

Machine Trades

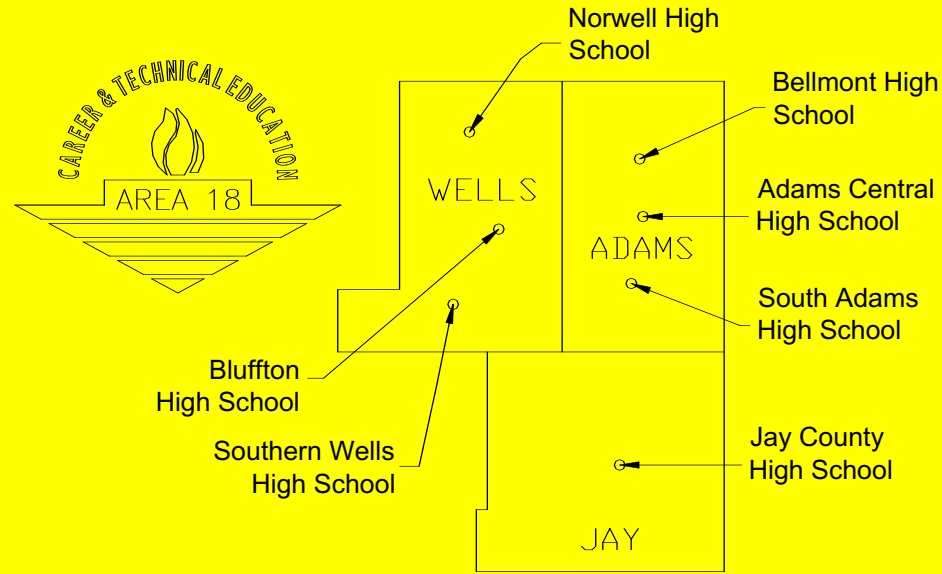
“If You Can Think It,
We Can Make It!”

Machine Trades

- **OPEN** to **ALL**
- **Sophomores, Juniors and Seniors**
- *Adams Central, Bellmont, Bluffton, Jay, Norwell, South Adams, Southern Wells*

AREA 18

CAREER AND TECHNICAL EDUCATION



SOUTH ADAMS MACHINE TRADES SOUTH ADAMS AUTO MECHANICS

SERVING ADAMS, JAY, AND WELLS COUNTY HIGH SCHOOL
FRESHMAN, SOPHOMORES, JUNIORS, AND SENIORS

South Adams / Area 18 Machine Trades

- The class will give students the technical knowledge and hands-on project oriented experience to allow graduates to enter directly into an entry level position in the Machining, Mold Making, and Tool and Die industries.
- In addition to covering ALL aspects of the Machine Trades, an introduction to Welding, Solid Edge (Drafting), Engineering, Product assembly, and Technology research will also be covered.

Manufacturing / Machining is EVERYWHERE!

- Think of everything you have used today in your life, from your toothbrush to the car/bus that brought you here today; **SOMEBODY**, a Machinist, had to make the item directly or they made the mold and/or die that produces that item.

South Adams / Area 18 Machine Trades Is it for YOU??

- Do you like working with your hands?
- Do you enjoy creating interesting projects beginning only with an idea?
 - Do you want to be part of one of the most technologically advanced, diversified, highest paid, secure, challenging, and most respected of all of the skilled trades?
- Would you like to work in a temperature controlled, clean, and highly organized workplace while still having the advantage of moving around?

Beginning Machine Trades

Drill Gage

The **Drill Gage** applies classroom knowledge of shop safety, print reading, layout, basic hand tools, band saws, drill presses, and semi-precision measurement, just to name a few, to complete a quality project that anyone can use to sharpen drill bits.



Beginning Machine Trades

C-Clamp

The **C-clamp** allows the class to advance into the the set-up and operation of precision machine tools including lathes, milling machines, and surface grinders. Heat-treating (hardening) is also introduced.



Beginning Class Projects

Brass Hammer

The **Brass Hammer** introduces more complex set-ups and operations on the lathe and mill, plus the use of a polisher to add a high luster to the very useful and/or decorative tool is used.



Beginning Machine Trades

Precision Vise

The **Precision Vise**, while many of the basic operations of the lathe, mill, and surface grinder are still needed, the tighter tolerances give this very precise tool a challenging twist.

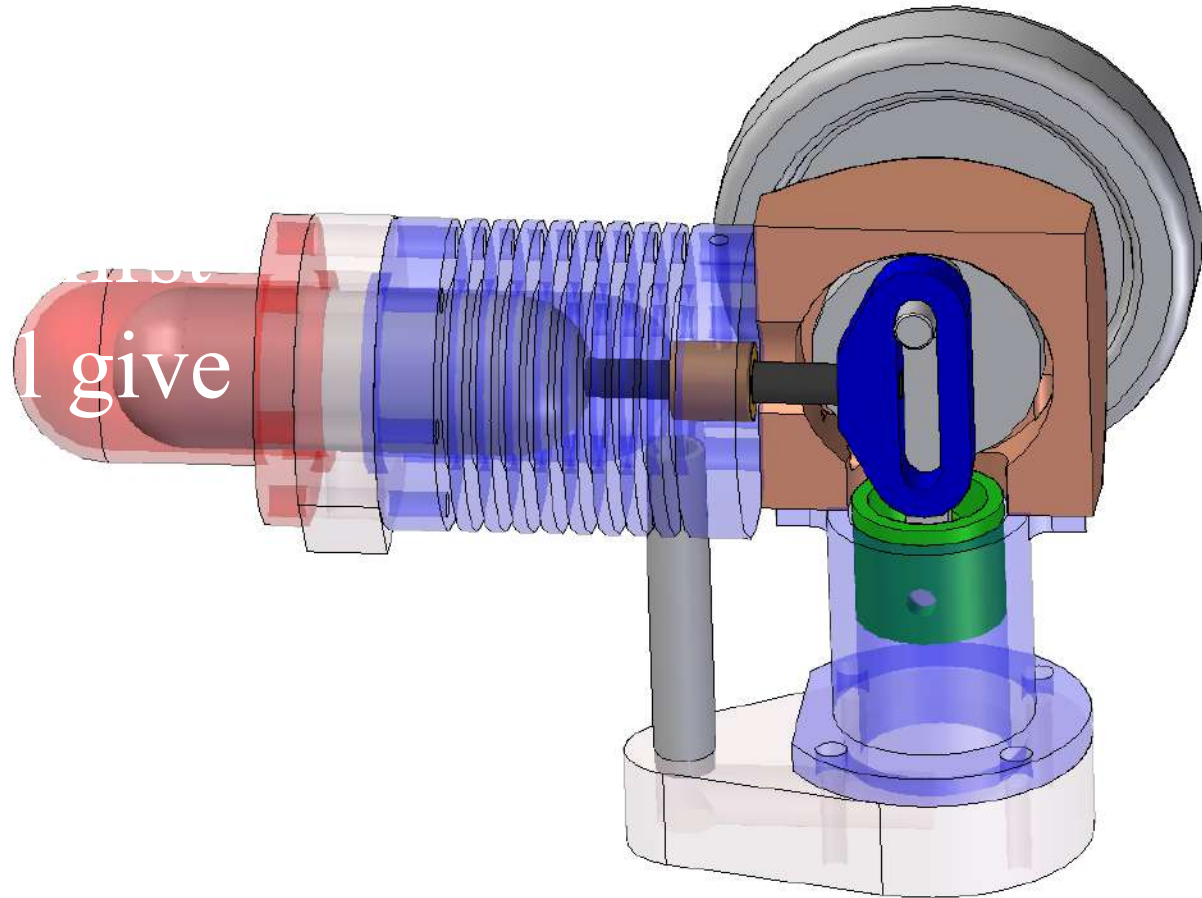


Beginning Class Projects

Stirling Engine

- **Stirling Engine:**

Skills and know
learned during
production of the
three projects will give
students the conf
to manufacture
assemble their ver
working engine



Advanced Machine Trades Project Theory

- All of the projects completed in the Advanced class are completely designed, engineered, and machined by the class in a team environment.
- Students must work together to complete a complex assembly (example: internal combustion engine).
- Each year the project begins with a blank sheet of paper and ends up with a working assembled project when completed.

