further deteriorate, our debtor status will worsen, and foreign acquisition of U.S. assets will soar. The wealth and revenues generated by manufacturing will decline with a consequent negative impact on the nation's ability to resolve its economic and social problems. Further reliance on overseas resources of defense materials will limit, over the long term, the nation's options in the conduct of its foreign and defense policies.

A major national effort is required to modernize America's industrial infrastructure and restore the global competitiveness of American products. Every American has a stake in the success of this effort, not just manufacturing companies and the industrial workforce. A strong, innovative industrial base is an essential foundation for national economic strength, secure and challenging jobs, a high standard of living, and national security.

**Exhibit 8: Ranking of Top Business Functions
for Competitive Edge**



Source: Price Waterhouse, Strategic Advantage, 1990

If such an effort is to be effective, it must be rooted in an understanding that the resurgence in American manufacturing will not occur overnight. It is a challenge that must be answered with profound structural changes which can only be addressed through sustained commitment over many years. It also requires a comprehensive approach which integrates action in all related fields: fiscal, monetary, managerial, education and training, research and development, and industrial extension services.

Such a commitment will require close cooperation between industry, government, schools, and unions at the federal, state and local levels. This effort cannot be monolithic in approach but must reflect the diversity and particular needs of individual firms and geographic areas.

STRATEGIES FOR FEDERAL ACTION

This paper does not attempt to address all aspects of public and private efforts which will be needed across the country to reinvigorate American manufacturing. This paper concentrates instead on a comprehensive strategy of *federal* action which NACFAM believes will assist the U.S. in becoming a world leader in high quality manufacturing by the Year 2000. This strategy integrates federal action in those areas of manufacturing competitiveness in which the federal government already exercises major responsibilities: technology diffusion and development, education and training, tax policy, and the cost of capital.

This strategy is based upon leadership, technology transfer, human resource development, and modernization incentives.

This strategy addresses the nation's industrial infrastructure as a whole. It does not "pick winners or losers." It does not substitute government policy for corporate competitiveness. It acknowledges that competition in the industrial sector is primarily the responsibility of individual companies.

At the same time, this strategy recognizes the responsibility of government to provide a public policy environment in which manufacturers in America have a fair opportunity to match foreign competitors and to ensure a robust industrial base for defense production to meet new challenges to national security.

While this paper focuses on federal actions, a number of the measures suggested herein would also be appropriate for action by state governments. Moreover, it is essential that all federal actions promoting manufacturing competitiveness should be conceived in a spirit of cooperation with state efforts.

The key contribution which this White Paper seeks to make is to identify specific actions which the federal government should adopt to facilitate industrial modernization. This is not an exclusive list; experience will obviously modify some of the proposals outlined in this paper and others will be added in the course of time.

As an action organization, NACFAM is actively engaged in pressing for the implementation of specific federal measures to enhance the modernization of the nation's industrial infrastructure.

Strategy: Leadership

The prerequisite for a successful strategy for federal action is national leadership. It is incumbent upon the nation's leaders in government, industry, and academia to recognize officially that industrial competitiveness is a major national issue and to give this issue high priority. Leadership is required to help the public understand the significance of this issue for the nation's future prosperity and security. Leadership is also pivotal in the implementation of the program for federal actions proposed in this paper.

As a first step in the inauguration of this strategy, this paper proposes that the President deliver a major policy address delineating the scope of the national effort required for modernization, announcing that, in the near future, the President will take the following concrete actions:

- *Proclaim the modernization of America's manufacturing infrastructure by the Year 2000 as a new national goal.*

Industrial Modernization: An American Imperative

- *Undertake a strong and continuing effort to explain the importance of this goal for the entire nation and not just for manufacturing industry.*

- *Create a National Commission to review progress towards that goal. Criteria which could be used in progress evaluation might include such factors as: the trade balance in manufactured goods, global and domestic market share for U.S. manufacturing, R&D funding levels for industrial technology and innovation, workforce skill level, and rates of adoption for advanced technologies and processes.*

- *Designate an annual "U.S. Manufacturing Week," which will serve as the occasion for public recognition of achievements in manufacturing and training; for an annual review of progress in attaining industrial modernization; and for a public information effort to stimulate careers in manufacturing, industrial engineering, and applied science.*

Strategy: Technology Transfer and Development

An integral aspect of the effort to enhance the competitiveness of American industry is the recognition that the nation must devote increased resources to the dissemination of advanced manufacturing technologies - especially readily available, off-the-shelf technologies - and to provide greater support for emerging critical manufacturing-related technologies, particularly for process technologies.

In the first instance this involves the encouragement of new means for technology transfer. Existing off-the-shelf technologies must be disseminated much more efficiently, especially to smaller firms. Industrial extension services can play a critical role in the integration of currently available technology into the factory floor. The nascent

infrastructure of extension services should be provided additional funding, and industry must undertake a direct role in the development and coordination of these programs.

At the same time, the proportion of federal R&D spending on manufacturing-related technologies must be significantly increased. Particular attention should be paid to support programs for precompetitive generic research and for newly emerging critical technologies. Most importantly, industry should be directly involved in all federal R&D programs related to manufacturing.

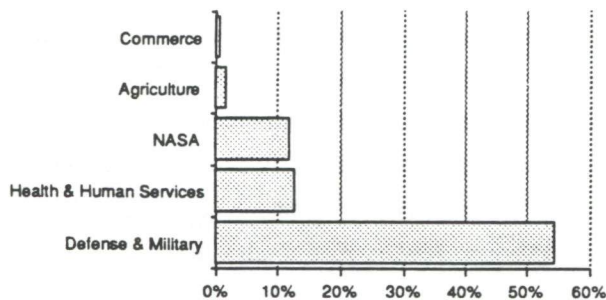
To accomplish these goals, this paper proposes the implementation of the following actions:

1. Revise Priorities in Federal R&D Programs to Allow for Increased Funding for Manufacturing Technologies

In light of major decisions required for the most effective allocation of federal research funds, the Administration and Congress should urgently reassess current R&D priorities. The fundamental criterion in this reassessment should be the potential impact of all candidate technologies on the future competitiveness of American industry.

In the current Administration proposal for federal budget authority in FY 1991, defense-military R&D spending will absorb 54% of the total \$71 billion federal R&D budget, while space projects will account for an additional 12% (a 3.2% increase over 1990). This 66% proportion on defense-military and space projects compares with the 0.6% allocated to all Commerce Department programs, including support for the National Institute of Standards and Technology (NIST). (See Exhibit 9.)

Exhibit 9: Federal Funding of Research & Development FY 1991



Source: Budget of the U.S. Government, FY 1991

At a time when private sector R&D investment is beginning to decline, and the costs of basic research are exceeding the budgets of even the largest American firms, federal R&D funding must be brought into better balance to meet the economic competitiveness imperatives of the 1990's.

A critical review of current U.S. goals in R&D would allow increased support for technologies with direct impact on U.S. competitiveness, not through an increase of overall federal R&D expenditures, but through a reprioritization within existing levels of appropriation.

Higher priority should especially be given to manufacturing process and materials technologies. They are fundamental to the enhancement of productivity and quality in all industry sectors. It is noteworthy that U.S. firms devote about two-thirds of their R&D expenditure to product technologies (aimed at the development of new products and at the improvement of existing products), and only one-third to process technologies (development of new manufacturing processes and optimization of existing processes). Among Japanese firms, the proportion is almost exactly reversed.

This difference in allocation of R&D funds probably accounts for the relatively high gains in Japanese productivity, since process R&D tends to have a much greater impact on productivity than product R&D. (7)

The relative neglect of process technologies places American industry at a competitive disadvantage, since Japan's prowess in process technology is the basic reason why Japanese industry can manufacture, at higher quality and lower cost, products which were first designed and commercialized in the United States. (8)

At minimum, the level of federal funding for R&D on manufacturing technologies should be raised to at least 10% of the \$71 billion proposed for the federal R&D budget in FY 1992, and that proportion should be further increased throughout the 1990's. In a subsequent public policy paper, NACFAM will address the question of how this expanded effort should be organized within the federal government.

2. Endow Chairs in Technical Education Centers

This federal program would establish chairs on a matching fund basis in about 200 community colleges, universities, and other manufacturing education centers to be filled by experienced professionals from industry who would act as a liaison between these academic institutions and the local manufacturing community. Such experienced industry professionals would ensure that the programs of these institutions effectively respond to the actual modernization requirements of industrial firms. NIST's Manufacturing Technology Centers and other large centers could offer training assistance to the chair holders.

3. Bolster Federal Government Support for Manufacturing Extension Service Programs

To meet the urgent problems of transferring commercially available off-the-shelf technologies and know-how to the nation's smaller firms, the Administration should act on the recent recommendation of the Office of Technology Assessment: Set a minimum goal of extending industrial extension programs nationwide to 24,000 manufacturing firms per year, approximately 7% of the nation's 350,000 small to medium sized manufacturing enterprises. If the federal share of the funding were 30%, as it is in the Agricultural Extension Service, the cost to the U.S. government would range from \$36 to \$144 million, depending on the level of service. (9)

This modest investment would yield an enormous return in increased productivity and quality. Even at the maximum level proposed by OTA, this program would be less costly than the Agricultural Extension Service for which \$369 million are currently allocated out of a total \$2.2 billion for agricultural research and extension services.

In this connection, it should be noted that the Agricultural Extension Service, through its diffusion of advanced technology and know-how to the American farmer, has been highly successful in helping to place the U.S. in a world leadership position in agriculture. The nation enjoyed an export surplus of \$16.2 billion in agricultural products in 1989. (10) It should also be noted that the well-endowed (\$369 million) Agricultural Extension Service (supporting a \$90 billion contribution by agriculture to the GNP) stands in marked contrast to the meager \$19 million expenditure (11) by the Department of Commerce to support industrial extension programs (supporting a \$1.8 trillion contribution by manufacturers to the GNP).

Fortunately, thanks to some modest federal initiatives, a rudimentary industrial extension infrastructure is slowly beginning to take shape at the federal level. These fragmented efforts include Manufacturing Technology Centers ("Hollings Centers"); the State Technology Extension Program and the Trade Adjustment Assistance Programs at the Department of Commerce; and the National Technical Transfer Center and Industrial Applications Centers at NASA. On the business management aspects of industrial modernization, the Small Business Development Centers and the Advanced Manufacturing Program of the Department of Commerce have the potential to help overcome manufacturing obstacles.

These federal extension and advisory programs supplement the growing number of state extension service facilities which have been initiated by many state governments. It is important that the expansion of the federal industrial extension program proposed by this Paper should be designed and conceived in such a way as to strengthen, and not duplicate, the extension services currently provided at the state level. Federal assistance to these state programs should include provisions for seed funding on a matching basis under strict criteria.

As a first step, the number of Manufacturing Technology Centers ("Hollings Centers") should be expanded from the three currently in existence to twenty-five by the end of this decade.

To ensure a much higher degree of technology transfer to industry, the federal government should also develop a unified protocol for federal technology transfer data bases and provide for direct access by manufacturing firms to this information. Personnel in industrial extension services should also receive training in the use of federal technology transfer programs.

The federal government should also identify the best human resource programs currently operating at state and local levels in order to facilitate their replication on a nationwide basis.

4. Strengthen Department of Defense Quality Manufacturing Programs, Including Creation of Manufacturing Extension Programs for Defense Suppliers

Large manufacturers are in a strong position to stimulate smaller firms to achieve higher standards of quality. In the aerospace and automotive sectors, the major manufacturing companies have been very successful in instituting standards of high quality and performance which have induced their first tier and second tier suppliers to establish stringent quality control programs. In a similar vein, the federal government can insist on high standards of quality and efficiency for the large number of companies which provide goods and services to government agencies.

This is particularly true of the Department of Defense. As the government's single largest purchaser of manufactured goods, the Department of Defense can serve as a powerful force for industrial modernization, especially in times of budgetary stringency, while ensuring that it receives the best value for the products it purchases. This objective can be achieved through the enactment of the innovative manufacturing initiatives proposed in the Senate version of the National Defense Authorization Act for Fiscal Year 1991. (S. 2884) The Administration should strongly support and supplement the manufacturing programs envisaged in this Bill.

This legislation includes a new provision for exploring the use of manufacturing extension programs to assist defense subtier manufacturers to adopt advanced manufacturing concepts. It provides for an expanded role for such

programs as Manufacturing Technology (MANTECH), Industrial Modernization Incentives Program (IMIP), and Small Business Innovative Research (SBIR). It also provides for other valuable innovations such as Small Business Partnership Model programs, a Defense Total Quality Management Institute, a Critical Technologies Institute, and Advanced Materials Processing Partnerships. In addition, this legislation encourages defense acquisition in forms that break down barriers between civilian and military industrial production and broaden the Independent Research and Development (IRAD) programs to diffuse new technologies into dual use applications.

Strategy: Human Resource Development

Advanced manufacturing technologies such as computer integrated manufacturing, computer-aided design, robotics, just-in-time inventory, and flexible manufacturing are revolutionizing the way things are made, and a host of new process technologies is waiting in the wings. The successful and profitable integration of these technologies into a firm's operations, however, requires a well-trained workforce, including managers, engineers, industrial designers, and shop floor personnel able to adapt to rapid change. Managerial and workforce training at all levels is the basis from which we can expect the greatest improvements in manufacturing quality.

The importance of this education and training function was recognized at the Charlottesville Education Summit last year, which included as a national objective the elevation of the nation's workforce to internationally competitive levels. However, public policy follow through on that goal is required.

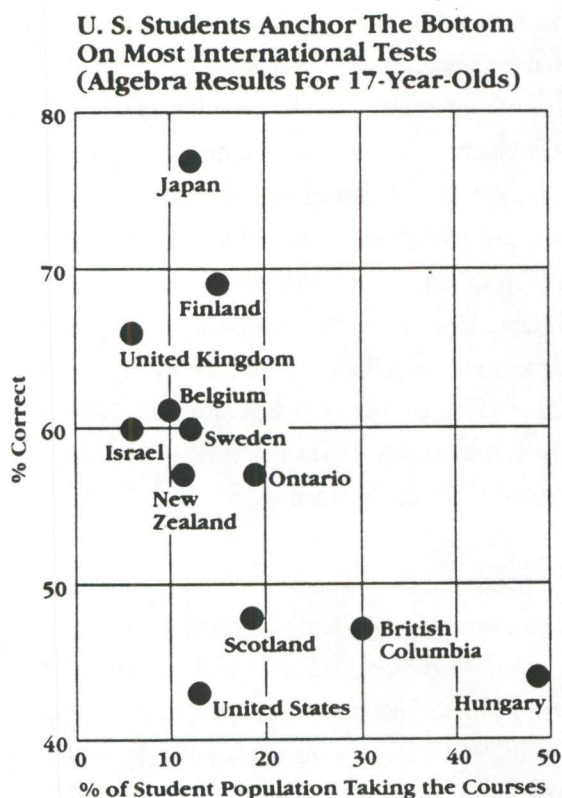
The first prerequisite for successful implementation of advanced technology is a sound high school education in

Industrial Modernization: An American Imperative

science and mathematics. Yet, in both these areas, our high school programs lag far behind the education offerings available to high school youth abroad.

By any reasonable standard, the achievement of mathematics students in U.S. high schools is very low. In algebra, U.S. students score at the very bottom in a comparison study of achievement by high school students in twelve countries. (See Exhibit 10.) In contrast, Japanese students almost invariably attain higher scores than their counterparts in all the other countries surveyed.

Exhibit 10: Comparison Study of High School Achievement



Source: Incentives for Learning
John H. Bishop

In fact, *the average Japanese student does better than all U.S. students in advanced mathematics.* Despite this record of failure, no progress has been discernible in the past decade. Proficiency in mathematics was about the same in 1986 as in 1973 for both 13 and 17 year olds; proficiency in science for these age groups actually declined. (12)(13)

Just as the demand for a highly-skilled workforce in manufacturing is increasing, the supply is decreasing. In many sectors, industry is experiencing grave difficulty in obtaining the services of skilled technicians and qualified workers, while over one half million of America's young people drop out of high school each year. (14)

Increasingly, this problem is not limited to the technician and skilled craftsman fields. In almost all areas of manufacturing there is a growing shortage of engineers and junior engineers.

There is also a decided reluctance on the part of high school graduates to enter the manufacturing workforce, as traditionally "blue collar" work has been considered to be socially inferior to "white collar" employment. To overcome this lingering bias, it will be necessary to institute new information programs which realistically depict the upgraded quality of work experience and the high degree of responsibility enjoyed by production employees in an advanced automation workplace.

New programs are needed to train workers to operate in an advanced manufacturing environment and provide them with continuous, career-long upgrading of industrial skills. Such training programs are urgently needed in U.S. manufacturing as current programs are totally inadequate to meet existing needs. Recent studies have indicated that, while training programs for the manufacturing workforce demonstrably boost productivity, they receive inadequate funding as compared with programs available to manag-

Industrial Modernization: An American Imperative

ers and administrators. The Commission on the Skills of the American Workforce has estimated that as little as 14% of all company training expenditures goes to skilled craft and production workers. (15)

The federal government shares responsibilities in the field of human resource development with state and local government, industry, and private education and training institutions. Among the actions which the federal government should take to meet its obligations in this area are the following:

1. Expand the "Tech Prep", Two-Plus-Two Program in the Perkins Vocational Education Act

The Perkins Bill is the primary federal government vocational and technical education program. While this bill has traditionally focused on the needs of special populations, the current legislation introduces a major new program: "Tech Prep", Two-Plus-Two. (16) This program provides funding to states for continuous training of skilled technicians in an articulated course of study which joins the last two years of high school with the standard two years of community college education. This program would make an important contribution to increasing the shrinking pool of technicians, an indispensable prerequisite for any true resurgence of quality manufacturing in America. As it proves successful in the start-up phase, this program should be supported at higher funding levels.

2. Strengthen of Department of Labor's Work-Based Learning Programs to Improve Workforce Quality

An encouraging sign in the uphill effort to build a more highly skilled workforce is the recent initiative by the Department of Labor (DoL) to strengthen work-based learning programs which abolish the traditional distinc-

tion between work and learning.

The new work-based learning programs have a close affinity with West German apprenticeship programs, which have always featured work-based learning as an integral part of the educational process. Currently, over 60% of West German youth participate in this highly successful apprenticeship program.

The new programs supported by the Department of Labor will establish on-site demonstration projects which provide work-based learning education, incorporating a blend of formal instruction, on-the-job experience, and individualized mentor sessions. DoL should be encouraged to extend and develop these programs beyond the few demonstration projects currently in existence. As these demonstration programs prove successful, the Department of Labor should encourage industry to adopt the principal features of the work-based learning approach into their own training programs. If small and medium sized enterprises have insufficient resources to develop such programs, the Department of Labor could, if necessary, assist in the formation of training consortia among groups of smaller firms.

The Department of Labor, working in conjunction with industry groups and training development associations, should develop criteria for the accreditation of work-based learning programs and the certification of worker skills. For this purpose, a new Congressional initiative will be required.

3. Make a National Commitment to Win the International Youth Skills Olympics

This annual event is the premier international competition among the most skilled practitioners in a range of vocational trades. U.S. entrants traditionally fare badly in this

Industrial Modernization: An American Imperative

competition. (See Exhibit 11.) The President and the nation's Governors should proclaim U.S. victory in this event as a major goal in the 1990's. Senior industry and academic officials should become more directly involved. This goal should be used to galvanize support for vocational and apprenticeship education and training programs throughout the nation.

4. Create a Charlottesville Specialist Skills Award Program

To reinforce the Charlottesville Education Summit commitment to international excellence in America's workforce, awards could be given each year to the top vocational students in high schools across the country. High schools would submit nominations to a committee located in Washington made up of representatives of the

White House, the National Governors Association, the Department of Labor, and national trade and education associations. Awards would be given at high school graduation ceremonies, with a few of the most outstanding awardees being honored in the White House. In addition to recognizing aspiring industrial specialists, this award would increase the prestige of jobs in manufacturing.

Strategy: Targeted Modernization Incentives

The federal government through its fiscal and monetary policies, wields great influence over the nation's ability to sustain and increase investment in new plants and equipment. The government should demonstrate leadership by offering modernization incentives to American manufacturers at least as attractive as those enjoyed by our over-

Exhibit 11: Average Level of Performance in the International Youth Skill Olympics, 1989

France	521
Austria	519
Korea	518
Switzerland	515
Taiwan	515
Germany	512
Japan	508
Ireland	508
Australia	504
Lichtenstein	498
Brazil	497
UNITED STATES	486
United Kingdom	485
Portugal	485
Papua New Guinea	462

Source: Vocational Industrial Clubs of America, Report on the 1989 IYSO

Industrial Modernization: An American Imperative

seas competitors. Incentives which help lower the cost of capital are particularly crucial.

A major step, of course, would be the reduction in the federal budget deficit. Doubtless there are general tax policy measures which could also be helpful in lowering the cost of capital.

The 1990 debate over the federal budget deficit, however, failed to yield measures which would be strongly effective in augmenting manufacturing productivity and investment. To attain this goal, we must develop new targeted incentives which directly address manufacturing investment and productivity. It will be necessary to draft tax legislation which specifically promotes modernization efforts, rather than more general measures with less direct impact on productivity and productive investment.

In this context, NACFAM proposes the targeted incentives outlined below.

