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ANNUAL REPORT (8TH) OF THE MACHINABILITY
DATA CENTER

Robert E. Snider

Machinability Data Center

Prepared for:

Army Materials and Mechanics Research Center

September 1972

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EIGHTH ANNUAL REPORT OF THE
MACHINABILITY DATA CENTER

SEPTEMBER 1972

ROBERT E. SNIDER
Metcut Research Associates Inc.
Cincinnati, Ohio

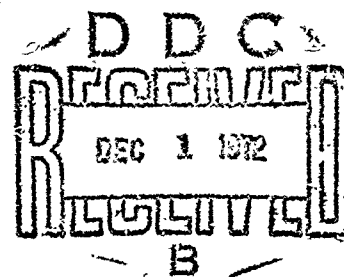
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NATIONAL TECHNICAL
INFORMATION SERVICE

Prepared for

ARMY MATERIALS AND MECHANICS RESEARCH CENTER
Watertown, Massachusetts 02172



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13. ABSTRACT During its eighth year of operation MDC has evaluated and processed an additional 2,148 technical documents on machining data and related topics. From these documents coded evaluations have resulted in keypunching of an additional 9,491 punched cards, which are in turn recorded on organized computer files. These computer files represent an automated index to a physical file of more than 30,000 individually coded documents. These documents represent 79,268 individual records such as the type of operation, speed, feed, condition, hardness, material group, etc. The results of a computer search on any given set of input parameters of these documents would result in an output listing of document file numbers which would facilitate manual retrieval of the specific hard copy documents from the physical file previously mentioned. Approximately 247 specific inquiries of this nature were answered for 156 different organizations representing 186 individuals during this reporting period. Since the Center's inception in October 1964, a total of 6,793 inquiries have been processed. Statistics are presented for estimated cost savings from MDC's services to its users. Through July 31, 1972, it has been conservatively estimated that these savings amounted to more than \$59,500,000. Also in this report are tables and information reflecting MDC activity in other areas related to data publications, government activity, types of inquiries, etc.			

Data Processing Systems

AMMRC CTR 72-18

**EIGHTH ANNUAL REPORT OF THE
MACHINABILITY DATA CENTER**

**ROBERT E. SNIDER
Metcut Research Associates Inc.
Cincinnati, Ohio**

SEPTEMBER 1972

**EIGHTH ANNUAL - CONTRACT F33615-71-C-1112
PROJECT 9M810 - 8975
TASK NO. 897506**

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Prepared for

**ARMY MATERIALS AND MECHANICS RESEARCH CENTER
Watertown, Massachusetts 02172**

FORWARD

The Eighth Annual Report of the Machinability Data Center (MDC) covers work performed under Contract F33615-71-C-1112 from October 1, 1971, through July 31, 1972. The work described in this report covers that accomplished under project No. 8975, Materials Information Analysis Centers, Task No. 897506, Machinability Data Center. It also cites some statistics covering the 7½ years that MDC has been in operation. This Center is operated for the Department of Defense under the supervision of the Army Materials & Mechanics Research Center, by Metcalf Research Associates Inc., 3980 Rosslyn Drive, Cincinnati, Ohio 45209. The manuscript was released by the author, Robert E. Snider, Manager of MDC, in August 1972 for publication as an MDC report.

During the contract period covered by this report work was administered by the Air Force Materials Laboratory with Mr. E. L. Horne (LAM) as program monitor from October 1, 1971 to May 31, 1972. From June 1, 1972, to July 31, 1972, work was administered by the Army Materials & Mechanics Research Center (AMXMR-XP) with Dr. John J. Burke as program monitor.

For a complete analysis of the progress made by the Center from its early inception to the present, the following eight references should be reviewed:

"Final Report on the Design of a System for Collecting, Evaluating and Disseminating Machinability Data for Aerospace Materials," Technical Documentary Report Nr. ASD-TDR-63-572, July 1963, AD-416743.

"First Annual Report of the Air Force Machinability Data Center," AFMDC 65-2, February 1966, AD-482278

"Second Annual Report of the Air Force Machinability Data Center," AFMDC 66-4, February 1967, AD-813037.

"Third Annual Report of the Air Force Machinability Data Center," AFMDC 67-8, February 1968, AD-829879.

"Fourth Annual Report of the Air Force Machinability Data Center," AFMDC 68-6, October 1968, AD-844920.

"Fifth Annual Report of the Air Force Machinability Data Center," AFMDC 69-6, October 1969, AD-697794.

"Sixth Annual Report of the Air Force Machinability Data Center," AFMDC 70-5, October 1970, AD-722478.

"Seventh Annual Report of the Machinability Data Center," MDC 71-1, April 1972, AD-740916.

ABSTRACT

During its eighth year of operation MDC has evaluated and processed an additional 2,148 technical documents on machining data and related topics. From these documents coded evaluations have resulted in keypunching of an additional 9,491 punched cards, which are in turn recorded on organized computer files. These computer files represent an automated index to a physical file of more than 30,000 individually coded documents. These documents represent 79,268 individual records such as the type of operation, speed, feed, condition, hardness, material group, etc. The results of a computer search on any given set of input parameters of these documents would result in an output listing of document file numbers which would facilitate manual retrieval of the specific hard copy documents from the physical file previously mentioned.

Approximately 247 specific inquiries of this nature were answered for 156 different organizations representing 186 individuals during this reporting period. Since the Center's inception in October 1964, a total of 6,793 inquiries have been processed.

Statistics are presented for estimated cost savings from MDC's services to its users. Through July 31, 1972, it has been conservatively estimated that these savings amounted to more than \$59,500,000.

Also in this report are tables and information reflecting MDC activity in other areas related to data publications, government activity, types of inquiries, etc.

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INTRODUCTION

The Machinability Data Center has been operated continuously since October 1, 1964, by Metcut Research Associates Inc. From October 1, 1964 through October 1, 1968, the Center operated under contracts from the Manufacturing Technology Division of the Air Force Materials Laboratory. On October 1, 1968, government administration of the Center was changed to the Materials Information Branch of the Air Force Materials Laboratory. Another change of administration took place during this contract period on August 1, 1971. The Defense Supply Agency assumed contract responsibility with the Materials Information Branch of the Air Force Materials Laboratory at Wright-Patterson Air Force Base continuing technical monitoring of the Center's activity. On May 31, 1972, technical monitor responsibilities were assigned to the Army Materials & Mechanics Research Center, Arsenal Street, Watertown, Massachusetts.