'00-'01 Advanced Machine Trades Engine Project



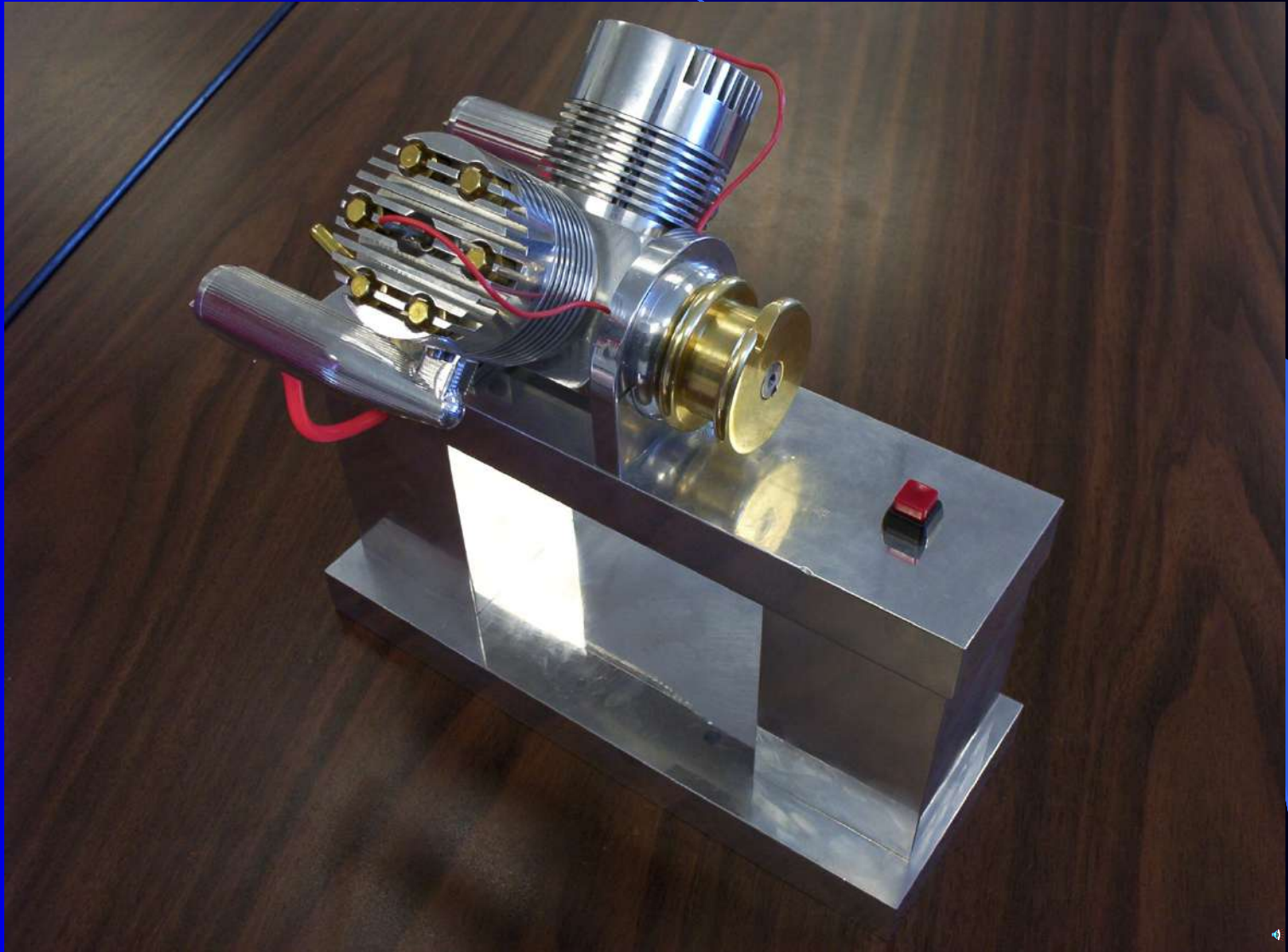
'00-'01 Advanced Machine Trades Engine Project



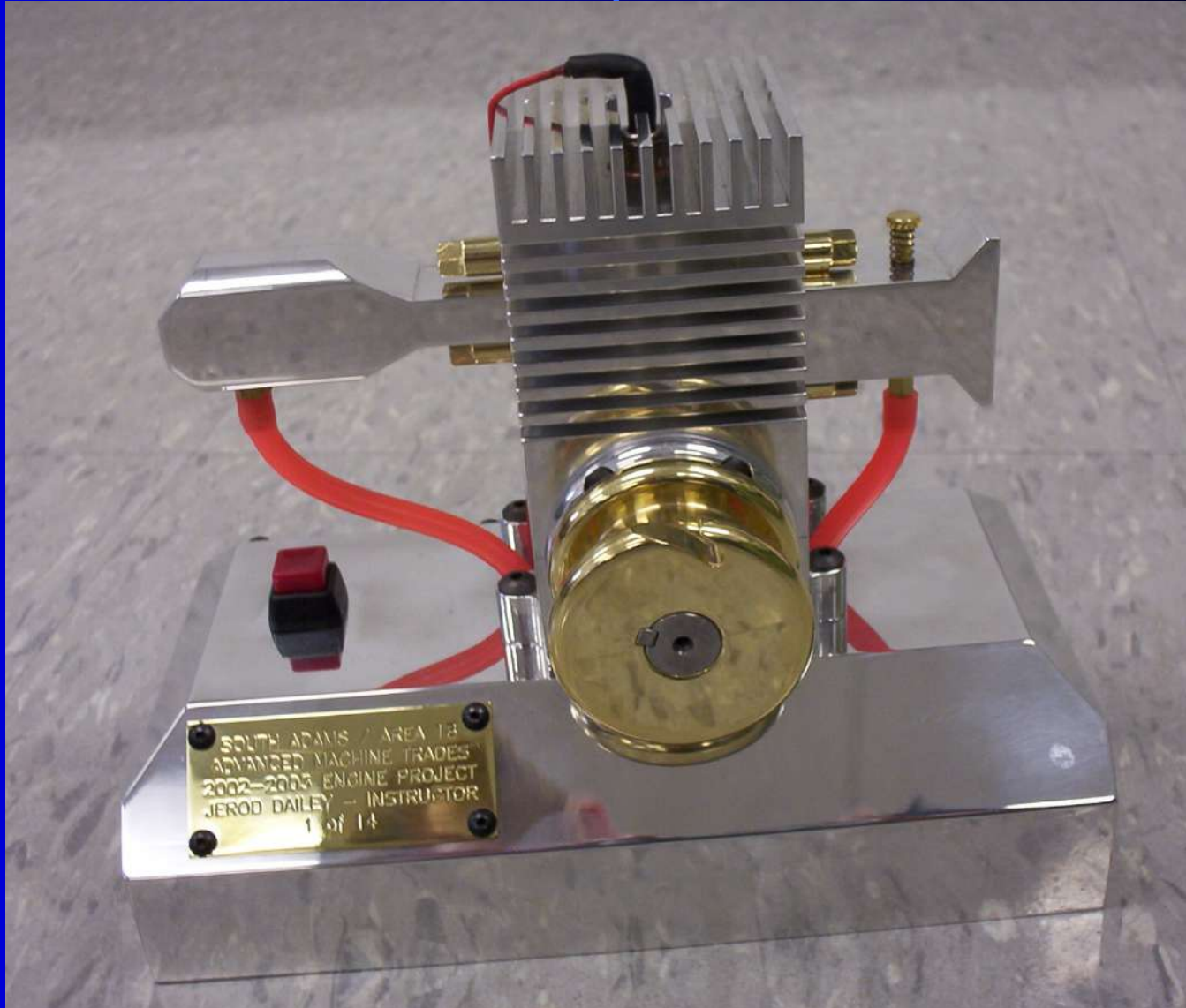
'01-'02 Advanced Machine Trades Truck Project