1. Introduce Modernization Tax Incentives

(a) Modernization Tax Credits

- A 10% modernization tax credit for new or refurbished plants and equipment, both hardware and software.
- An additional 5% credit for the same purpose to small manufacturing companies capitalized at \$50 million or less.
- An additional 5% modernization credit to qualified manufacturing companies which have realized a demonstrable productivity gain of 5% or higher during a previous tax year base period.

(b) Accelerated Cost Recovery Schedules

- Inclusion of all computer-based manufacturing equipment as qualified technological equipment under Section 168 of the Internal Revenue Code and the reclassification of all such equipment as 3-year property.
- Accelerated expensing of qualified manufacturing process equipment under Section 179 of the Internal Revenue Code in exclusion amounts not exceeding \$75,000.

It should be noted that the tax credit formula for realized productivity gains follows closely a similar measure incorporated in the Amendments to the Internal Revenue Code of 1986 to Encourage Investments in New Manufacturing Equipment (H.R. 4860), a bill introduced in this session of Congress by Representatives Don Ritter, Tom Campbell, and twelve other co-sponsors. The mechanism by which such productivity gains may be assessed remains to be determined. It will be necessary to provide a stringent definition of qualified productivity enhancing equipment in order to minimize abuse and defeat the use of these provisions for "tax shelter" purposes. The provisions for accelerated cost recovery of productivity enhancing equipment represents a synthesis of numerous proposals put forward by executives of manufacturing firms and industry associations.

In advancing this proposal, NACFAM is not suggesting a return to the former broad-gauged investment tax credit. We do believe, however, that a targeted incentive for equipment modernization would make a significant contribution to the strength of American industry. In this connection, we would note that even the former investment tax credit, which was not as targeted towards industrial productivity as is our proposal, still made a strong contribution to raising productivity rates.

Industrial Modernization: An American Imperative

In the 1970's, for example, the relatively low tax rate on industrial equipment appears to have resulted in an acceleration of equipment purchases. (17) The impact of the investment tax credit on the machine tool industry from its reinstatement in 1976 until the onset of the 1981 recession can be clearly demonstrated. (See Exhibit 12.)

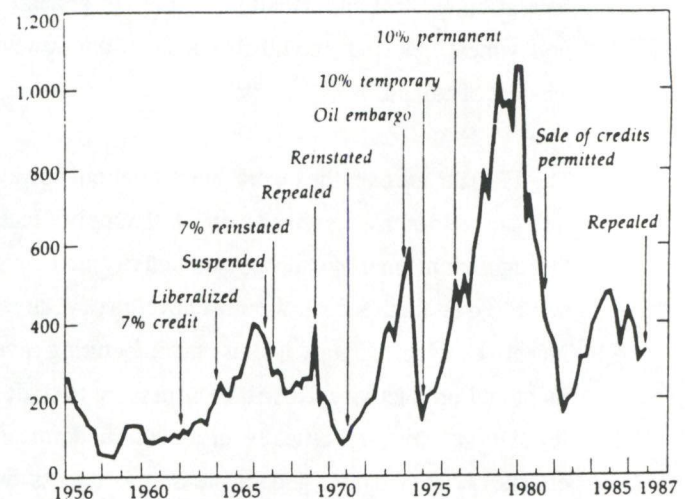
Indeed, a study by the Federal Reserve Board (August 1990) states that, although the Tax Reform Act of 1986 (TRA) reduced the maximum marginal tax rate for manufacturing companies and permitted somewhat more accelerated depreciation rates than the schedule in force just prior to TRA, the elimination of the investment tax credit and of the preferential taxation of long term capital gains more than offset these gains. The result was that the average corporate tax rate rose substantially from 31% in 1985 to 44% in 1989. The increase in the average corporate tax rate created a huge financing gap between needed capital expenditures and internal funds available to companies for capital investment. (18)

The elimination of the investment tax credit could not have come at a worse time, as the imposition of the higher tax rate virtually coincided with a sharp trend reversal in the average age of industrial equipment in U.S. factories, while the corresponding age of Japan's industrial equipment remained virtually constant. (See Exhibit 13.)

Although a targeted tax credit at this time would create a brief drop in government revenues, its longer term effect would be to stimulate strong growth in industrial activity and employment that would then generate significant revenue gain from both corporate and personal income taxes. In this connection, it should be noted that just a one percentage increase in GNP growth over 5 years (using 1989 as a base line) would yield an additional \$40 billion annually in government revenues by 1994, which would in itself make a major contribution to federal budget deficit reduction. (19)

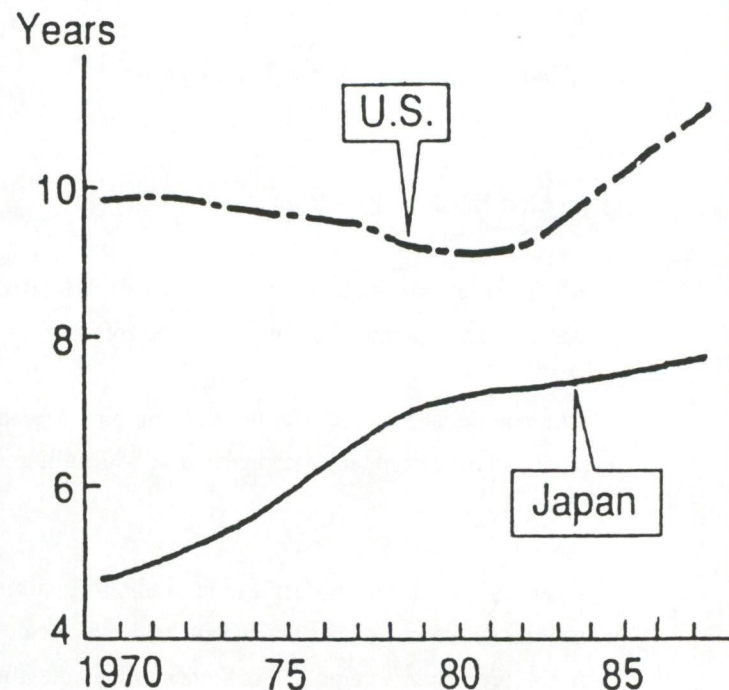
Exhibit 12: The Impact of Investment Tax Credit on the Machine Tool Industry

NET NEW ORDERS FOR METAL-CUTTING MACHINE TOOLS
AND CHANGES IN INVESTMENT TAX CREDIT, 1956-1987
(millions of dollars)



SOURCE: Adapted from *American Machinist & Automated Manufacturing*; based on data from National Machine Tool Builders Association.

Exhibit 13: Average Age of Industrial Equipment



Source: The Japan Economic Journal, July 28, 1990

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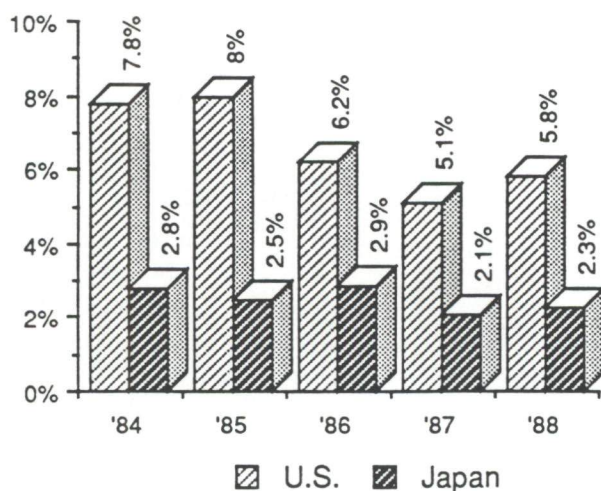
Japan appears to recognize this fact since the Japanese tax code permits a 20% tax credit (40% for smaller firms) for investment in specified categories of high tech manufacturing equipment.

2. Create a Secondary Financial Market for Industrial Modernization Investments Under Strict Criteria

A major obstacle to modernizing manufacturing facilities is the shortage of "patient" capital which permits a longer term repayment schedule to allow for the downtime usually associated with the installation of new plants and equipment and related workforce training.

The roots of this problem are directly related to the fact that the cost of capital has been substantially lower for our economic competitors than for U.S. firms. The difference between the U.S. and Japan is particularly striking. (See Exhibit 14.)

Exhibit 14: Real After Tax Cost of Funds



Source: Federal Reserve Bank of New York, Summer 1989

Beyond this general consideration, there is an additional obstacle for firms wishing to obtain capital for new industrial equipment. Under current lending practice, there is no secondary market for this purpose. As a result, financial institutions generally do not accept newly purchased equipment as collateral for loans for such purposes.

A special secondary loan market, equivalent to that available for mortgage loans and operated under strict criteria, should be created to make this kind of patient capital available to manufacturing firms wishing to modernize through the purchase or lease of new equipment.

To create such a secondary loan market, it will be necessary to establish a new guarantee mechanism for industrial loans similar to the Federal National Mortgage Association (Fannie Mae). For lease guarantees, the Japanese Robotics Leasing Corporation (JAROL) provides a highly successful example. Accordingly, planning should now get underway for the creation of a federally chartered, but privately owned, corporation to create a secondary market for loans made by banks to small and medium sized companies for the purchase or lease of equipment and plant facilities. This planning should be particularly attentive to finding ways to limit the federal government's exposure and generally to ensure that these investments are sound. The planning body should include representatives of government agencies, financial institutions with special experience in industrial loans, industrial companies, and industry associations.

3. Improve Small Business Administration Loan Programs for Purchasing Advanced Manufacturing Equipment

Smaller manufacturing firms are falling behind larger companies at an increasing rate in the adoption of advanced manufacturing technologies and processes. In

large measure, the principal impediment to automation is the inability of the smaller companies to obtain adequate funding from banks and other financial institutions. For this reason, smaller manufacturers require special assistance from banks and government agencies acting as lenders of last resort such as the Small Business Administration. Yet, the federal government made only \$3.6 billion in commercial loans to all small businesses in 1989, while the Japanese government authorized \$27 billion in direct loans and an additional \$56 billion in loan guarantees to smaller firms during the same year. (20)

One significant step for facilitating the modernization of the some 350,000 small manufacturing companies in the U.S. would be to permit these companies to defer payment for one year on SBA's 504 loans for advanced manufacturing equipment. Since by law this is not presently allowed under the 504 program, new legislation will be needed to effect this change.

In making these proposals we would underline the need to ensure that these SBA loans are made under strict criteria and careful monitoring procedures. For example, we would favor orienting this program not to start-up firms but for improving the performance of well-established smaller manufacturing companies by facilitating the purchase of advanced manufacturing equipment.

4. Revise Standard Accounting Practices

Current accounting principles evolved through an earlier era of industrialization. Consequently, they do not reflect the momentous changes created in industry by advanced manufacturing technologies such as CAD/CAM, JIT, MRP II, FMS, and other technologies comprising the various levels and application areas of computer integrated manufacturing (CIM). For example, under present rules, large inventories are carried as an asset, while

software and data related to modern manufacturing processes are currently expensed. Most importantly, present accounting methodologies fail to estimate total costs accurately.

These accounting practices provide a wholly artificial picture of up-to-date manufacturing establishments and create financial obstacles to firms desiring to upgrade their plants and equipment. While accounting practices are not the immediate responsibility of government, government agencies could draw the attention of the accounting community to the importance of this issue. Moreover, when the accounting community develops more contemporary accounting principles, the IRS should make the relevant adjustments to its tax filing requirements.

CONCLUSIONS

The recommendations set forth in this paper are not exclusive of other federal initiatives that could be undertaken to help the nation move successfully into the new advanced manufacturing era. However, taken together, they constitute the elements of a federal strategy which will help ensure that this nation's industrial base will continue to contribute significantly to the Gross National Product and provide undiminished opportunities for manufacturing employment. This approach will also enable the nation to sustain its own infrastructure for defense production to respond to a wide range of contingencies with short lead times and greater mission specificity.

In cases where new funds must be expended, these expenditures are fully justifiable. No public investment will offer greater return in terms of downstream government revenue gains and in assuring the nation's economic security and standard of living than those advocated above: leadership, manufacturing technology transfer, human resource development, and targeted modernization incentives.

Most importantly, the modest sacrifices called for in this strategy are ones which must be made if the United States is to secure global leadership in manufacturing. If the structural gap between the infrastructure for manufacturing in the U.S. and that in leading competitive nations grows any wider, the United States may simply never catch up.

With government, industry and academia working cooperatively, the kinds of public policy actions proposed in this paper could be implemented without delay. Decisive leadership and strong measures are needed to reverse the growing — and highly dangerous — perception among the general public and the investment community that

America is unable to manufacture competitive, high quality products.

America has the means at its disposal to restore its global preeminence in manufacturing. If we fail to marshal our resources for greater industrial modernization and productivity, the erosion of our economic strength and standard of living will be irreversible.

Industrial Modernization: An American Imperative

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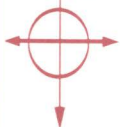
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- University and College Deans for Research, Development, Engineering, and University - Industrial Relations
- Press and publishers
- Public policy think tanks

Advanced
Manufacturing
Conference

NACFAM '91

December 9-10, 1991

Conference Registration Form *(Please mail directly to NACFAM.)*

NACFAM '91 ANNUAL CONFERENCE • December 9-10, 1991 • Washington, D.C.

Name _____

Title _____

Organization _____

Address _____

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Name for Badge _____

Name of Guest (if attending) _____

REGISTRATION FEES

- \$325 for NACFAM members
- \$395 for nonmembers

Two or more attendees from same company or organization:

- \$295 each for NACFAM member organizations
- \$340 each for nonmember organizations

Spouse/guest registration fee:

- \$195 each (meals)

Cancellations must be made in writing. No refunds after November 26. Substitutions welcome.

GENERAL INFORMATION

REGISTER EARLY

DISCOUNT HOTEL AND TRAVEL

Special conference lodging & airline discounts are available subject to cutoff dates and availability. Make reservations early to be assured of receiving the discount rates. You must mention that you are attending the **NACFAM Conference** and give appropriate conference code number to receive the special conference rates.

Hotel Note: *The Omni-Shoreham*, one of Washington's leading luxury hotels, is offering extraordinarily low conference rates (\$85 single, \$105 double). To enjoy these rates, you must reserve by November 8. For reservations, call 202-234-0700, mention "NACFAM Conference."

Airline Note: *American Airlines*, is offering discount rates of 45% off its full coach fare for travel to the National Coalition for Advanced Manufacturing Annual Conference. It requires a 14 day advance purchase. Travel to Washington D.C., must be between December 6 and 12, 1991, to qualify for these discounts. For special airline rates call American Airlines, (1-800-433-1790) and ask for STARFILE S-01D14K. Mention "NACFAM Conference December 9-10."

REGISTRATION

Registration fees: \$325 for NACFAM members; \$395 for nonmembers; two or more attendees from same company or organization: \$295 each for NACFAM members organizations, \$340 each for nonmember organizations; spouse/guest registration fee \$195 (meals). Cancellations must be in writing. No refunds after November 26. Substitutions welcome.

To register by phone: Call Alice Mann at (202)347-0090. To register by fax, call (202) 637-3182

PRESENTERS & SPEAKERS

NACFAM '91—Inaugurates new era of closer industry, government, academic cooperation in modernizing America's factories. NACFAM '91 will feature (1) comprehensive review by leading policymakers in fields of leadership, technology, human resources, and cost of capital and (2) presentations by program directors from various federal departments and agencies.

Federal Program Presenters will include: The second day of the Conference features briefings from 8 Federal Agencies including:

- The Department of Defense
- The Department of Commerce
- The Department of Energy
- The Department of Education
- The Department of Labor
- The National Science Foundation
- NASA
- The Department of Agriculture

In addition to the briefings, NACFAM '91 will feature briefing rooms reserved by federal agencies where conferees can meet one-on-one throughout the conference with federal program officers.

NACFAM '91—Features outstanding leaders in the industrial modernization community:

ROSTER OF SPEAKERS

Keynoters: Secretary of Commerce Robert Mosbacher*; Senior Official Department of Energy*; Senator Al Gore (D-Tenn.)*; William Fife, Chairman and CEO, Giddings and Lewis, Inc. **Chairman (first day):** John Klein, Director Manufacturing Products Lab, IBM. **Chairman (second day):** Robert White, Under Secretary for Technology, U.S. Department of Commerce. **Commentator:** Allan Rose, Johnson & Johnson. **Hosts (December 9 dinner):** Bruce Merrifield, Wharton School of Business; Ralph Richardson, Group Publisher, Thomas Publications.

ROSTER OF PANELISTS

Moderators: Robert Henderson, President, South Carolina Research Authority; Jerry Jasinowski, President, National Association of Manufacturers; Joseph Oakey, President, Autodesk Foundation; Al Moore, President, NMTBA Association for Manufacturing Technology; Edith Ritter, Executive Director, Manufacturing Services Extension Center

Panelists Include: Brad Bergmann, Director - Manufacturing Modernization, Office of the Assistant Secretary of Defense (Production and Logistics), U.S. Department of Defense; Betsy Brand, Assistant Secretary (Vocational and Adult Education), U.S. Department of Education; Matt Coffey, President, National Tooling and Machining Association; Robert Collins, CEO, GE Fanuc; David Conklin, President, Merck Chemical Manufacturing; Glenn Hubbard, Deputy Assistant Secretary (Tax Analysis), U.S. Department of Treasury*; Graham Jones, Chairman, Science & Technology Council of the States, National Governors Association, Executive Director, New York State Science and Technology Foundation; Robert Jones, Assistant Secretary (Training), U.S. Department of Labor; Cherri Langenfeld, Director, Office of Technology Transfer, U.S. Department of Energy; John Lyons, Director, National Institute of Standards and Technology; Edward Miller, President, National Center for Manufacturing Sciences; Eric Mittelstadt, CEO, GMF Robotics; David Pierce, President, Amaerican Association of Community and Junior Colleges; Joseph Shuster, CEO, Teltech, Inc.; Eugene Wong, Associate Director, Office of Science and Technology Policy, The White House.

Advanced
Manufacturing
Conference
NACFAM '91
December 9-10, 1991

REGISTER TODAY

12:30 p.m. Luncheon

1:00 p.m. Keynote Speaker:

*Senior Official, U.S. Department of Energy***

2:00 p.m. NASA Programs

- Manufacturing Technology at NASA—NASA Regional Tech Transfer Centers: Robert Penaranda, Director, Office of Technology Commercialization

Questions and Answer Session

2:45 p.m. National Science Foundation Programs

- Joseph Boudogna, Assistant Director for Engineering, Directorate for Engineering

Questions and Answer Session

3:30 p.m. Coffee Break

3:45 p.m. Department of Education/Department of Labor Vocational- Technical Programs

- James D. Van Erden, Administrator, Office of Work-Based Learning, Department of Labor
- Winifred Warnat, Director, Vocational-Technical Education Division, Department of Education

Questions and Answer Session

4:30 p.m. Department of Agriculture

- Agricultural Extension Service—Lessons Learned; User-driven Approach to Tech Transfer; Agriculture-industry Overlaps in Manufacturing: Mitch Geasler, Associate Administrator, U.S. Department of Agriculture Extension Service

Questions and Answer Session

**5:15 p.m. Next Steps:
Leo Reddy, President, NACFAM**

5:30 p.m. Conference Concludes

** Most agencies will have a briefing room in the immediate conference area for one-on-one meetings

PROGRAM DAY AGENDA

TUESDAY, DECEMBER 10

7:30 a.m. Continental Breakfast

*Keynote Speaker: Senator Al Gore (D-TN) **

8:30 a.m. Opening of Second Session of Conference (Program Day)

Introduction by Chairman of Second Session:

Hon. Robert White, Under Secretary of Commerce for Technology; Chairman, Committee on Industry and Technology, Federal Coordinating Council for Science, Engineering and Technology.