This Eighth Annual Report of the Machinability Data Center presents accomplishments and progress during the period from October 1, 1971 through July 31, 1972.

This report contains charts reflecting data input activities and the scope of services provided industry and government in answering technical inquiries and the dissemination of data through the sale of data publications.

DESCRIPTION OF MDC

MACHINABILITY DATA CENTER, 3980 ROSSLYN DRIVE, CINCINNATI, OHIO 45209. Operated for the Department of Defense, Defense Supply Agency, with technical aspects being monitored by the Army Materials & Mechanics Research Center, Arsenal Street, Watertown, Massachusetts, under Contract F33615-71-C-1112, by Metcut Research Associates Inc.

SCOPE

The Machinability Data Center (MDC) collects, evaluates, stores, and disseminates material removal information including specific and detailed machining data for the benefit of industry and government. Strong emphasis is given to engineering evaluation for the purpose of developing material removal parameters, such as speeds, feeds, depths of cut, tool material and geometry, cutting fluids and other significant variables. Data are being processed for all types of materials and for all kinds of material removal operations such as turning, milling, drilling, tapping, grinding, electrical discharge machining, electrochemical machining, etc.

COLLECTION

MDC has a data file of over thirty thousand selected documents pertaining to material removal technology. This data file is supported by a retrieval system which is controlled by an IBM 1130 computer installation. Information retrieval is based upon the specific material (with definite chemical, physical, and mechanical properties) and the specific material removal operation being used. Computerized search techniques are employed utilizing a combination of search parameters to produce source data. Information retrieval can be refined to the extent necessary to satisfy the requirements of a specific inquiry by controlling the input search parameters.

INFORMATION SERVICES PROVIDED BY MDC

MDC maintains an intensive effort to serve as a communication link for both government and industry by providing services related to the field of material removal. MDC's output consists of providing analyzed data in response to technical inquiries, compilation and marketing of data publications on subjects of current interest to the manufacturing industry. MDC also maintains a selected mailing list for providing notification of the availability of new information and services from the Center.

TO REQUEST MACHINING INFORMATION.

Telephone: 513-271-9510
TWX: 810-461-2840 or
Write: Machinability Data Center
3980 Rosslyn Drive
Cincinnati, Ohio 45209

NOTE: Association of the names of companies and individuals with specific requests is kept confidential. However, data developed remain the property of MDC for dissemination as required for answering similar inquiries and for developing data publications

SUMMARY OF MAJOR ACTIVITY

Contract Changes

Technical monitoring of the Center's contract (F33615-71-C-1112) was changed effective May 31, 1972, from the Air Force Materials Laboratory to the Army Materials & Mechanics Research Center, Arsenal Street, Watertown, Massachusetts.

Inquiry Service Charges

The terms of the new contract, covering the period of this report, stipulated that a service charge system would be initiated for MDC products and services. The objectives of this service charge system would be aimed at achieving a rate of gross income equal to at least 50% of the contract funding by December 31, 1972.

A service charge policy was implemented by MDC effective January 1, 1972. This policy fixed a charge for inquiry services based upon the complexity of the inquiry and the total effort required by the Data Center. Charges for data publications were also adjusted to meet the stated objectives.

The following table shows a breakdown of inquiries received during each month of this reporting period:

		<u>Total Inquiries</u>	<u>Total Paid</u>
1971	October	60	
	November	62	
	December	60	
1972	January	18	8
	February	12	7
	March	11	8
	April	3	3
	May	4	1
	June	12	9
	July	5	4
		<u>247</u>	<u>40</u>

By referring to the above table it can be seen that the announcement of the service charge policy in January 1972 brought about a sharp decrease in the number of specific inquiries each month thereafter. Only 65 inquiries were received between January 1, 1972 and July 31, 1972. Of this total, only 40 were in sufficient detail to require a service charge. The others were answered by

Inquiry Service Charges (cont.)

telephone. Many requests for information were received, but when the service charge policy was explained, the User generally rejected the services of MDC because of a lack of administrative procedures within the User company to handle even nominal charges for inquiries.

An extensive effort was made by MDC during the contract period to reach an accommodation with the large prime contractors of the aerospace industry and other large company Users of MDC's services regarding a blanket order or minimum annual fee for inquiry services. Charges for individual inquiries would be credited against this annual fee according to the complexity of the individual inquiry. This method of charging for inquiry services has found a very limited degree of acceptance by those companies contacted. Negotiations in this area are continuing at the time of this report. To date two different User organizations have agreed to budget a specified dollar amount for annual inquiry services. Neither of these constitute a blanket order to MDC since inquiries are paid for on an individual basis. The total amount of these budgeted agreements is \$2,800.

Data Publications

While specific inquiry services decreased sharply, MDC publication sales were encouraging. The Second Edition of the Machining Data Handbook was printed and placed in distribution in April 1972. Through July 31, 1972, orders for 1,877 copies of the revised Handbook have been received. Sales of MDC data publications, particularly the Machining Data Handbook, have made it possible for MDC to achieve a cost recovery rate consistent with contractual requirements.

MDC Newsletter

A bimonthly newsletter service was initiated in January 1972 with distribution to the individuals who are maintained on MDC's selected User File. The newsletter is intended to keep MDC's Users informed concerning new ideas and developments in the metal removal industry, with particular reference to machinability data. Information is also provided to industry and government regarding new MDC data publications. This newsletter has stimulated increased activity in the sale of MDC data publications.

DISTRIBUTION OF MDC USER FILE

Names are added to the User File as a result of: 1) inquirers, 2) visitors, 3) additional names submitted by current Users, 4) requests resulting from dissemination of data publications, and 5) technical articles published in periodicals and announcements pertaining to the Center.