'01-'02 Engine Project



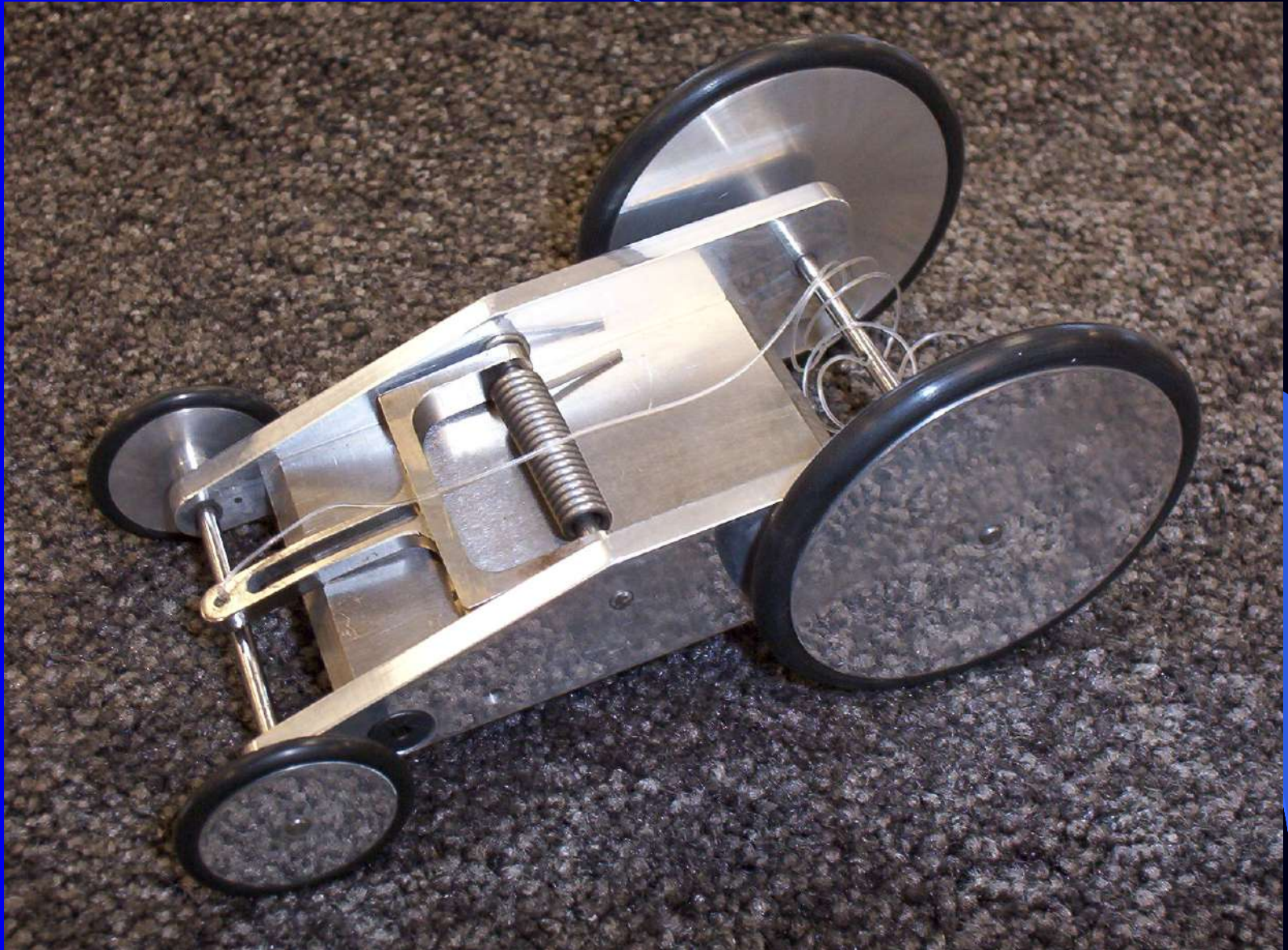
'02-'03 Engine Project



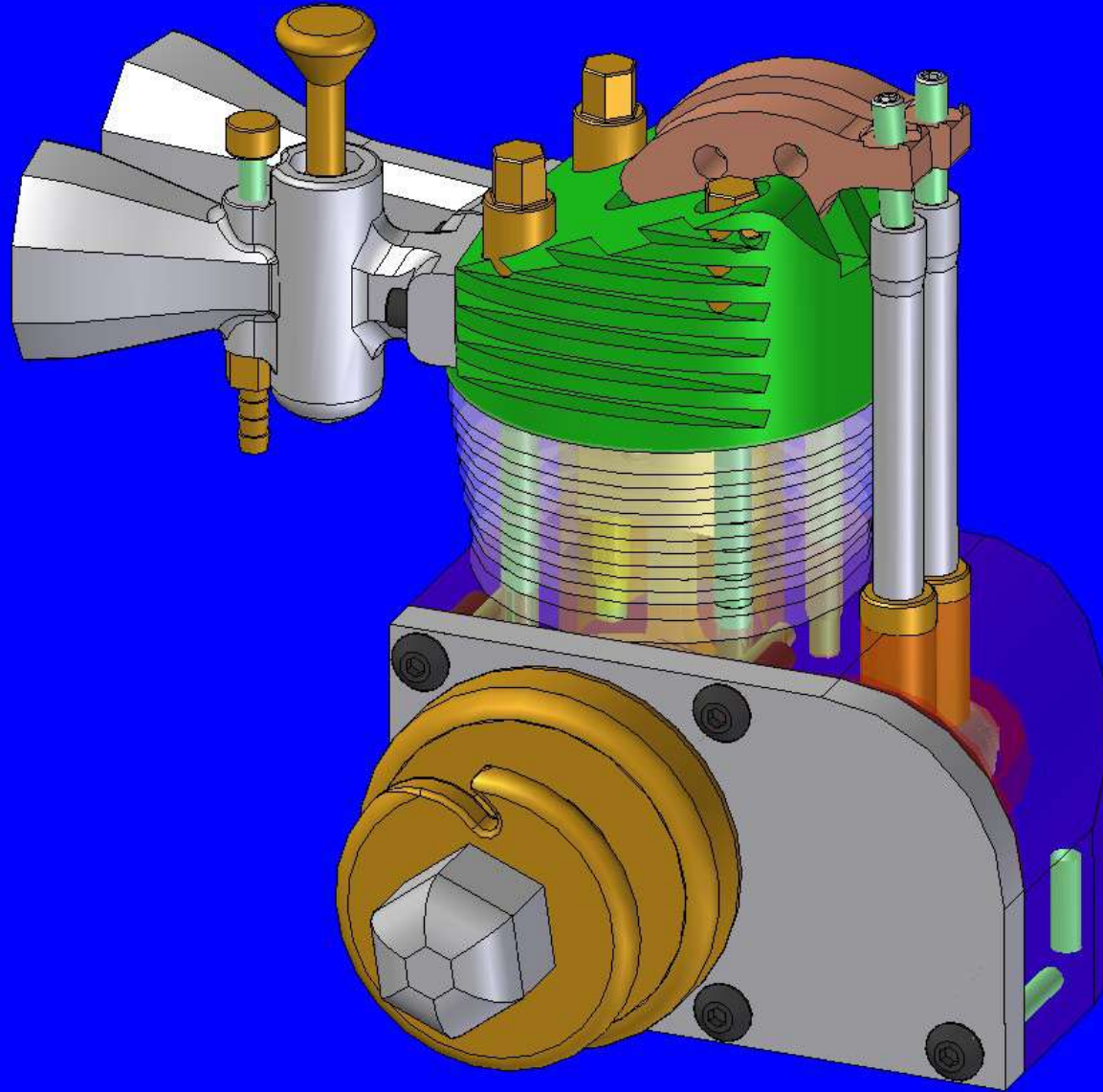
'02-'03 Engine Project



'03-'04 Mouse Trap Cars



'04-'05 Engine Project



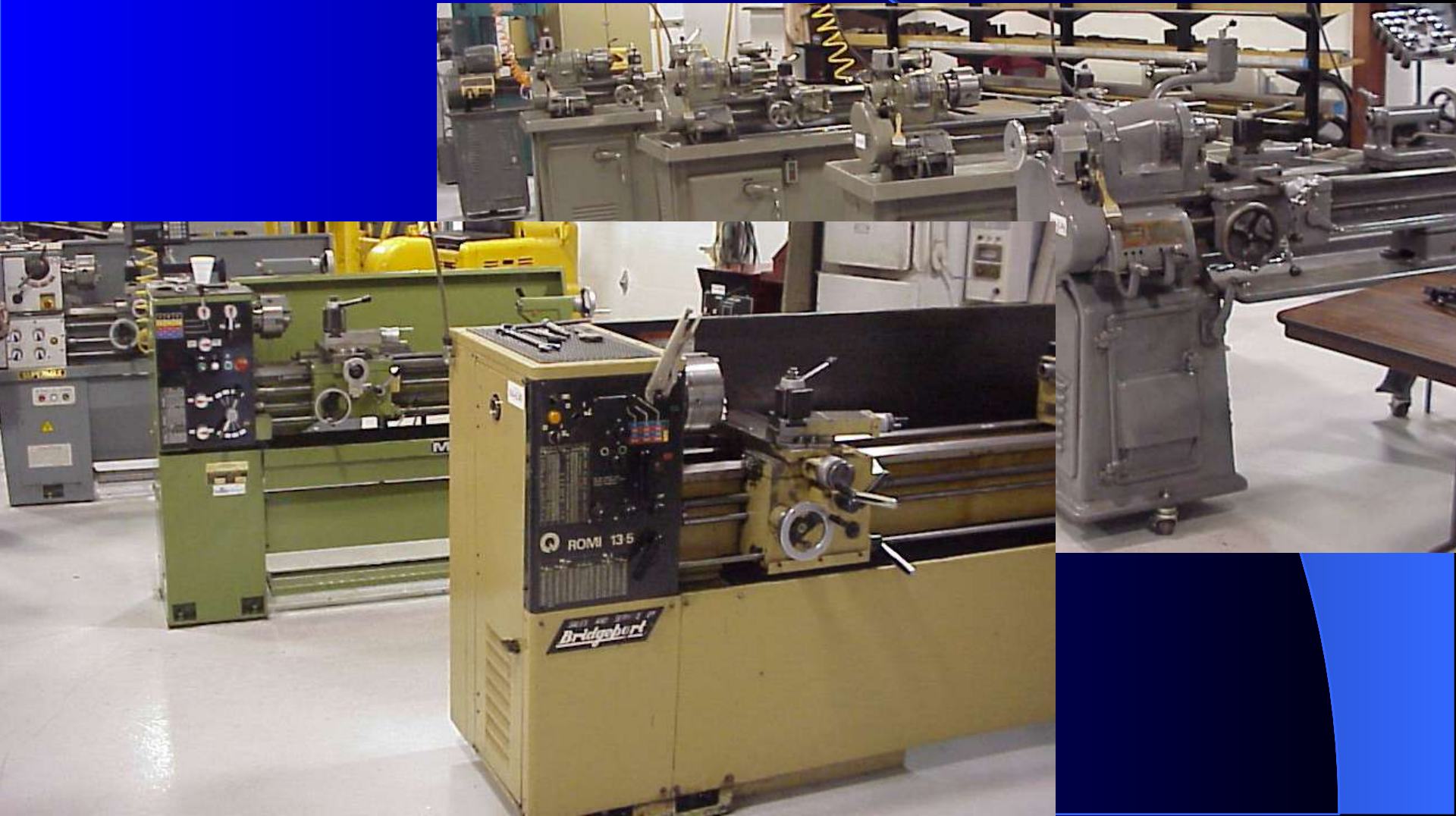
Vertical Milling Machines

Use: Machine Flat, Square, or Round Work Pieces
Locate, Drill, Bore, Ream, or Thread Holes



Engine Lathes

Use: Machine Round Parts;
Turn Outside Diameters; Tapers, Grooves, Threads, Knurls
Turn Internal Diameters; Drill, Bore, Ream, Thread, Taper, Groove



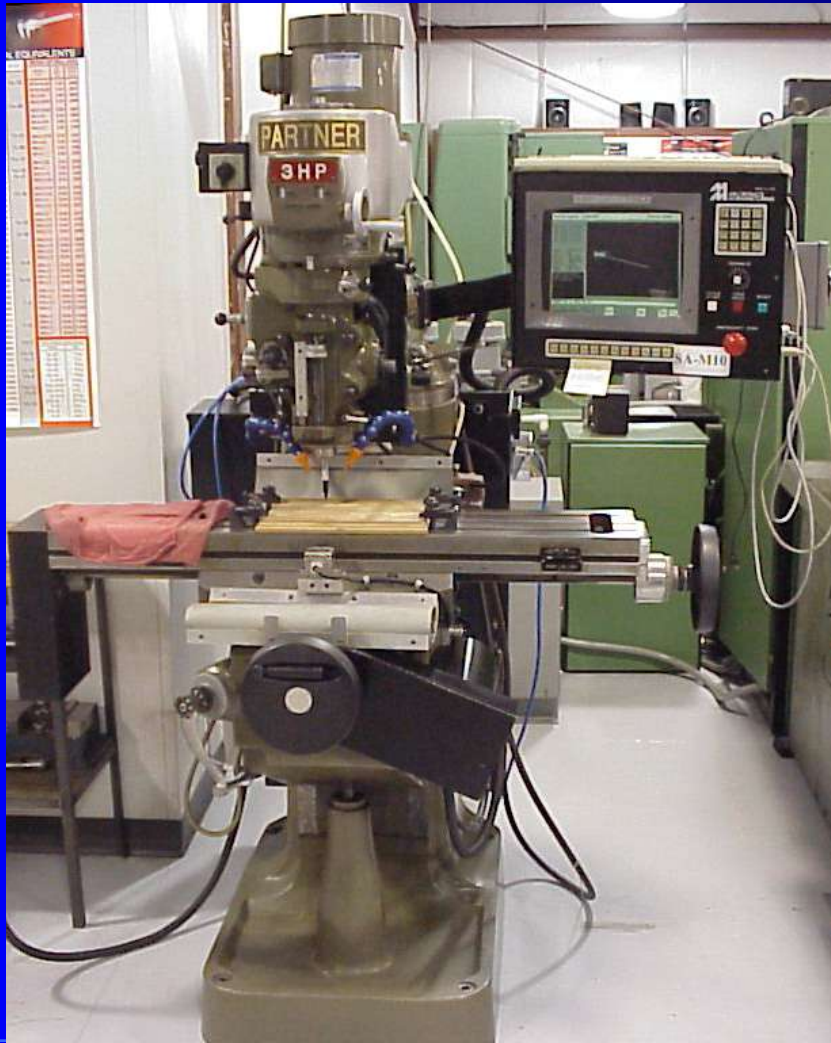
Precision Grinders

Use: Machine precise, flat, smooth surfaces, commonly holding tolerances to within $1/30^{\text{th}}$ of a human hair



Computer Numerical Control (CNC) Milling Machines

Use: Once Programmed and Set-up a Computer Controlled Machine Will Complete Precise and Complex Parts Unattended



Electrical Discharge Machining

Use: Machines Otherwise Impossible Features by Harnessing the Power of Lightning, Which “Burns” Away the Conductive Work Piece



College Dual Credit

Each machine trades student earning “B” average or better during the entire year can earn college credit that will get them on their way towards a manufacturing degree.

Skills USA / VICA

For the past 10 years South Adams / Area 18 Auto Mechanics and Machine Trades has consistently sent students to the Indiana State Skills USA / VICA contest to compete against the best high school machinist in Indiana.

Machine Trades

“If You Can Think It,
We Can Make It!”