Industry Commentator:

Allan Rose, Director, Office of Technology Development, Corporate Headquarters, Johnson & Johnson

8:45 a.m. Department of Commerce Programs

- Intelligent Manufacturing Systems (IMS), Metric System: Hon. Deborah Wins-Smith, Assistant Secretary of Commerce for Technology Policy
- Advanced Technology Program (ATP): George Uriano, Director, ATP NIST
- Manufacturing Technology Centers (MTC) and Other Extension Programs: Phillip Nanzetta, Director, MTC Program, NIST

Question and Answer Session

10:15 a.m. Department of Defense Programs

- Office of the Assistant Secretary of Defense (Production and Logistics)—Manufacturing Technology Programs, Brad Bergmann, Director, Manufacturing Modernization

Question and Answer Session

11:30 a.m. Department of Energy Programs

- Manufacturing Technology Transfer at the National Labs—Tech Transfer Policy; Cooperative Research and Development Agreements; State Extension Services: Warren Chernock, Deputy Science Advisor, Office of Defense Programs

Questions and Answer Session

* Subject to confirmation and change

POLICY DAY AGENDA

SUNDAY, DECEMBER 8

5:00 p.m. Early Registration Opens

Hospitality and Greeting

7:30 p.m. Early Registration Closes

MONDAY, DECEMBER 9

7:00 a.m. Registration Opens

7:30 a.m. Continental Breakfast

8:15 a.m. NACFAM Annual Business Meeting

Welcome:

Michael Kelso, President, ELS;
Chairman, NACFAM Board of Directors

Secretary's Report:

Ralph Schlenker, Executive Director,
Systems Research Center, University of
Maryland

President's Report

Election of Board of Directors
Any Other Business

9:00 a.m. Opening of First Session of Conference (Policy Day)

Theme and Purpose of Conference:
Leo Reddy, President, NACFAM

Introduction by Chairman of First Session
John Klein, Director, Manufacturing
Products Laboratory, IBM; Chairman,
Industrial Automation Division, National
Electrical Manufacturers Association

9:15 a.m. Leadership Issues Panel

Moderator:

Jerry Jasinowski, President, National
Association of Manufacturers

David Conklin
President, Merck

Eric Mittelstadt

CEO, GMF Robotics

Eugene Wong, Director-
Industrial Technology, OSTP

The White House

H. Graham Jones,

Chairman, Science & Technology
Council of the States, National
Governors Association

Question and Answer Session

TELL YOUR COLLEAGUES

10:30 a.m. Coffee Break

11:00 a.m. Technology Panel

Moderators:

Co-chairs, NACFAM Technology Committee

Robert Henderson, *President, South Carolina Research Authority;*
Edith Ritter, *Executive Director, Manufacturing Services Extension Center*

Ed Miller, *President, National Center for Manufacturing Sciences*
Joseph Shuster, *CEO, Teltech*
John Lyons, *Director NIST, National Institute of Standards and Technology*
Brad Bergmann, *Director - Manufacturing Modernization, Office of Assistant Secretary of Defense (Production & Logistics), Department of Defense**
Ms. Cherri Langenfeld, *Director Office of Technology Transfer, Department of Energy*

Question and Answer Session

12:30 p.m. Luncheon

1:00 p.m. Keynote Speaker:

Hon. Robert S. Mosbacher
*Secretary of Commerce**

2:00 p.m. Human Resources Panel

Moderator:

Chairman, NACFAM Human Resources Committee

Joseph Oakey, *President Autodesk Foundation*

Matt Coffey, *President, NTMA, National Tooling and Machining Association*
David Pierce, *President, American Association of Community and Junior Colleges*
Hon. Betsy Brand, *Assistant Secretary of Education Department of Education*
Hon. Robert Jones, *Assistant Secretary of Labor, Department of Labor*

REGISTER TODAY

3:15 p.m. Coffee Break

3:45 p.m. Modernization Incentives Panel

Moderator:

Al Moore, *President, NMTBA, Association for Manufacturing Technology*

Robert Collins
CEO, GE Fanuc

Hon. Glenn Hubbard
Deputy Assistant Secretary of Treasury for Tax Policy

Question and Answer Session

5:00 p.m. Special Presentation "21st Century Manufacturing Enterprise Strategy"

Industry-led view developed under the auspices of the U.S. Department of Defense
Presented by Roger Nagel, *Iaccocca Institute, Lehigh University*

6:00 p.m. Reception

7:00 p.m. Dinner

7:30 p.m. Program

Welcome
D. Bruce Merrifield, *Walter Bladstrom Chair for Entrepreneurial Management, Wharton School of Business, and Chairman, NACFAM Advisory Board*

Introduction of Keynote Speaker
Ralph Richardson, *Group Publisher Thomas Publications*

Keynote Speaker:

William Fife, Chairman & CEO, Giddings and Lewis, Inc.

"What our nation needs to do to revitalize its domestic manufacturing through the rapid adoption of advanced manufacturing"

Targeted Incentives for Industrial Revitalization

*Testimony by Leo Reddy
President, National Coalition for Advanced Manufacturing*

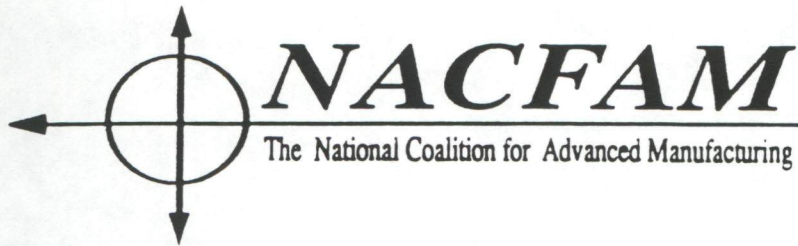
*Before the United States House of Representatives
Committee on Ways and Means, Washington, D.C.
September 12, 1991*

NACFAM

*Changing the
Advanced Manufacturing
Environment
in the '90s*

NOW

THE NATIONAL COALITION
FOR ADVANCED MANUFACTURING



**TESTIMONY BEFORE WAYS AND MEANS COMMITTEE
U.S. HOUSE OF REPRESENTATIVES**

**By Leo Reddy
President, National Coalition for Advanced Manufacturing**

September 12, 1991

Targetted Tax Incentives for Industrial Revitalization

SUMMARY

Without a significant stimulus, including through the tax code, America's underinvestment in factory modernization poses a major danger to our nation's competitiveness in the global economy.

Equipment investment is the strongest form of investment in productivity growth, yet America's investment in machinery and equipment lags well behind that of our leading global competitors. NACFAM estimates that an increase of \$183 billion would now be required for the U.S. to reach Japan's level of such investment.

The failure to adopt advanced manufacturing production technologies, hardware and software, is especially pronounced among the some 360,000 small to medium-sized (under 500 employees) manufacturing firms. These firms represent 98.5% of nation's total number of manufacturing companies.

For both small and large firms the loss of the Investment Tax Credit in the 1986 Tax Reform Act was an especially sharp setback for their rates of equipment investment. If the 1985 ITC had remained in place, the level of gross private domestic investment would have been higher by \$106 billion.

Although somewhat lower interest rates are reducing the cost of capital, there is still an acute shortage of domestic sources of the kind of longer-term patient capital needed for investments in plant modernization. A new study of 1,700 firms in Pennsylvania showed that their number one interest area for financial assistance was machinery and equipment.

The longer term consequences of this underinvestment will be severe. The nation will run the risk of becoming primarily an exporter of raw materials and low technology components and an importer of finished, high value-added goods. This will have a depressive effect on our standard of living.

To help reverse this decline in capital investment and to ensure strong, sustained industrial productivity and competitiveness, NACFAM would like to propose the following tax measures for the committee's consideration:

- A 10% modernization tax credit for industrial machinery and equipment, hardware and software, and related implementation, such as non-recurring costs of training, data transfer, and factory floor rearrangement
- An acceleration of cost recovery for productivity-enhancing equipment through the inclusion of all computer-based manufacturing equipment as qualified technological equipment under Section 168(i)(2) of the Internal Revenue Code and the reclassification of all such equipment as 3-year property. The deduction allowable under Section 168 would be treated as allowable under the alternative minimum tax system.
- An acceleration of expensing of qualified manufacturing process equipment under Section 179 of the Internal Revenue Code, in exclusion amounts not exceeding \$250,000. The deduction allowable under Section 179 would be treated as allowable under the alternative minimum tax system.

On the question of offsets, NACFAM's basic view is that these tax measures are sufficiently targetted and would have such a salutary effect on GNP, employment and wages that they would result over a brief time in a net gain to the U.S. Treasury and thus do not need to be offset with any corresponding tax increase.

At the same time, NACFAM is sufficiently convinced of the positive effect of these tax measures on the nation's economic strength and competitiveness that we are willing to consider supporting a package, including a temporary offsetting revenue increase, if that were the necessary price of enacting these changes in the tax code--especially if any net revenue increase were committed to deficit reduction and excluded from new government spending programs.

We are prepared to meet with Committee members and staff to consider such a package. This would include a detailed consideration of the macroeconomic effects of the tax measures we are proposing and the trade-off with various possible offsets.

* * * * *

Mr. Chairman,

I am pleased to have this opportunity to appear before your committee on behalf of the National Coalition for Advanced Manufacturing, a non-profit, non-partisan organization committed to a vigorous national effort to revitalize the nation's industrial base. With its headquarters in downtown Washington, our rapidly-growing organization presently consists of 32 corporations, including several Fortune 500 companies; 133 centers of manufacturing technology research, education, training, and extension; and 22 national trade and technical training associations that represent between them over 80,000 companies and 47,000 technical training institutions.

The Issue

One of the principal unifying factors in our coalition is deepening concern over the lack of investment in modernizing the nation's industrial base. Advanced production technologies, both equipment and software, are prerequisites for making high-quality products on time, flexibly and at low cost. These are the essential ingredients of global

competitiveness in manufacturing. The emphasis today is on shorter lead times and product cycles, more customization and product variety, and zero defects--all of which require advanced manufacturing hardware and software. Yet a manufacturing firm can not move up the ladder of production technologies without capital investment.

Equipment Investment: The Major Spur to Productivity Growth

The importance of this kind of investment goes beyond the health of the manufacturing sector. It profoundly effects the state of the national economy as a whole. Many factors contribute to a nation's economic growth and productivity, such as technology, workforce skills, management practices, innovation, design, marketing skills, research and development, and so forth. Investment in capital equipment, however, has an especially profound effect on productivity growth.

Economists J. Bradford DeLong and Lawrence H. Summers published a landmark report last year for the National Bureau of Economic Research¹ on their retrospective study, covering the 1960-1985 period, of the impact of various kinds of public investment on economic growth. Their principal conclusion was as follows:

"Over 1960-85, each percent of GDP invested in equipment is associated with an increase in GDP growth of 1/3 a percentage point per year. . . [There is] a clear, strong and robust statistical relationship between national rates of machinery and equipment investment and productivity growth. Equipment investment has far more explanatory power for national rates of productivity growth than other components of investment, and outperforms many other variables included in cross-country equations accounting for growth. High rates of equipment investment can, for example, account for nearly all of Japan's extraordinary growth performance."

Indeed, the driving force behind Japan's remarkable strides in manufacturing productivity has been a massive investment in industrial technologies, particularly in modern machinery and equipment. For example, since 1987 Japan has sharply accelerated its expenditures on new manufacturing plants and equipment.

Low Rates of Capital Investment in U.S.

In the last three years, the proportion of Japan's GDP devoted to investment in manufacturing has risen sharply, increasing almost six times faster than the corresponding rate in the U.S. In 1990, manufacturing investment in Japan will comprise about 5.1% of its GDP compared with 3.5% for the U.S.²

According to the most recent OECD data, in 1988 the U.S. ranked well behind France, Germany, Italy, Japan, the Netherlands, and the United Kingdom in investment in machinery and equipment as a percentage of GDP³. As a direct consequence of the relatively low rate of U.S. capital investment in manufacturing, the capital stock of American industry is increasing at a marginally slow rate. According to one recent

¹Equipment Investment and Economic Growth, National Bureau of Economic Research, Inc., Cambridge, Mass., November 1990

²Nihon Keizai Shimbun, September 22, 1990; Federal Reserve Bulletin, October 1990; OECD Main Economic Indicators, 1990/2.

³OECD Economic Surveys, 1990/1991

survey,⁴ the U.S. ranks 20th out of 22 industrialized nations--ahead only of Bulgaria and Yugoslavia--in one of the primary measures of industrial growth: per capita consumption of machine tools.

In general, the rates of adoption by U.S. manufacturing of advanced production technologies have been remarkably low, particularly for state-of-the-art equipment. Since 1980, the average age of industrial equipment in U.S. factories has been increasing, to about eleven years old today, while the corresponding age of Japan's industrial equipment has remained virtually constant at close to seven years.⁵ Only 15% of U.S. manufacturing firms have acquired state-of-the-art programmable controllers and computer numerically-controlled machines.⁶

The failure to modernize is especially evident among small to medium-sized manufacturers (fewer than 500 employees). The relative productivity and earnings of these smaller firms have declined steadily throughout the 1980's. This is an acute problem for small and large companies alike, because large manufacturers increasingly rely upon outside suppliers for parts and components. In addition, these smaller companies have generated the majority of new jobs created in manufacturing during recent years. they account for nearly one-half of the value added in U.S. manufacturing, and they represent 98.5% of the total manufacturing establishments nationwide.⁷

The Loss of the Investment Tax Credit: A Setback for Industrial Modernization

For both small and large firms, the loss of the investment tax credit in the 1986 Tax Reform Act was an especially sharp setback for their rates of investment in new plant and equipment. In the 1970's, for example, the relatively low tax rate on industrial equipment resulted in a sharp acceleration of equipment purchases up until the onset of the 1981 recession.⁸

Indeed, a study by the Federal Reserve Board (August 1990) states that, although the Tax Reform Act of 1986 (TRA) reduced the maximum marginal tax rate for manufacturing companies and permitted somewhat more accelerated depreciation rates than the schedule in force just prior to TRA, the elimination of the investment tax credit and of the preferential taxation of long-term capital gains more than offset these gains. The result was that the average corporate tax rate rose substantially from 31% in 1985 to 44% in 1989. The increase in the average corporate tax rate created a huge financing gap between needed capital expenditures and internal funds available to companies for capital investment.⁹

Gordon Richards, Chief Economist at the National Association of Manufacturers, has reported the following in his 1991 briefing on the investment tax credit:

⁴ American Machinist, February 1991

⁵ The Japan Economic Journal, July 28, 1990

⁶ Deloitte & Touche, Making the Grade in the 1990's

⁷ Small Business Administration, Handbook of Small Business Data, 1988, p. 225. U.S. Bureau of Census, Statistical Abstracts, 1990.

⁸ Peter S. Fisher, Journal of Economic Issues, March 1985, p. 8

⁹ Leland E. Crabbe et al., Federal Reserve Bulletin, August 1990, p. 595

"A retrospective simulation of the economy over the period 1986-88 indicates that the removal of the ITC under the 1986 Tax Reform Act significantly reduced investment spending. Our simulations indicate that with the 1985 tax law in place, the level of GNP would have been higher by \$95 billion in constant 1982 dollars in 1988, while the level of gross private domestic investment would have been higher by \$106.3 billion."

Although a targeted tax credit at this time would create a brief drop in government revenues, its longer term effect would be to stimulate strong growth in industrial activity and employment that would then generate significant revenue gain from both corporate and personal income taxes. In this connection, it should be noted that just a one percentage increase in GNP growth over 5 years (using 1989 as a base line) would yield an additional \$40 billion annually in government revenues by 1994, which would in itself make a major contribution to offsetting revenues lost to the federal budget from this tax credit.¹⁰

American industry recognizes that the rate of investment in new manufacturing technologies by U.S. manufacturing is far from satisfactory. A 1990 survey showed industry executives giving themselves a poor "report card" for overall performance and assigning themselves a "D" for the adoption of advanced manufacturing technologies.¹¹ Another survey that year asked executives in the mid-Atlantic region to rank the three top business functions for competitive edge. Just over 60% indicated that manufacturing processes should be given top priority.¹²

Scarcity of Patient Capital

One of the reasons why U.S. firms are not investing more vigorously in machinery and equipment is the scarcity of longer-term financing. By definition, factory re-tooling is a long-term investment. Productivity gains are realized only over time, as the new equipment is being installed and integrated into overall production operations, and as newly-trained personnel move up the learning curve.

As Mr. Ronald Rosenzweig, President and CEO of Anadigics, Inc., testified before this committee on July 18 on behalf of the American Electronics Association,

"... the whole notion of patient capital has become alien to our financial system, and we are paying the price for it. . . . As a result, too many American entrepreneurs are failing to get the financing they need or are turning to foreign investors."

Our nation's manufacturers need investment for plant modernization more than for any other purpose. A recent illustration of this need is contained in a 1991 survey of 1,700 Department of Defense contractors in Pennsylvania conducted by the Pennsylvania Industrial Resource Centers and KPMG Peat Marwick. This survey concluded that the number one interest area for financial assistance was machinery and equipment.

This finding reflects a global pattern of investment in manufacturing. Among the OECD countries, for example, 50% of direct investment in manufacturing goes into

¹⁰Lawrence B. Lindsey, The Growth Experiment, Basic Books, New York, 1990, p. 177.

¹¹Deloitte & Touche, Making the Grade in the 1990's

¹²Price Waterhouse, Strategic Advantage, 1990.

machinery and equipment, 28% represent buildings and structures, and 22% is inventory.¹³

U.S. manufacturers require longer-term capital to grow. Stricter bank lending requirements, the difficulties being faced by credit corporations, the preoccupation with short-term returns on investment, and the decline in venture capital sources have all worked to diminish the availability of longer-term capital. Companies with sufficient experience in international capital markets are turning increasingly to overseas sources.

Consequences of Underinvestment

If the U.S. falls farther behind in the race to modernize its industrial plant and equipment, the consequences will be severe. The nation will run the risk of becoming primarily an exporter of raw materials and low technology components and an importer of finished, high value-added goods.

This ominous trend is already evident. According to a study published by the Federal Reserve Board of New York, U.S. exports of finished goods remained constant during the 1980's while U.S. imports of finished goods rose by 77%.¹⁴

The nation's standard of living will also suffer. A 1990 study by the Federal Reserve Bank of St. Louis demonstrated the close nexus between the growth in capital stock and the standard of living. As that study clearly established, the failure to increase the investment ratio in capital stock beyond the current rate will result in a stagnant standard of living well into the middle decades of the 21st century. In fact, according to this study, if we wish to maintain the historic improvement of our standard of living at the trend rates prevalent since the Second World War, we will have to triple our net real investment in capital stock relative to real GNP by the year 2010.¹⁵

NACFAM's Tax Policy Recommendations

Numerous suggestions have been made to increase the rate of U.S. investment in capital stock. Indeed, the most widely tax publicized measures --a capital gains tax reduction, an improved IRA deduction--are often justified under the banner of increasing capital investment.

Such broad measures would act as a stimulus to savings and investment. Yet their impact on increased productivity and competitiveness would not be as powerful as incentives directed specifically to investment in new machinery and equipment. In addition, the debate over the capital gains tax reduction has become highly politicized. A pro-growth middle ground is needed.

For this reason, NACFAM, in its October 1990 White Paper, Industrial Modernization: An American Imperative, proposed a series of "targetted modernization

¹³Statement of John G. Wilkins, Director of Tax Policy for Economic Analysis, Coopers & Lybrand, before the Ways and Means Committee, U.S. House of Representatives, July 18, 1991

¹⁴Susan Hickox, Quarterly Review, Federal Reserve Bank of New York, Spring 1991

¹⁵Keith Carlson, Federal Reserve Bank of St. Louis Review, March/April 1990, pp. 3-15.

incentives" in the field of tax policy that I would like to recommend to the Committee today. We call these measures "targetted" because they are designed specifically to increase investment directly in new factory machinery and equipment. More targetted measures also reduce the loss in federal revenue.

A 10% Modernization Tax Credit

The first measure is:

A 10% modernization tax credit for industrial machinery and equipment, hardware and software, and related implementation, such as non-recurring costs of training, data transfer, and factory floor rearrangement.

This credit would not only stimulate investment in new machinery and equipment, it would also incentivize the kinds of investment needed in a modern factory environment by crediting software as well as hardware. Computer-controlled equipment and computer-integrated production, materials, and inventory control systems have become essential tools for competitiveness.

This credit would also recognize that the purchase of new machinery and equipment is only a fraction of the actual cost of installation. Integrating this equipment successfully in a factory environment typically requires training personnel, reorganizing and transferring data and computer programming, and changing the factory floor layout.

Even with the inclusion of non-recurring installation costs, this is still a modest incentive. The Japanese tax code, for example, allows a 20% reduction--with an additional 20% for small and medium-sized industrial enterprises.

This measure is a good example of the targetted approach suggested by our coalition. It would be more restrictive than the pre-1986 investment tax credit. It would be available only for industrial machinery and equipment, not for other kinds of investment and not for buildings and structures.

Most importantly, this credit would begin to reverse the decline in capital investment in the U.S. by reducing the cost of purchasing depreciable assets. This credit will stimulate further investment because it increases the funds available for this purpose, as well as the expected profit from the use of improved equipment.

The inclusion of non-recurring training costs in our formulation for this credit would help address one of the most serious deficiencies in our nation's industrial base, inadequate levels of investment in technical training. According the Office of Technology Assessment of the U.S. Congress, only about 35 % of workers receive skill improvement training in their current job. In the automotive industry, Japanese workers receive over three times more hourly training than do U.S. workers--and five times more for newly hired workers.¹⁶

The credit we are proposing would not, of course, remedy this problem, since it is tied exclusively to non-recurring training costs related to the installation of new machinery and equipment. It would, however, incentivize further skill improvement training on the

¹⁶ U.S. Congress. Office of Technology Assessment. Worker Training. 1990.

job and help raise the overall investment in such training closer to internationally competitive levels.

The targetted approach favored by NACFAM would also reduce the revenue lost from a modernization tax credit. The following table¹⁷ simulates the macroeconomic impact of the 10% machinery and equipment modernization tax credit proposed by NACFAM:

	Year 1	Year 2	Year 3
Nonresidential Fixed Investment			
Constant 1982 Dollars	\$23.19	66.55	99.1
Percent Change	4.69	12.94	18.02
Gross National Product			
Constant 1982 Dollars	\$31.85	90.80	115.61
Percent Change	0.77	2.13	2.63
Federal Revenues (Current \$)	- 5.19	- 1.37	- 1.51

Inclusion of all Computer-based Manufacturing Equipment as Qualified Technological Equipment

The second measure proposed by NACFAM is:

An acceleration of cost recovery for productivity-enhancing equipment through the inclusion of all computer-based manufacturing equipment as qualified technological equipment under Section 168(i)(2) of the Internal Revenue Code and the reclassification of all such equipment as 3-year property. The deduction allowable under Section 168 shall be treated as allowable under the alternative minimum tax system.

