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SEVENTEENTH ANNUAL REPORT ON THE DEFENSE METALS INFORMATION CENTER (17th)

OCTOBER 1, 1970 TO JULY 31, 1971,

(9) Final Rept.,

(10) H. DANA MORAN

DIRECTOR, DEFENSE METALS INFORMATION CENTER

(11) Feb 72

(12) 113 p.

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AIR FORCE MATERIALS LABORATORY
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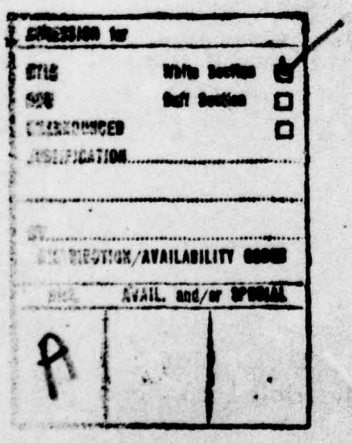
SEVENTEENTH ANNUAL REPORT

on the

DEFENSE METALS INFORMATION CENTER

October 1, 1970, to July 31, 1971

H. Dana Moran, Director



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FOREWORD

The following report was prepared by Battelle Memorial Institute, Columbus (Ohio) Laboratories, under Contract Number F33615-71-C-1067. The program was conducted under Project Number 8975, "Defense Metals Information Center (DMIC)". The work was administered by the Air Force Materials Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio with Mr. Barry Emrich, LAM, as Project Engineer.

The report constitutes the final report under the above contract for the period October 1, 1970 through July 31, 1971. The report was submitted to AFML for review and approval prior to publication.

The work described represents the collective effort of the entire staff of the Defense Metals Information Center and various technical specialists of Battelle's Columbus Laboratories.

This technical management report has been reviewed and is approved.

Edward Dugger, Chief
Materials Information Branch
Materials Support Division
Air Force Materials Laboratory

ABSTRACT

The following report summarizes the activities of the fourteenth annual period of the Defense Metals Information Center (DMIC), the seventeenth year of operations including the predecessor, Titanium Metallurgical Laboratory, established at Battelle in January 1955. Because the DMIC contract in this instance initiated on September 16, 1970, this report covers the remaining period of FY 71 and July 1971, 10-1/2 months, rather than the usual 12 months.

DMIC continued in its objective of providing to industry and Government timely, authoritative information services on a variety of advanced metals and related processes. These services included response to technical inquiries, issuance of regular newsletters summarizing recent developments, and publication of a series of technical reports, memoranda, notes, and other literature. Reductions in the level of funding combined with increases in operating costs were reflected in a general decrease in output during the fiscal period.

During the contract period reported herein, DMIC continued its conversion to computerized storage and retrieval of technical information. First steps were taken in the introduction of charges for DMIC services, including the sale of publications to the general public. A variety of special studies were undertaken for ODDRE, the Department of Commerce, the Air Force, and The Technical Cooperation Program (TTCP).

Effective July 1, 1971, the scope of the DMIC contract was expanded to include the coverage of ceramic materials previously assigned to the Defense Ceramic Information Center (DCIC), the contract for which terminated that date. As of August 1, 1971, the two Centers were formally merged into the present Metals and Ceramics Information Center (MCIC).

The activities of DMIC are discussed in detail, and statistical information on the operations of the Center is presented in this report.

(197 pp.)(9 fig.)(6 tbls.)(0 ref.)

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SEVENTEENTH ANNUAL REPORT
(October 1, 1970 to July 31, 1971)

INTRODUCTION

In 1955, the Office of the Secretary of Defense, concerned with the technical delays in utilization of titanium for military systems, established at Battelle the Titanium Metallurgical Laboratory (TML). Its purposes were to assist and advise the Defense Department and its contractors in the development and utilization of titanium. Three years later, the value of this program was well established, and in order to provide similar support to the utilization of the broader category of advanced metals, the scope of the program was expanded and retitled the Defense Metals Information Center (DMIC). In subsequent years, the services and resources of DMIC continued to expand; it now represents probably the largest single resource of professionally evaluated and analyzed technical information on the advanced metals and of skilled materials specialists in the free world.

This report, covering the activities of DMIC for the period October 1, 1970 through July 31, 1971, is submitted in compliance with the requirements of the present Air Force Contract F33615-71-C-1067. Although that contract initiated September 16, 1970, DMIC customarily reports progress on a calendar month basis, and the first fifteen days of the new contract period were included in the Sixteenth Annual Report.

Department of Defense Instruction 5100.45 (July 1964) defines 'Centers for Analysis of Scientific and Technical Information'. As one of the family of such centers supported by DoD, the basic function of DMIC is to provide a resource of authoritative information and advisory services, including state-of-the-art reports, critical reviews, reference data, and technical assistance to guide the military services and DoD contractors in the utilization of the advanced metals. The fundamental approach, which has made possible the record of superior service to the DMIC users, is to combine a sound, comprehensive information base with a pool of highly skilled specialists in all aspects of the metals within the Center's scope. Building on this foundation, DMIC has continued to adapt new methods for improving its services and expanding its resources. Although funding limitations and increases in operational costs necessitated some economies, DMIC has provided its sponsor and users with technical support of the highest quality.

On August 1, 1971, the Defense Metals Information Center was merged with the Defense Ceramic Information Center (also at Battelle), resulting in the new Metals and Ceramics Information Center (MCIC). That new program continues with similar objectives as DMIC, although of course with substantially expanded scope. Thus, although this is the final report on the DMIC program, its role as a primary source of authoritative information and data on advanced metals continues under the new aegis.

FUNCTIONS OF DEFENSE METALS INFORMATION CENTER

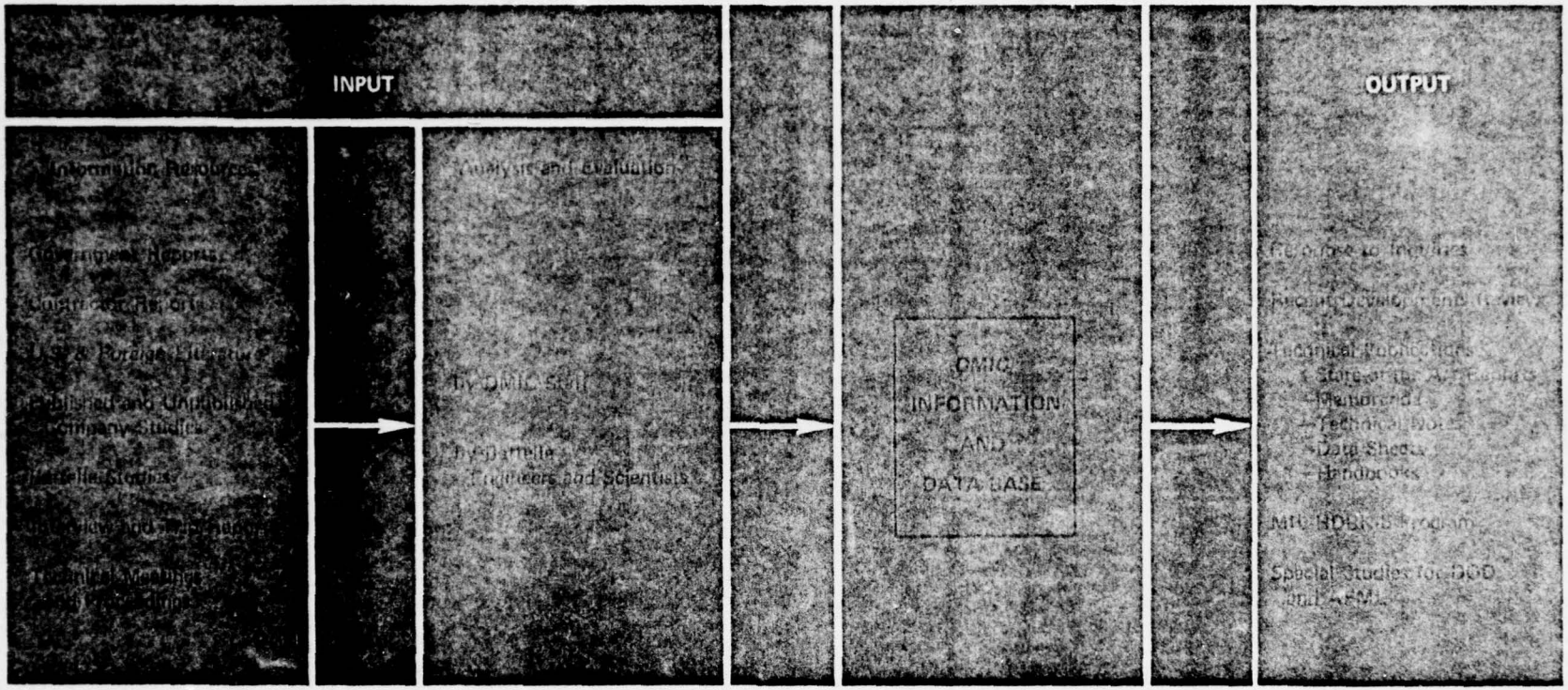


FIGURE 1.