GENERAL CONCENTRATION OF USERS BY NUMBERS

STATES	ORGANIZATIONS	TOTAL NO. ORGANIZATIONS	STATES*	INDIVIDUAL	TOTAL INDIVIDUAL USERS
7	0	0	7	0	0
14	1-10	72	13	1-25	171
17	11-25	312	13	26-50	468
5	26-50	178	10	51-125	694
3	51-100	195	7	126-300	1,510
9	OVER-100	<u>1,831</u>	5	OVER-300	<u>3,117</u>
	TOTAL	2,588		TOTAL	5,960

AREA CONCENTRATION OF ORGANIZATIONS

West Coast (3 states)-	310 companies
Midwest (5 states) -	931 companies
North Central (3 states) -	538 companies
New England (6 states)-	283 companies

The total User File (5,960 individuals and 2,588 plants), can be broken down as follows:

Company Users (Individuals)	5,161
Companies	2,350
 Educational Institutions (Individuals)	 692
Colleges	204
 Societies, Centers, etc. (Individuals)	 107
Societies, Centers, etc.	34

* Includes Washington, D.C.

SUMMARY OF SPECIFIC INQUIRIES BY TYPE OF INQUIRY

October 1, 1971 - July 31, 1972

NO. OF
INQUIRIES
10/1/71-7/31/72

1. RECOMMENDATIONS FOR A SPECIFIC MACHINING SITUATION. <i>Typical Example:</i> Requested recommendations for turning Waspalc. in the solution treated and aged condition.	47
2. STARTING RECOMMENDATIONS FOR AN EXTENSIVE GROUP OF MACHINING SITUATIONS. <i>Typical Example:</i> Requested machinability data on AN-350, S-816, HS-25, HS-31, Inconel X-750, Unitemp M-252 and Kasteilloy R-235.	73
3. INFORMATION PERTAINING TO NEW MACHINING PROCESSES, EQUIPMENT AND TOOLS. <i>Typical Example:</i> Requested information on the manufacturer of equipment called "Liquid Lathe".	15
4. COORDINATION AND POTENTIAL USE OF AFMDC. <i>Typical Example:</i> Requested detailed information on services available from AFMDC.	7
5. REQUESTS FOR SPECIFIC DOCUMENTS, REPORTS, BOOKS, PAPERS, ETC. <i>Typical Example:</i> Requested a list of reports available for machining of titanium. Also wanted cost of each report.	3
6. GENERAL INFORMATION SUCH AS SAFETY PRACTICES, NAMES OF FIRMS HAVING CERTAIN MACHINING CAPABILITIES, TOOL MATERIAL PROPERTIES, ETC. <i>Typical Example:</i> Requested the names of people to contact in the fields of metal removal such as EDM, ECM, ECG, EDU, USW, CHW, LBM, Abrasive Machining and Hot Machining.	18
7. REQUESTS FOR BIBLIOGRAPHIES AND ABSTRACTS. <i>Typical Example:</i> Request for bibliographies with abstracts covering use of ceramic tools and abrasives in machining various materials.	8
8. STATE-OF-THE-ART INFORMATION AND REPORTS <i>Typical Example:</i> Suggestions for important manufacturing programs for the next five years in the field of material removal. Supply problem, approach and approximate funds.	2

SUMMARY OF SPECIFIC INQUIRIES BY TYPE OF INQUIRY (cont.)

October 1, 1971 - July 31, 1972

NO. OF
INQUIRIES
10/1/71-7/31/72

9.	SPECIAL INQUIRIES AND REPORTS FOR U.S. AIR FORCE, MANUFACTURING TECHNOLOGY DIVISION. <i>Typical Example:</i> Requested a report on the progress during the last five years in machining of titanium and hard to machine materials - state-of-the-art.	7
10.	EVALUATION, TRANSLATION AND REVIEW OF REPORTS, BOOKS, PAPERS. <i>Typical Example:</i> Requested an evaluation of a report published in Electro-Technology, October 1964, concerning adaptive control possibilities.	2
11.	REQUESTS FOR INFORMATION ON METAL REMOVAL RATES. <i>Typical Example:</i> Requested information on maximum metal removal rates in turning and drilling of leaded steels.	1
12.	COMPARISON OF ONE PROCESS OR MATERIAL WITH ANOTHER. <i>Typical Example:</i> Requested a comparison of the machining of Inconel W with Inconel X in both solution treated and solution treated and aged conditions, primarily in turning but also drilling and milling if possible.	7
13.	INFORMATION PERTAINING TO CUTTING FLUIDS. <i>Typical Example:</i> Requested cutting fluid recommendations for titanium and a wide variety of high temperature alloys and stainless steels.	6
14.	INFORMATION ON MACHINABILITY RESEARCH. <i>Typical Example:</i> Requested machining information on the effect of work diameter on tool life, mathematical correlations of the various machine processes and the means of predicting the surface quality in milling.	15
15.	INFORMATION PERTAINING TO ESTIMATING COST, SETTING TIME STANDARDS, AND PRODUCTION RATES IN MACHINING. <i>Typical Example:</i> Requested information including formulas that could be used to predict production rates and costs.	36
TOTAL		247

This total does not include requests for published data publications such as AFVAC reports.

ANALYSIS OF INQUIRIES BY STATE

October 1, 1971 - July 31, 1972

10 STATES LEADING INQUIRIES			
STATES	COMPANIES	INDIVIDUALS	NO. OF INQUIRIES
California	10	12	12
Illinois	7	7	7
Indiana	9	10	11
Massachusetts	4	4	8
Minnesota	4	4	7
New Jersey	4	4	7
New York	8	11	12
Ohio	46	63	98
Pennsylvania	18	19	24
Texas	3	4	6
Wisconsin	6	6	6
TOTAL	119	144	198
OTHER STATES SUBMITTING INQUIRIES			
Arkansas	1	1	1
Colorado	2	2	2
Connecticut	4	5	5
Delaware	1	1	1
District of Columbia	1	1	1
Georgia	1	1	1
Idaho	1	1	1
Iowa	1	1	1
Kansas	1	1	2
Kentucky	2	3	5
Louisiana	2	3	5
Michigan	5	5	5
Mississippi	1	1	2
Missouri	4	4	4
New Hampshire	2	2	2
Oklahoma	1	1	1
Rhode Island	2	2	2
Tennessee	2	3	3
Vermont	2	2	4
Washington	1	1	1
TOTAL	37	42	49
TOTAL FOR ALL STATES	156	186	247