Under current law, certain kinds of technological equipment qualify for accelerated cost recovery under Section 168:

- any computer or peripheral equipment
- any high technology telephone station equipment installed on the customer's premises, and
- any high technology medical equipment

Whether intentionally or otherwise, this section does not apply to computer-based industrial machinery. The law states that specifically that the term "computer or peripheral equipment" shall not include any equipment "which is an integral part of other property which is not a computer."

If this committee and the Congress are interested in incentivizing investment to make our factories more competitive, computer-based manufacturing equipment should be included for accelerated cost recovery under this section. Few measures would have a more immediate effect on industrial modernization. Most advanced manufacturing machinery and equipment are computer-based. Yet, as noted above, only a small fraction of U.S. manufacturing firms have acquired advanced production technologies, such as state-of-the-art programmable controllers and computer numerically-controlled machines.

¹⁷ Courtesy of Gordon Richards, National Association of Manufacturers, Washington, DC

Accelerated cost recovery for computer-based industrial equipment would also recognize the fact that manufacturing technologies are changing at an ever-increasing rate. The past 20 years alone have witnessed the introduction of whole new kinds of production technologies that rely heavily upon computers. These include, in addition to the controllers and numerically-controlled machines just mentioned, bar-coding and shipping equipment, computer-aided testing and inspection, flexible machining centers, robotics, automated materials handling, and automated storage and retrieval systems.

The emergence of new computer-based production equipment will accelerate even more rapidly in the future. Some examples are wider use of production and control technology using artificial intelligence, expert systems, and neurologic; autonomous scheduling technology; advanced materials handling technology; production data base integration; production simulation; real-time image-processing for manufacturing systems; electronic data interchange; autonomous robotics; and advanced scheduling technologies.

U.S. manufacturers will have to accelerate their current rates of investment just to stay even with leading overseas competitors in the acquisition of these new technologies--technologies that will increasingly define the environment for global competitiveness in manufacturing. Accelerated cost recovery for computer-based equipment would be a significant incentive for them to do so. This would not be a significant incentive, however, unless it were excluded from the alternative minimum tax.

Increase IRC SEC. 179 Expense Limit from \$10,000 to \$250,000

The third targetted tax measure suggested by NACFAM is:

An acceleration of expensing of qualified manufacturing process equipment under Section 179 of the Internal Revenue Code, in exclusion amounts not exceeding \$250,000. The deduction allowable under Section 179 shall be treated as allowable under the alternative minimum tax system.

The code allows a firm to treat the cost of any Section 179 property as an expense not chargeable to capital account, in lieu of depreciating the property under accelerated cost recovery, up to an aggregate amount not exceeding \$10,000. In addition, if the combined cost of qualified property placed in service during the tax year exceeds \$200,000, the dollar limit is reduced by one dollar for each dollar of excess. This tax measure is intended especially to encourage small businesses to investment in new equipment.

Given the low amounts permitted to be expensed, Section 179 is of only marginal value to small manufacturers wishing to modernize their machinery and equipment. New computer-controlled machine tools, for example, typically cost upwards of a quarter of a million dollars.

These high costs are one of the main reason why large differences have arisen between the large and small companies, as smaller establishments have fallen increasingly behind in the implementation of advanced technologies. Firms with 500 employees or fewer have adopted advanced manufacturing technologies at about one-third the rate of

larger firms.¹⁸ This problem goes to the core of the nation's industrial base, since 98.5% of America's total manufacturing establishments have 500 employees or fewer.¹⁹

To be meaningful in terms of industrial modernization, the Section 179 limit should be raised from \$10,000 to \$250,000 for industrial machinery and equipment. The combined cost ceiling for qualifying property placed in service during the tax year should be raised from the current limit of \$200,000 to \$1,000,000. Under this formula, if the combined cost of qualifying property placed in service during the tax year exceeds \$1,000,000, the dollar limit of \$250,000 is reduced by one dollar for each dollar in excess.

This formula would provide a significant option for smaller manufacturers to use Section 179 in lieu of accelerated cost recovery to modernize their production capabilities. This benefit would still be relevant only to small firms, since the ceilings are not significant for large manufacturers who typically spend tens or hundreds of millions of dollars for re-tooling. Again, however, the advantages of this incentive would be largely nullified unless it were excluded from the alternative minimum tax.

The Question of Offsets

Mr. Chairman,

Given the severity of the federal budget deficit, proponents of tax changes that would reduce federal revenues are expected to propose ways to offset such reductions with corresponding tax increases. NACFAM's basic view is that the tax credits and deductions it proposes would have such a salutary effect on GNP, employment, and wages that they would result over time in a net gain to the U.S. Treasury and thus do not need to be offset with any tax increase. In order to reduce revenue loss and maximize productivity growth, our proposed measures have also been carefully confined only to investments in industrial machinery and equipment.

The current tax code will automatically provide \$75 billion to \$80 billion more in tax revenue each year as long as economic growth is sustained at its postwar average of 3.2% annually.²⁰ Today, manufacturing represents our best hope for restoring GNP to that level or above it, since productivity is significantly higher in the manufacturing sector than in the service sector.

At the same time, NACFAM is sufficiently convinced of the positive effect of these tax measures on the nation's economic strength and competitiveness that it would be willing to consider supporting certain offsets, if that were the necessary price of enacting these changes in the tax code. These offsets should be temporary, however, and last no longer than needed to reach revenue neutrality, i.e., approximately three years. Any net revenue increases deriving from an offset should also be committed to deficit reduction not to new government spending programs.

Some temporary offsets currently being discussed include the following:

- a uniform business tax

¹⁸U.S. Bureau of the Census, Current Industrial Report, Manufacturing Technology, 1988

¹⁹U.S. Bureau of the Census, 1988 Figures, published 1990

²⁰ Lawrence B. Lindsey, op. cit., p. 172

- a value added tax
- a small percentage increase in the upper personal income tax bracket
- a competitiveness tax on securities transactions
- a leveraged buyout tax

While we are willing to list these for illustrative purposes, they are not necessarily commensurate with the three targetted modernization tax incentives proposed above. While we have not worked out in detail the macroeconomic effects of our three measures, the total revenue loss in the first year would probably not exceed \$10 billion and would decline in subsequent years, reaching revenue neutrality on or about the third year.

On the other hand, a Uniform Business Tax, if it included a cross-border tax, would yield approximately \$50 billion in additional revenue. Depending upon their structure, the other offsets listed above could also yield revenues of \$50 billion or more.

Conclusion

Mr. Chairman,

My organization would like to follow up on this hearing by sitting down with your Committee and staff and working out a tax package that would provide a major stimulus to increased investment in modernizing America's factories without worsening the federal budget deficit. Indeed, the surge in productivity and economic growth that would flow from the targetted tax incentives proposed by NACFAM would secure our emergence from the current recession. More importantly, the measures we propose would modernize the nation's entire industrial base and place us on a sure path to restoring our global leadership in manufacturing.

Increased investment in machinery and equipment and related technical training is one of the soundest investments the nation can make to ensure that manufacturing can remain the primary engine of growth, guarantor of rising standards of living, and bellweather of competitiveness throughout the coming decades.

*People to See & Things to Do
When in Washington*

NOTES

NOTES

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*Federal Role in Fostering Advanced Manufacturing
Technologies*

*Testimony by Leo Reddy
President, National Coalition for Advanced Manufacturing*

*Before the United States Senate Committee on Commerce,
Science, and Transportation, Washington, D.C. June 19,
1991*

NACFAM

*Changing the
Advanced Manufacturing
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in the '90s*

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THE NATIONAL COALITION
FOR ADVANCED MANUFACTURING

Federal Role in Fostering Advanced Manufacturing Technologies

Testimony by Leo Reddy

President, National Coalition for Advanced Manufacturing (NACFAM)

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SUMMARY

U.S. manufacturing made valuable strides in the 1980's in improving productivity quality, and is better positioned to respond promptly to a restoration of consumer confidence and stronger orders.

However, before getting swept away with euphoria about the "revival of U.S. manufacturing," Americans should recognize deep-seated structural weaknesses in American industry that, if not corrected, will lead the nation down the path of a comfortable, but second rate economic power.

These weaknesses include: a propensity to export low value-added basic goods, a deepening loss of market share within the domestic market, low rates of productivity growth in comparison with leading competitor nations, a chronic shortage of long-term investment capital (which, among other things, places the U.S. just ahead of Bulgaria and Yugoslavia in the consumption of machine tools), an increasingly uncompetitive supplier base (98.5% of U.S. manufacturing firms have fewer than 500 employees), a tax structure that is detrimental to critically-needed investment in new plant and equipment, and a weak technical education base.

NACFAM's October 1990 White Paper, Industrial Modernization: An American Imperative, proposed a strategy for federal action in an overall national effort to address these challenges squarely.

One area that NACFAM identified for especially prompt federal action was in the field of advanced manufacturing technology, where the U.S. is lagging increasingly behind its global competitors.

Essentially, NACFAM called for a two-part response in this field:

1. Accelerated development of advanced manufacturing technologies through reprioritizing federal R&D spending, even if that means slowing down major defense and space research projects. NACFAM would like to see federal funding in this field increase from its current 1.7% of the federal budget to 10% in the 1990's.
2. Accelerated deployment of both new and existing manufacturing technologies to the nation's small and medium-sized manufacturers through greater federal support for state and local education, training, and extension centers. NACFAM proposes that the Department of Commerce receive an initial \$100 million increase to kick off its part of this program.

Under NACFAM's approach, all relevant federal agencies--notably Defense, Commerce, Energy, NASA, and NSF--would play an enhanced role, under the guidance of the White House Office of Science and Technology Policy, in both the development and deployment tasks. The Department of Commerce would play a key leadership role in this process.

INTRODUCTION

Mr. Chairman,

I am honored to have this opportunity to testify before your distinguished committee, especially on the eve of landmark legislation on advanced manufacturing technology that will shortly be introduced in the U.S. Senate.

You have invited me to summarize the importance of manufacturing to the United States, the role of advanced manufacturing technologies, the rate at which the United States and its competitors are adopting these technologies, the need and opportunity for government-industry cooperation in the development and deployment of advanced manufacturing technology, and the specific roles that the Departments of Commerce and Defense could play in these cooperative efforts.

Since I will be commenting on those points today in my capacity as President of the National Coalition for Advanced Manufacturing (NACFAM), let me begin by saying a few words about this organization. NACFAM is a rapidly-growing, non-profit, non-partisan association committed to action at the national level to facilitate the productivity, quality, and competitiveness of U.S. industry through the accelerated development and deployment of advanced manufacturing technologies.

The 160 institutional members of NACFAM represent the major sectors of America's manufacturing enterprise: small, medium, and large firms, including several Fortune 500 companies; centers of manufacturing technology research, education, training, and extension; and national trade and technical training associations. Through our association members, we advocate the interests of over 70,000 manufacturing firms and 47,000 technical training institutions nationwide in the field of advanced manufacturing.

IMPORTANCE OF MANUFACTURING

To provide some perspective for a serious discussion of technology policy affecting manufacturing, it is important to understand the role of manufacturing industries in the U.S. economy. A prevalent view for several years has been that manufacturing has declined and has entered a "post-industrial" era dominated by service industries. This view is misleading and potentially destructive.

Manufacturing has not become less important to the U.S. economy. It has remained steady at 19-23% of real (inflation-adjusted) GNP since 1947. According to current Department of Commerce figures for the last year available, 1988, the value added to GNP by manufacturing that year was 23.0%.

Productivity is perhaps the primary measure of a nation's economic strength and growth. In the 1980's, manufacturing productivity increased 3.9%--the best performance since World War II and three times the productivity increase in service industries.¹

Manufacturing plays a critical role in the nation's position in world trade. About 85% of trade is in goods, not in services.

Manufacturing industries account for about 90% of nongovernmental R&D funding and are acutely sensitive to innovative technology. They are the battleground on which most of the global technology race is being fought. The astute deployment of technology is vital to making high value-added products, which define a nation's leadership in the world marketplace.

Manufacturing represents a critical source of employment for the nation. In 1988, The total number of persons engaged directly in manufacturing industries was 19,600,000 and in engineering industries (e.g. iron, steel, and non-ferrous metals) was 8,500,000.² While the 19.6 million figure for manufacturing represents a slide from 21 million in 1979, this does not reflect the spin-off from manufacturing in related service and raw materials industries. Manufacturing-related employment is between 20 and 30 million.³ A fair estimate of the number of jobs created by manufacturing and engineering industries and related service sectors is thus between 47-57 million--around 40% of the total national labor force.

There is no serious question, therefore, about the continued importance of manufacturing industries to the strength of the U.S. economy. If there is any confusion in our country about this, America's leading overseas competitors are not troubled by this ambiguity. They clearly view manufacturing, not as a declining asset, but as the main engine of growth. They have understood that a nation's financial strength and economic power turn essentially on its ability to produce high-quality, cost-effective products that are responsive to customer demand and are thus prepared to make the necessary investments in plant modernization to make this happen. Fortunately, a number of American economists are beginning to dispel any lingering doubt on this point. To mention just one, J. Bradford DeLong and Lawrence H. Summers writing under the National Bureau of Economic Research, Inc. have established that investment in equipment offers the single greatest return to growth for the economy as a whole.

The most critical question is the competitiveness of U.S. manufacturing firms against its commercial rivals. About 70% of U.S. manufacturing faces direct foreign competition. U.S. companies must compete in domestic as well as overseas markets.

U.S. MANUFACTURING COMPETITIVENESS

Encouraging Indicators

The despair, so prevalent in the 1980's, over the decline in U.S. competitiveness is yielding gradually to a new mood of greater optimism. As noted above, manufacturing as a whole continues to maintain a firm grip on its percentage of real GNP and manufacturing productivity is improving.

After a 10-month slump, industrial output may be turning the corner, as manufacturing orders are picking up. Inventories are leaner--thanks in part to the use of advanced technologies for "just-in-time" inventory control--and thus factories will be more responsive to small increases in consumer spending. Due partly to advances in automation and other labor-saving technologies, labor costs in the U.S. are less significant as a cost factor. The Manufacturing Studies Board recently reported that direct labor content in most U.S. manufacturing industries has dropped to 15% or less of production costs and in high-technology industries is increasingly less than 5% of production costs.⁴

Stimulated by the "quality revolution," including the Malcolm Baldrige National Quality Award, many firms have improved the competitiveness of their products. World demand for U.S. capital goods increased, especially among newly-industrialized nations.

Many sectors of U.S. manufacturing, even though they have lost some portion of the global market, remain strongly competitive, e.g. chemicals, aerospace, computer software, instrumentation, and advanced materials.

The export picture has brightened considerably. The U.S. merchandise trade deficit has dropped to the lowest levels in eight years. It may slip below the \$100 billion level for the first time since 1983.

As a result of these indicators, many economists are hoping that manufacturing industries, driven by a strong export market, will take the lead in bringing the nation's economy out of the current recession. Manufacturing firms, more modernized and with leaner inventories than during the last recession, are positioned to play that role.

Whether or not these optimistic projections are realized, U.S. manufacturing still faces severe global economic challenges and structural fault-lines. Public policies designed to strengthen manufacturing in America should look beyond the current fluctuations in the business cycle and focus on these longer term challenges.

Sobering Challenges

More compelling than the debate over how the nation will pull through the current recession are the structural, long-term weaknesses within the U.S. manufacturing enterprise. These are the deep-seated flaws that over time, sap the vigor and competitiveness of all manufacturing industries. These are the problems that, if not corrected, create the greatest danger that the United States will gradually lose its economic leadership and become primarily a supplier of raw materials, low-cost labor, and low value-added products to more sophisticated industrial powers in Europe and Asia.

Composition of Exports: While the U.S. can draw satisfaction from the improvement in the nation's merchandise trade deficit, a prudent analysis of the factors involved is required.

The most important indicator for the long-term competitiveness of U.S. industry is the composition of current exports. According to a recent report published by the Federal Reserve Bank of New York, finished goods as a share of U.S. manufactured-goods exports failed to rise between 1978 and 1989. By contrast, finished goods as a share of U.S. imports of manufactured goods jumped from 66% to 77% in the same period while world exports of finished goods rose far faster than exports of industrial materials.⁵

The major factors affecting the boomlet in exports are the weakness of the U.S. dollar--still one-third below its 1985 value--and the reduced purchasing power of U.S. consumers of foreign imports. This reduced purchasing power can be attributed in part to the fact that real incomes in America are in one of the deepest slides in any postwar recession. This drop pre-dates the current recession. While disposable income nearly doubled in the preceding 35 years, hourly wages since 1986 have declined 5%.⁶

Loss of Market Share: Although the U.S. can not be expected to predominate in every industry sector, the sheer magnitude of the decline in market share commands our attention. The U.S. has lost its lead in many critical products both in the global market, and in the domestic economy. American-owned companies have lost a significant share of the U.S. market between 1979 and 1989 in the following industries: chemicals, aerospace, computers, telephone equipment, semi-conductors, machine tools, cars and light trucks, apparel, textiles, shipbuilding, steel, paper and paperboard, industrial machinery,

household furniture, household appliances, color TV, ball and roller bearings, cement, and nuts, bolts, and washers.⁷

Relative Productivity: While industrial productivity increased in the 1980's at an improved rate, our principal overseas competitors were increasing their productivity at an even faster rate and U.S. productivity gains were relatively modest by America's own 20th Century standards. (See Table) In productivity, the 1989 U.S. output per hour in manufacturing increased by only 2%, a drop of about 60% from the peak gains achieved in 1983-84. This poor performance left the U.S. behind all but one of eleven other industrial countries in productivity growth that year.

Table 1 offers a view of the current comparative position of the U.S. in productivity, measured by productivity growth in output/hour, as well as historic trends in U.S. productivity growth. Table 2 shows that, for the first time since World War II, Japan has overtaken the U.S. in overall productivity.

The more recent reports of increased industrial output also need to be kept in perspective. The National Association of Purchasing Management's index of industrial activity increased to 45.4% in May, from 42.1% in April. A rise in new orders--the first in 10 months--led the overall gain in May. The index, however, is still below the 50% mark. That means that manufacturing is not declining as steeply as before, but has not returned to previous levels. Factories do not have enough demand to keep production lines busy. The Department of Commerce reported recently that new orders increased by 1.8% in April, but that followed five consecutive drops. Factory output rose slightly in April, but that was partly because past inventory cutting, especially in cars, has left stockpiles extremely low.⁸

Capital investment: Access to capital may be improving slowly for some U.S. manufacturers, yet our competitive position in this area remains weak. In the last three years, the proportion of Japan's Gross Domestic Product devoted to investment in manufacturing has risen sharply, increasing almost six times faster than the corresponding rate in the U.S. In 1990, manufacturing investment in Japan comprised about 5.1% of its total GDP (in current dollars in yen) compared with 3.5% for the U.S. One result is that the average age of industrial equipment in U.S. factories is nearly 11 years as compared with seven years for Japan.

A close correlation exists between manufacturing productivity increases and capital investment. (See Table 3.) The fact that capital equipment purchases in the U.S. are now beginning to climb is a healthy sign, but higher rates will need to be sustained over several years to modernize equipment at all levels of the U.S. industrial base. Unless domestic investment in capital and equipment strengthens, U.S. finished goods producers will face growing competitive pressures.

Tax Structure: One reason for the decline in capital investment is the absence of significant tax incentives. Indeed, current tax policies include disincentives to such investment. For example, with the repeal of the investment tax credit and other provisions in the Tax Reform Act of 1986, the effective tax rate for equipment rose from 10% to just under 40%. It is noteworthy that in the years following the TRA, Japanese investment in plant and equipment has skyrocketed while in the U.S. there has been little change (See Table 4.)

In the unlikely event that the Congress agrees to the Administration's proposal for a capital gains tax reduction, those reductions would not necessarily result in major increases in

capital investment. Many of our overseas competitors have tax codes that directly favor factory modernization.

Fault lines in the supplier base: The some 350,000 small manufacturing establishments in America are, in general, poorly equipped to deal with the challenges of competition from increasingly sophisticated foreign suppliers. The relative productivity and earnings of these smaller firms have declined steadily throughout the 1980's, and they have fallen increasingly behind larger firms in plant modernization.

Their problems are a serious weakness for the entire manufacturing enterprise, since (1) they produce about a third of the value added in U.S. manufacturing, (2) they account for almost one half of the U.S. trade deficit, and (3) large manufacturers are increasingly relying upon outside suppliers for discrete manufactured parts and components. Even though large firms are shrinking their supplier base, they are ultimately dependent upon tens of thousands of discrete parts makers and suppliers.

The enclosed NACFAM pyramid (Table 5) chart offers a picture of the important place that firms with fewer than 500 employees play in the total U.S. manufacturing base.

Workforce Skills: Just as the demand for a highly-skilled workforce in manufacturing is increasing, the supply is decreasing. International comparisons consistently show U.S. students behind most other leading industrialized nations in science, math, and vocational skills. In many sectors, industry is experiencing grave difficulty in obtaining the services of skilled technicians and qualified workers, while over one half million of America's young people drop out of high school each year. Companies are now spending tens of billions of dollars giving basic remedial education that their employees should have learned in primary and secondary schools.

Technology: Another major factor in the ability of U.S. manufacturing to become more competitive is in the development and deployment of advanced manufacturing technologies. Since this subject is one of the primary focal points of this hearing today, I will concentrate the remainder of my testimony on this structural problem.