PURPOSES AND SCOPE OF DMIC

The objective of DMIC has been to provide technical assistance and information to the Government, its contractors, and their suppliers on the following materials(1)

Titanium Beryllium Aluminum and Magnesium Refractory Metals High-Strength Steels Superalloys	and	Coatings to improve corrosion and oxidation resistance New metals which become of interest for structural applications or for use in space power systems, space vehicles, etc.

To accomplish these purposes, the DMIC program has consisted of four basic functions (Figure 1)

1. Maintenance of a comprehensive, up-to-date, usable Technical Information Base
2. Response to requests for technical advice and assistance from Government Agencies, contractors, and suppliers
3. Issuance of a series of timely Reviews of Recent Technical Developments on a variety of subjects within the DMIC scope
4. Publication of Technical Reports, Memoranda, and Notes, and related documents appraising the state of the art of metals and processes within the DMIC scope.

Through fiscal 1971, DMIC provided a direct avenue of support for the MIL-HDBK-5 "Metallic Materials and Elements for Aerospace Structures" program; in FY 71, prime responsibility for support of that program was reassumed by the Air Force Materials Laboratory.

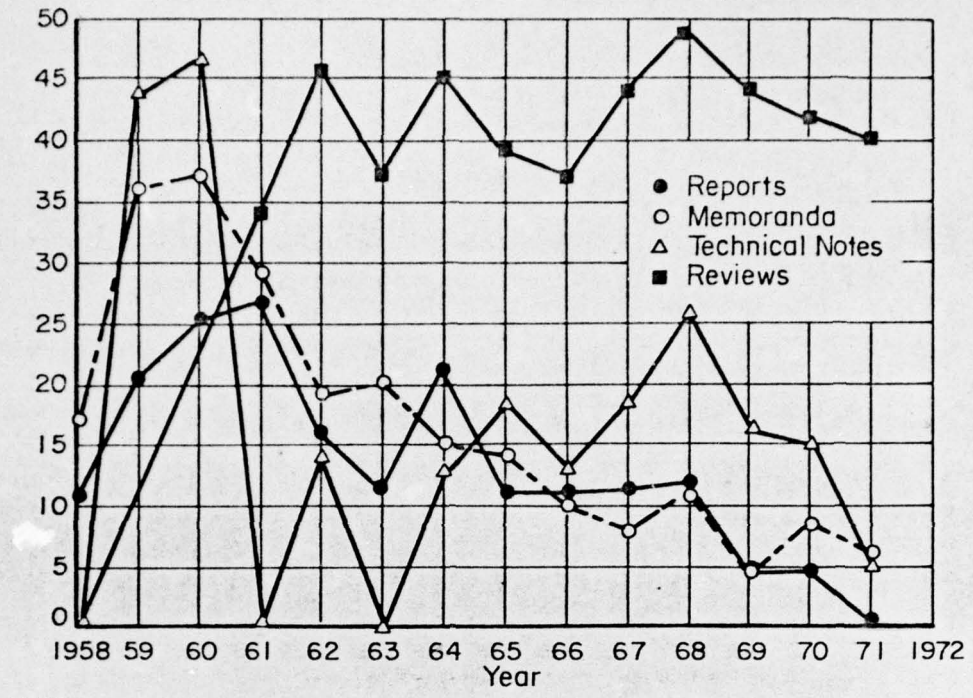
In addition, DMIC has frequently conducted special studies for its Air Force and DoD sponsors.

The products of DMIC operations during the past 14 years are summarized in Table 1 and discussed in detail in the following pages. Those same data are presented graphically in Figure 2.

PROJECT ORGANIZATION

Within Battelle's Columbus Laboratories, the DMIC Project is assigned to the Materials Information Division of the Materials Processing and Fabrication Department. The Defense

(1) For complete DMIC contractual Work Statement and Scope, see Appendix H; objectives of the new MCIC, in the fields of metals technology, are essentially the same, although the community it serves has been broadened.



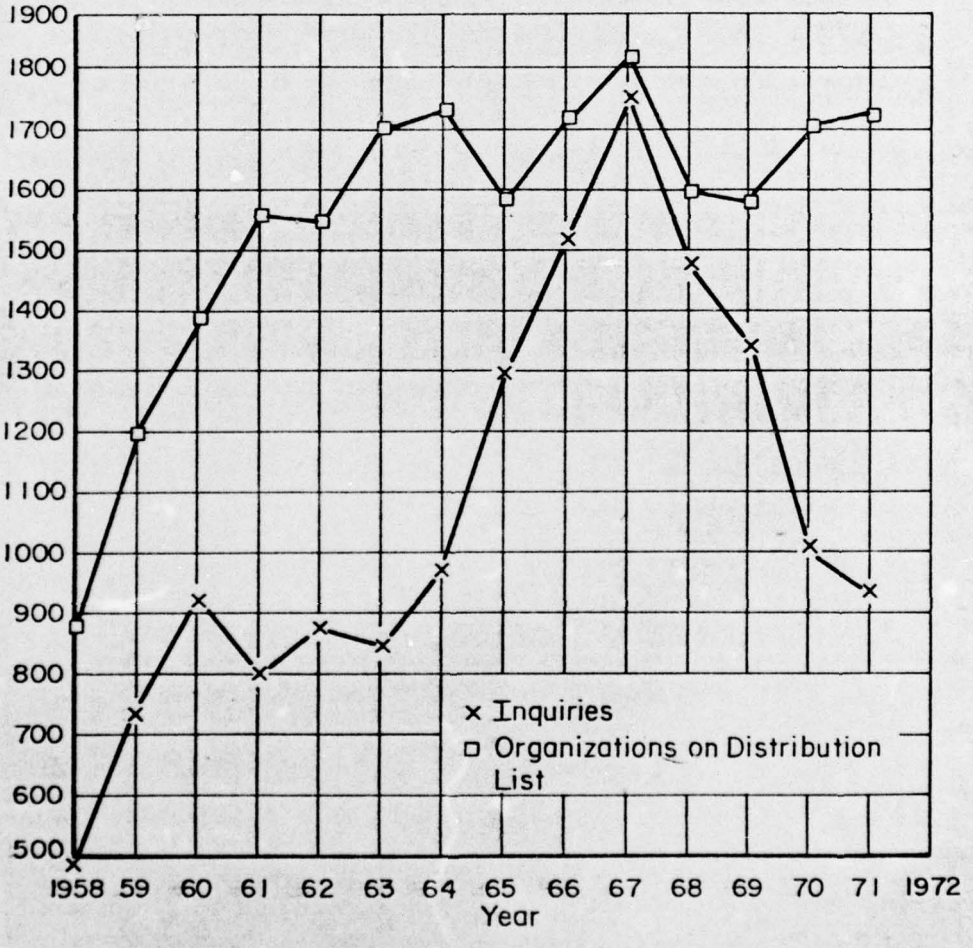


FIGURE 2. GRAPHIC CHARTS FOR PUBLICATIONS OF DMIC, INQUIRIES, AND DISTRIBUTION

TABLE 1. SUMMARY OF DMIC ACTIVITIES FOR 14 YEARS

	1958	1959	1960	1961	1962	1963*	1964	1965	1966	1967	1968	1969	1970**	1971*
Technical Reports	12	18	24	26	17	11	21	12	11	9	3	1	1	0
Special Reports	--	3	1	2	--	2	1	--	1	4	11	3	3	2
Handbooks	--	--	--	--	--	--	--	--	--	2	3	--	--	1
Technical Memoranda	17	36	37	29	19	20	15	14	10	8	11	4	8	6
Technical Notes	--	44	47	--	14	--	13	18	13	18	26	16	15	5
Quarterly Reviews	--	--	--	34	46	37	45	39	37	44	48	44	42	40
Data Sheets	--	--	--	--	--	--	--	--	147	442	188	232	17	--
Technical Inquiries														
Number	490	744	938	900	882	855	979	1302	1529	1761	1490	1351	1018	942
Organizations	270	393	381	406	421	382	453	462	553	550	517	477	350	338
Nontechnical Inquiries	1140	1680	2400	3840	9621	2733	3146	2813	2528	2677	2806	1795	1569	1476
Visitors to DMIC														
Individuals	183	232	288	202	175	196	121	121	127	355	121	74	44	40
Organizations	97	138	102	112	98	102	86	85	86	88	80	43	35	28
Visits by DMIC Personnel														
Individual Visits	457	397	385	215	271	245	274	256	266	211	221	251	194	233
Organizations	225	243	203	114	145	168	170	167	155	144	163	126	119	109
Documents Added to DMIC Files	--	4922	4793	4912	4406	4744	4283	4586	4091	4162	2774	3039	2453	2021
Documents Added to Data Files	--	--	--	--	--	--	--	--	--	739	743	513	--	--
Distribution of Reports														
Individuals	1573	2372	2660	2965	2999	3296	3616	3190	3416	3721	3372	3506	3609	3689
Industrial Organizations	657	870	1048	1197	1169	1307	1318	1204	1315	1401	1261	1209	1303	1321
Government Agencies	222	330	349	367	383	402	420	393	411	407	342	381	398	413

*11-month period.
**10-month period.