ANALYSIS OF INQUIRIES BY MATERIAL GROUP

October 1, 1971 - July 31, 1972

MATERIAL GROUP	INQUIRIES
PLAIN CARBON & LOW ALLOY STEELS	28
ULTRA HIGH STRENGTH & TOOL STEELS	11
CARBIDES	0
CAST IRON	10
CAST STEELS	3
STAINLESS STEELS	12
NICKEL ALLOYS	1
HARDENING STEELS	1
HIGH TEMPERATURE ALLOYS	48
TITANIUM ALLOYS	12
REFRACTORY ALLOYS	5
BERYLLIUM ALLOYS	1
ZIRCONIUM ALLOYS	1
ALUMINUM, MAGNESIUM, ZINC, LEAD, COPPER & TIN ALLOYS	18
PRECIOUS & RARE METALS	1
POWDER METALS	3
OTHER METALS	0
NONMETALLICS INCLUDING CERAMICS, PLASTICS, GRAPHITE & COMPOSITES	9
MULTIPLE GROUP	18
UNKNOWN TYPE (NO GROUP)	61

ANALYSIS OF INQUIRIES BY TYPE OF MACHINING OPERATION

October 1, 1971 - July 31, 1972

OPERATION	INQUIRIES
<u>CONVENTIONAL CHIP REMOVAL</u>	
TURNING	29
BORING	5
MILLING (GENERAL)	3
FACE MILLING	5
END MILL SLOTTING	4
PERIPHERAL END MILLING	7
SLAB MILLING	1
ALL OTHER TYPES OF MILLING	3
DRILLING	20
GUN DRILLING	0
REAMING	3
TAPPING	6
GEAR CUTTING	0
BROACHING	7
ROUTING	1
BANDSAWING	2
TOTAL	96
<u>CONVENTIONAL GRINDING</u>	
GENERAL GRINDING	13
SURFACE GRINDING	4
CYLINDRICAL GRINDING	2
INTERNAL GRINDING	0
CENTERLESS GRINDING	1
ABRASIVE MACHINING	1
ABRASIVE BELT GRINDING	0
ABRASIVE CUTOFF	1
FINISHING	3
TOTAL	25
<u>ALTERNATE MACHINING METHODS</u>	
ELECTRICAL DISCHARGE MACHINING	9
ELECTROCHEMICAL MACHINING	5
ELECTROCHEMICAL GRINDING	0
CHEMICAL MACHINING	7
PHOTOCHEMICAL MACHINING	0
ULTRASONIC MACHINING	0
LASER MACHINING	0
ABRASIVE JET MACHINING	0
SUB-ZERO MACHINING	1
HOT MACHINING	0
THREAD ROLLING	1
TOTAL	23
<u>MISCELLANEOUS</u>	
BURNISHING	1
POLISHING	4
UNITERM DESCRIPTIVE OPERATIONS	58
MULTIPLE OPERATIONS	34
MISCELLANEOUS CONVENTIONAL OPERATIONS	5
TOTAL	102

SUMMARY OF INQUIRIES PROCESSED BY MDC FOR STSP* & SBA**

October 1, 1971 - July 31, 1972

NUMBER OF INQUIRIES FOR STSP*	
<u>STATE</u>	<u>NO. OF INQUIRIES</u>
VERMONT	3

NUMBER OF INQUIRIES FOR SBA**	
<u>STATE</u>	<u>NO. OF INQUIRIES</u>
MASSACHUSETTS	2
MINNESOTA	3
MISSISSIPPI	2
NEW YORK	1
PENNSYLVANIA	1
TEXAS	<u>3</u>
TOTAL	12

STSP* - STATE TECHNICAL SERVICES PROGRAMS

SBA** - SMALL BUSINESS ADMINISTRATION TECHNOLOGY
UTILIZATION PROGRAMS

MACHINABILITY DATA CENTER

SUMMARY OF SPECIFIC INQUIRIES BY SIC* NUMBER

October 1, 1971 - July 31, 1972

NUMBER OF INQUIRIES

<u>SIC MAJOR GROUP NO.</u>	<u>SIC INDUSTRY NO.</u>		<u>BY SIC INDUSTRY NO.</u>	<u>BY SIC MAJOR GROUP NO.</u>	<u>% OF TOTAL</u>
		FEDERAL GOVERNMENT		32	13.0
91	9100	U.S. DEPT. OF THE NAVY	3		
	9100	U.S. DEPT. OF THE AIR FORCE	7		
	9100	U.S. DEPT. OF THE ARMY	1		
	9100	NATIONAL AERONAUTICS & SPACE ADM.	5		
	**9191	STATE TECHNICAL SERVICE PROGRAMS	3		
	9192	SMALL BUSINESS ADMINISTRATION	12		
96	9651	NATIONAL BUREAU OF STANDARDS	1		
19		ORDNANCE AND ACCESSORIES		6	2.4
27		PRINTING, PUBLISHING, AND ALLIED INDUSTRIES		16	6.5
28		CHEMICALS AND ALLIED PRODUCTS		0	0
29		PETROLEUM REFINING AND RELATED INDUSTRIES		5	2.0
32		STONE, CLAY, GLASS, AND CONCRETE PRODUCTS		4	1.6
33		PRIMARY METAL INDUSTRIES		17	6.9
34		FABRICATED METAL PRODUCTS, EXCEPT ORDNANCE, MACHINERY, AND TRANSPORTATION EQUIPMENT		8	3.2
35		MACHINERY, EXCEPT ELECTRICAL		20	32.4
36		ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES		19	7.7

* Standard Industrial Classification Manual (SIC). Executive Office of the President, Bureau of the Budget, 1967

** This SIC Number Was Assigned Because of the Special Significance of the State Technical Services Programs

SUMMARY OF SPECIFIC INQUIRIES BY SIC* NUMBER (cont.)