The following is courtesy of
Charmilles Technologies Corp.

A leader in Electrical
Discharge Machining (EDM)
with the intent to promote
Manufacturing Education

A Career In Toolmaking or Machining Technologies: The Right Choice for Students, Community and Country

For more information on promoting careers in manufacturing
or on EDM's for schools and colleges, contact:

Charmilles Technologies Corporation

560 Bond Street

Lincolnshire, IL 60069-4224

FAX: 847/913-5342

PHONE: 847/913-5300

LuAnn Twite, Schools & Centers Coordinator, 847/955-7170

Harry C. Moser, President, 847/955-7102

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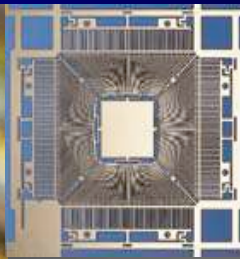
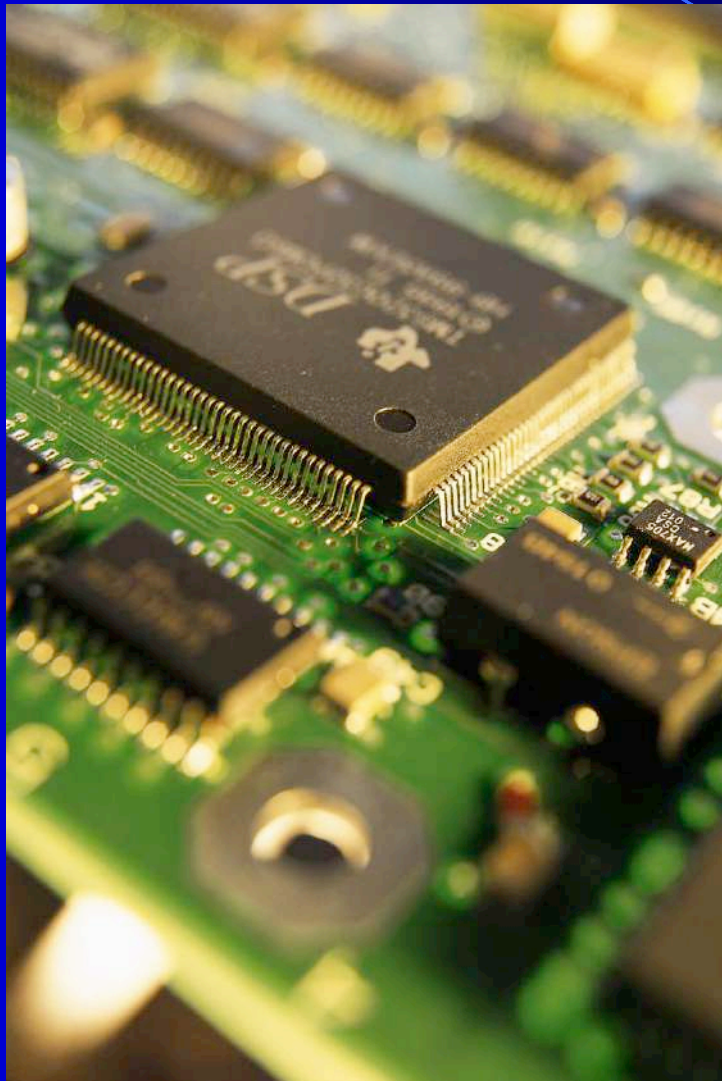
Telecommunications



Aerospace



Electronics



AUTOMATION



BRENNER TOOL, PA

- (2) Roboform 55's and Workmaster Robot
- Product 13,000 General Electric Parts in 12 Months
- Machining Time Per Part: 60 Min.
- (3) Racks for Pieces, (1) Rotary Magazine for Electrodes

Importance to the Country

- **Manufacturing Supplies 47% of non-farm employment**
 - 16% Direct Manufacturing Jobs
 - 31% Secondary Jobs Generated by Manufacturing
- **A Manufacturing Job creates three to five times more Secondary Jobs than does a Service Job.**
- **World Class Production Requires and Follows World Class Tooling.**



Source: Employment Multipliers in the U.S.
Economy by Dean Baker and Thea Lee (Working Paper
No. 107, March, 1993. Economic Policy Institute with
Support from Crafted with Pride in the U.S.A. Council, Inc.)