IMPORTANCE OF ADVANCE MANUFACTURING TECHNOLOGY

As I devoted some time above to describing the importance of manufacturing in the nation's economy, I would like to begin this portion of my remarks by commenting on the role of advanced manufacturing technologies in the nation's industrial base. In referring to "advanced manufacturing," I mean the use by manufacturing firms of computer-based and other high-precision product and process technologies which, when integrated with a sound business-financial strategy and effective education-training programs, will improve the quality, productivity, and competitiveness of those firms.

That definition is important in understanding that technology alone will not necessarily make a manufacturing company more competitive. Many factors involved: leadership, strategic planning, employee involvement and development, financial planning, design, marketing, buyer-supplier relations, etc. Before costly investment in new, advanced manufacturing equipment is justified, successful companies first need to improve efficiency throughout their production operations. This is often accomplished through such measures as closing down obsolete plants, trimming middle management, overhauling factory floor layout, creating self-managed work teams, and retraining.

Ultimately, however, a manufacturing firm can not become truly world-class without the introduction of advanced manufacturing hardware and software. Competitiveness in modern global economy requires quality and responsiveness to the customer. In terms of production operations, this means significant increases in reliability, timeliness of delivery, order-processing time, defect and lead-time reduction, inventory reduction, cost reduction. The emphasis is on shorter lead times and product cycles, more customization and product variety, and zero defects.⁹

Combined with effective management and training strategies, advanced manufacturing technologies have dramatic effects on design capabilities, assembly time, and cost. To give but one example, when Sony designed its "Walkman," the number of mechanical parts were decreased from 97 to 45, the number of assembly workers from 60 to 10, assembly time to a third, and, finally, the sales price dropped in the U.S. from \$39 to \$32 despite a soaring yen.¹⁰

Advanced manufacturing technologies are now used in modern factories to control all the processes of production: turning, boring, drilling, milling, gear-cutting, grinding, threading, broaching, tapping, cutting, punching, shearing, bending, forming, finishing, polishing, pressing, forging, diecasting, rolling, riveting, welding, molding, heat-treating, etc.

Most manufacturing firms can not attain world-class manufacturing standards within acceptable cost parameters without the assistance of advanced manufacturing technologies. A recent study by Deloitte & Touche of 872 U.S. manufacturing firms, including a large number of world-class firms, concluded:

"While many manufacturers continue to struggle with state-of-the-art technology, industrial modernization is at the heart of world class manufacturing. Technological leadership in manufacturing is a primary engine of performance and capability development. **Both hard and soft technologies are essential to world-class firms** (emphasis added). Superior manufacturers have made massive investments in process technologies, integration, and coordination technologies, training and education. About 50% of world class companies have implemented islands of automation or have begun to integrate automation.¹¹

According to the highly-regarded Boston University Manufacturing Roundtable, the most effective actions that firms undertook during the 1980's to improve manufacturing competitiveness included adoption of such advanced manufacturing technologies as statistical process control, strategies to reduce product development time, and "Just-in-Time" inventory control¹²

Every indication is that advanced manufacturing technologies will be adopted with increasing frequency throughout the nation's industrial base. New export opportunities will prompt U.S. manufacturers to expand capacity. Rapid rates of investment by overseas competitors in new plant and equipment will require U.S. producers to invest, if they plan to stay ahead.

Another compelling reason for moving towards forms of automation is the slow growth in the size of the work force. In the 1980's, the work force grew at a rate of 1.6% annually, compared with a projected growth rate of 1.2% in the coming decade.

Companies will have to spend money on labor-saving technologies, promising a boost in productivity.¹³

Japan has made no secret of the importance it attaches to advanced manufacturing technology. A notable example was the proposal by Japan's Ministry of International Trade and Industry in the fall of 1989 for a \$1 billion dollar international research consortium on "Intelligent Manufacturing Systems" (IMS). The terms of Japan's initial bid for this U.S.-European-Japanese consortium--which would have placed Tokyo in the position of majority shareholder and primary arbiter of intellectual property rights--would have given the Japanese a predominant world position in these critical technologies.

POSITION OF U.S. IN ADVANCED MANUFACTURING TECHNOLOGY

Japan and the industrially-advanced nations of Western Europe have pulled well ahead of the United States in the adoption of most advanced manufacturing technologies. An excellent overview of the U.S. position is contained in the recent Council on Competitiveness Report, Gaining New Ground. Among six technology clusters contained in that report, the field in which the U.S. was shown as weakest relative to its overseas competitors was in "Engineering and Production Technologies." The relevant chart is attached as Table 6.

A good measure of where the U.S. stands is in the use of numerically-controlled (NC) machine tools. Since the introduction of NC machines at the end of the 1950's and computerized NC in early 1970's, NC technology has become one of the most important tools for increasing productivity and product quality. The United States is lagging behind Japan and the leading industrialized countries of Western Europe in the consumption of total NC metal-cutting machines: Japan (69.3%), Germany (69.1%), France (67.5%), U.K. (66.3%), Italy (45.9%), U.S. (42.7%)¹⁴

U.S. is also lagging far behind in the adoption of industrial robots. U.S. acquisition of this equipment surged in the early and mid-eighties, then declined somewhat sharply. Japan, however, reduced its purchases of industrial robots only briefly and then returned to a high rate. Acquisition rates are likely to increase again in the future as robotics technology improves and robots are adopted to an ever-widening range of uses. Here is the current picture on the adoption of industrial robots:

Japan:	176,000 robots (up 25%)
Western Europe:	48,000 robots (up 20%)
U.S.:	33,000 robots (up 12%)

Japan's growth rate pattern in robots: +25% in '86; + 22% in '87; + 26% in '88
 U.S. growth rate pattern in robots : +25% in '86; + 16% in '87; + 12%
 in '88¹⁵

On a more encouraging note, the United States is currently in a leadership position on many kinds of software needed in advanced manufacturing operations. Computer-aided design, manufacturing, and engineering (CAD/CAM/CAE)--essential elements of computer-integrated manufacturing (CIM)--are now dominated by IBM and Prime. These technologies are traditionally based upon mainframes and work-stations, but with PC-based CAD -- dominated by Autodesk -- becoming increasingly popular, lower costs offer the prospect of an upsurge in the global use of CAD.

Another measure of the U.S. position in advanced manufacturing technology is the production and consumption of new machine tools. From being the world's largest producer of machine tools as late as 1981, the United States is now only the fifth largest.¹⁶ Among the world's 10 leading machine tool manufacturers, 6 of 10 are Japanese, with Yamasai Mazak ranking first (with \$675 million sales in '87) and Fanuc, Ltd., Japan ranking second (with \$651 million sales in '87).

17

In 1990, Japan, West Germany, and Italy substantially increased their investment in machine tools, while consumption in the U.S. actually declined (by 11 %). Machine tool consumption is calculated as domestic production plus imports less exports, and it is often seen as a measure of a country's rate of industrialization.

Most strikingly, per capita consumption of machine tools in the US in 1990 was \$18, roughly half of that of the former East Germany and Taiwan, a third that of Italy and Japan, and a fifth that of the former West Germany. The following table demonstrates how far the U.S. is behind other industrialized nations in per capita consumption of machine tools.

Per Capita Consumption of Machine Tools, 1990 est. (\$US)

Switzerland	\$200.09
Germany (fmr FRG)	95.59
Singapore	69.69
Japan	60.42
Italy	53.74
Sweden	48.43
France	44.93
Austria	43.09
Finland	39.29
Taiwan	36.57
Fmr. East Germany	36.05
Canada	33.67
South Korea	33.48
United Kingdom	31.42
Belgium	30.57
Denmark	28.84
Spain	27.29
Soviet Union	20.47
Netherlands	17.76
United States	17.65
Bulgaria	12.80
Yugoslavia	11.42 ¹⁸

By contrast, Japan's explosive growth consumed close to \$7.5 million in machine tools in 1991, helping fuel a 7.7% growth in the nation's machine-tool output, to \$10.8 billion. Japan's imports of machine tools rose slightly, but only from 7.6% to 8.6%.

At the beginning of 1991, one report by a Japanese securities institute stated that Japan's 10 automakers are planning to invest nearly \$10 billion in factories and manufacturing gear within them--up 29% from the previous year. Toyota, for example, recently announced plans to build three new factories, including a capacity to produce 200,000 luxury cars per year, while it doubles the size of output at its Kentucky plant. Japanese automakers are modernizing plants and partly using automation to counter a

chronic labor shortage in Japan. In the meantime, in the United States, manufacturing industries plan a 1.4 % decrease in spending for plant and equipment in 1991, with durable goods industries planning a 3.5% decrease.¹⁹

ROLE OF FEDERAL GOVERNMENT

The federal government has a role to play in addressing many of the structural weaknesses that confront U.S. manufacturers in their effort to become globally competitive. To identify what that role should be in an overall national effort to revitalize manufacturing, NACFAM published a White Paper in October 1990 entitled, Industrial Modernization: An American Imperative.

That paper proposed a series of specific federal measures in the fields of leadership, human resources, investment incentives, and technology. In the area of technology, the White Paper suggested two fundamental steps:

1. Accelerate the **development** of advanced manufacturing technologies, especially process technologies, through reprioritizing the federal R&D budget to give greater prominence to these technologies
2. Accelerate the **deployment** of both new and existing manufacturing technologies, particularly to the nation's small and medium-sized manufacturers, through greater federal support for state and local centers of technology training, education, and extension.

Development

Despite their central importance for the nation's productivity and competitiveness, of advanced manufacturing technologies receive very low priority in the federal government's R&D budget. The Administration's FY 92 budget proposal includes an increase in federal R&D from \$72 billion to \$76 billion, with a concomitant increase in most categories. However, as shown in Table 7, advanced manufacturing and materials technologies, represent only 1.7% of that budget proposal and would actually be reduced slightly from FY 91 levels.

Federal research--which accounts for nearly one-half of the nation's total research budget--has traditionally been used to reduce the costs and risks of high-cost new technologies in the early stages of research and development, where some basic national interest was being served. The costs and risks of developing new, highly complex production technologies are now exceeding the capacity of even the largest U.S. firms. To quote an IBM executive on this subject, "It is increasingly difficult for individual companies to go it alone when pursuing products where prices are falling, product lives are even shorter, competition is increasing, and production costs are escalating, particularly in pre-competitive areas"²⁰

Perhaps the most compelling reason for supporting federal research in advanced manufacturing is that these new technologies will over time control the very means of national production and thus lie at the root of the nation's industrial strength. Some examples of these new technologies are: production and control technology using artificial intelligence, expert systems, and neurologic; autonomous scheduling technology; production data base integration; production simulation; real-time image-processing for manufacturing systems; standardization of electronic data interchange; interface technology for cell-based communications; production technologies using overseas networks via

satellite; three-dimensional recognition technology; autonomous robotics; process and solid-image sensors; advanced scheduling technologies; energy-beam processing; use of automatically-guided vehicles in clean rooms; warehouse automation; ultra-heat-resistant ceramics and composites, materials handling technology; advanced infra-red photography; and production ergonomics.

The primary reason for the low priority given to these technologies is, of course, the traditional orientation towards defense and space research. Our leading economic competitors meanwhile have purposefully promoted research and technology for economic development.

The time has come for a fundamental reexamination of federal research priorities. The high priority given to defense-military and space research were rooted in the national interest of containing Soviet communism and winning the ideological struggle. With the Cold War behind us and with democracy and the free market prevailing in Europe, Latin America and elsewhere, it is time to re-direct our national resources to the next great challenge to our national security interests--the global economic challenge.

I am not, of course, calling for a cessation of defense and space research, but only a more rigorous examination of each project in these fields as to its continuing, direct relevance to our nation's security relative to our pressing economic needs. Current budgetary stringencies suggest that there is little chance that overall R&D spending levels will increase enough to accommodate both a robust, new program of precompetitive, generic research in industrial technologies and current levels of spending on defense and space research. In its report, Gaining New Ground, the Council on Competitiveness also calls for such a reappraisal, with a view to stretching out showcase R&D projects.

Some obvious candidates for reexamination are the Mans to Mars project, the Space Station, space-based Strategic Defense Initiative (SDI) programs, and the Superconducting Supercollider. The purpose of such a reexamination should not be to eliminate such projects but to determine whether they should be continued at somewhat reduced levels, in order to accommodate effective industrial technology programs.

Another step that would begin to re-direct R&D resources more towards civilian economic needs would be to make greater use of government laboratories. The federal government operates more than 700 laboratories with an annual budget of about \$21 billion--three-fifths of which goes towards defense applications. According to Dr. Eric Bloch, former Director of the National Science Foundation, "From the perspective of the American economy, these laboratories are an underutilized resource. As an experiment, the missions of some government labs, or specific divisions or projects of a single lab, should be redirected to support industrial collations aimed at creating leadership positions in strategic, generic technologies. Through joint industry-government funding and management, these efforts could become the nuclei of U.S. generic, pre-competitive technology development."²¹

The approach to technology development that NACFAM is suggesting, therefore, would call upon all federal agencies with manufacturing research programs to reexamine their priorities with a view to reprogramming existing funds to orient them more towards government-industry joint efforts to enhance the nation's economic strength and competitiveness. This would apply to the Department of Commerce, the Department of Defense, the Department of Energy, the National Aeronautics and Space Administration, and the National Science Foundation.

With the participation of all these agencies, increased federal R&D funding for industrial technologies can make a significant difference in America's economic strength. Our approach is fully consistent with the technology policy statement issued by the Executive Office of the President last September, which called for "Participation with the private sector in precompetitive research on generic, enabling technologies that have the potential to contribute to a broad range of government and commercial applications."²² This is a wise policy statement, not just from perspective of the benefits to industry, but also from perspective of government agencies, such as Defense, Energy, and NASA, who are also major procurement agencies. In a technological era in which private industrial research is often well ahead of government research, these partnerships will contain ample opportunities to spin off major benefits for the federal government.

The Department of Commerce is especially well situated to build upon this approach. It already has experience with the Advanced Technology Program (ATP) that is designed explicitly to form industry-government consortia in precompetitive technologies. The only significant drawback with this program is that it is grossly underfunded for the task it has undertaken. The federal government's current contribution to just one consortia--SEMATECH--is nearly three times the total ATP budget projected for FY 92.

For its part, NACFAM would propose that the overall federal R&D budget for advanced manufacturing technologies be raised in the 1990's from its current level of 1.7% of the federal budget to 10%. This is still modest, given the nature of the challenge, but will set compass points for federal research activities that are more directly and immediately relevant to the needs of American industry.

Deployment

As discussed above, small and medium-sized manufacturers (fewer than 500 employees) represent 98.5% of the nation's 365,000 manufacturing establishments. Small and medium-sized manufacturers are especially important in the critical machine tool industry. As British Business remarked in its October 21, 1988 edition, "If all the employees of the American machine-tool industry were to work for a single company, that company would rank only about fiftieth in size among American industrial corporations."

Despite their fundamental importance to the strength of domestic industry, small and medium-sized manufacturing firms face severe obstacles to modernizing their plant and equipment through the adoption of advanced manufacturing technologies.

Their situation is well described in a recent report by the Industrial Technology Institute, Ann Arbor, which has undertaken extensive research on such firms in Michigan. According to ITI, small and medium-sized firms in their state are "caught in a vicious circle of backwardness. They are far less likely to be technology users than their large-firm counterparts. Their small size and low wages hold back their productivity. Their lower productivity inhibits wage growth still further, making recruitment and retention of good workers difficult. The lack of skilled workers makes technology adoption and use risky and often unsuccessful, and high turnover among skilled workers discourages costly training."²³

Most small manufacturing firms face common obstacles: constrained financial resources; over-taxed product and manufacturing engineering staffs; and preoccupation with day-to-day operational demands. They find it difficult to define their manufacturing modernization needs, to implement new methods, and to gain rapid access to current

technical information. This is reflected in their very sluggish adoption of advanced production technologies (see Table 8).

One resource that can materially assist these smaller firms to deal with these problems are regional and local centers of manufacturing education, training, and in-factory assistance. These centers can be, for example, a federal Manufacturing Technology Center, a community college, a technical college, or a university-based industrial extension service. Experience shows that firms often look to these local, largely non-profit centers for assistance. Small Business Development Centers can also provide valuable assistance, especially with the business-financial-legal aspects of plant modernization.

The ability of these centers to be responsive, however, is severely limited. Most are underfunded and do not have sufficient technical staff or demonstration facilities to meet the needs of such a large number of firms. The use of expert data bases, PCs and modems can help extend the outreach of these centers, but a far more vigorous program is required to have any genuine impact on the large base of small and medium-sized firms.

For example, the Missouri Advanced Technology Institute has reported to NACFAM that a "one-on-one approach is not effective, since there is not enough time or dollars to do the job. In greater Missouri alone it would take over 30 years to help 2,400 narrowly-defined companies (out of a total of 10,000) manufacturing firms) if the present one-on-one programs continue at the pace of 60-70 per year."

In their report on this subject last year, the analysts at the Office of Technology Assessment came to the following conclusion: "Altogether current industrial extension programs, state and federal, reach only a small fraction--probably less than two% per year--of the nation's small manufacturing firms. In 1988, the combined technology transfer and technology management assistance programs of the 30 states that had such programs came to \$58 million and that included assistance to all kinds of business, not just manufacturing. State industrial extension programs giving one-on-one technical advice to individual firms probably add up to about \$35-40 million per year." ²⁴

The meager resources that the U.S. is devoting to support its smaller firms stands in marked contrast with Japan, where small to medium-sized manufacturers have access to a nation-wide public system of support for technology adoption and development. A central element of this system is the network of 169 public centers, known as Kohsetsushi Centers. They provide research services, testing, training, and guidance, and administer a system of qualifying and registering private consultants. There are centers in every prefecture (roughly equivalent to a state in the U.S.) in Japan with a budget of \$500 million a year combined prefectural, municipal, and federal funding. These centers deal with a large number of cases each year, reaching a significant share of Japan's small and medium-sized firms.²⁵

The only parallel to this kind of system in the United States is the Agricultural Extension Service. This well-endowed (\$369 million) service (supporting a \$90 billion contribution by agriculture to GNP) stands in market contrast to the meager \$19 million by the Department of Commerce to support industrial extension (supporting a \$1.8 trillion contribution by manufacturers to GNP). It is worth noting that the Agricultural Extension Service has been a solid success. The nation enjoyed an export surplus of \$16.2 billion in agricultural products in 1989.

NACFAM's approach to the deployment of advanced manufacturing technologies to small and medium-sized firms is analogous to its approach to technology development.

Each federal agency would play its role in transferring this technology to the industrial base. The Pentagon has an urgent need to strengthen the domestic suppliers of critical defense components, to diffuse manufacturing technologies of special relevance to defense production, and to realize the cost savings associated with advanced manufacturing. The national labs under the Department of Energy have already started to make some of their manufacturing know-how available to manufacturers in their areas, and NASA has an excellent national network of industrial application centers.

This is an area, however, in which the Department of Commerce should play a key leadership role. Commerce already has a legislative mandate to coordinate state industrial extension service programs and has made an excellent beginning with its Manufacturing Technology Centers (MTC) and State Technical Extension (STEP) Programs. In NACFAM's view, the multiple centers of manufacturing education, training, and extension should be more strongly supported by each federal agency and tied together in a hub-and-spoke network with Commerce's Manufacturing Technology Centers serving as the hub.

This, of course, will require additional resources well beyond the meager amounts currently proffered for the MTC and STEP programs. NACFAM believes that Department of Commerce funding for industrial extension programs should be raised immediately to the \$100 million level, with further increases as these programs mature and prove their effectiveness.

Even with the strongest program, it will not be possible to reach the full 360,000 smaller manufacturing firms around the nation. It will be possible to reach those 120,000 to 240,000 with the greatest need, such as companies that integrate several different technologies, companies working in rapidly changing markets, and companies with low levels of support from vendors and associations.

CONCLUSION

The foregoing strategy for federal support for developing and deploying advanced manufacturing technologies will not succeed without leadership at all levels: from industry, state government, the Congress, and the Administration. You have shown such leadership, Mr. Chairman, in drafting legislation on this subject.

It is now time for the President and the Administration to carry out this legislation. NACFAM's basic approach--to have all appropriate federal agencies play their respective roles in this field--will not work without effective White House coordination. That is why we favor a strong role by the President's Science and Technology Policy advisor (OSTP) in providing guidance for both the development and deployment programs. His primary instrument for interagency coordination would be the Federal Coordinating Council for Science, Engineering, and Technology.

In as much as the Undersecretary of Commerce for Technology heads the manufacturing subcommittee of the council the approach would also give major coordinating responsibilities to the position. For this reason, the budget for that important office should be strengthened, not weakened.

Fortunately, OSTP and the council are already beginning to develop a work program for a federal initiative in the field of advanced manufacturing technology development. Similar leadership is needed in the even more critical field of deploying both new and existing technologies into the hands of the nation's industrial base of small, medium, and large firms.

Mr. Chairman, the most pressing national security needs now facing this nation are economic. The collapse of the Soviet empire in Eastern Europe and the dramatic events now unfolding within the Soviet Union have their roots in the failure of the communist economic system. The Persian Gulf War had its roots in the issue of who would control the world's principal source of oil.

And there is no question that, to preserve its standard of living, job security, and productive capacity, the United States must strengthen its industrial and technology base. To quote the Administration's statement of technology policy, "The goal of U.S. technology policy is to make the best use of technology in achieving the national goals of improved quality of life for all Americans, continued economic growth, and national security."²⁶

This is not a question of choosing economics over politics. In the modern era of technologically-advanced industrialized states competing aggressively and primarily in the marketplace, economic power **defines** power. A robust domestic industrial base is the prerequisite for an independent defense production capability. A strong industrial base will define this nation's power and its ability to protect its global interests for the foreseeable future.