Ceramic Information Center is assigned to the same Division. The permanent staff consists of sixteen people, eight in the Coordination Office and eight in the Information Operations. This staff is supplemented, as needed, by part-time technical and clerical employees from the Battelle organization. The basic Project management structure is outlined in Figure 3 below.

DEFENSE METALS INFORMATION CENTER

MANAGEMENT ORGANIZATION

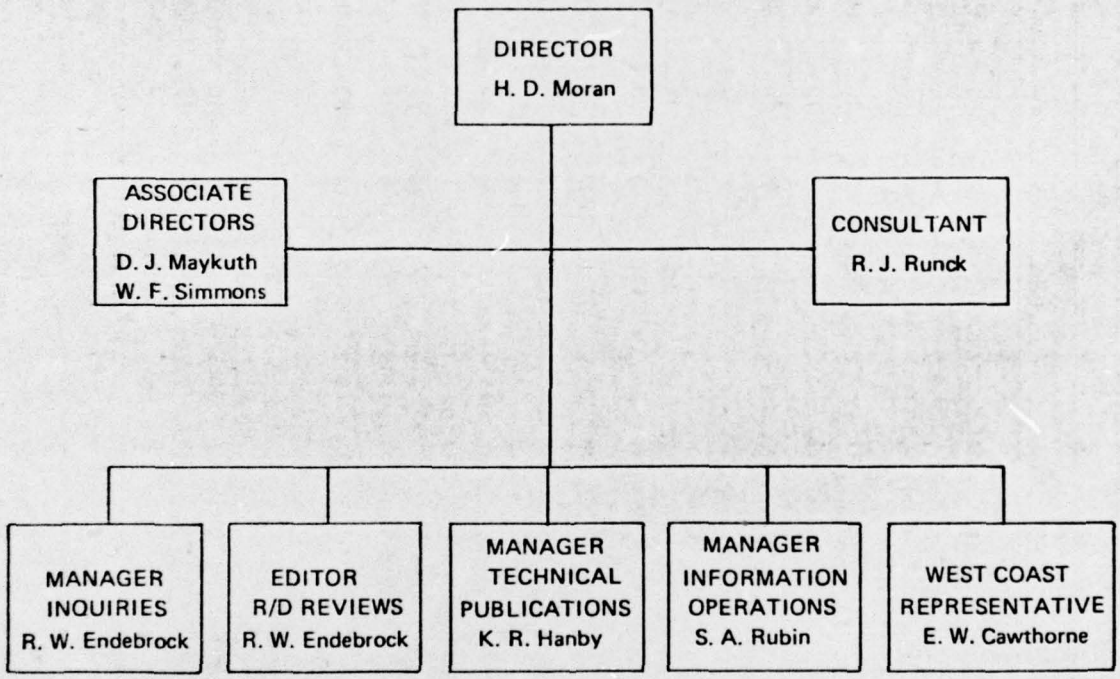


FIGURE 3.

An important aspect of the program is the close working relationship DMIC enjoys with many of its major users. This 'give-and-take' association -- DMIC giving technical assistance, receiving timely information and intelligence -- has contributed significantly over the years to the Center's ability to fulfill its objectives. Since the aerospace industry is both the largest user group and one of the best resources of unpublished information and current experience, DMIC maintains a full-time representative on the West Coast, based in Battelle's Long Beach facility. Similar liaison with companies in the east is maintained by the staff in Columbus.

Early in the contract period, plans were implemented for the establishment of a DMIC Advisory Panel. A dozen prominent members of the materials community, from both government and industry, agreed to assist on a voluntary basis. However, shortly after the initial arrangements had been completed, ODDRE announced plans for major changes in the direction and structure of the information analysis programs. In view of the then unknown effect of those changes, formalization of the Advisory Panel was indefinitely delayed. However, the volunteer members of this still-unofficial group have been of considerable assistance in providing advice and recommendations on an individual basis.

PROFESSIONAL AND TECHNICAL RESOURCES

That primary factor in the DMIC operational plan which constitutes its greatest strength, and which distinguishes it from many other information centers, is the use of engineers and scientists throughout the Battelle staff for the preparation of technical output. More than 100 metallurgists, physicists, engineers, chemists, and chemical engineers, each an authority in his own field of specialty, are available to DMIC to provide competent response to technical inquiries and to prepare state-of-the-art studies for DMIC publication (Figure 4).

During the period of this report, some 100 Battelle engineers and scientists worked an average of 10 to 15 percent of their time for DMIC. These specialists are engaged for the majority of their time in research and development projects for industrial and Government sponsors. Thus, they retain contemporary involvement with changing technologies and, when responding to inquiries or preparing studies for DMIC, are able to contribute the latest and best advice. Appendix G lists both the full-time and part-time personnel who supported the program during the past 10 months.

INFORMATION OPERATIONS

The first of the four basic functions of DMIC is the maintenance of an up-to-date, authoritative information base with comprehensive coverage of the materials in the Center's scope. The files serve as the basic reference tool for DMIC engineers, as a resource for literature searches, as a reference base for visiting researchers, and as a vital, detailed record of the development of metals technology in the United States during the past two decades. Since 1955, more than 80,000 reference documents have been reviewed, evaluated, extracted, and indexed, resulting in the largest collection of its kind in this country.