Quote - Peter Drucker, Business Guru

**“THE ONLY COMPARATIVE
ADVANTAGE OF THE
DEVELOPED COUNTRIES IS
IN THE SUPPLY OF
KNOWLEDGE WORKERS”**

Technology Requires Skill

REQUIREMENTS FOR BEING WORLD COMPETITIVE:

- **QUALITY**
- **COST**
- **DELIVERY**

NECESSARY CONDITIONS:

- **SKILLED LABOR**
- **TECHNOLOGY INVESTMENT**

PROBLEMS:

- **VERY SHORT SUPPLY**
- **40% OF COMPANIES CAN NOT MODERNIZE EQUIPMENT BECAUSE WORKERS LACK THE SKILLS**

- **INEFFECTIVE SKILLS AMONG EMPLOYEES HAVE PREVENTED ONE IN FIVE MANUFACTURERS FROM EXPANDING.***

CONCLUSION: A COMPETITIVE U.S. ECONOMY REQUIRES MORE SKILLED MANUFACTURING TRADESPEOPLE.

SOURCE: Competitiveness Policy Council

*SOURCE: National Association of Manufacturers

Should We Train Service Providers or Toolmakers?



Trainee	Work Importable/Exportable?	Impact on Employment
Beautician or Carpenter	No	U.S. Jack vs. U.S. Jill
Toolmaker	Yes	U.S. vs. Hong Kong



CONCLUSION: Our training resources should be directed to the kinds of work that are both highly paid and subject to import competition.

Importance of Machining to the Community



- Clean
- High Income
- Stable Jobs
55 Hrs/Week in Boom Times
40 Hrs/Week in Recessions
- Small-Medium Size
Privately & Locally owned, stable
Companies dependent on Local, Skilled
Labor
- Local Youth Stay in the Community
- Spin-off Companies, e.g., from
Talon Industries, have made Meadville,
PA a center for Toolmaking

Importance of Machining to the Individual

- Occupational Income: High (\$40,000 - \$60,000/yr)
- Job Security: High
- Mobility: Jobs Everywhere
- Entrepreneurial Opportunities: Excellent
- Computer Content: High
- Job Satisfaction: High
- Relation of Job to Education: High



Attitudes/Expectations of College Freshmen

WORK RELATED LIFE GOALS RATED VERY IMPORTANT OR ESSENTIAL

MenWomen

Be very well-off financially 77.2%* 71.9%*

Become an authority in my field 62.5% 60.0%

Obtain recognition from colleagues 53.0% 53.0%

Be successful in my own business 45.0%* 35.3%*

Have administrative responsibility 39.8% 35.6%

Make a theoretical contribution

to science 21.5% 16.0%

Write original works 14.4% 13.9%

Create artistic work 12.9% 15.9%

*items to promote



Conclusion: Tooling and machining fit well with U.S. Youths' expectations.

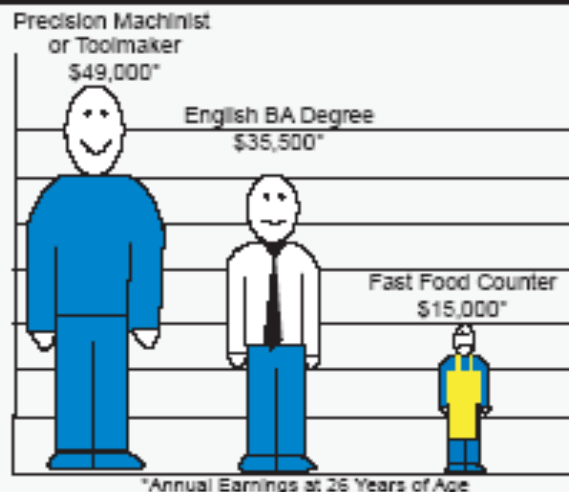
Source: "The American Freshman: National Norms for Fall 2000."

Higher Education Research Association, UCLA

CAREER OPPORTUNITIES IN TOOLING & MACHINING

Did You Know?

- Entry level toolmakers can average \$35,000 a year during a four-year training program.
- Experienced precision metalworkers' earnings range from \$40,000 to \$75,000 annually.
- The U.S. Government projects 3 job openings for every new certified precision metalworker.
- Precision machining provides a practical basis for an engineering or business degree.
- The gloomy rooms and greasy machines of the past are replaced with computers and high technology.
- Many toolmakers eventually own their own shops. The typical shop brings in sales of \$2 million per year and was founded by a 35-year old precision machinist.



U.S. TOOLMAKING/ MACHINING INDUSTRY

# of Companies	12,000
# of Employees	240,000
Annual Sales	\$26 Billion
# of Job Openings	5,000

Note

The median incomes in all categories...

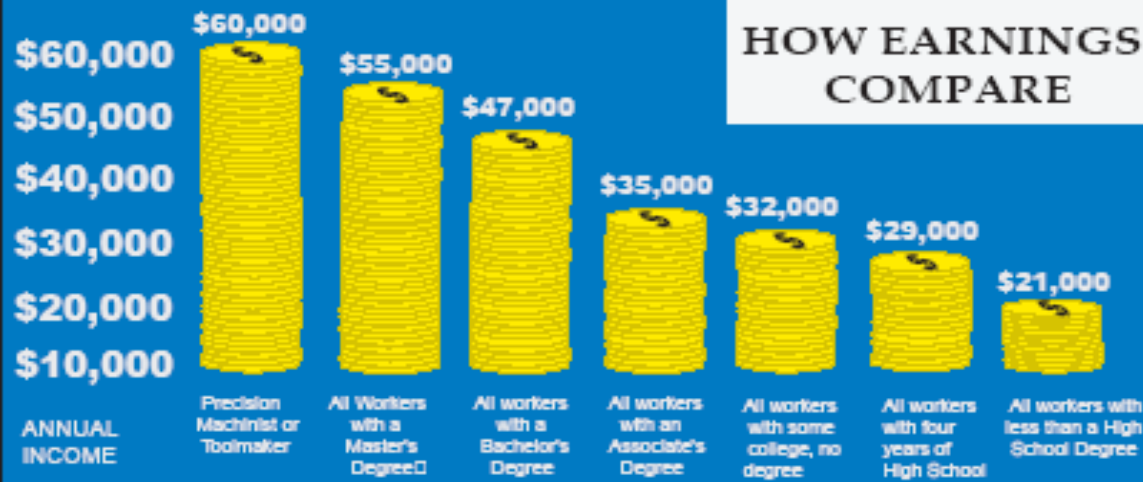
- Vary approx. +/- 35% based on location and skill level.
- Include overtime on a 50 hour workweek for the precision machinists/toolmakers. (Most workers in other high income categories work overtime but are not paid extra.)
- Are for 2003.

Sources

- U.S. Bureau of Labor Statistics
- NSF/SRS
- NTMA, TMA, AMBA, PMA

For More Information
Contact associations listed on the back.

HOW EARNINGS COMPARE



Provided by: **CHARMILLES** 
NUMBER ONE IN EDM
1 (800) CTC-1EDM
www.charmillus.com

Overtime: Toolmakers and Other Professions

EMPLOYEE GROUP

AVERAGE WEEKLY WORK HOURS

Toolmakers	45-55 Hours
Medical Residents, Investment Bankers, Corporate Lawyers and other Professionals	70-80 Hours
All Full Time Workers:	50.8 Hours



CONCLUSION: TOOLMAKERS WORK ABOUT AS MUCH OVERTIME AS OTHERS WITH HIGH INCOMES.

SOURCES: TMA, Labor Market Information 1995; Bureau of Labor Statistics, 1997

WORK & PLAY HARD!

- **A TOOL & DIE MAKER WORKS HARD BUT CAN LEAVE WORK BEHIND. IN CONTRAST FOR BUSINESS EXECUTIVES ON VACATION:**
- **26% CHECK OFFICE DAILY, 63% WEEKLY**
- **18% TAKE WORK ALONG**
- **36% DO WORK ON VACATION**

Opportunities Versus Expectations

Pick a Career In Which You Are Likely to Find a Job!