SIC MAJOR GROUP NO.	SIC INDUSTRY NO.		NUMBER OF INQUIRIES		
			BY SIC INDUSTRY NO.	BY SIC MAJOR GROUP NO.	% OF TOTAL
37		TRANSPORTATION EQUIPMENT		33	13.4
	3721	AIRCRAFT AND MISSILES	7		
	3722	AIRCRAFT ENGINES & ENGINES PARTS - MISSILE ENGINES	14		
	3729	AIRCRAFT PARTS & AUXILIARY EQUIPMENT - MISSILE PARTS OTHERS	3 9		
38		PROFESSIONAL, SCIENTIFIC, AND CONTROLLING INSTRUMENTS; PHOTOGRAPHIC AND OPTICAL GOODS; WATCHES AND CLOCKS		0	0
39		JEWELRY, PRECIOUS METALS		1	0.4
40		RAILROADS, LINE-HAUL OPERATING		0	0
50		WHOLESALE TRADE		6	2.4
73		MISCELLANEOUS BUSINESS SERVICES		7	2.9
82		EDUCATIONAL SERVICES		3	1.2
86		NONPROFIT MEMBERSHIP ORGANIZATIONS		0	0
89		MISCELLANEOUS SERVICES		10	4.0
TOTALS				247	100.0%

* Standard Industrial Classification Manual (SIC). Executive Office of the President,
Bureau of the Budget, 1967

COMPANIES AND AGENCIES SUBMITTING INQUIRIES TO NDC

OCTOBER 1, 1971 TO JULY 31, 1972

• INDICATES NEW INQUIRERS

• AERJET NUCLEAR CO
DEPT OF THE AIR FORCE
DEPT OF THE AIR FORCE
• DEPT OF THE AIR FORCE
AIR FORCE MATERIALS LAB
AIR FORCE MATERIALS LAB
AIR FORCE MATERIALS LAB
• ALLIS-CHALMERS MFG CO
• ALLIS-CHALMERS MFG CO
ALUMINUM CO OF AMERICA
AMERICAN MICRO PRODUCTS
• ARMSTRONG CORK COMPANY
DEPT OF THE ARMY
• AUTOMATIC MACHS & SYSTS
AVCO CORPORATION
AVCO CORPORATION
AVCO CORPORATION
• ROBERT G AYERILL, MS
BARCOCK & WILCOX CO
BARCOCK & WILCOX CO
BATTTELLE COLUMBUS LABS
BATTTELLE-NORTHWEST
• BELL TELEPHONE LABS
BELOIT CORP
THE BENDIX CORP
BLUE ASM TOOL & DIE CO
BRAD FOOTE GEAR WORKS
• BURROUGHS CORP
• C T R INC
CHRYSLER CORP
CHRYSLER CORP
CINCINNATI MILACRON INC
CINCINNATI MILACRON INC
• CINCINNATI MILACRON INC
• CLIMAX MOLYBDENUM CO
CONTINENTAL AVIA & ENGRG
CONTINENTAL CAN CO
COORS PORCELAIN CO
CRUCIBLE STEEL CO
CUMMINS ENGINE CO
CYCLOPS CORP
• DAS INDUSTRIES INC
DEUTSCH CO
• DIAMOND AUTOMATION INC
DOVER CORP
E I DUPONT DENEMOURS CO
• JOSEPH DYSON & SON INC
• EMERSON ELECTRIC CO
ENGRG SOCIETIES LIBRARY
• ESSEX INTERNATIONAL INC
• FAGERSTA INC
THE FALK CORP
• GENERAL DYNAMICS CORP
GENERAL ELECTRIC CO
GENERAL ELECTRIC CO
GENERAL ELECTRIC CO
GENERAL ELECTRIC CO
GENERAL ELECTRIC CO
GENERAL ELECTRIC CO
GENERAL ELECTRIC CO
GENERAL ELECTRIC CO
GENERAL MOTORS CORP
GENERAL MOTORS CORP
GENERAL MOTORS CORP
GOODYEAR AEROSPACE CORP
• GORTON MACHINE CORP
GOULD INC
GREDE FOUNDRIES INC
• HAMMILL CO
• HANSEN MACHINE COMPANY
• HIGH VOLTAGE ENGRG CORP
INDUSTRIAL TOOL & MCH CO
THE INGERSOLL MILL MACH

IDAHO FALLS, ID
ROBINS AFB, GA
WRT-PTSRN AFB, OH
WRT-PTSRN AFB, OH
WRT-PTSRN AFB, OH
WRT-PTSRN AFB, OH
WRT-PTSRN AFB, OH
MARVEY, IL
YORK, PA
CLEVELAND, OH
CINCINNATI, OH
LANCASTER, PA
ST LOUIS, MO
NEW BERLIN, WI
LOWELL, MA
RICHMOND, IN
STRAITFORD, CT
RINGWOOD, NJ
ALLIANCE, OH
BEAVER FALLS, PA
COLUMBUS, OH
RICHLAND, MA
NORTH ANDOVER, MA
BELOIT, WI
UTICA, NY
CINCINNATI, OH
CICERO, IL
PAOLI, PA
ELK GROVE, IL
DAYTON, OH
NEW ORLEANS, LA
CINCINNATI, OH
CINCINNATI, OH
CINCINNATI, OH
ANN ARBOR, MI
TOLEDO, OH
CHICAGO, IL
GOLDEN, CO
PITTSBURGH, PA
COLUMBUS, IN
PITTSBURGH, PA
BELLEFONTAIN, OH
BANKING, CA
MIDDLETOWN, OH
CINCINNATI, OH
WILMINGTON, DE
PAINESVILLE, OH
MAYSVILLE, KY
NEW YORK, NY
UNION CITY, IN
WEST CALDWELL, NJ
MILWAUKEE, WI
ST LOUIS, MO
CINCINNATI, OH
CINCINNATI, OH
CLEVELAND, OH
ERIE, PA
LOUISVILLE, KY
SCHENECTADY, NY
SCHENECTADY, NY
ANDERSON, IN
FLINT, MI
INDIANAPOLIS, IN
SANDUSKY, OH
AKRON, OH
RACINE, WI
CLEVELAND, OH
MILWAUKEE, WI
TOLEDO, OH
GARDEN GROVE, CA
BURLINGTON, MA
ESMOND, RI
ROCKFORD, IL