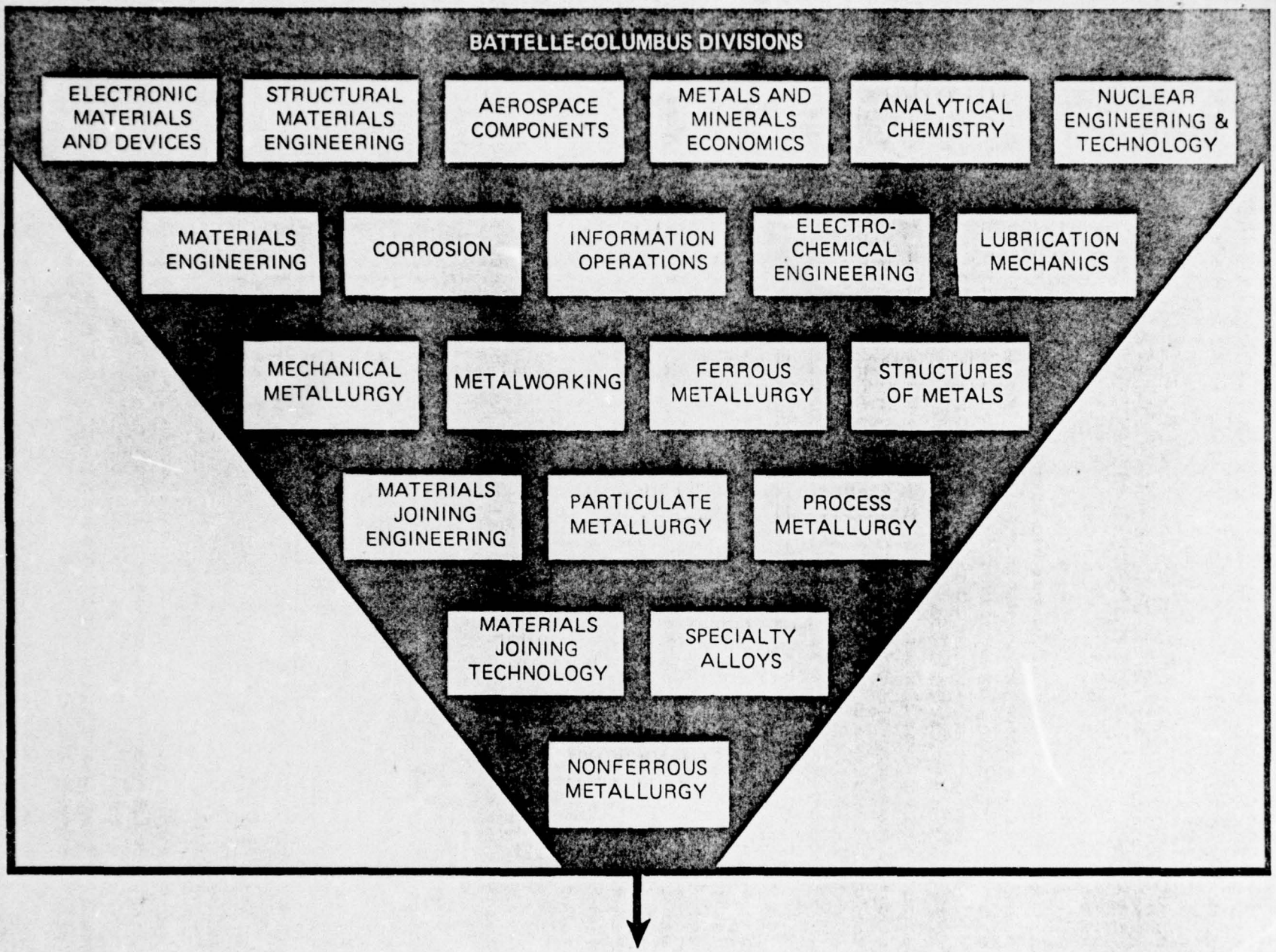


FIGURE 4

More than 100 Battelle engineers and scientists in the Columbus Laboratories' research divisions provide technical consulting services to the Defense Metals Information Center

An important and somewhat unique feature of the DMIC reference files is the inclusion of a variety of significant information not available in the open literature. Through the excellent cooperation of DMIC users and correspondents in industry, the Center's staff has access to many internal reports and memoranda, IRAD reports, personal communications, and unpublished data which contribute importantly to total information resource. An essential factor in this asset is the assurance that DMIC will observe proprietary restraints on the release of such information.

The maintenance of DMIC's Information Base consists of five basic steps

1 Identification and accession of pertinent reference information

2 Technical review and evaluation

3 Extraction of the elements of the reference useful to the purposes of DMIC

4 Processing and storage of the extracted information, with appropriate identification data and retrieval clues

5 Search and retrieval of needed information and data.

Collection

A current, comprehensive resource of technical information and data in a form readily usable by engineers and scientists is essential to the performance of an information analysis center. The criteria of timeliness and quality relate directly to DMIC's purpose, which is to identify, analyze, and disseminate the very latest in technical information judged important to the defense community. DMIC is geared to meet the needs of users expert in their fields, and our collection program is similarly oriented.

There has been no important change in the program for collecting information since this was described in the Sixteenth Annual Report.

Table 2 shows the relationship over the past five years in the makeup of input. While there has been a slight change in composition from 1970, the figures are exceptionally consistant over the period covered. Report literature constitutes 61.5 percent of the Center input; journal articles 24.3 percent; papers presented at technical meetings 9.1 percent; internal DMIC papers (such as letters and trip reports) 2.6 percent and other miscellaneous items 2.4 percent.

The total number of documents selected for inclusion into the technical files decreased approximately 19 percent during the past year. Since the contract period was for 10 months, rather than the 12 months summarized in previous statistics, Table 3 includes a projection of input to a full-year rate equivalent.

TABLE 2. PROFILE OF DMIC COLLECTION, PERCENT

	1971	1970	1969	1968	1967
Reports	61.5	57.6	62.6	63.4	62.8
Journal Articles	24.3	32.1	23.9	21.1	24.6
Papers from Meetings	9.1	7.5	10.0	11.1	7.8
Internal Papers	2.6	2.0	2.2	2.9	2.1
Miscellaneous	2.4	0.8	1.3	1.5	2.7

TABLE 3. PERTINENT ACCESSIONS

Year	Total Accessions*	Reports	Articles	Papers	Internal Papers	Miscellaneous
1967	4162	2614	1024	325	87	112
1968	2611	1655	551	290	76	39
1969	3039	1902	726	304	67	40
1970**	2453	1414	788	184	49	18
1970***	2845	1640	914	213	57	21
1971**	2021	1244	491	184	53	49
1971***	2310	1422	561	210	61	56

*Exclusive of temporary items such as technical news releases in journals and newspapers.
**10-month period.
***Projected to reflect 12-month report period.

In comparison to 1969, there has been an input decrease of 24 percent. This very significant decrease is due in part to the drastic reduction in Government expenditures in research and development, and hence the reduction in government research reports generated. A significant reduction in journal articles accepted into the system is a result of a continuing emphasis on quality input and the rigorous criteria established for the acceptance of this type of input.

As of July 31, 1971, a total of 80,880 documents have been processed by DMIC. This figure does not include temporary items such as technical news releases which were processed into the files but to which accession numbers were not assigned.

Processing, Storing, and Retrieving Information

There have been no significant changes in the operation of the 'historic' DMIC files. The operation of these files has been described in detail previously (Tenth and Fourteenth Annual Reports).

Under supplement to the DMIC Contract (P0003), a two-phase program designed to compliment the Battelle-sponsored BASIS-70 system was initiated in December 1969. BASIS-70 is a highly sophisticated computerized information storage and retrieval system. It represents Battelle's newest and most sophisticated capability in the science of information handling. It is economically viable and completely user oriented. The system involves teletype or high-speed CRT terminals coupled to a time-shared computer housed at Battelle.

Phase 1. The first phase of the DMIC program was completed and described in the Sixteenth Annual Report. A search of the data base at that time resulted in a printout of pertinent document numbers. This capability was the objective of that first phase.

Phase 2. Using the DURA 1041 business machines, 1663 machine readable 'extracts' were produced in accordance with previously established formats. A complete description, including the 42 fields of information contained in the format, can be found in the DMIC Computer Input Format, Revision 1 (August 1970).

The paper-tape extracts have been converted to magnetic tape and run through several computer programs designed to produce a digitized version of the document. Using Snobol language, the magnetic tape is edited and checked for obvious inconsistencies; those items failing to meet certain predefined standards were rejected. The rejection rate has, so far, been less than three percent.

Index and header files were built for the 'working' data base of 2400 documents. These are searchable in precisely the same manner as the manual files. The advantage of performing searches based upon Boolean statements (and/or logic) will increase the speed and efficiency with which very specific information can be retrieved. A typical inquiry search request was to find available information on stainless steel-aluminum couples that are joined by diffusion bonding and/or brazing. Using a cathode-ray tube with an off-line print capability, Figure 5, presents a portion of that search. This is the output upon completion of Phase 2. Retrieval of information as contrasted to the identification of documents.