The kind of federal support envisioned by NACFAM and by your pending legislation to improve the public policy environment for the wider use of advanced manufacturing technologies is precisely the right kind of public policy initiative at this time for America. These measures will help build a new infrastructure of support to ensure that U.S. industry retains its world leadership position well into the next century.

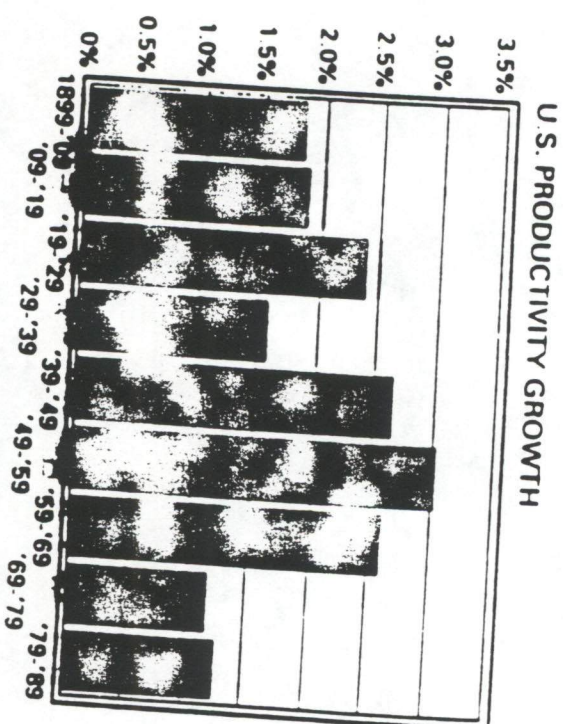
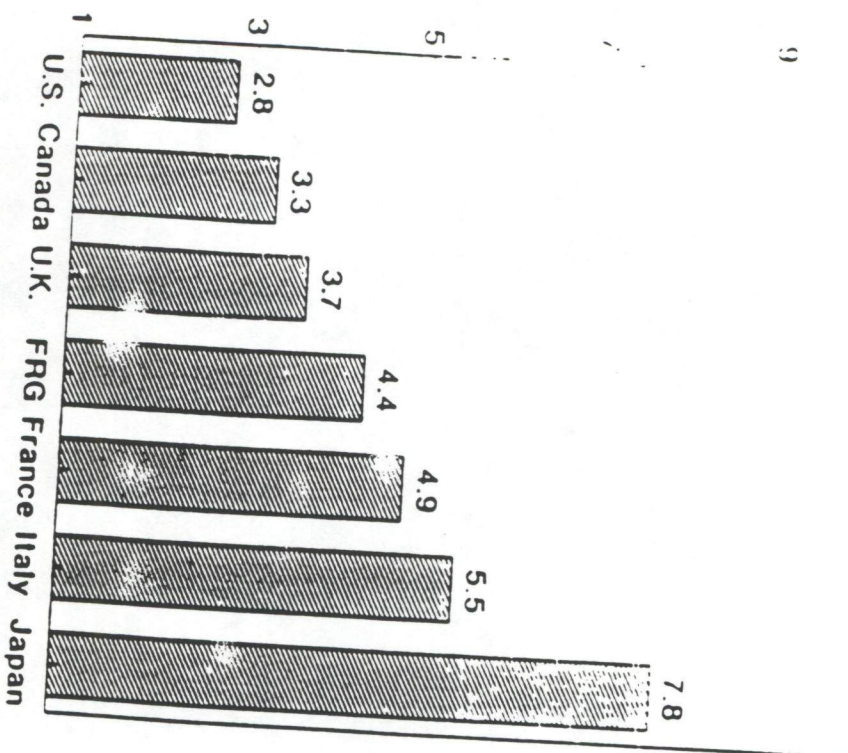
Our factories have become our first line of defense.

TABLE 1

U.S. PRODUCTIVITY IS DOWN RELATIVE TO

- PERFORMANCE OF OTHER INDUSTRIAL NATIONS
- HISTORIC U.S. VALUES

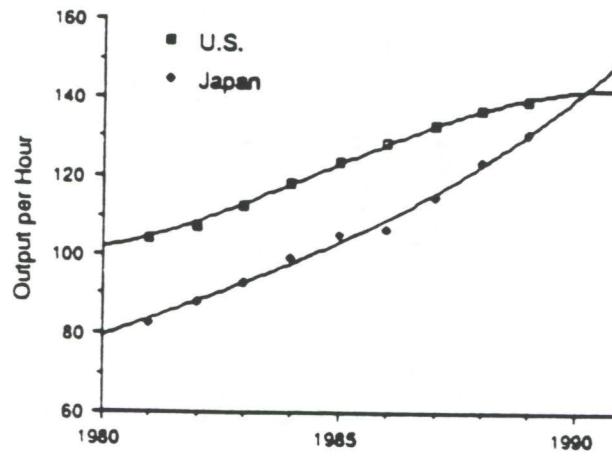
Percent growth in output/hour



Sources: U.S. Department of Labor, Bureau of Labor Statistics
Historical Statistics of the United States

Table 2

**Manufacturing Productivity,
Japan v. US**

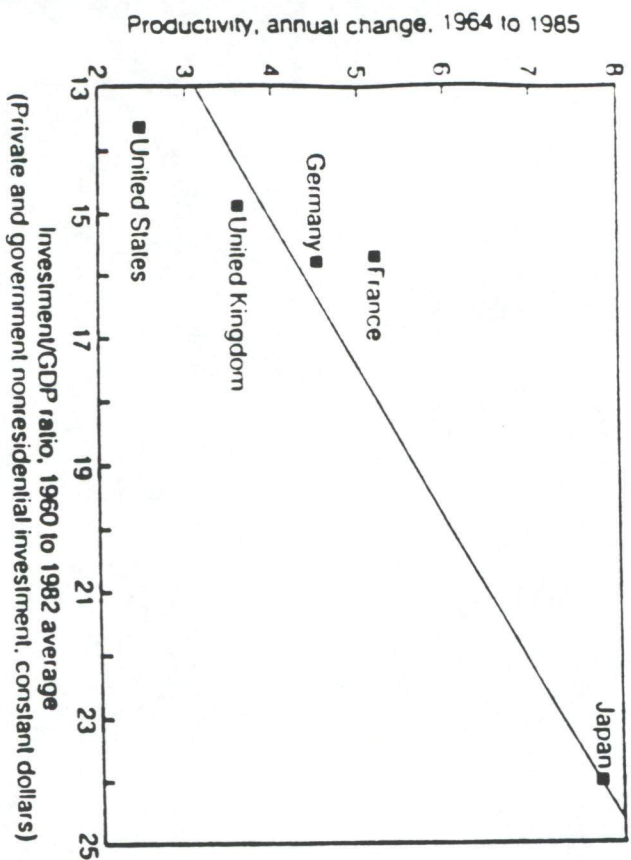


Source: International Productivity Center, U.S. Dept. of Labor

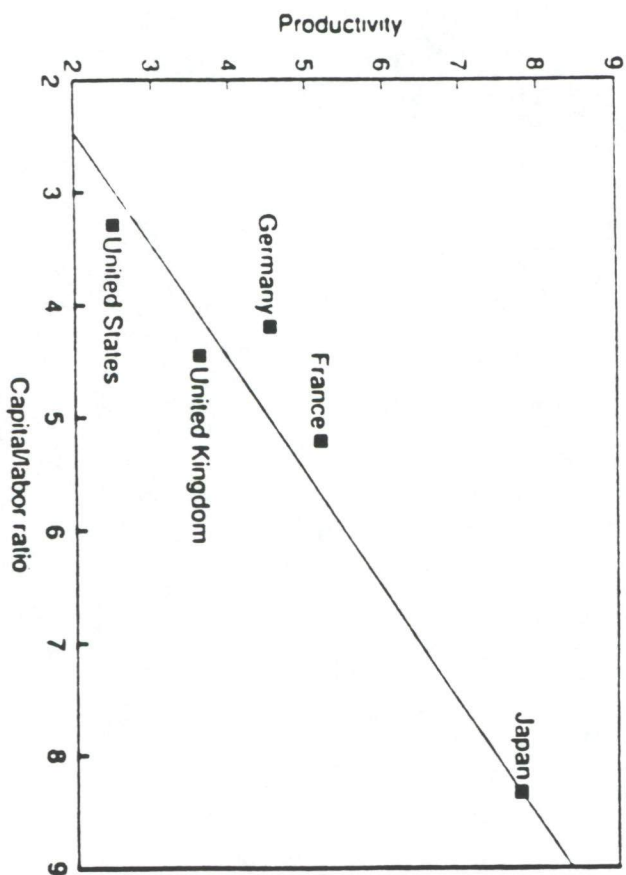
THE BASIC EQUATION

$$\text{PRODUCTIVITY GAIN} = \text{INVESTMENT} + \text{MODERNIZATION}$$

Manufacturing Productivity and Investment/GDP Ratio



Productivity and Capital Labor, Manufacturing 1964 to 1985 (Average Annual Rates of Change)



IN THE THREE YEARS FOLLOWING THE TRA,
JAPANESE INVESTMENT IN P&E HAS SKYROCKETED
WHILE IN THE U.S. THERE HAS BEEN LITTLE CHANGE

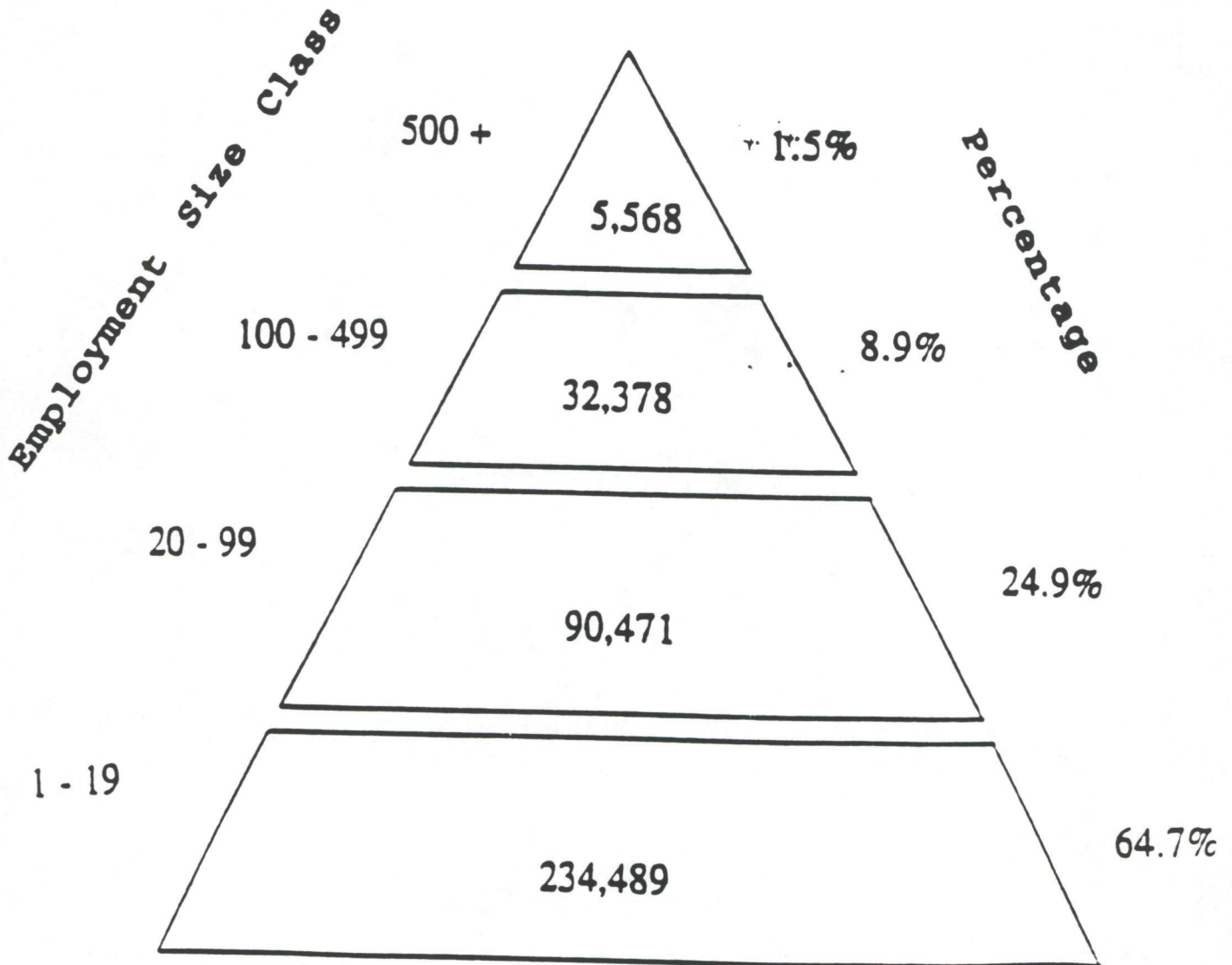
Year	U.S.			JAPAN		
	Investment In P&E (\$B)	Annual Rate of Increase	Investment /GDP	Investment In P&E (trillion yen)	Annual Rate of Increase	Investment /GDP
1987	\$146	11.0%	3.2%	10.4	5.5%	2.9%
1990	\$192	4.7%	3.5%	21.5	17.4%	5.1%

Sources: U.S. Bureau of Census, Plant and Equipment Survey PESVY (90)-2
Nihon Keizai Shimbun, September 22, 1990

NACFAM PYRAMID CHART

U.S. MANUFACTURING ESTABLISHMENTS

(SIC 20 - 39)
Total: 362,906



U.S. Bureau of the Census, 1988
Figures published December 1990

ENGINEERING AND PRODUCTION TECHNOLOGIES

TECHNOLOGY	U.S. POSITION			
	Strong	Competitive	Weak	Losing Badly or Lost
Design and Engineering Tools				
Computer-Aided Engineering	■			
Human Factors Engineering		■		
Leading-Edge Scientific Instruments			■	
Measurement Techniques		■		
Structural Dynamics		■		
Systems Engineering	■			
Commercialization and Production Systems				
Computer-Integrated Manufacturing		■		
Design for Manufacturing			■	
Design of Manufacturing Processes			■	
Flexible Manufacturing			■	
Integration of Research, Design and Manufacturing			■	
Total Quality Management			■	
Process Equipment				
Advanced Welding		■		
High-Speed Machining			■	
Integrated Circuit Fabrication and Test Equipment				■
Joining and Fastening Technologies		■		
Precision Bearings			■	
Precision Machining and Forming			■	
Robotics and Automated Equipment				■

Source: Council on Competitiveness

II. DIRECTOR'S INTRODUCTION AND OVERVIEW TABLES

Part One-11

**Table II-2. ENHANCING RESEARCH AND DEVELOPMENT AND
EXPANDING THE HUMAN FRONTIER—HIGHLIGHTS**
(Dollar amounts in millions)

	Budget Authority			
	1991 Enacted	1992 Proposed	Dollar change	Percent change
Basic Research				
Doubling the NSF budget	2,316	2,722	+406	+18
Increasing Basic Biomedical Research at NIH	4,634	4,968	+334	+7
Human Genome Project	135	169	+35	+26
Agricultural Research Initiative	73	125	+52	+71
Superconducting Super Collider	243	534	+291	+120
Applied Research				
High Performance Computing and Communications	489	638	+149	+30
Energy R&D	676	903	+227	+34
Advanced Manufacturing and Materials	1,316	1,310	-6	—
HIV/AIDS	1,152	1,210	+58	+5
Moving Fusion Energy from Science to Engineering	275	337	+62	+23
Aeronautics R&D	482	543	+61	+13
Expanding R&D at the National Institute of Standards and Technology	215	248	+33	+15
Maintaining National Security: Defense R&D	37,783	43,247	+5,464	+14
Expanding the Geographic Frontier: Space Exploration				
Space Transportation Infrastructure	4,801	5,517	+716	+15
Space Science	1,774	2,141	+367	+21
Mission to Planet Earth (Global Change)	954	1,186	+232	+24
Mission From Planet Earth	2,199	2,470	+271	+12
Expanding the Human Frontier through Biotechnology	3,788	4,107	+319	+8

Source, Budget of the U.S. Government, FY 1992.

TABLE 8

THE U.S. IS LAGGING BEHIND IN THE ADOPTION OF AUTOMATION

- JAPAN IS WAY AHEAD IN ALL AREAS OF FLEXIBLE AUTOMATION
- INDUSTRIAL COUNTRIES IN EUROPE ARE ALSO PULLING AHEAD

Type of Machine:	Percentage Share of NC-Machines		
	Milling Machines	Lathes	Total Metalcutting
Germany	76.58	65.08	69.18
France	73.78	91.88	67.58
Italy	90.08	72.58	45.98
United Kingdom	N/A	76.78	66.38
Spain	N/A	N/A	50.08
Japan	61.88	80.48	69.38
United States	43.68	94.58	42.78

Footnotes

- ¹Bureau of Labor Statistics, 1990
- ²Economic Commission for Europe (ECE), Annual Review of Engineering Industries and Automation, United Nations, New York, Vol. II, p. 13
- ³Bureau of the Census, U. S Department of Commerce
- ⁴Manufacturing Studies Board, National Research Council, The Internationalization of U.S. Manufacturing, National Academy Press, 1991
- ⁵Susan Hickok, Quarterly Review, Federal Reserve Bank of New York, Spring 1991
- ⁶Business Week, Special Report, Dec. 17, 1990, p. 62
- ⁷Edmund Fahltermeyer, Fortune Magazine, Sept. 24, 1990
- ⁸Business Week, June 17, 1991
- ⁹Boston University School of Management, Manufacturing Roundtable, Beyond the Quality Revolution, p. 1.
- ¹⁰Economic Commission for Europe, op.cit., Vol. I, p. 50
- ¹¹Deloitte & Touche, Annual Survey of North American Manufacturing Technology, 1991, pp. 2-3
- ¹²Boston University, op. cit., p. 2
- ¹³Business Week, June 17, 1991
- ¹⁴ECE, op. cit., Vol. I, p. 46
- ¹⁵ibid., Vol. I, p. 53
- ¹⁶ibid., Vol. I, p. 40
- ¹⁷ibid., Vol. I, p. 38
- ¹⁸American Machinist, February 1991
- ¹⁹U.S. Department of Commerce, Bureau of Census. United States Department of Commerce News, June 6, 1991
- ²⁰Marshall Phelps, Director of IBM Governmental Programs, in Washington Technology, May 16, 1991
- ²¹The Manufacturing Forum. Toward a U.S. Technology Strategy: Enhancing Manufacturing Competitiveness. National Academy Press. Feb. 1991, p. 4.
- ²²Executive Office of the President, Office of Science and Technology Policy. "U.S. Technology Policy" September 26, 1990, p. 5.
- ²³Industrial Technology Institute, The Michigan Foundation: A Study of the Modernization Process, 1991
- ²⁴U.S. Congress, Office of Technology Assessment, Making Things Better: Competing in Manufacturing, 1990
- ²⁵Philip Shapira, Japan's Kohsetsushi Program of Public Examination and Technology Centers for Upgrading Small and Mid-Size Manufacturing Firms, Regional Research Institute, West Virginia Univ., Oct. 1990)
- ²⁶Executive Office of the President, Office of Science and Technology Policy, "U.S. Technology Policy" Sept. 26, 1990

NOTES

NOTES

THE NATIONAL COALITION FOR ADVANCED MANUFACTURING

1331 Pennsylvania Ave., NW • Suite 1500 – North Lobby • Washington, DC 20004

Telephone: (202) 347-0090 • Fax: (202) 637-3182

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9124506
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: NAUGHTON, Daniel P.: THE TORRINGTON CO.

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 10/22/91

SUBJECT: RE: URGING DR. BROMLEY TO SUPPORT THE VARIOUS BILLS
REGARDING MANUFACTURING POLICY. HE WOULD ALSO LIKE
TO KNOW DR. BROMLEY'S POSITION ON THE BILLS LISTED
IN THE LETTER.

DIRECTORATE STAFF
ASSIGNED: INDUSTRIAL ASSIGNED:

ACTION STAFF
REQUIRED: DIRECT REPLY ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 11/05/91 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:

OSTP RECEIVED: 10/22/91 DEPT RECEIVED:
FILE: P-INDUSTRIAL-MANUFACTURING
CENTRAL FILES:

RECE

91 OCT 22 12 46

Daniel Naughton
The Torrington Co.
3975 Steve Reynolds
Norcross, GA 30093
(404) 564-6486

Director D. Allen Bromley
Asst to the President
Science and Technology
The Office for Science and Technology
New Executive Office Building
Washington, DC 20506

OFFICE
DIRECTOR

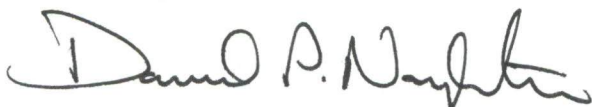
Dear Sir:

I work for the Torrington Company, and American manufacturer of bearings and automotive components. I believe that the future of our country and the quality of life that we enjoy are dependent upon the success of American manufacturing. For America to become successful, I believe government has to become proactive in providing support of the type outlined in the "Advanced Technology Act of 1991" and associated bills. I believe you should support the following bills:

"The Manufacturing Strategy Act of 1991"
"The Federal Technology Strategy Act of 1991"
"The National Critical Technologies Act of 1991"
"The Advanced Manufacturing Technology Act of 1991"

Please tell me your position with respect to these bills. Please work towards the successful, expeditious passage of this group of bills.