INTERNATIONAL HARVESTER
IRON AGE MAGAZINE
JONES & LAPSON
• KAYWALT MFG CO
• KEENE STATE COLLEGE
KELSEY-HAYES CO
KLIK INDUSTRIES
• KRAFFT CUSTOM GRINDING
LATROBE STEEL CO
LING-TEMCO-VOUGHT INC
• LITERATURE RESRON ASSOC
LOCKHEED AIRCRAFT CORP
LODGE & SHIPLEY CO
• LUKENS STEEL CO
• MANGANESE STEEL FORGE CO
MARTIN MARIETTA CORP
MASTER CHEMICAL CORP
• MC CULLOCH INDUS, INC
MC DONNELL DOUGLAS CORP
MC DONNELL DOUGLAS CORP
MC DONNELL DOUGLAS CORP
MICHIGAN TECH UNIV
• MINNESOTA MINING & MFG
• MINNESOTA MINING & MFG
• MOBIL OIL CORPORATION
MONARCH MACHINE TOOL CO
• KASCO ENGINEERING INC
NATIONAL AEROSPACE ADM
• NATIONAL AEROSPACE ADM
NATIONAL AUTOMATIC TL CO
• NATIONAL BUREAU STANDARDS
NATIONAL LEAD CO
NATIONAL LEAD CO OF OHIO
DEPT OF THE NAVY
• DEPT OF THE NAVY
NORTH AMERICAN ROCKWELL
NORTH AMERICAN ROCKWELL
NORTH AMERICAN ROCKWELL
PEARL EQUIPMENT CO
• ROBERT G PETIT
POLYMET CORPORATION
PRATT & WHITNEY AIRCRAFT
• RAY M PRATT SPEC TOOL
• PRECISE TOOL & ENGRG CO
• PRECISION TOOL & DIE
PRODEX COMPANY INC
R S C ASSOCIATES
REX CHAINBELT INC
ROCKWELL MFG CO
JOS T RYERSON & SON INC
• SEALED POWER CORP
• SHANKMAN ASSOCIATES
SMALL BUSINESS ADMIN
SMALL BUSINESS ADMIN
SMALL BUSINESS ADMIN
SMALL BUSINESS ADMIN
SMALL BUSINESS ADMIN
SMALL BUSINESS ADMIN
• PAUL G SPAULDING ASSOC
• ST JOE MINERALS CORP
STRUCTURAL DYNAMICS RES
• SUNDRAND CORP
• TEK INC
TOOL SALES & SERVICE
TRW INC
TRW INC
TWIN CITY TOOL COMPANY
U S STEEL CORP
UNION CARBIDE CORP
UNITED AIRCRAFT CORP
UNIVERSITY OF VERMONT
• VORTEC CORPORATION
WALKER MACHINERY CO
• WARNER GEAR COMPANY
• WEBSTER ELECTRIC
WENDT-SONIS UNIMET
WEST MILTON PREC TOOL CO
• WESTINGHOUSE ELECTRIC
WESTINGHOUSE ELECTRIC
WHEELLOCK LOVEJOY & CO
WILLEYS CARBIDE TOOL CO

SAN DIEGO, CA
BALA-CYNWYD, PA
SPRINGFIELD, VT
DAYTON, OH
KEENE, NH
SPRINGFIELD, OH
PORTLAND, CT
SPRINGFIELD, OH
LATROBE, PA
DALLAS, TX
DURHAM, NH
SUNNYVALE, CA
CINCINNATI, OH
CINCINNATI, OH
PHILADELPHIA, PA
DENVER, CO
PERRYSSBURG, OH
MINNEAPOLIS, MN
LONG BEACH, CA
SANTA MONICA, CA
ST LOUIS, MO
DOUGHTON, MI
ST PAUL, MN
ST PAUL, MN
PAULSBORO, NJ
SIDNEY, OH
EL SEGUNDO, CA
CLEVELAND, OH
HOUSTON, TX
RICHMOND, IN
WASHINGTON, DC
ALBANY, NY
CINCINNATI, OH
INDIANAPOLIS, IN
QUONSET POINT, RI
CANOGA PARK, CA
LOS ANGELES, CA
TULSA, OK
NASHVILLE, TN
N TERRE HAUTE, IN
CINCINNATI, OH
EAST HARTFORD, CT
DAYTON, OH
LEES SUMMITT, MO
SHREVEPORT, LA
CHERRY HILL, NJ
CLINTON, NY
DOWNERS GROVE, IL
PITTSBURGH, PA
CHICAGO, IL
MUSKOGEE, MI
ANN ARBOR, MI
BALA-CYNWYD, PA
BOSTON, MA
DALLAS, TX
JACKSON, MS
MINNEAPOLIS, MN
NEW YORK, NY
SYRACUSE, NY
MONACA, PA
CINCINNATI, OH
AMES, IA
DAYTON, OH
CINCINNATI, OH
CLEVELAND, OH
DANVILLE, PA
OLATHE, KS
HOMESTEAD, FL
OAK RIDGE, TN
EAST HARTFORD, CT
BURLINGTON, VT
CINCINNATI, OH
CINCINNATI, OH
MUNCIE, IN
RACINE, WI
ROGERS, AR
VANDALIA, OH
MEDIA, PA
PHILADELPHIA, PA
PITTSBURGH, PA
CINCINNATI, OH
DEARBORN, MI

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POTENTIAL FOR MDC SERVICES TO INDUSTRY