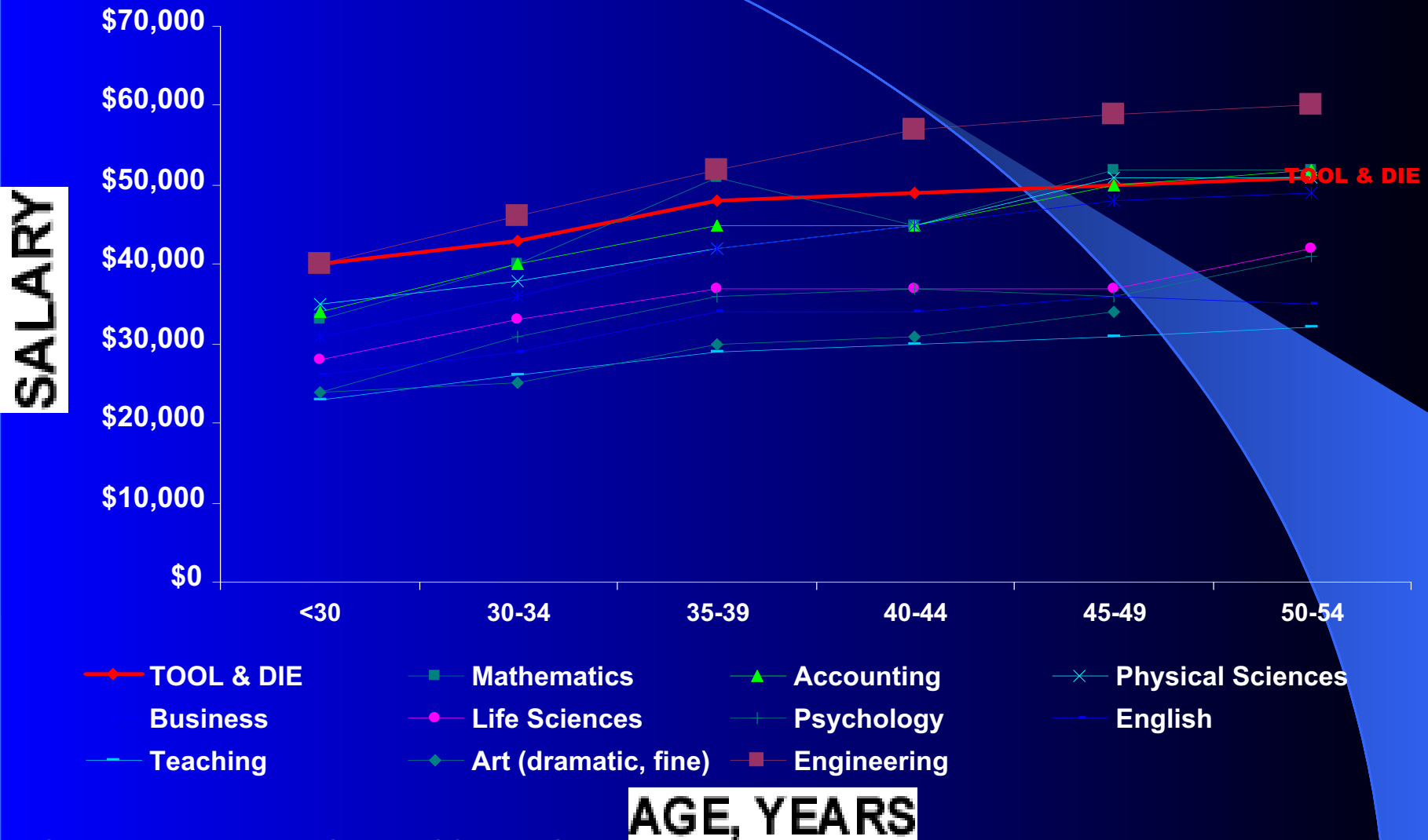
	Aspirations		Job Market
	1976	1988	1987
Labor/Semi-Skilled	3%	1%	17%
Service/Protective/Military	10%	10%	15%
Office Clerical	14%	9%	16%
Sales Clerk/Representative	4%	4%	8%
Crafts/Skilled Labor	12%	6%	12%
Owner/Manager	12%	19%	13%
Professional	45%	51%	19%

Source: University of Michigan Survey of High School Seniors. October 1990/ Illinois Issues.

(Latest available data, 9/1/01.)

CONCLUSION: SKILLED LABOR, E.G. TOOLMAKING, IS THE ONLY CATEGORY THAT BOTH: PAYS WELL AND HAS FEWER JOB SEEKERS THAN JOBS

Median Annual Salary of Bachelor's Graduates by Field of Major and Age, 1993



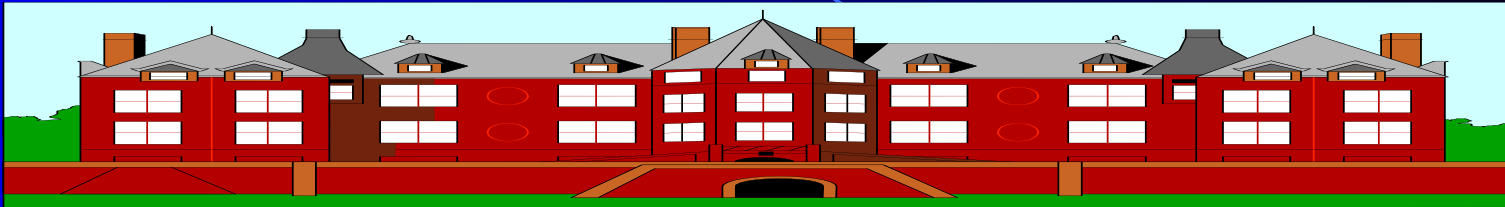
Source: 1993 National Survey of College Graduates,
NSF/SRS, NTMA, PMA/TMA.
(Data will next be released in 2003-2004)

Projected Average Annual Job Openings 1990-2005

	OPENINGS	NUMBER OF CREDENTIALS AWARDED	NET OPENINGS	OPENINGS PER CREDENTIALS AWARDED
Professional Managerial				
- Executive, Administration	436,000	506,830	-70,830	0.86
- Construction Managers	7,000	825	+6,175	8.48
- Marketing, Advertising, and Public Relations Managers	23,000	66,416	-43,416	0.35
Professional Specialty	623,000	1,120,063	-497,063	0.56
- Physical Scientists	8,000	35,163	-27,163	0.23
- Lawyers	28,006	44,314	-16,308	0.63
Technical				
- Technicians	183,000	212,767	-29,767	0.86
- Health	79,000	71,804	+7,196	1.10
- Engineering	52,000	85,611	-33,611	0.61
Blue-Collar Technical				
- Craft, Precision Metal, and Specialized Repair	455,000	133,057	+321,943	3.42
- Mechanics, Installers, Repairers	160,000	91,758	+68,242	1.74
Service Occupation	882,000	237,062	+644,938	3.72
Operators, Laborers	477,000	41,504	+435,496	11.49
Farming, Forestry, Fishing	90,000	14,547	+75,453	6.19

3rd highest projected job openings in the nation

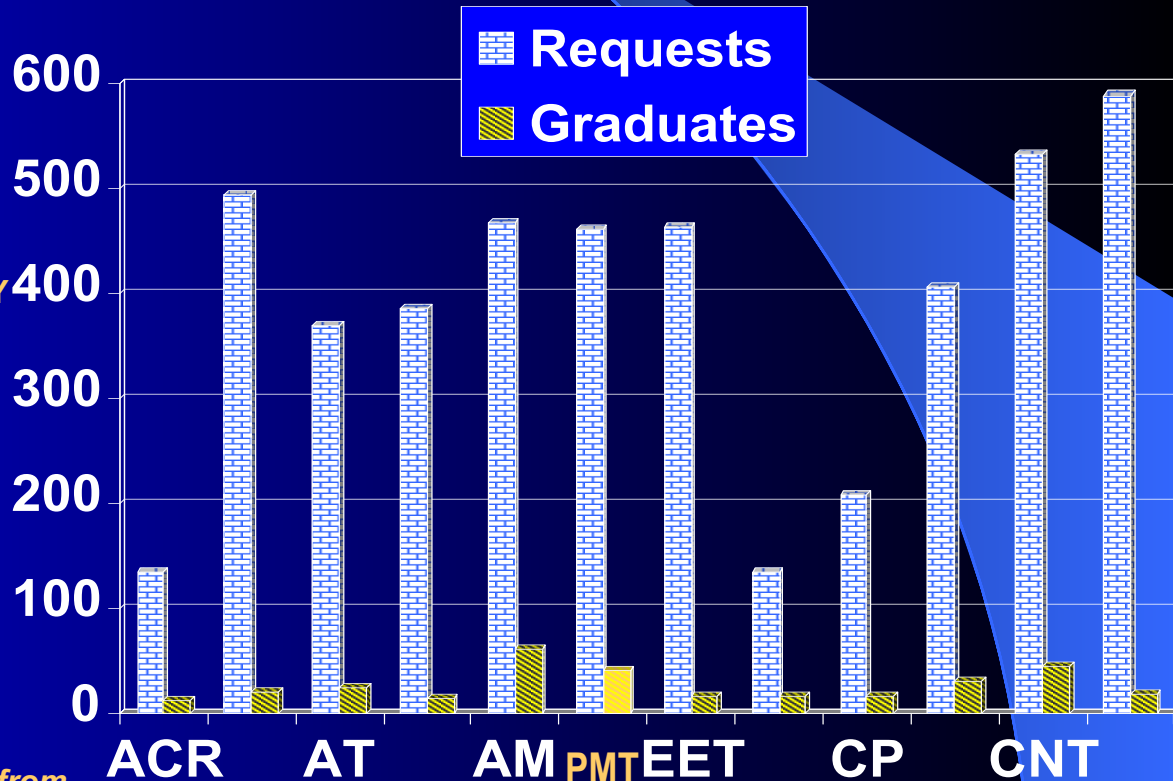
1999-2000 Job Opportunities vs. Graduates