Due to the limited size of the data base, it has been difficult to carry out very meaningful evaluations. What has been successfully demonstrated, however, is the concept of a remote search capability and the dynamic interplay with the CDC-6400 computer.

```
                B A S I S   7 0
 (PHASE I)
IS ON LINE+


ENTER YOUR SEARCH REQUEST (ONE SEARCH TERM AT A TI
ME)
 1/
STAINLESS STEEL
     68 ITEMS
 2/
ALUMINUM
     79 ITEMS
 3/
BRAZING
     19 ITEMS
 4/

DIFFUSION BONDING
     23 ITEMS
 5/
STAINLESS STEEL-ALUMINUM COMPOSITE
      2 ITEMS
 6/
COMPOSITES
      7 ITEMS
 7/
(3 OR 4 AND 1 OR 2 OR 5 OR 6)
      4 ITEMS
ENTER YOUR SEARCH REQUEST (ONE SEARCH TERM AT A TI
ME)
 8/


(DISPLAY 7)
THE DATA ELEMENTS FOR THE DMICX DATA BASE ARE
 1-ACCESSION NUMBER.
 2-AUTHOR(S).
 3-CORP AUTHOR - LOCATION.
 4-TITLE.
 5-DOCUMENT TYPE.
 6-BIBLIOGRAPHY DATA.
 7-REFERENCE NUMBER(S).
 8-DATA DESCRIPTORS.
 9-EXTRACT.
   WHAT FIELDS DO YOU WANT TO SEE?
ENTER FIELD NUMBERS SEPARATED BY COMMAS OR ALL
/
ALL



ITEMS FROM THE DMICX DATA BASE ARE .....

ITEM   1
   ACCESSION NUMBER : 75669
   AUTHOR(S) : LIN. J. M.CHEN. P. E.DIBENEDET
    TO. A. T.
   CORP AUTHOR-LOCATION : MONSANTO RESEARCH CO
    RPORATION: ST. LOUIS. MISSOURI
   TITLE : TRANSVERSE PROPERTIES OF UNIDI
    RECTIONAL ALUMINUM MATRIX FIBROUS COMPOS
    ITES
   DOCUMENT TYPE : RP
   BIBLIOGRAPHIC DATA : RESEARCH REPORT. F:
    1969 AUGUST: ONR/ARPA: P: 14 PAGES. 2 TA
    BLES. 17 FIGURES. 15 REFERENCES: DISPOSI
    TION: SHELF: DR=UNLIMITED: DISPLAYABLE G
    RAPHICS: NO INDEXABLE DATA
   REFERENCE NUMBER(S) : REPORT NO. HPC 69-92
                N00014-67-C-0218
   DATA DESCRIPTORS : 6061.2024.BORON-ALUM
    INUM COMPOSITES.STAINLESS STEEL-ALUMINUM
     COMPOSITES.DIFFUSION BONDING.AGE HARDEN
    ING.ELASTIC MODULUS.TENSILE STRENGTHS.ST
    IFFNESS.STAINLESS STEEL

   EXTRACT:
   ...COMPOSITES WITH 4 MIL BORON FIBERS AND
    9 MIL STAINLESS STEEL FIBERS FABRICATED I
    NTO 6061 AND 2024 ALUMINUM MATRICES BY FI
    LAMENT WINDING AND DIFFUSION BONDING TECH
    NIQUES WERE USED TO STUDY THE COMPOSITE P
    ROPERTIES UNDER EXTERNAL LOADING. APPLIED
    TRANSVERSELY TO THE UNIDIRECTIONAL REINFO
    RCING FIBERS.....THE BORON-ALUMINUM COM
    POSITES WERE FABRICATED UNDER 10.000 PSI
    PRESSURE. APPLIED AT 900F FOR 3 HOURS.  T
    HE PRESSURE WAS APPLIED ONE-HALF HOUR AFT
    ER THE MAXIMUM EQUILIBRIUM FABRICATION TE
    MPERATURE WAS REACHED.  THIS DELAYED APPL
    ICATION OF BONDING PRESSURE IS TO ENSURE
    THAT THE MATRIX WILL FLOW EASILY AROUND

    THE REINFORCING FIBERS WITHOUT CAUSING FI
    BER BREAKAGE.  TO FABRICATE STAINLESS STE
    EL-ALUMINUM COMPOSITES. THE FOLLOWING THR
    EE BONDING TECHNIQUES WERE USED: 1. SOLID
    -STATE DIFFUSION BONDING WITH 10.000 PSI
    PRESSURE. APPLIED FOR 6 HOURS AT A TEMPER
    ATURE OF 2 10 5F BELOW THE SOLIDUS TEMPER
    ATURE OF THE ALUMINUM ALLOY. USED AS THE
    MATRIX.  2. BONDING FOR 4 HOURS UNDER A P
    RESSURE OF 8.000 PSI WITH THE TEMPERATURE
    PULSATING ABOVE AND BELOW THE SOLIDUS TEM
    PERATURE OF THE ALUMINUM ALLOY.  THE RANG
    E OF THIS PULSATING TEMPERATURE WAS APPRO
    XIMATELY 4F.  WHEN THE MATRIX TEMPERATURE
    WAS ABOVE THE SOLIDUS TEMPERATURE. THE PR
    ESSURE WAS REDUCED TO 1.000 PSI IN ORDER

    TO AVOID EXCESSIVE FLOW OR MOLTEN ALUMINU
    M ALLOY.  3. BONDING FOR 2 HOURS UNDER 2.
    000 PSI PRESSURE AT A TEMPERATURE SLIGHTL
    Y ABOVE THE LIQUIDUS TEMPERATURE OF THE A
    LUMINUM ALLOY. FOLLOWED BY 20 HOURS OF LO
    W TEMPERATURE HOMOGENIZING HEAT TREATMENT
    ....AGE HARDENING  ELASTIC MODULUS  TENSI
    LE STRENGTHS  STIFFNESS  CONCLUSIONS THE
    RESULTS OF THIS INVESTIGATION HAVE SHOWN
    THAT BOTH HEAT TREATMENT AND AGE HARDENIN
    G ENHANCE THE TRANSVERSE TENSILE STRENGTH
    OF A UNIDIRECTIONAL ALUMINUM MATRIX FIBRO
    US COMPOSITE, BUT HAVE LITTLE OR NO EFFEC
    T ON THE CORRESPONDING TRANSVERSE TENSILE
    MODULUS.  THE SURFACE CONDITION OF THE RE

    INFORCING FIBERS ALSO CONTRIBUTES SIGNIFI
    CANTLY TO THE COMPOSITE TRANSVERSE STRENG
    TH.  THE ASPERITIES ON THE SURFACE OF A B
    ORON FIBER HELP TO PROVIDE A BETTER INTER
    FACIAL BOND THAN THE SMOOTH SURFACE OF A
    STAINLESS SSEEL FIBER.  MOREOVER. THE GOO
    D AGREEMENT BETWEEN THE THEORETICAL RESUL
    TS AND EXPERIMENTAL DATA FOR THE TRANSVER
    SE STIFFNESS AND STRENGTH SEEMS TO INDICA
    TE THAT THE BASIC ASSUMPTIONS USED FOR TH
    E THEORY ARE REASONABLE....
```

FIGURE 5. PORTION OF SEARCH FROM DMIC FILES

Contracts

Reports were received on contracts sponsored by the following organizations

	Number of Contracts	Percent of Total
Air Force	147	44
Navy	85	25
NASA	48	14
Army	33	10
AEC	25	7

Table 4 reveals trends in materials research and development expenditures by U. S. Government agencies. It was prepared from data acquired in the course of routine DMIC acquisition activities. No attempt was made to verify the completeness or accuracy of the data.

The principal input source was Commerce Business Daily (CBD), the publication that lists the unclassified procurements and contracts neogitated by various government agencies. Approximately 250 contracts were identified during the period covered. This period roughly corresponds to FY 71. One word of caution, CBD only announces contracts in excess of $25,000 and in some cases does not report the contract price.

It is interesting to note that almost $25.6 million Government R&D was distributed 59 percent Air Force, 23 percent NASA, 10 percent Navy, and 9 percent Army. Comparing these figures with the above source of DMIC documents (input) indicates that our Air Force acquisitions are lower than they should be. This in part is due to those contracts leading to hardware or production airframe output. On the other hand, our Navy accessions appear higher than actual Navy appropriations might indicate. This is due to the large amount of internal or inhouse research conducted by that organization.

Thesaurus Developments

During Phase II of the computerization of DMIC, subject indexing was continued under the prevailing and long established philosophy of free and unencumbered selection of clue words (index terms) to describe newly accessioned documents. The spirit of this philosophy was carried over to BASIS-70 system-design considerations, where the manual, clue word/extract card system is to be imitated using on-line, interactive, (conversational) time-sharing principles.

Consequently, although complete indexing freedom was and is preserved, the immediate result of such a philosophy is an open-ended, unstructured technical vocabulary. This vocabulary is essentially unstructured with regard to: (1) word form (plural versus singular, past versus present tense, noun versus verb versus participle or gerund), (2) word format (hyphenation and spaces versus absence of same), and (3) synonyms and homographs.

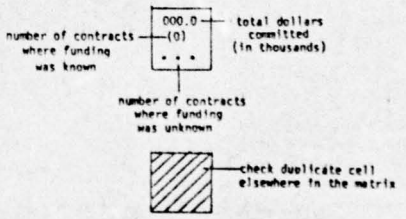
TABLE 4.