Respectfully,



Daniel P. Naughton

"CORRESPONDENCE TRACKING"

TYPE: INFORMATION

DOCUMENT NUMBER: 9122973

ORIGINATOR: 02

STATUS C

DIRECTORATE STATUS

FROM: SCIBELLI, Andrew M.: SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/29/91

SUBJECT: RE: THE STEADY DECLINE IN AMERICA'S LEADERSHIP
POSITION IN MANUFACTURING AND ENDORSEMENT OF THE
HOLLINGS AND BINGAMAN BILLS BY THE ADMINISTRATION
AND CONGRESS.

DIRECTORATE
ASSIGNED:

STAFF
ASSIGNED:

ACTION
REQUIRED:

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE:
DATE COMPLETED:

STAFF DUE DATE
DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL
Carl Bretscher

WHITE HOUSE TRACKING #:

CONTACT PERSON:
PHONE:

EXT:

REMARKS:

CLOSED

OSTP RECEIVED: 07/30/91
DEPT RECEIVED:

FILE: P-INDUSTRIAL *Manufacturing* ~~MANUFACTURING~~



SPRINGFIELD TECHNICAL COMMUNITY COLLEGE



ANDREW M. SCIBELLI
PRESIDENT

91 JUL 30 A 9: 13

OFFICE OF THE
DIRECTOR

July 29, 1991



The Honorable D. Allan Bromley
Presidential Advisor on Science
and Technology Policy
Room 358 Old Executive Office Bldg.
Washington, D.C. 20506

Dear Mr. Bromley:

As the President of the only technical community college in Massachusetts and a major player in training and retraining our regional work force, I offer this letter of support.

The steady decline in America's leadership position in manufacturing must cease. The continuing loss of market share, the dangerously low level of investment in new plant and equipment, the surge in foreign acquisitions of some of our most advanced factories, the heavy concentration of federal R&D on defense and space showcase projects, the persistent trade deficit, the erosion of the domestic supplier base, shortage of highly-skilled workers are all attacking the economic security and standard of living of the American people.

Without a resurgence of manufacturing productivity and growth, the federal government will never garner sufficient revenues needed to eliminate the budget deficit and address America's pressing financial and domestic needs. Nor will the nation have the kind of robust domestic industrial base needed for its national security requirements and its ability to conduct an independent foreign policy.

A much closer spirit of cooperation between industry, government, and academia is needed to revitalize American manufacturing. One modest, but quite concrete step in this direction is the legislation introduced by Senator Hollings (S.1330) and Senator Bingaman (S.1328) on advanced manufacturing technology. These bills would (a) reprioritize federal R&D spending to give much greater prominence to advanced manufacturing technologies (currently only 1.7% of the Administration's proposed \$76 billion R&D budget) and (b) provide stronger federal support

Mr. Bromley
July 29, 1991
Page 2

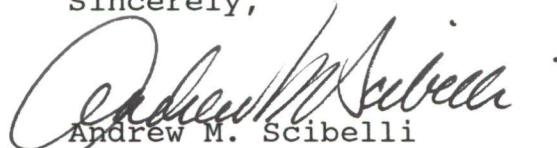
for state and local industrial technology extension programs (of special benefit to the 360,000 firms with fewer than 500 employees that represent 98.5% of the total number of manufacturing establishments in the U.S.).

Since funding for these efforts would come largely out of reprogramming existing funds within the relevant agencies (Commerce, Defense, Energy, NASA, and NSF), these bills would not require significant new federal spending. They would, however, symbolize a federal commitment to join an overall national effort to modernize America's industrial base and create a new infrastructure of industry-government R&D partnerships and technical service centers.

These bills originated in the private sector, in a strategy for federal action outlined in the October 1990 White Paper, "Industrial Modernization: An American Imperative," prepared by the National Coalition for Advanced Manufacturing (NACFAM). NACFAM is a non-partisan, industry-led, organization with broad national support. My organization, Springfield Technical Community College, fully shares NACFAM's view that industrial competitiveness is a pressing national issue, not a partisan issue. The Hollings and Bingaman bills deserve the endorsement of both the Administration and the Congress and of both parties.

Thank you for your consideration.

Sincerely,


Andrew M. Scibelli
President

AMS:sl

"CORRESPONDENCE TRACKING"

TYPE: INFORMATION DOCUMENT NUMBER: 9122951
ORIGINATOR: 02 STATUS C DIRECTORATE STATUS

FROM: OWEN, Larry G.: SOUTHERN ARKANSAS UNIVERSITY TECH

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/29/91

SUBJECT: RE: CONCERNS ABOUT THE FUTURE OF MANUFACTURING IN
AMERICA.

DIRECTORATE STAFF
ASSIGNED: ASSIGNED:

ACTION STAFF
REQUIRED: ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

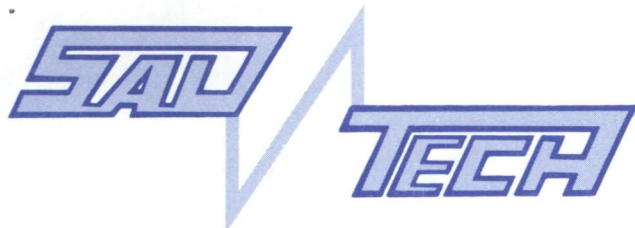
COPIES TO: D. Allan Bromley
INDUSTRIAL
Carl Bretscher

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:

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DEPT RECEIVED:

2951



Southern Arkansas University Tech

Camden, AR 71701 (501) 574-4500

91 JUL 29 P 3: 55

OFFICE OF THE
DIRECTOR

Dean
Tech-Engineering
(501) 574-4538

July 23, 1991

The Honorable D. Allen Bramley
President Advisor on Science and Technology Policy
Room 358 Old Executive Building
Washington, D.C. 20506

As an educator and consultant to the manufacturing industry I have grave concerns about the future of manufacturing in America. As you know there has been a steady decline in America's leadership position in manufacturing with a continuing loss of world market share. It is sad that it took so long for many to recognize the importance of manufacturing in our economy.

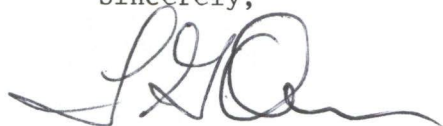
The dangerously low level of investment in new plant and equipment, the surge in foreign acquisitions of some of our most advanced factories, the persistent trade deficit, the erosion of the domestic supplier base and shortage of highly-skilled workers are all attacking the economic security and standard of living of the American people.

A closer spirit of cooperation between industry, government, and academia is needed to revitalize American manufacturing, (especially true for the small manufacturer). One step in this direction is the legislation introduced by Senator Hollings (S 1330) and Senator Bingaman (S 1328) for advanced manufacturing technology. These bills would reprioritize federal R&D spending to give much greater prominence to advance manufacturing technologies (currently only 1.7% of the Administration's proposed \$76 billion R&D budget) and provide stronger federal support for state and local industrial technology extension programs.

The funding for these bills would come largely out of reprogramming existing funds within the relevant agencies (Commerce, Defense, Energy, NASA, and NSF). They would symbolize a federal commitment to join an overall national effort to modernize America's industrial base and create a new infrastructure of industry-government R&D partnerships and technical service centers.

These bills originated in the private sector, in a strategy for federal action outlined in the October 1990 White Paper, "Industrial Modernization: An American Imperative," prepared by the National Coalition for Advanced Manufacturing (NACFAM).

Sincerely,

A handwritten signature in dark ink, appearing to read 'LGO', with a long horizontal flourish extending to the right.

Larry G. Owen
Dean, Center for Competitive Manufacturing

LGO:lm

TYPE: INFORMATION

DOCUMENT NUMBER: 9123135

ORIGINATOR: 02

STATUS C

DIRECTORATE STATUS

FROM: ACTOR, Elliot J.: IBM

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/25/91

SUBJECT: RE: THE STEADY DECLINE IN AMERICA'S LEADERSHIP
POSITION IN MANUFACTURING AND ENDORSEMENT BY THE
ADMINISTRATION AND CONGRESS OF THE HOLLINGS AND
BINGAMAN BILLS.

DIRECTORATE
ASSIGNED:

STAFF
ASSIGNED:

ACTION
REQUIRED:

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE:
DATE COMPLETED:

STAFF DUE DATE
DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL
Carl Bretscher

WHITE HOUSE TRACKING #:

CONTACT PERSON:
PHONE:

EXT:

REMARKS:

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OSTP RECEIVED: 08/01/91
DEPT RECEIVED:

FILE: P-INDUSTRIAL-MANUFACTURING

IBM

3135

International Business Machines Corporation

P.O. Box 1328
Boca Raton, Florida 33429-1328
407/443-2000

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91 AUG 1 AIO: 16

July 25, 1991

OFFICE OF THE
DIRECTOR

The Honorable D. Allan Bromley
Presidential Advisor on Science
& Technology Policy
Room 358, Old Executive Office Bldg.
Washington, D. C. 20506

Dear Mr. Bromley:

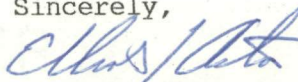
The steady decline in America's leadership position in manufacturing must cease. The continuing loss of market share, the dangerously low level of investment in new plant and equipment, the erosion of the domestic supplier base, and shortage of highly-skilled workers are all attaching the economic security and standard of living of the American people.

A much closer spirit of cooperation between industry, government, and academia is needed to revitalize American manufacturing. One modest, but quite concrete step in this direction is the legislation introduced by Senator Hollings (S. 1330) and Senator Bingaman (S. 1328) on advanced manufacturing technology. These bills would (a) reprioritize federal R & D spending to give much greater prominence to advanced manufacturing technologies (currently only 1.7% of the Administration's proposed \$76 billion R & D budget) and (b) provide stronger federal support for state and local industrial technology extension programs (of special benefit to the 360,000 firms with fewer than 500 employees that represent 98.5% of the total number of manufacturing establishments in the U.S.).

Since funding for these efforts would come largely out of reprogramming existing funds within the relevant agencies (Commerce, Defense, Energy, NASA, and NSF), these bills would not require significant new federal spending. They would, however, symbolize a federal commitment to join in overall national effort to modernize America's industrial base and create a new infrastructure of industry-government R & D partnerships and technical service centers.

These bills originated in the private sector, in a strategy for federal action outlined in the October 1990 White Paper, "Industrial Modernization: An American Imperative," prepared by the National Coalition for Advanced Manufacturing (NACFAM). NACFAM is a non-partisan, industry-led, organization with broad national support which includes IBM. My organization, IBM CIM In Higher Education, fully shares NACFAM's view that industrial competitiveness is a pressing national issue and that is why IBM has already invested over \$80M so far in this effort. The Hollings and Bingaman bills deserve the endorsement of both the Administration and the Congress and of both parties. IBM has done its part, and we are constantly working to get other industries to do their part, but now it is about time our government did its part.

Sincerely,



Elliot J. Actor, Manager
CIM In Higher Education

"CORRESPONDENCE TRACKING"

TYPE: INFORMATION DOCUMENT NUMBER: 9122962
ORIGINATOR: 02 STATUS C DIRECTORATE STATUS

FROM: MYERS, Robert J.: GRUMMAN CORPORATION

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/22/91

SUBJECT: RE: THE NEED FOR ENDORSEMENT BY THE ADMINISTRATION
AND CONGRESS OF THE LEGISLATIVE PACKAGE PROPOSED BY
SENATORS BINGAMAN, HOLLINGS, NUNN AND GORE.

DIRECTORATE STAFF
ASSIGNED: ASSIGNED:

ACTION STAFF
REQUIRED: ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL
Carl Bretscher

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:

CLOSED

OSTP RECEIVED: 07/29/91 FILE: P-IND-MANUFACTURING
DEPT RECEIVED:

Grumman Corporation

Bethpage, New York 11714-3580

RECEIVED

Robert J. Myers
President and
Chief Operating Officer

91 JUL 29 P 3: 55

July 22, 1991
OFFICE OF THE
DIRECTOR

The Honorable D. Allan Bromley
Presidential Advisor on Science
and Technology Policy
Room 358 Old Executive Office Building
Washington, DC 20506

Dear Mr. Bromley:

Reports from the private sector - including the Council on Competitiveness, a coalition of chief executives from business, higher education and labor, and the National Coalition for Advanced Manufacturing - clearly show significant reductions in the U.S.'s share of the world market for manufactured products. The U.S. has already effectively lost its market position in a number of basic industries. Today, America's leadership position in aerospace, and computer hardware and software is facing challenges as never before. The nation that pioneered mass production, machine tools and industrial robots now invests less in plant and equipment than Japan.

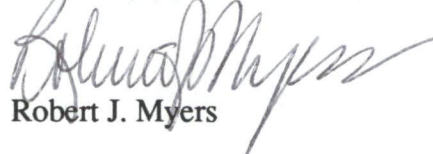
We must build a policy that supports our technological needs, particularly in the area of manufacturing. The United States, long accustomed to a virtual monopoly in world markets, ignored the critical importance of advanced manufacturing to competition in a global economy. Federal R&D policy, limited to support for basic science and mission-oriented technology development, has neglected it as well. We are now paying a heavy price for such oversight. Michael Dertouzos, the chairman of MIT's Commission on Industrial Productivity, recently summed it up: "[In the U.S.] we value creativity and innovativeness, and we don't value production. But the money is not in invention, it's in production." It is imperative that this steady decline in America's leadership position in manufacturing be brought under control and reversed.

On June 19th, Senators Bingaman, Hollings, Nunn and Gore introduced a package of four bills, S.1327-S.1330, aimed at developing a much closer spirit of cooperation among industry, government, and academia which is needed to revitalize our technological and manufacturing position. The bills provide a comprehensive national strategy for promoting U.S. leadership in core technologies deemed critical to future economic prosperity and national security. Furthermore, these bills, endorsed by the National Coalition for Advanced Manufacturing, as well as numerous other non-partisan organizations, associations and individuals, would reprioritize federal R&D spending to give greater prominence to advanced manufacturing technologies and provide stronger federal support for state and local industrial technology extension programs.

Since funding for these efforts would come largely from reprogramming existing funds within the relevant agencies (Commerce, Defense, Energy, NASA, and NSF), significant new federal spending would not be required. They would, however, symbolize a federal commitment to join an overall national effort to modernize America's industrial base and create a new infrastructure of industry-government R&D partnerships and technical service centers.

We now must make a commitment to reversing the evident trends and restoring our leadership. The legislative package proposed by Senators Bingaman, Hollings, Nunn, and Gore, together with a renewed cooperative attitude between business and government, represent a concrete step toward reclaiming our mantle as a technology leader. I believe they deserve the endorsement of both the Administration and Congress.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Robert J. Myers", written in a cursive style.

Robert J. Myers

RJM:dp

7-29-

"CORRESPONDENCE TRACKING"

TYPE: ACTION DOCUMENT NUMBER: 9122513
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: WINCE-SMITH, Deborah L.: DEPARTMENT OF COMMERCE

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/18/91

SUBJECT: RE: THE IMS STATUS REPORT AND AN OPPORTUNITY TO
DICSUSS IT FURTHER.

DIRECTORATE STAFF
ASSIGNED: INTERNATIONAL/POLICY ASSIGNED:

ACTION STAFF
REQUIRED: COMMENT TO DAB ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 07/29/91 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 8/2/91

COPIES TO: D. Allan Bromley
INDUSTRIAL
Steve Olson

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:

REMARKS: Per Sara Bowden: This does not require a
Response, ~~unless there is something~~
~~substantive~~

CLOSED

OSTP RECEIVED: 07/19/91 FILE: INT-JAPAN*IND-MANUFACTURING
DEPT RECEIVED:



UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Technology Policy
Washington, D.C. 20230

July 18, 1991

01 JUL 19 03

MEMORANDUM FOR DISTRIBUTION

FROM: DEBORAH L. WINCE-SMITH *mam for*
Assistant Secretary for Technology Policy

SUBJECT: IMS STATUS REPORT

For your information, I am enclosing a brief status report on the U.S. response to Japan's proposal for international collaborative R&D in intelligent manufacturing systems (IMS). This status report was sent to U.S. industries and trade associations who have indicated an interest in the proposal and subsequent U.S. response.

I welcome an opportunity to discuss this with you further.

distribution:

Dr. D. Allan Bromley ✓
Dr. Robert M. White
Ms. Linda Stuntz
Mr. Reginald Bartholomew
Mr. Colin McMillan
Mr. Walter Massey
Mr. Lynn Williams



UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Technology Policy
Washington, D.C. 20230

July 12, 1991

Knowing of your continuing interest in working with us on the U.S. response to Japan's proposal for international collaborative R&D in intelligent manufacturing systems (IMS) and national efforts to establish a domestic coalition of U.S. producers and users to deploy intelligent manufacturing systems, I would like to provide you with a brief status report.

In regard to the U.S. proposal for the Terms of Reference for a multilateral feasibility study to assess the potential tenets of international collaboration in IMS, we received comments from Japan, the European Community (EC), the European Free Trade Association (EFTA), Canada and Australia. In response to the comments, we drafted a revised version of the IMS Terms of Reference that has been cleared within the U.S. Government. The revised version is enclosed for your information with this letter. We welcome your timely comments. We have sent the revised draft to the approximately 150 individuals on our national IMS mailing list.

TERMS OF REFERENCE

Allow me to summarize the key comments we received on the U.S. proposal for the Terms of Reference from our potential foreign partners.

Europe

The European comments (EC and EFTA) centered on the composition of the International Steering and Technical Committees. The EC and EFTA wish to be considered as a European group. However, they recognize the independence of the other four Participants. The European group wishes to have ten representatives total on each of the two committees, while the other four Participants would each have five. In conjunction with this change, rather than calling for a unanimous vote in each committee, the Europeans prefer reaching recommendations by consensus. In our revised version, we kept EC and EFTA separate, but agreed that recommendations could be reached through a consensus process. We believe this will keep the feasibility study flexible enough to ensure productive discussions and output.

The Europeans also proposed language to clearly delineate equity in contributions, types of participants and benefits for a future IMS project, and proposed limitations on the number of observers in Section III (B)(4) and Section IV (4)(d)(5). We accepted these proposals.

Japan

Japan's comments are based upon the premise that the feasibility study should be a mutual understanding among governments rather than a formal agreement. Their suggested changes reflect this concept, e.g., changing "agreed" to "shared the view." We accepted some rewording, but not where it pertained to the feasibility study itself. We believe we must clearly delineate in the Terms of Reference that all partners are agreeing to "conduct a feasibility study" not to have a "mutual understanding" about a feasibility study. We believe a flexible non-binding agreement is acceptable during the feasibility study; however, if an international IMS program is established, a formally binding international agreement would be necessary.

Other Comments

The Europeans, Japanese and Canadians all suggested that the selection of international committee delegates be completed within 60 days after the Terms of Reference are agreed upon, and that we aim for the feasibility study to be completed within 18 months. Because of the importance of obtaining broad-based input from interested parties in U.S. industry and the need for security clearances for U.S. delegates, we agreed to make every effort to complete the process expeditiously, but not be bound by a specific completion date.

Australia accepted the U.S. proposal in its entirety. They stated, however, that their final clearance would be based upon the new revised version.

We expect to finalize the Terms of Reference late this summer. If further consultations are necessary which we believe is unlikely given the substance of the comments we have received, we will offer to chair a meeting of the six governments in Washington, D.C. in early September to conclude the document.

IMS COMMITTEE APPOINTMENTS

As regards U.S. implementation of the feasibility study itself, we will appoint members of the U.S. delegations to the International Steering and Technical Committees after the Terms of Reference are finalized. At the same time, we will begin to consider candidates for the Intellectual Property Rights Committee. After initial candidate selection is completed, we expect the appointment process to take a minimum of 60 to 90 days because of the reasons noted above. We actively solicit your suggestions for possible candidates to ensure that we have an outstanding, well-rounded group of U.S. participants on these key committees.

In order to ensure appropriate and broad representation of our national interest, we are following the guidelines established in the Federal Advisory Committee Act and delineated in the U.S. Commerce Department's Committee Management Handbook to make the appointments. The handbook states:

"The composition of an advisory committee requires careful consideration and planning. The Act prescribes that the composition be fairly balanced in terms of viewpoints represented and the functions to be performed. For purposes of attaining balance, the committee shall consider for membership interested persons and/or groups with professional or personal qualifications or experience to contribute to the functions and tasks to be performed.

The Act also prescribes that the advice and recommendations of a committee shall not be inappropriately influenced by the appointing authority or by any special interest. Depending on the committee's mission, it is the Department's policy that balanced membership also include the interest of the geographic regions of the country (North, South, East and West); the diverse sectors of our society (business and industry, science, academia, the public at large, particularly consumers); and the size of the firm or institution represented (big, medium and small)."

Because development and deployment of intelligent manufacturing based systems in the United States will require close collaboration between the producers and users of such systems, it is essential that both these industrial interests are balanced and represented on the relevant committees. In addition, the candidates must be U.S. citizens and must represent the broad national interests of the United States, not those of a single company, institution or association.