- ACR - AUTOMOTIVE COLLISION REPAIR
- IE - INDUSTRIAL ELECTRICITY/ELECTRONICS
- AT - ARCHITECTURAL TECHNOLOGY
- CST - CONTROL SYSTEMS TECHNOLOGY
- AM - AUTOMOTIVE MAINTENANCE
- PMT - PRECISION MACHINING TECHNOLOGY**
- EET - ELECTRONICS ENGINEERING
- PL - PLUMBING
- CP - CARPENTRY/BLDG CONSTRUCTION
- RAH - REFRIGERATION, AC, HEATING
- CNT - COMPUTER NETWORKING
- IMT - INDUSTRIAL MAINTENANCE

*College's Ten Year Placement
Rate is 98%*

*(period covered for chart: 99/00 school year from
June 1, 1999 through May 31, 2000)*



HIGH SCHOOL GRADUATION RATES

THE LOWEST RISK OF DROPPING OUT OF HIGH SCHOOL IS FOR STUDENTS WITH:

3 CAREER & TECHNICAL EDUCATION UNITS PER 4 ACADEMIC UNITS

CONCLUSION: TAKING SOME HIGH SCHOOL CAREER AND TECH COURSES ENHANCES EDUCATIONAL CONTINUITY.

Source: The CTE/Academic Balance and Three Secondary Outcomes in Brief: Fast Facts for Policy & Practice No. 18 by Michael Wonacott (2002) (<http://nccte.org/publications/infosynthesis/in-brief/in-brief18/indix.asp>.)

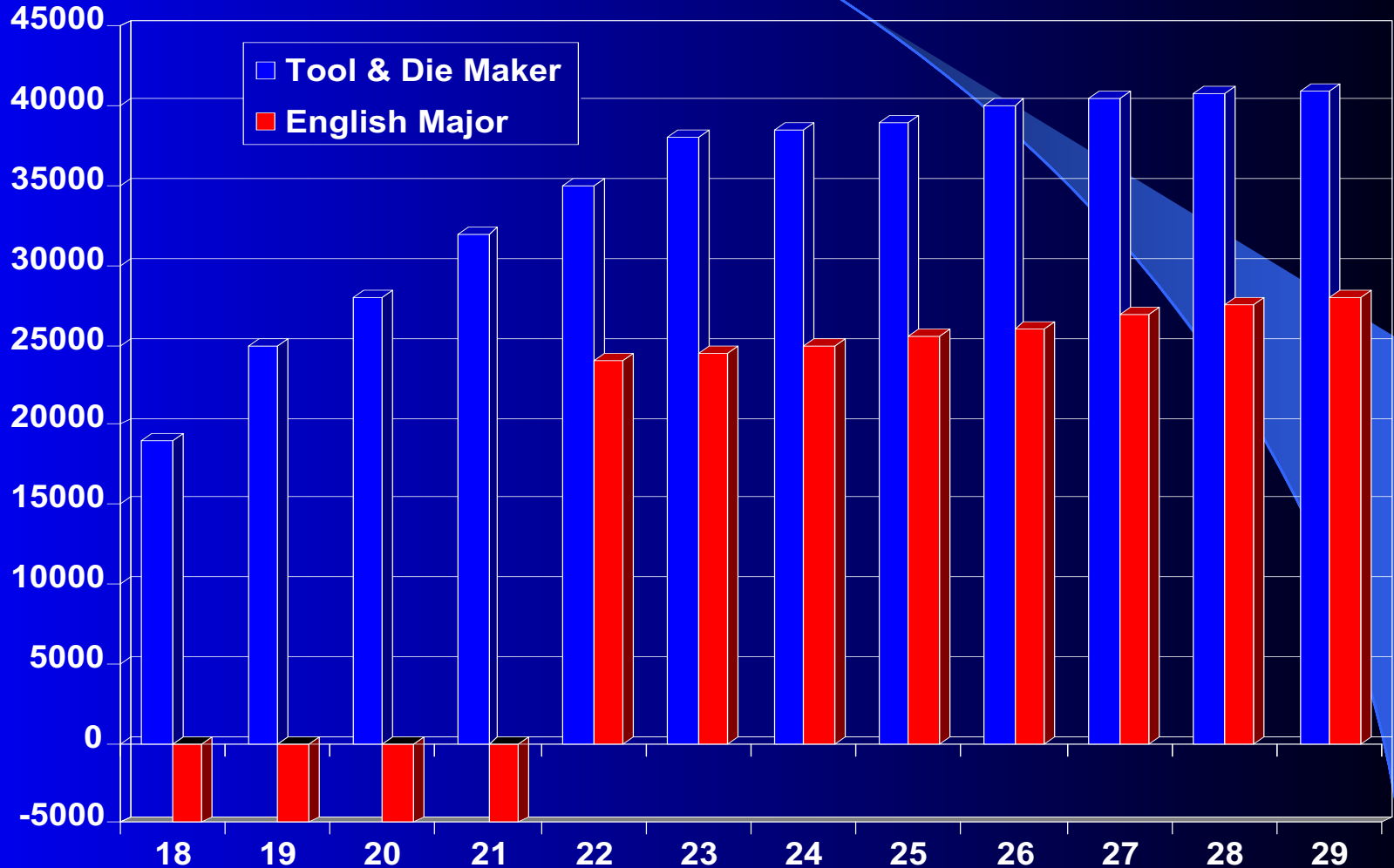
CONTEXTUAL LEARNING

- **60% of students learn best in context**
- **Schools should offer:**
 - **Career focus for all students (reason to remain in school and continue education)**
 - **Contextual teaching strategy (enables students to master high levels of academics)**
 - **Real world, open ended problems**