Funding Summary for New Contract Awards listed in Cumulative Index **

	Adhesive/Adhesion Studies	Aircraft/Airframe Missiles, Space Shuttle	Armor, Guns, Cartridge Cases	Coating Processes	Coatings	Composites	Corrosion/ Compatibility	Creep Stress Rupture	Fatigue	Fracture/ Fracture Toughness	General	Heat Treating	Joining	Mechanical Properties	Melting and Casting	Metalworking/ Fabrication	Non-Mechanical Machining	Physical Metallurgy and Properties	Strength	Testing Methods and Techniques	Tribology, etc.	Turbine Application	total*
Aircraft/Airframe Missiles, Space Shuttle					487.2 (3)		351.6 (2)	65.0 (1)	746.5 (7)	351.5 (2)			179.8 (2)	65.0 (1)		552.4 (4) *		75.0 (1)	54.3 (1)	938.1 (10)		25.0 (1)	
Aluminum	38.0 (1) *		50.0 (1)	152.2 (1)	34.1 (1)	200.9 (3)	120.0 (2)		96.2 (2)	82.0 (1)						132.8 (2)		50.0 (1)	36.3 (1)	14.2 (1)			589. (10)
Beryllium						130.6 (2)				**			17.0 (1)	30.3 (1)						36.7 (1)		33.7 (1) *	118. (4)
Chromium				69.7 (1)	69.7 (1)																		70. (1)
Cobalt			65.7 (1)								55.0 (1)												121. (2)
Columbium					290.0 (2)	69.7 (1)	109.0 (1)	109.0 (1)								109.0 (1)		109.0 (1)	109.0 (1)				449. (3)
Composites	50.0 (1)	6682. /231	**		45.8 (1)		90.6 (2)		210.0 (3)	255.8 (5) *	1029. (7) **	99.1 (1)		1321. (6)		567.4 (7) **		58.8 (1)	110.0 (2)	305.6 (6)		96.9 (1)	9660. (50)
Fiber Reinforced Metals		158.4 (2)				*					209.5 (3) *	99.1 (1)		97.8 (1) *		50.0 (1)		97.8 (1)	75.0 (1)	160.1 (3)		33.7 (1)	884. (9)
General	371.1 (6)	1788. (18) *	348.6 (4) *	62.6 (1)	609.0 (10) ***		930.7 (15) **	65.0 (1) *	567.1 (10) *	190.3 (2) **			74.8 (2)	493.5 (10) *	31.6 (1)	1126. (10) ***	242.7 (1)	1325. (16)		301.9 (7) *	1004. (8)	880.2 (7)	N/A
High Strength Steel/General			118.6 (2)			28.6 (1)	54.7 (1)							79.8 (1)		*	36.9 (1)	145.6 (3)	49.6 (1)				397. (8)
Magnesium						25.0 (1)																	25. (1)
Molybdenum					30.0 (1)																		30. (1)
Nickel					145.0 (2)	165.0 (1)	151.0 (3)		74.0 (1)			115.5 (2)	6.0 (1)	6.0 (1)		206.5 (2)		41.4 (1)					398. (6)
Refractory Metals		155.0 (1)						124.4 (1)												155.0 (1)			279. (2)
Sandwich Structures	48.5 (1)	250.0 (1)				115.0 (1)					250.0 (1)			115.0 (1)									413. (3)
Stainless		100.0 (1)					45.5 (1)									45.5 (1)							145. (2)
Superalloys													74.0 (1)							37.2 (1)			111. (2)
Tantalum		376.8 (11)			64.6 (11)		260.0 (21 *											35.7 (1)	*	376.8 (1)			701. (4)
Titanium	*	481.5 (4) *			77.0 (2)	196.9 (2)	136.7 (3)		210.3 (3)		*		341.0 (2) **	121.3 (2) *	110.0 (1)	909.9 (8) **		329.9 (4)	70.5 (2)	158.7 (2)		81.0 (1)	2222. (24)
Tungsten						49.7 (1)																	50. (1)
total*	418. (7)	10797. (57)	507. (7)	284. (3)	1368. (19)		2001. (31)	298. (3)	1611. (19)	687. (8)	N/A	207. (2)	693. (9)	2258. (23)	142. (2)	5497. (41)	280. (2)	2170. (29)	433. (6)	1592. (24)	1004. (8)	1117. (11)	25558.

AIR FORCE	$14,846,000
NASA	5,836,000
NAVY	2,566,000
ARMY	2,310,000
TOTAL	$25,558,000

key:



* Totals are not equal to the summation of individual cells because funding values were multiply entered in the matrix when appropriate.

Totals reflect the summation of unique programs in each subject area.

** designed and compiled by R. T. Nicholl and R. J. O'Brien

In the manual extract card system, an unstructured, open-ended vocabulary caused few problems because the information scientists, who are responsible for the storage and retrieval of information, could make interpretive decisions about the vocabulary with which they were dealing.

However, conversion ot the manual storage and retrieval system to an automated one, where inverted files are built, stored, and searched internally by the computer, necessitates a more formalized, structured vocabulary because the interpretive functions once performed by the information scientist during searching are replaced by noninterpretive machine searching. Consequently, a thesaurus of technical terms is currently under development to provide the needed control over the indexing vocabulary. This thesaurus will be stored internally on the computer and serve as one of the various criteria checks on new imput. In other words, all input will be checked against the thesaurus before being added to internal, inverted files. Those clue word (index) terms not found in the thesaurus will be rejected by the computer until such time as they do appear in the thesaurus. Therefore, thesaurus updating will be an essential and frequent activity in future operations.

Thesaurus development at DMIC has progressed in three areas: (1) generic and semantic control for alloys, (2) generic structures (trees) for 22 broad categories of technical terms, and (3) semantic control for the unedited raw vocabulary generated from the computerized input to approximately 2500 extracts.

The alloy portion of the thesaurus was created, in part, from an earlier version used during the operation of the DMIC data base (since discontinued) and, in part, from current information systems activities. A sample of this product is shown in Figure 6.

Generic structures for 22 subject categories were prepared from terms found in the manual system -- using several existing thesauri as reference tools and Battelle engineers as technical editors/reviewers for selected categories. An example of this product is shown in Figure 7.

Finally, the unedited, raw clue-word vocabulary present in 2500 machine-stored and searchable extracts is being processed into thesaurus format using the two previously mentioned products as guides. This phase of the thesaurus development is most important because the terms being processed are machine searchable in their present form and that form is essentially an unstructured, raw indexing vocabulary containing many errors, inconsistencies, and variations. Work on this phase is proceeding in two steps; first the establishment of semantic control and terminological conventions and second, the establishment of generic control. Step one is currently in progress, step two will be attempted later. An example of the unedited, raw vocabulary is shown in Figure 8a. The edited version (from step one only) is shown in Figure 8b.

The final product will be a single thesaurus of technical terms, available both as a desk-top reference tool and as an on-line, vocabulary control mechanism. The on-line version will differ from the desk top version in that it will contain all vocabulary variations encountered, while the desk top version will display only a limited number of terms and term

```
MARAGING (350)
  18NI-13CO-4MO-2TI-0.2AL-BAL(FE)
    UF  VASCOMAX 350 CVM
    UF  18NI 350 MARAGING
    BT  MARAGING STEEL
    BT  STEEL

MARAGING STEEL
    BT  STEEL
    NT  MARAGING (180)
    NT  MARAGING (200)
    NT  MARAGING (250)
    NT  MARAGING (300)
    NT  MARAGING (350)
    NT  PYROMET X-15
    NT  RS-181
    NT  12NI-5CR-3MO
    NT  13CR-16CO
    NT  13CR-16CO-4.5MO
    NT  13CR-8NI-4.5MO
    NT  18NI-8CO-3MO

MA15
    BT  ALUMINUM ALLOYS

MDA57
    USE A390

MD57
    USE 390

MG-11Y
    BT  MAGNESIUM ALLOYS

MG-15SC-4LI
    BT  MAGNESIUM ALLOYS

MG-30SC
    BT  MAGNESIUM ALLOYS

MG(UNALLOYED)
    USE MAGNESIUM

MO-.5TI
  .5TI-BAL(MO)
    BT  MOLYBDENUM ALLOYS
```