STATISTICAL SUMMARY OF METALWORKING PLANTS PARTIAL LIST FROM DUN & BRADSTREET METALWORKING, DIRECTORY 1972		MDC SUMMARY OF INQUIRIES FOR 8 SIC GROUPS OCTOBER 1, 1971 - JULY 31, 1972			
STANDARD INDUSTRIAL CLASSIFICATION (SIC) NUMBER & INDUSTRY CLASSIFICATION	MAJOR PRODUCT MANUFACTURED NO. OF COMPANIES*	NO. OF INDIVIDUALS	NUMBER OF MDC COMPANIES	NUMBER OF MDC INQUIRERS	TOTAL INQUIRIES
MAJOR GROUP 19 ORDNANCE & ACCESSORIES	131	124,619	3	5	6
MAJOR GROUP 37 - TRANSPORTATION EQUIPMENT SIC INDUSTRY NO.					
3721 - AIRCRAFT & MISSILES	72	266,006	6	7	7
3722 - AIRCRAFT ENGINES & PARTS	126	143,162	8	13	14
3729 - AIRCRAFT PARTS & AUXILIARY EQUIPMENT	398	112,866	3	3	3
MAJOR GROUP 33 - PRIMARY METAL INDUSTRIES	3,580	1,172,228	16	16	17
MAJOR GROUP 34 - FABRICATED METAL PRODUCTS, EXCEPT ORDNANCE, MACHINERY & TRANSPORTATION EQUIPMENT	9,329	1,221,162	6	8	8
MAJOR GROUP 35 - MACHINERY, EXCEPT ELECTRICAL	9,520	1,749,256	53	61	80
MAJOR GROUP 36 - ELECTRICAL MACHINERY, EQUIPMENT & SUPPLIES	5,135	1,669,035	9	13	19
TOTAL	28,291	6,458,334	104	126	154

* 20 or more employees

DESCRIPTION OF MDC DATA PUBLICATIONS

October 1, 1971 - July 31, 1972

DESCRIPTION & CONTENT	NO. OF COPIES DISSEMINATED	SALES INCOME
AFMDC 65-1, MACHINING DATA FOR TITANIUM ALLOYS, AUGUST 1965 Turning, Face Milling, End Mill Slotting, Peripheral End Milling, Drilling, Reaming, Tapping, Broaching, and Surface Grinding for Commercially Pure Titanium, Alpha & Alpha-Beta, and Beta Alloys.	58	\$ 87.00
AFMDC 66-1, MACHINING DATA FOR NUMERICAL CONTROL, DECEMBER 1966 Contains all the data originally printed in the 7 individual reports, AFMDC 66-1.1 through 66-1.7	66	438.00
AFMDC 66-2, GRINDING RATIOS FOR AEROSPACE ALLOYS, JUNE 1966 Surface Grinding of Alloy Steels, Ultra-High Strength Steels, Tool Steels, Stainless Steels, Titanium Alloys, High Temperature Alloys, Refractory Alloys, and Nonmetals.	35	35.00
AFMDC 66-3, MACHINING DATA FOR BERYLLIUM METAL, JUNE 1966 This booklet covers problems involved in machining beryllium, in addition to specific data for 10 conventional operations and 4 alternate machining methods.	78	68.00
AFMDC 68-1, DETERMINATION AND ANALYSIS OF MACHINING COSTS AND PRODUCTION RATES USING COMPUTER TECHNIQUES, AUGUST 1968 This data publication describes a practical approach to the problem of obtaining machining costs and production rates. It includes equations, numerous computer calculations, and computer source program listings.	63	219.00
AFMDC 68-2, 1968 SUPPLEMENT TO MACHINING DATA FOR NUMERICAL CONTROL, AUGUST 1968 This supplement is a companion volume to Machining Data for Numerical Control (AFMDC 66-1). Machining data are presented for the newer aerospace materials.	50	150.00
AFMDC 70-1 MACHINING OF HIGH STRENGTH STEELS WITH EMPHASIS ON SURFACE INTEGRITY, JUNE 1970 This book was prepared from data collected on various high temperature alloys and both conventional and nonconventional machining operations. The emphasis in the presentation of machining data and information is on providing guidelines for maintenance of high surface quality and in particular high surface integrity.	68	1,020.00
USAF MACHINABILITY REPORTS, VOL. 1 thru 4	10	185.00
MACHINING DATA HANDBOOK, 2nd Edition	1,877	85,695.00
TOTAL	2,305	87,897.00

MDC OPERATING COSTS

October 1, 1971 - July 31, 1972

INPUT COSTS	
TECHNICAL EVALUATION	\$25,975.43
DATA PROCESSING	19,407.69
DOCUMENT ACQUISITION & REPRODUCTION	5,126.95
	<u>50,510.07</u>
EQUIPMENT, SUPPLIES & SERVICES	9,431.71
TOTAL	\$59,941.78
OUTPUT COSTS	
INQUIRIES	
TECHNICAL EVALUATION	\$10,844.80
DATA PROCESSING & RETRIEVAL	502.84
DATA ACQUISITION & REPRODUCTION	744.59
	<u>12,092.23</u>
DATA PUBLICATIONS COMPLETED & IN PROCESS	27,639.49
MACHINING DATA HANDBOOK	71,312.55
EQUIPMENT, SUPPLIES & SERVICES	5,702.89
	<u>104,654.93</u>
TOTAL	\$116,747.16
GENERAL DISSEMINATION	
GENERAL DISSEMINATION OF MACHINABILITY DATA AND CENTER INFORMATION	\$16,417.42
EQUIPMENT, SUPPLIES & SERVICES	1,316.05
TOTAL	<u>\$17,733.47</u>
REPORTS	
MDC, MSD AND INFORMATION BRANCH MEETINGS, ETC.	\$ 6,984.60
EQUIPMENT, SUPPLIES & SERVICES	21,133.34
TOTAL	<u>\$10,932.76</u>
SYSTEMS ANALYSIS, MODIFICATION & CONTROL	
TECHNICAL EVALUATION	\$ 127.14
TECHNICAL & SYSTEMS ASPECTS	21,133.34
	<u>21,260.48</u>
EQUIPMENT, SUPPLIES & SERVICES	1,535.39
TOTAL	<u>\$22,795.87</u>
TOTAL ACTUAL COSTS NOT INCLUDING FIXED FEE (10/1/71-7/31/72)	\$228,151
TOTAL ACTUAL COSTS NOT INCLUDING FIXED FEE (10/1/70-9/30/71)	201,480
TOTAL COSTS FOR CONTRACT PERIOD	<u>\$429,631</u>
CREDIT FOR REVENUE FROM SALE OF DATA PRODUCTS	138,042
NET COST PER CONTRACT	<u>\$291,589</u>

AS OF JULY 31, 1972, \$70,800 REVENUE HAS BEEN ACTUALLY BILLED -
THE REMAINING \$67,242 WILL BE REALIZED FROM THE SALE OF THE
REMAINING 2,870 BOOKS ON HAND JULY 31, 1972.