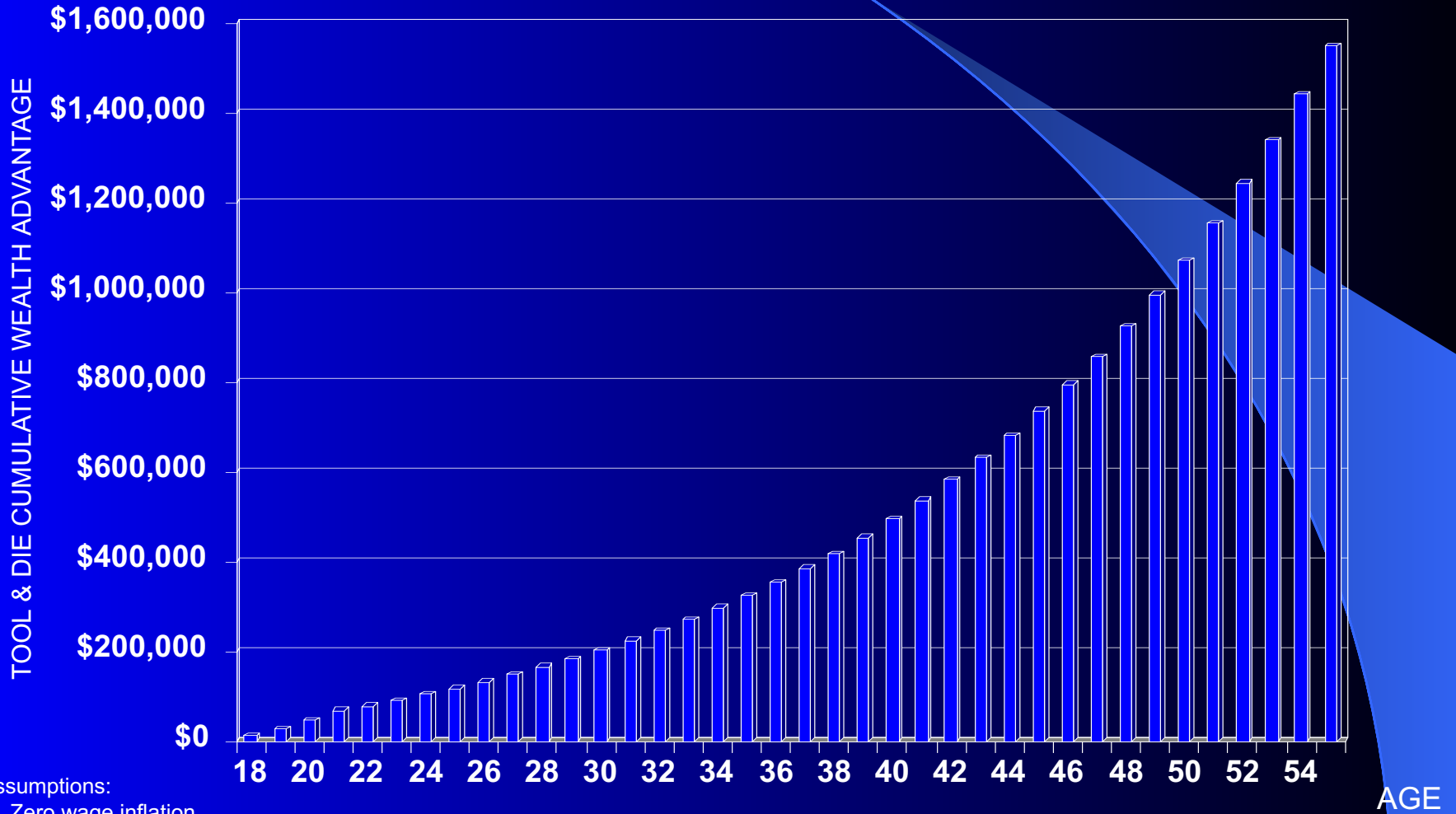
SOURCE: Education and Career Preparation for the New Millennium 10/2000. Daniel Hull, CEO, Cord.

[Www.cord.org/news.cfm?headline=12](http://www.cord.org/news.cfm?headline=12)

ANNUAL INCOME/AGE



TOOL & DIE OR ENGLISH MAJOR? A MILLION \$ DECISION!



- Assumptions:
- 1. Zero wage inflation
 - 2. Savings = 50% of difference in income
 - 3. Investment return of 7% per year on savings

Chinese Proverb

**“I HEAR AND I FORGET.
I SEE AND I REMEMBER.
I DO AND I UNDERSTAND.”**

COMMENT: Toolmaking provides an ideal combination of theoretical and hands-on learning.

SOURCE: Chinese Proverb.

Career Options

- Computer Numerical Controlled (CNC) Programmers
- CNC Machinist / Machinist
- Tool & Die Maker
- Mold Maker
- Mechanical / Application Engineer
- Electrical Engineer
- Machine Tool Salesman
- Industrial Maintenance
- Draftsman
- Designer
- Welder / Fabricator
- Industrial Management
- Automotive Technician
- Plus Many, Many More!



Key Questions

IS TOOLMAKING A BETTER CHOICE THAN A LIKELY M.D.
FROM HARVARD OR STATE UNIVERSITY?

NO

IS TOOLMAKING, LINKED TO A TECHNICAL DEGREE,
MUCH BETTER THAN A PROBABLE COLLEGE DROP-OUT
OR A MARGINAL LIBERAL ARTS COLLEGE GRADUATE?

YES

YES, FOR THE INDIVIDUAL:

- **INCOME**
- **JOB SECURITY**
- **CAREER**

YES, FOR THE COMMUNITY AND COUNTRY:

STABILITY
COMPETITIVENESS



Challenge

- **Guidance Counselors**

- Present toolmaker career alternative to most “college track” students

- **Vocational Teachers**

- Make machining and toolmaking exciting
- Get modern equipment
- Attract good students

- **Shops**

- Support the schools
- Create and expand apprenticeship programs

- **Machinery Makers**

- Support the training programs



"Life's challenges are not supposed to paralyze you, they're supposed to help you discover who you are."

BACKGROUND VS. HOW OBTAINED OWNERSHIP

BACKGROUND	FOUNDED	PURCHASED	INHERITED	UNSPECIFIED	TOTAL OWNERS
APPRENTICE GRADUATE	50%	35%	10%	40%	35%
MACHINING TRAINING BUT NOT APPRENTICE	24%	20%	39%	20%	28%
MANUFACTURING MANAGEMENT	11%	12%	11%	20%	11%
BUSINESS MANAGEMENT BUT NOT MANUFACTURING	4%	24%	19%	20%	12%
OTHER	11%	8%	21%		13%
TOTALS	100%	99%	100%	100%	99%

CONCLUSION: APPRENTICES & MACHINISTS FOUND COMPANIES

BACKGROUND VS. DEGREE YEARS

DEGREE YEARS	APPRENTICE #	APPRENTICE %	MACHINING #	MACHINING %
0	73	80	37	52
2	10	11	13	18
4	6	7	16	23
6	2	2	5	7
TOTALS	91	100	71	100

CONCLUSION: APPRENTICES & MACHINISTS GET DEGREES

Advice About Careers in the Precision Metalworking Trade

“Go for it! It has given me a lot of discipline at work and at home. It is great when you can use your brain and hands all day long! Precision Metalworking trade is an excellent step for a good and meaningful future.”

“It’s not a job, it’s a career.”

“Get into metalworking because there’s a lack of decent metalworkers. Very good job availability and benefits. Don’t become an office working drone - be a man, work with steel.”



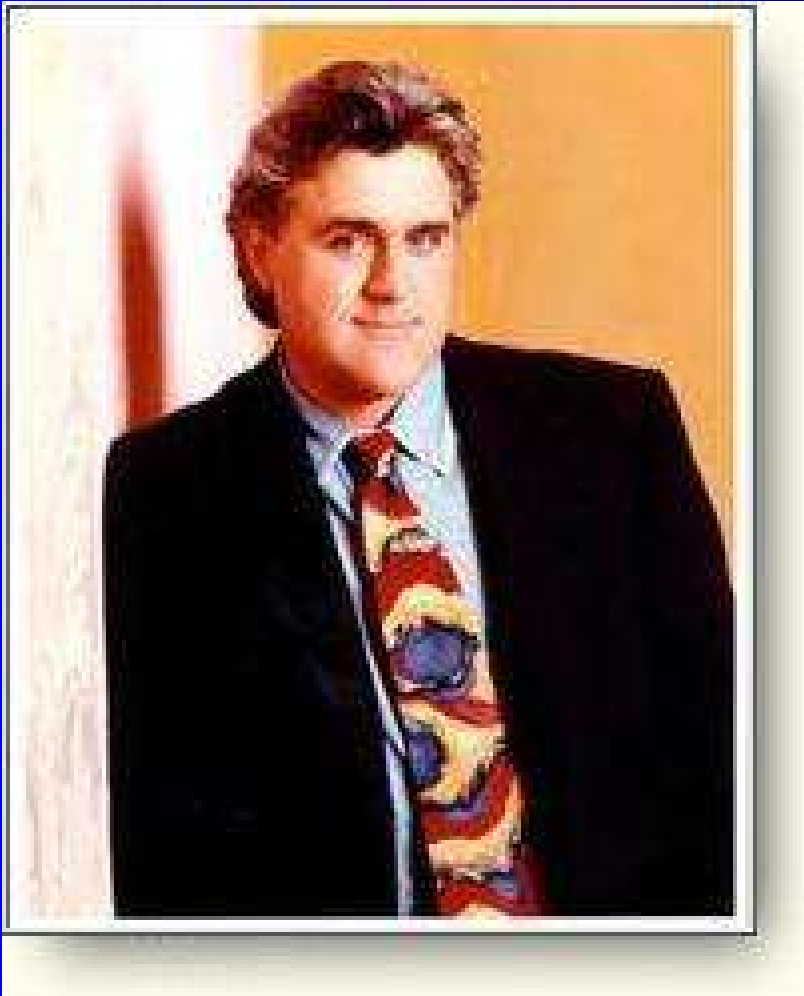
“It’s fun, never boring, challenging, mind opening, sensory perceptual and very, very rewarding after completion of a job or project.”

“Do it, it’s a lot of fun and good money.”

“It’s a good and challenging skilled environment.”

SOURCE: TMA “Apprentice Survey”, 1994-1995 Term/1995-1996 Term.

CALLING ALL MACHINISTS



“Machine shops.....

-it’s a respectable trade and there’s still a lot of money to be made.”

“True machinists don’t think of metal as something hard and unchangeable. They can make anything they want, or replace nearly any part that’s ever been made. I have a lot of respect for those guys. I always will.”

-Jay Leno