FIGURE 6. PORTION OF THESAURUS

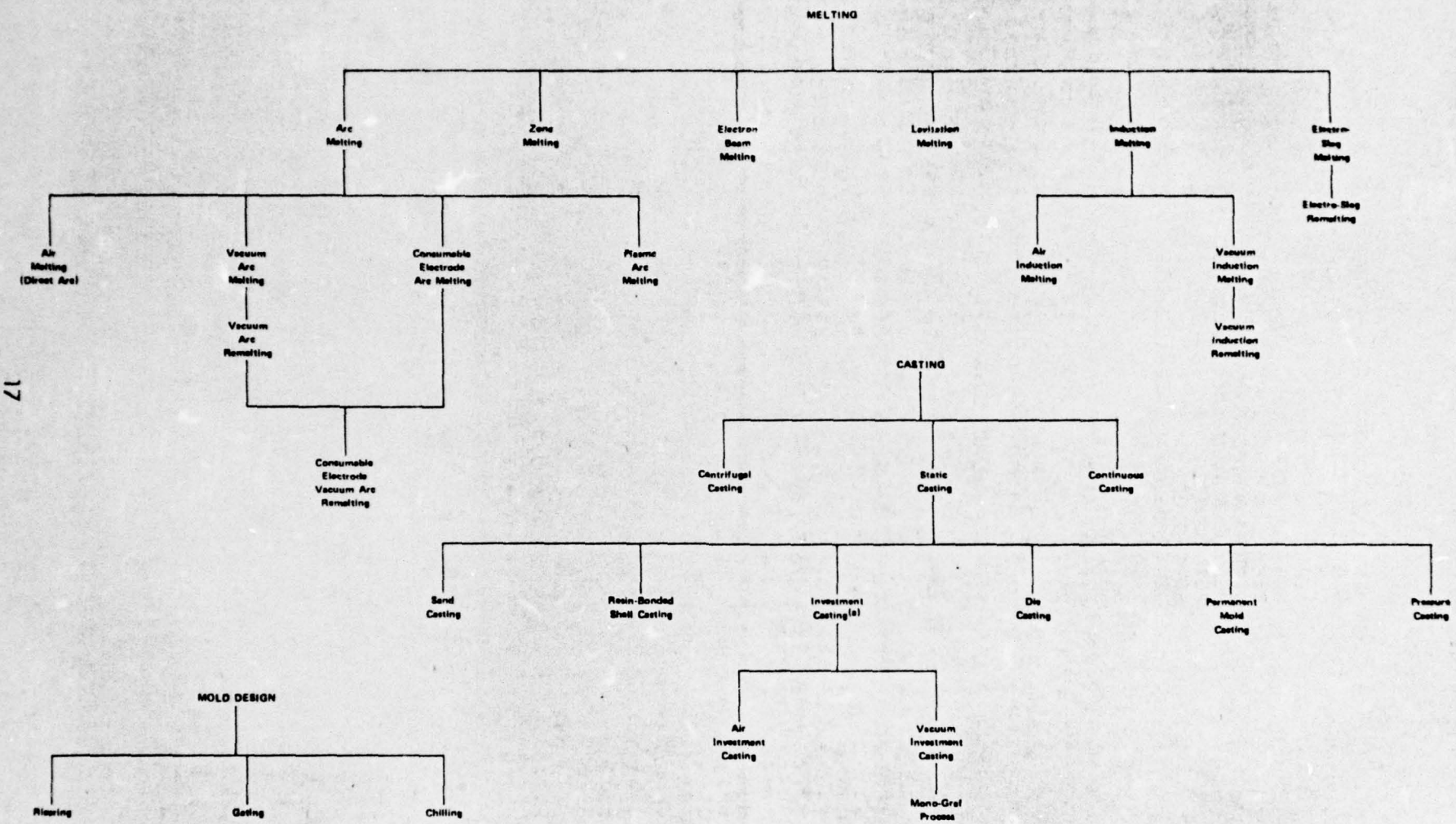


FIGURE 7. EXAMPLE OF GENERIC STRUCTURE FOR SUBJECT CATEGORIES

BERYLLIUM ADDITION
BERYLLIUM ADDITIONS
BERYLLIUM ALLOYS
BERYLLIUM COATINGS
BERYLLIUM COPPER
BERYLLIUM WIRE-ALUMINUM MATRIX
BERYLLIUM WIRE-TITANIUM MATRIX
BERYLLIUM-ALUMINUM COMPOSITES
BETA COMPOSITIONS
BETA FORGE
BETA FORGED
BETA FORGING
BETA III
BETA III TITANIUM
BETA PHASE
BETA PHASES
BETA PROCESSING
BETA RAY MEASURING
BETA ROLLED
BETA STABILIZING ELEMENTS

a.

beryllium addition
+UF Be addition
+UF Be additions
+UF beryllium additions

+beryllium additions
+USE beryllium addition

beryllium alloys
UF beryllium copper

beryllium coatings

beryllium copper
USE beryllium alloys

beryllium wire-aluminum matrix
USE Al-Be composite

beryllium wire-titanium matrix
USE Be-Ti composite

beryllium-aluminum composites
USE Al-Be composite

beta compositions (rejected as an index term)

+ beta forge
+USE beta forging

beta forged
USE beta forging

beta forging
+UF beta forge
UF beta forged

beta III
+UF beta III titanium

+beta III titanium
+USE beta III

beta phase
+UF beta phases

+beta phases
+USE beta phase

beta processing (term rejected)

beta ray measuring

+beta rolled
+USE beta rolling

beta rolling (this term was created)
+UF beta rolled

beta stabilizing elements (term rejected)

UF = used for
+ = a nonprint term, used only in the internal machine version of the thesaurus.

b.

FIGURE 8. DEVELOPMENT OF THESAURUS FORMAT FOR DMIC EXTRACTS

variations. The reason for this is that while it is necessary for the computer to recognize all word form variations, word formats and synonyms for the purpose of maintaining the integrity of the internal, inverted files, it is not necessary, nor desirable to display all such terminological variations in a printed thesaurus. Thesaurus development will receive high priority during the next year.

TECHNICAL INQUIRIES

The most dynamic of the DMIC services is placing a technical inquirer in direct communication with a specialist who has the capability of providing the latest and most accurate information on the inquirers' problems. This straightforward but highly sophisticated service which has developed over the years distinguishes DMIC as an Information Analysis Center, Figure 9.

During the 14-year span of DMIC services, the peak period for processing technical inquiries was 1967, with a total of 1761 inquiries answered. Since that year, the total number of technical inquiries processed has decreased during each succeeding contract period. Although the inquiries processed during the 1971 contract period can be directly compared with those processed during the 1970 period, one must be cognizant of the 10-month reporting period instead of the usual 12-month period. There was a reduction of about 7.5 percent of processed inquiries during the 1971 period and a corresponding 3.4 percent decrease in the number of companies represented. Although requests originating directly from Government agencies during 1971 remained essentially the same (15.9 percent) as those of 1970, the inquiries originating from Wright-Patterson AFB represented only 3.9 percent as compared with 6.1 percent in the previous contract period. The numerical account of technical inquiries processed each year since 1958 is summarized in Table 5.

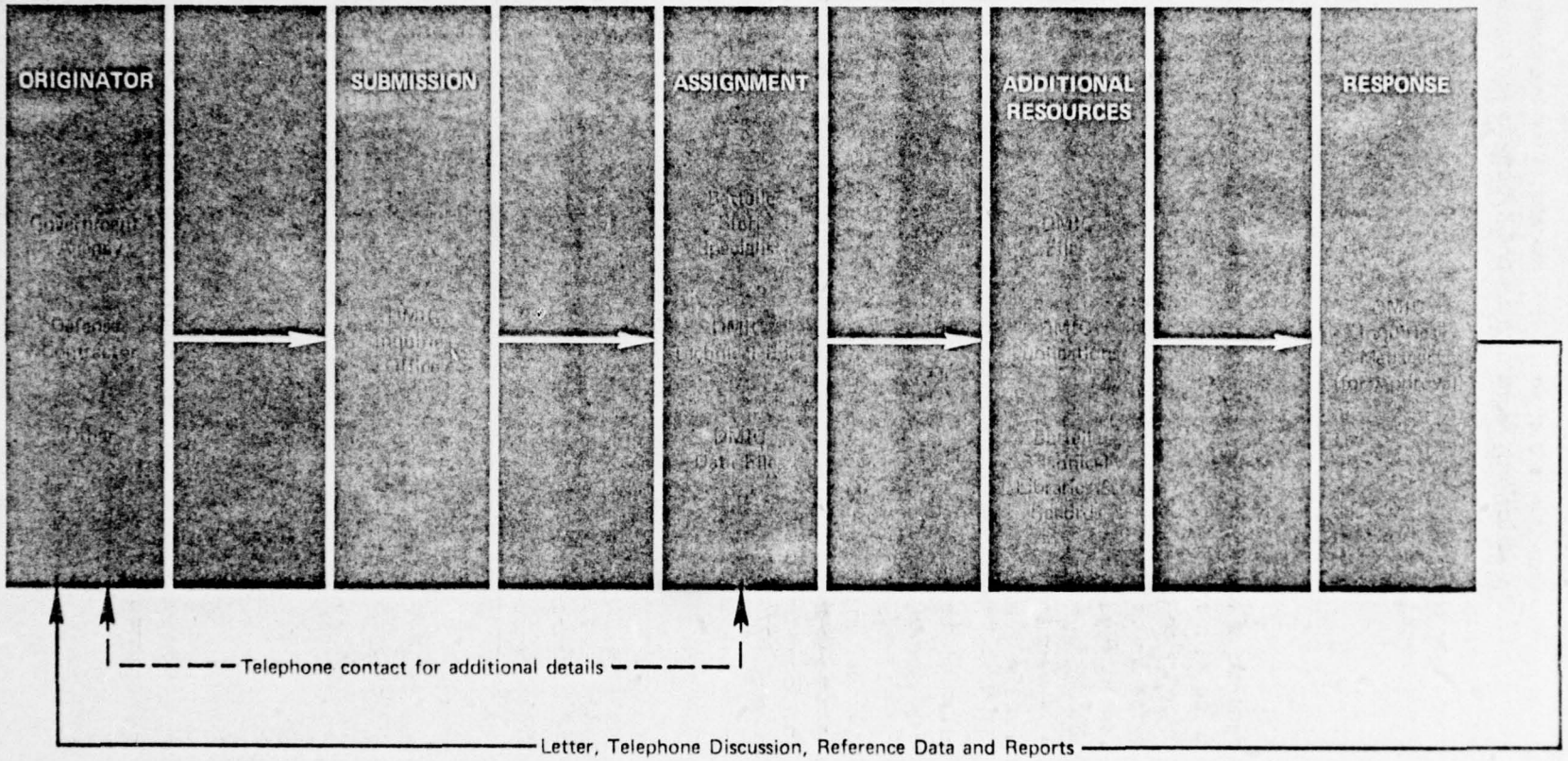
TABLE 5. ANNUAL TOTALS – TECHNICAL INQUIRIES