Steering Committee

For the Steering Committee, we are seeking four individuals from industry and/or academia with an outstanding knowledge of domestic and international technology policy issues, including manufacturing. These individuals should have a high-level of credibility with industry and a demonstrated ability to work at the national level to execute cooperative R&D programs. They must be willing to commit the substantial personal time and resources necessary to ensure a productive feasibility study and to bring others into the process as necessary. Resources include such items as the cost of international travel to committee meetings.

Technical Committee

For the Technical Committee, we also are seeking four individuals from industry and/or academia. These individuals must have an excellent technical knowledge of manufacturing. They should be aware of recent developments in technology commercialization and in such advanced manufacturing methods as computer integrated manufacturing and advanced materials processing. They also must be willing to commit the substantial personal time and resources necessary to ensure a productive feasibility study and to bring others into the process as necessary.

Procedures

We will arrange the first meeting of the International Steering Committee, thus beginning the feasibility study, once all regions have completed appointments. The International Steering and Technical Committees then will discuss and make recommendations to the six regional governments on how to structure an equitable international project. Elements of that structure will be tested through approximately three R&D test cases which will be proposed, processed and accepted through the committees' consensus as set forth in the Terms of Reference.

The U.S. members of the IMS Committees will be able to provide and/or solicit private sector advice. Two Department of Commerce officials will serve as members on these Committees, a policy level official on the International Steering Committee and a technical expert on the International Technical Committee. We will work to ensure that the national interest is served and will help the private sector members of the IMS Committees arrange appropriate events such as workshops with U.S. companies and universities. In addition, we will call upon the Department's newly-established Industrial Technology Advisory Board (ITAB) for guidance and

continue to brief groups such as the Department's Industry Sector Advisory Committees (ISACs). We hope that your associations also will help us continue the productive dialogue we have enjoyed to date with your member companies.

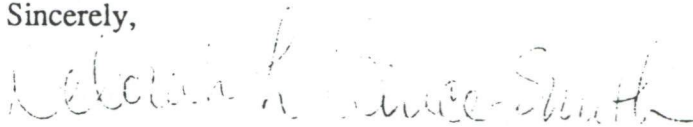
OTHER ISSUES

As regards the ongoing activities for establishing a domestic U.S. coalition on intelligent manufacturing systems, we hope to have a strawman vision ready for industry review in late July that we are preparing based upon requests by several U.S. companies and trade associations. We have completed a first draft that is under review and revision within the Department of Commerce.

Our foreign partners are anxious to receive the U.S. Government's revised proposal for the Terms of Reference. Accordingly, we intend to send the Terms of Reference to the other regions by early August and in concert, begin to assess possible candidates for the committee appointments. Therefore, I request that you consider the revised Terms of Reference and provide us with your comments on it and with your suggested candidates for the feasibility study committees by August 1. If you have any questions, please contact Phyllis Genther of my staff by phone at 202-377-1287 or 202-377-1288, or by fax at 202-377-4826.

We at the Department of Commerce thank you for your continued interest and participation with us in addressing the challenges of advanced manufacturing.

Sincerely,



Deborah L. Wince-Smith

Enclosure

cc: Dr. D. Allan Bromley
Dr. Robert M. White
Mr. Reginald Bartholomew
Mr. Colin McMillan
Ms. Linda Stuntz
Mr. Walter Massey
Mr. Lynn Williams

July 11, 1991

TERMS OF REFERENCE FOR A FEASIBILITY STUDY ON
INTERNATIONAL COOPERATION IN ADVANCED MANUFACTURING

I. PURPOSE

This document sets out the terms of reference for the participants to study the feasibility of entering into international cooperation in research and development in the field of advanced manufacturing.

II. PRINCIPLES

WHEREAS, manufacturing is a primary generator of wealth and is critical to establishing a sound economic basis for economic growth;

WHEREAS, the need for greater sophistication in manufacturing operations has become critical as a result of the establishment of global markets;

WHEREAS, the role of research and development in the field of advanced manufacturing is increasingly pivotal to manufacturing operations;

WHEREAS, substantial advanced manufacturing research is being carried out worldwide;

WHEREAS, properly managed international collaboration in advanced manufacturing research could help improve manufacturing operations; and

WHEREAS, participants to discussions held in Tokyo on November 19 and 20, 1990 shared the view that international collaboration in advanced manufacturing could only proceed upon the following bases:

- A. Such collaboration should be international.
- B. Contributions to, and benefits from, such collaboration should be equitable and balanced.
- C. Collaborative projects should have industrial relevance.
- D. Research should be carried out by consortia which should be interregional, geographically distributed and decentralized.
- E. Research projects should occur throughout the innovation process.

- F. Results of research should be shared through a process of controlled diffusion that protects and equitably allocates any intellectual property rights created or furnished during collaborations.
- G. Projects under government sponsorship or utilizing government resources should involve precompetitive research and development.
- H. A feasibility study on international collaboration in advanced manufacturing is necessary to define the program and for each participant to decide whether to participate in such a program.
- I. The six Participants in the Feasibility Study are:
 - Australia
 - Canada
 - The European Community (EC)
 - The EFTA Countries (EFTA)
 - Japan
 - The United States

The Participants will undertake a feasibility study based on these principles and structured as delineated below to determine if an international collaborative program in advanced manufacturing can be created that is equitably and beneficially structured. If such a program is undertaken, there is a possibility that additional participants might be included.

III. FEASIBILITY STUDY

The feasibility study will consist of two (2) parts:

- A. Study. The following areas will be studied:
 - 1. modalities for international collaboration, including requirements for participation in a possible future program and the composition and function of any committees established;

2. technical themes for a possible future program, including criteria for evaluating and approving research projects;
 3. contribution and funding arrangements for international collaboration; and
 4. guidelines for information sharing and intellectual property rights (IPR).
- B. R&D Test Cases. In order to design procedures for a possible future program, the following principles will be followed in carrying out sufficient (approximately three) research and development (R&D) test cases:
1. A sufficient number of (approximately three) R&D test cases will be carried out to provide adequate information to design a possible future program.
 2. Existing international projects may be used as the basis for R&D test cases in order to expedite the feasibility study if they meet, or can be modified so as to meet, the criteria for approving an R&D test case.
 3. Partners in an approved R&D test case must delineate acceptable IPR provisions in advance.
 4. Collaboration in each R&D test case will be equitable and balanced, in terms of partners, contributions and benefits.

IV. IMPLEMENTATION PROCEDURES FOR THE FEASIBILITY STUDY

A. Funding.

1. Each Participant will fund its own participation in the feasibility study.
2. Each Participant will determine the method by which its own participation will be funded.

B. Committees. The feasibility study will be carried out through the following committee structure.

1. General Principles

- a. Committee members should be of comparable and high enough level to enable the Committees concerned to carry out their responsibilities.

- b. Committee members will need to be knowledgeable about manufacturing.

2. International Steering Committee

- a. Composition (30 members). There will be five members each from Australia, Canada, the EC, EFTA, Japan and the United States. Delegation members may be from the industrial, academic and/or government sectors of Each Participant and a strong representation from industry is encouraged. Each Participant may be accompanied by one observer from their designated Secretariat.
- b. Responsibilities. The International Steering Committee will discuss and make recommendations regarding the establishment of an international collaborative program for R&D on advanced manufacturing. Specifically, the Committee will consider and make recommendations on modalities of international collaboration, IPR Committee recommendations, contribution and funding. The Committee will also select and begin implementation of test cases based on the recommendations of the International Technical Committee. All recommendations will be arrived at unanimously through a consensus process among the Participants.
- c. Commissioned Independent Study. Experts will be assembled by the International Steering Committee with costs to be equally shared by the six Participants to recommend:
 - (1) administrative procedures for the program; and
 - (2) assessment mechanisms and accounting procedures for non-financial contributions (e.g., equipment, expertise, personnel, facilities).

3) Intellectual Property Rights (IPR) Committee.

- a. Composition. This Committee will be assembled by, and report to, the International Steering Committee and will only exist during the feasibility study.
- b. Responsibilities. The IPR Committee will develop:
 - (1) guidelines which program applicants can use to help formulate an IPR agreement for their individual project consistent with relevant international agreements and domestic laws; and
 - (2) rules for the exchange of information, and confidentiality and conflict of interest rules for Committee members.

4. International Technical Committee

- a. Composition (30 members). There will be a delegation of five members each from Australia, Canada, the EC, EFTA, Japan and the United States. Delegation members may be from the industrial, academic and/or government sectors of each Participant and a strong representation from industry is encouraged. Delegations shall be appointed by the respective Participant. Each delegation may be accompanied by one observer from their designated Secretariat.
- b. Responsibilities. The International Technical Committee will discuss technical themes for an international program, review proposals for R&D test cases based on such technical themes, develop criteria for use in evaluating proposals, and make recommendations to the International Steering Committee which is responsible for all final decisions. As with the International Steering Committee, all recommendations will be arrived unanimously through a consensus process among the Participants.

c. Technical Themes. Technical themes will be based on the following principles:

- (1) No manufacturing-related technology should be excluded initially except where national security concerns preclude cooperation.
- (2) The technical themes will encompass areas in which significant contributions can be made to world knowledge.
- (3) Technical themes will be chosen which benefit multiple participants to the greatest extent possible.
- (4) Technical themes will be discussed after each Participant has had sufficient opportunity to develop its own suggestions for themes.

d. Criteria. Criteria for R&D test cases will include the following principles:

- (1) The proposed R&D test case will have scientific and technical merit, industrial relevance, and include a high degree of interregional collaboration and participation.
- (2) An appraisal of the effectiveness of adoption and deployment strategies, and proposed methods of technology transfer will be included.
- (3) The IPR provisions will be consistent with IPR guidelines developed by the International IPR Committee (see Section IV, B, 3).
- (4) The proposing consortia will have sufficient resources and qualifications to undertake and complete the proposed R&D test case.
- (5) Collaboration in each R&D test case will be equitable and balanced, in terms of contributions, benefits and comparable participants.

- C. Secretariat. The Commission of the European Communities Directorate-General XIII (DGXIII), the U.S. Department of Commerce (USDOC), Japan's Ministry of International Trade and Industry (MITI), Industry, Science and Technology Canada (AISC), and Australia's Department of Industry, Technology and Commerce, and an appropriate governmental agency designated by the European Free Trade Association will act as the Secretariat during the feasibility study to disseminate programmatic information.

V. TIME FRAME

Participants will make every effort to complete selection of members for the International Steering and Technical Committees within sixty (60) days after the last intention of each Participant is conveyed to the other Participants.

After the establishment of these Committees, it is expected that the feasibility study will be deemed completed when R&D test cases show sufficient results on which the decision concerning the establishment of an international program in advanced manufacturing should be based and the International Steering Committee has completed its deliberations. The aim should be to complete the feasibility study within a reasonable period, preferably within eighteen (18) to twenty-four (24) months.

When the feasibility study has been completed, the Participants will decide whether to establish an international program in advanced manufacturing based upon experiences from the feasibility study.

"CORRESPONDENCE TRACKING"

TYPE: INFORMATION DOCUMENT NUMBER: 9122297
ORIGINATOR: 02 STATUS C DIRECTORATE STATUS

FROM: HUMPHREY, Blake B.: BLAKE & DECKER

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/15/91

SUBJECT: RE: THE STEADY DECLINE IN AMERICA'S LEADERSHIP
POSITION IN MANUFACTURING AND THE HOLLINGS AND
BINGAMAN BILLS.

DIRECTORATE STAFF
ASSIGNED: ASSIGNED:

ACTION STAFF
REQUIRED: ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL
Carl Bretscher

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:

CLOSED

OSTP RECEIVED: 07/17/91 FILE: P-INDUSTRIAL-MANUFACTURING
DEPT RECEIVED:



RECEIVED

91 JUL 17 P 2: 44

OFFICE OF THE
July 15, 1991
DIRECTOR

The Honorable D. Allan Bromley
Presidential Advisor on Science
and Technology Policy
room 358 Old Executive Office Bldg.
Washington, DC 20506

Dear Sir:

The steady decline in America's leadership position in manufacturing must cease. The continuing loss of market share, the dangerously low level of investment in new plant and equipment, the surge in foreign acquisitions of some of our most advanced factories, the heavy concentration of federal R&D on defense and space showcase projects, the persistent trade deficit, the erosion of the domestic supplier base, shortage of highly-skilled workers are all attacking the economic security and standard of living of the American people.

Without a resurgence of manufacturing productivity and growth, the federal government will never garner sufficient revenues needed to eliminate the budget deficit and address America's pressing financial and domestic needs. Nor will the nation have the kind of robust domestic industrial base needed for its national security requirements and its ability to conduct an independent foreign policy.

A much closer spirit of cooperation between industry, government, and academia is needed to revitalize American manufacturing. One modest, but quite concrete step in this direction is the legislation introduced by Senator Hollings (S. 1330) and Senator Bingaman (S. 1328) on advanced manufacturing technology. These bills would (a) reprioritize federal R&D spending to give much greater prominence to advanced manufacturing technologies (currently only 1.7% of the Administration's proposed \$76 billion R&D budget) and (b) provide stronger federal support for state and local industrial technology extension programs (of special benefit to the 360,000 firms with fewer than 500 employees that represent 98.5% of the total number of manufacturing establishments in the U.S.).

Since funding for these efforts would come largely out of reprogramming existing funds within the relevant agencies (Commerce, Defense, Energy, NASA, and NSF), these bills would not require significant new federal spending. They would, however, symbolize a federal commitment to join an overall national effort to modernize America's industrial base and create a new infrastructure of industry-government R&D partnerships and technical service centers.

Page Two

These bills originated in the private sector, in a strategy for federal action outlined in the October 1990 White Paper, "Industrial Modernization: An American Imperative," prepared by the National Coalition for Advanced Manufacturing (NACFAM). NACFAM is a non-partisan, industry-led, organization with broad national support. Black & Decker fully shares NACFAM's view that industrial competitiveness is a pressing national issue, not a partisan issue. The Hollings and Bingaman bills deserve the endorsement of both the Administration and the Congress and of both parties.

Sincerely,

A handwritten signature in dark ink, appearing to read "B. B. Humphrey". The signature is fluid and cursive, with the first and last names being more prominent than the middle initial.

Blake B. Humphrey

BBH:pb

"CORRESPONDENCE TRACKING"

TYPE: INFORMATION

DOCUMENT NUMBER: 9122170

ORIGINATOR: 02

STATUS C

DIRECTORATE STATUS

FROM: EVANS, R.S.: CRANE COMPANY

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/15/91

SUBJECT: RE: THE DECLINE IN AMERICA'S LEADERSHIP POSITION IN
MANUFACTURING AND THE HOLLINGS (S. 1330) & BINGAMAN
(S. 1328) BILLS.

DIRECTORATE
ASSIGNED:

STAFF
ASSIGNED:

ACTION
REQUIRED:

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE:
DATE COMPLETED:

STAFF DUE DATE
DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL
Carl Bretscher

WHITE HOUSE TRACKING #:

CONTACT PERSON:
PHONE:

EXT:

REMARKS:

CLOSED

OSTP RECEIVED: 07/15/91
DEPT RECEIVED:

FILE: P-INDUSTRIAL-MANUFACTURING

2170
RECEIVED

CRANE CO. 757 THIRD AVENUE NEW YORK, N.Y. 10017

91 JUL 15 P 4: 04

R. S. EVANS
CHAIRMAN AND CHIEF
EXECUTIVE OFFICER

OFFICE OF THE
DIRECTOR
July 1, 1991

The Honorable D. Allan Bromley
Presidential Advisor on Science
and Technology Policy
Room 358 Old Executive Office Bldg.
Washington, D. C. 20506

Mr. Bromley:

The steady decline in America's leadership position in manufacturing must cease. The continuing loss of market share, the dangerously low level of investment in new plant and equipment, the surge in foreign acquisitions of some of our most advanced factories, the heavy concentration of federal R&D on defense and space showcase projects, the persistent trade deficit, the erosion of the domestic supplier base, shortage of highly-skilled workers are all attacking the economic security and standard of living of the American people.

Without a resurgence of manufacturing productivity and growth, the federal government will never garner sufficient revenues needed to eliminate the budget deficit and address America's pressing financial and domestic needs. Nor will the nation have the kind of robust domestic industrial base needed for its national security requirements and its ability to conduct an independent foreign policy.

A much closer spirit of cooperation between industry, government, and academia is needed to revitalize American manufacturing. One modest,

legislation introduced by Senator Hollings (S. 1330) and Senator Bingaman (S. 1328) on advanced manufacturing technology. These bills would (a) reprioritize federal R&D spending to give much greater prominence to advanced manufacturing technologies (currently only 1.7% of the Administration's proposed \$76 billion R&D budget) and (b) provide stronger federal support for state and local industrial technology extension programs (of special benefit to the 360,000 firms with fewer than 500 employees that represent 98.5% of the total number of manufacturing establishments in the U.S.)

Since funding for these efforts would come largely out of reprogramming existing funds within the relevant agencies (Commerce, Defense, Energy, NASA, and NSF), these bills would not require significant new federal spending. They would, however, symbolize a federal commitment to join an overall national effort to modernize America's industrial base and create a new infrastructure of industry-government R & D partnerships and technical service centers.

These bills originated in the private sector, in a strategy for federal action outlined in the October 1990 White House Paper, "Industrial Modernization: An American Imperative," prepared by the National Coalition for Advanced Manufacturing (NACFAM). NACFAM is a non-partisan, industry-led, organization with broad national support. My organization fully shares NACFAM'S view that industrial competitiveness is a pressing national issue, not a partisan issue. The Hollings and Bingaman bills deserve the endorsement of both the Administration and the Congress and of both parties.

Very truly yours,

A handwritten signature in blue ink, appearing to read "M. Evans", is written below the typed text.

"CORRESPONDENCE TRACKING"

TYPE: INFORMATION DOCUMENT NUMBER: 9122569
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: COLLINS, Robert P.: GE FANUC AUTOMATION

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/15/91

SUBJECT: REQUESTING SUPPORT FOR THE LEGISLATION INTRODUCED BY
HOLLINGS AND BINGAHAM ON ADVANCED MANUFACTURING
TECHNOLOGY TO REVISE THE DECLINE IN AMERICA'S
LEADERSHIP POSITION IN MANUFACTURING.

DIRECTORATE STAFF
ASSIGNED: ASSIGNED:

ACTION STAFF
REQUIRED: ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INDUSTRIAL
Carl Bretscher

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS:

CLUSED

OSTP RECEIVED: 07/22/91 FILE: P-INDUSTRIAL-MANUFACTURING
DEPT RECEIVED:



2569
RECEIVED GE Fanuc Automation

91 JUL 22 P 2: 22

Robert P. Collins

President and CEO - North America
Chairman - Canada
Co-chairman - Europe & Asia

P.O. Box 8106
Charlottesville, Virginia 22906
Tel. 804-978-5881 - Fax 804-978-5320

OFFICE OF THE
DIRECTOR

July 15, 1991

The Honorable D. Allan Bromley
Presidential Advisor on Science
and Technology Policy
Room 358 Old Executive Office Building
Washington, D. C. 20506

Dear Mr. Bromley:

As you know, the steady decline in America's leadership position in manufacturing must become a national priority if we are to reverse the decline. The continuing loss of market share, the dangerously low level of investment in new plant and equipment, the surge in foreign acquisitions of some of our most advanced factories, the heavy concentration of federal R&D on defense and space showcase projects, the persistent trade deficit, the erosion of the domestic supplier base, shortage of highly-skilled workers are all attacking the economic security and standard of living of the American people.

Without a resurgence of manufacturing productivity and growth, the federal government will never garner sufficient revenues needed to eliminate the budget deficit and address America's pressing financial and domestic needs. Nor will the nation have the kind of robust domestic industrial base needed for its national security requirements and its ability to conduct an independent foreign policy.

A much closer spirit of cooperation between industry, government, and academia is needed to revitalize American manufacturing. One modest, but quite concrete step in this direction is the legislation introduced by Senator Hollins (S. 1330) and Senator Bingaman (S. 1328) on advanced manufacturing technology. These bills would (a) reprioritize federal R&D spending to give much greater prominence to advanced manufacturing technologies (currently only 1.7% of the Administration's proposed \$76 billion R&D budget) and (b) provide stronger federal support for state and local industrial technology extension programs (of special benefit to the 360,000 firms with fewer than 500 employees that represent 98.5% of the total number of manufacturing establishments in the U.S.).

Since funding for these efforts would come largely out of reprogramming existing funds within the relevant agencies (Commerce, Defense, Energy, NASA, and NSF), these bills would not require significant new federal spending. They would, however symbolize a federal commitment to join an overall national effort to modernize America's industrial base and create a new infrastructure of industry-government R&D partnerships and technical service centers.

These bills originated in the private sector, in a strategy for federal action outlined in the October 1990 White Paper, which I helped to create, titled "Industrial Modernization: An American Imperative" prepared by the National Coalition for Advanced Manufacturing (NACFAM). NACFAM is a non-partisan, industry-led, organization with broad national support. My organization fully shares NACFAM's view that industrial competitiveness is a pressing national issue, not a partisan issue. The Hollings and Bingaman bills deserve the endorsement of both the Administration and the Congress and of both parties.

I would appreciate your personal support to this modest beginning and look forward to a growing momentum in the Congress regarding this important issue.

Best regards,

A handwritten signature in dark ink, appearing to read 'R. P. Collins', with a long, sweeping horizontal stroke extending to the right.

R. P. Collins
President & CEO

RPC:w