ESTIMATED COST SAVINGS RESULTING FROM MDC'S OPERATION

OCTOBER 1, 1964 - JULY 31, 1972

COST SAVINGS RESULTING FROM MDC'S

RESPONSE TO SPECIFIC INQUIRIES

Total Number of Specific Inquiries 6,793

Estimated Total Number of Machining Situations Included in the 6,793
Inquiries - 33,965

Estimated Savings per Machining Situation Response - \$800.00

Estimated Total Savings Resulting from Specific Inquiries - 33,965
Machining Situations x \$800.00 = \$27,172,000.00

COST SAVINGS RESULTING FROM MDC'S 14 DATA PUBLICATIONS

Total Number of Data Publications Copies Distributed - 21,599

Estimated Number of Machining Situations Utilized per Data Publications
Copy - 5

Estimated Total Number of Machining Situations - 21,599 Data Publication
Copies x 5 - 107,995

Estimated Savings per Machining Situation - \$300.00

Estimated Total Savings Resulting from Data Publications - 107,995 Machining
Situations x \$300.00 = \$32,398,500.00

TOTAL ESTIMATED COST SAVINGS RESULTING FROM MDC'S OPERATION

\$59,570,500.00

ECONOMIC ENVIRONMENT FOR MDC OPERATIONS

(ANNUAL COSTS)

Labor and Overhead Costs for Operating Metal Cutting Machine Tools in the United States

Total number of metal cutting machine tools in the metalworking industries	=	2,500,000*
Average labor cost + overhead	=	\$8.00 per hour
Average working day	=	8 hours
Number of working days per year	=	250
Average number of direct labor personnel per machine	=	1
Total cost of labor + Overhead: 2,500,000 x \$8.00 x 8 x 250 x 1	=	\$40,000,000,000

\$40,000,000,000

*Based on American Machinist Tenth Inventory (1968)

Total Shipments Including Exports of Metal Cutting Type Metalworking Machinery

\$1,097,718,000

Source: U.S. Department of Commerce (1970)

Machine Tool Accessories Industry

Small cutting tools for machine tools and metalworking
machinery in the amount of \$670,000,000, includes
\$45,500,000 for tool holders.

Source: U.S. Department of Commerce (1970)

NDC INPUT & OUTPUT SUMMARY

SYSTEM INPUT

October 1, 1964 - July 31, 1972

Document and Card Totals

Documents Entered into the System (including Specific Inquiries)

Oct. 1, 1964 - Jan. 31, 1967	17,576
Feb. 1, 1967 - Jan. 31, 1968	3,695
Feb. 1, 1968 - Sept. 30, 1968	2,341
Oct. 1, 1968 - July 31, 1969	3,316
Aug. 1, 1969 - Sept. 30, 1970	5,638
Oct. 1, 1970 - Sept. 30, 1971	3,408
Oct. 1, 1971 - July 31, 1972	1,525
Total	37,499

Evaluated Documents (including Specific Inquiries)

Oct. 1, 1964 - Jan. 31, 1967	9,367
Feb. 1, 1967 - Jan. 31, 1968	3,734
Feb. 1, 1968 - Sept. 30, 1968	2,840
Oct. 1, 1968 - July 31, 1969	3,780
Aug. 1, 1969 - Sept. 30, 1970	7,522
Oct. 1, 1970 - Sept. 30, 1971	2,649
Oct. 1, 1971 - July 31, 1972	2,226
Total	32,118

Total Cards Punched

Oct. 1, 1964 - Jan. 31, 1967	75,173
Feb. 1, 1967 - Jan. 31, 1968	27,077
Feb. 1, 1968 - Sept. 30, 1968	13,833
Oct. 1, 1968 - July 31, 1969	33,868
Aug. 1, 1969 - Sept. 30, 1970	27,054
Oct. 1, 1970 - Sept. 30, 1971	11,316
Oct. 1, 1971 - July 31, 1972	9,491
Total	197,812

SYSTEM OUTPUT

Data Publications

Copies
Distributed

AFMDC 65-1, Machining Data for Titanium Alloys	6,334
AFMDC 66-1, Machining Data for Numerical Control	1,193
AFMDC 66-2, Grinding Ratios for Aerospace Alloys	1,156
AFMDC 66-3, Machining Data for Beryllium Metal	1,554
AFMDC 68-1, Determination & Analysis of Machining Cost & Production Rates Using Computer Techniques	1,149
AFMDC 68-2, 1968 Supplement to Machining Data for Numerical Control	897
AFMDC 70-1, Machining of High Strength Steels with Emphasis on Surface Integrity	582
USAF Machinability Reports, Vol. 1 thru 4	79
Machining Data Handbook, 2nd Edition	1,877

**NBC VISITS FOR ACQUISITION AND
DISSEMINATION OF MACHINABILITY INFORMATION**

October 1, 1971 - July 31, 1972

THE MACHINING CONFERENCE - Participated
The Cleveland State University - Division of Continuing Education
Cleveland, Ohio
November 2, 1971

FIELD TRIP FOR DISSEMINATION OF INFORMATION
Southern California Aerospace Contractors
February 20-25, 1972

DSA-NTIS-IAC CONFERENCE - Participated
Sponsored by Defense Supply Agency
NTIS Headquarters
Alexandria, Virginia
March 7-8, 1972

WESTEC THE THIRD AIR FORCE METALWORKING CONFERENCE - Participated
Los Angeles, California
March 13-17, 1972

SME INTERNATIONAL ENGINEERING CONFERENCE AND TOOL EXPOSITION - Attended
Chicago, Illinois
April 24-28, 1972

7th ANNUAL OHIO VALLEY INTERNATIONAL TRADE CONFERENCE - Attended
Cincinnati, Ohio
April 28, 1972

AMERICAN SOCIETY FOR INFORMATION SCIENCE REGIONAL CONFERENCE - Attended
Theme: Cost Reduction in Information Systems
University of Dayton
Dayton, Ohio
May 19-21, 1972

NATIONAL SYMPOSIUM ON TECHNOLOGY TRANSFER - Participated
Washington, D. C.
June 12-16, 1972

SYMPOSIUM: SURVIVAL AND GROWTH: THE SMALL R&D FIRM - Attended
Washington, D. C.
June 12-16, 1972