Year	Number of Inquiries	Number of Companies
1958	490	270
1959	744	393
1960	938	381
1961	900	406
1962	882	421
1963*	855	382
1964	879	453
1965	1302	462
1966	1529	553
1967	1761	550
1968	1490	517
1969	1351	477
1970**	1018	350
1971**	942	338

*11-month period.
**10-month period.

FIGURE 9.

DMIC – PROCESSING OF TECHNICAL INQUIRIES



The elements that appear to have had the greatest effect on the inquiry activity during 1971 are assessed as follows.

(1) Federal Budget Changes: This year the budget continued to de-emphasize defense funding in favor of postwar social and domestic problems.

(2) Major Programs: Most of the major aerospace programs, whether or not defense oriented, are near termination, as in the case of the Apollo program, are under very close budgetary scrutiny, as in the case of the B-1 and C-5 programs, or have been scrapped, as in the case of the SST program. The slowdown in the aerospace industry coupled with the lull in the maritime and atomic energy industries have affected both the nature and the frequency of inquiries.

(3) DMIC Funding: For the 1971 contract period, DMIC funding was reduced by about 15 percent. This reduction plus continued erosion by inflation has forced DMIC to become very selective in both accepting and processing requests.

(4) Recovery of Charges: Ever since the DMIC clientele has been informed that charges for services were under consideration, many users either ask if charges have been initiated or preface their requests by indicating that authorization to charge is not implied.

The number of technical inquiries represented in Table 5 are very conservative. Actually, many of the requests dealt with several facets of technology, often requiring the services of more than one specialist to provide a complete answer. Perhaps, the total figure given in Table 6 reflects more accurately the number of processed inquiries inasmuch as this represents the distribution of multiple requests according to topic category. For example, a request counted as a single inquiry frequently asks for a variety of properties under various conditions and environments for several compositions of a class of alloys. Often, the nature of some inquiries is so extensive as to require a very large effort in accumulating and evaluating data. Occasionally, an answer to an inquiry will be negative in that information on a particular subject has not been generated. Such answers often are used to establish a need for research and development in a given field of interest. Answers of a positive nature, on the other hand, serve to reduce or eliminate costly and unnecessary duplication of research effort. Major technical inquiries answered by DMIC during 1971 are listed in Appendix A.

TABLE 6. DISTRIBUTION OF TECHNICAL INQUIRIES[a]

(October 1, 1970 - July 31, 1971)

MATERIALS	USE, MARKET, AND SOURCE INFORMATION[c]	PRODUCTION	PRIMARY FABRICATION	SECONDARY FABRICATION	POWDER METALLURGY	JOINING	DIFFUSION	MECHANICAL AND PHYSICAL PROPERTIES	PHYSICAL METALLURGY	COATINGS	ENVIRONMENTAL EFFECTS	QUALITY CONTROL	GENERAL TECHNOLOGY	TOTALS
LIGHT METALS														
Aluminum	5	1	1	3	--	17	3	42	8	19	14	4	2	119
Beryllium	4	1	1	3	--	5	--	15	1	4	2	--	1	37
Magnesium	1	--	--	--	1	1	--	7	1	2	3	2	--	18
Titanium	39	6	4	52	2	42	1	84	19	33	58	10	12	362
HIGH-STRENGTH STEEL														
Maraging	3	--	1	1	--	2	--	15	2	1	5	3	--	33
Stainless	4	1	4	2		17	2	61	6	4	36	8	1	146
General	5	--	--	7	--	7	1	45	6	7	14	7	--	99
REFRACTORY METALS														
Chromium	--	--	--	--	--	--	--	--	--	1	--	--	--	1
Columbium	4	2	1	3	--	8	--	9	1	3	7	3	--	41
Molybdenum	5	--	--	--	--	3	--	5	2	--	2	2	--	19
Rhenium	1	--	--	--	--	--	--	--	--	--	--	--	--	1
Tantalum	3	--	--	2	--	4	--	1	1	--	3	--	--	14
Tungsten	2	--	--	2	--	--	--	6	2	--	1	--	--	13
General	2	1	1	4	1	2	--	5	--	2	1	--	1	20
SUPERALLOYS														
Nickel-Base	11	1	4	8	--	14	2	37	9	5	14	5	7	117
General	2	--	--	5	--	5	--	9	4	1	7	3	3	39
FIBER-REINFORCED METALS	2	--	--	1	1	2	--	3	--	--	4	--	7	20
MISCELLANEOUS METALS[b]	27	2	9	20	3	19	--	28	9	9	27	33	12	198
Totals	120	15	26	113	8	148	9	273	71	91	198	80	46	1297

(a) Ten months only.
(b) General metal systems and materials only marginally within the DMIC scope.
(c) Applications, relative costs of materials, procurement, and contract identification.

Analysis of Inquiry Distribution

Distribution of technical inquiries is analyzed to provide administrative awareness of the areas within the DMIC scope that are of greatest interest to the users and to help in the recognition of significant shifts in emphasis. As in previous annual reports, inquiries have been distributed to appropriate categories and then combined with an annual summary. Table 6 covers the period from October 1, 1970 through July 31, 1971.

Although most of the subject headings are self-explanatory, two of them should be further clarified. The column heading "Use, Market, and Source Information" refers to requests involving applications of materials, relative costs dealing with past, present, and projected markets for materials, procurement of materials, and contract identification. For the most part, the row heading "Miscellaneous" refers to materials that are of infrequent interest, that now are only marginally within the scope of DMIC, or that deal with several metal systems.

For an equitable distribution, some of the complex inquiries were subdivided into several categories, so that the total number of inquiries in Table 6 (1297) is higher than the total number of inquiries for which DMIC was credited during the 1971 contract period (942).

An analysis of the inquiry distribution is summarized as follows.

(1) The number of titanium-oriented inquiries answered continued to be greater than those for other material categories. In fact, there was about a 3 percent increase in the number over the preceding contract period.

(2) Interest in stainless steels and aluminum showed some gain over 1970, while interest in nickel-base alloys lagged somewhat.

(3) The "Miscellaneous Metals" category decreased by about 4.5 percent as compared with the last report period, perhaps reflecting only the general decrease in total inquiries.

(4) Although there are some changes in rank of the various materials, the changes do not appear to be significant. Arranged in order of descending numbers of inquiries processed, the ranking of the 10 alloy systems of interest in 1971 is as follows: titanium, stainless steels, aluminum, nickel-base alloys, high-strength steels, columbium, general superalloys, beryllium, maraging steels, and fiber-reinforced metals.

(5) Perhaps the greatest shift of emphasis (9.5 percent decrease) was away from properties. The decrease in interest probably reflects a general decrease in programs, investigating new alloys, and possibly the DMIC effort toward becoming more selective in accepting inquiries. Some slight increases in interest were shown in joining and in environmental effects.

DMIC discontinued its procedure for orienting inquiries in terms of their relationship with Government agency contracts in February 1970 (previous contract period). However, the experience gained from the exercise indicates that the distribution of technical inquiries continued to be essentially the same during the 1971 contract period, i.e. (in percent), 33.4 Air Force, 20.0 NASA, 12.0 Navy, 7.4 AEC, 6.9 Army, 4.7 FAA, and the remainder -- other agencies and unidentified users.

User Evaluation Survey

DMIC conducted an informal survey of its users throughout the 1971 contract period by employing a simple questionnaire distributed randomly to inquirers. Responses, in most cases, confirmed the value of the Center's services. Information gained from this survey is used in the planning of the program as well as to determine gaps in existing resources.

A summary of the statistics obtained from returned questionnaires is as follows.

(1) Of those responding, 75 percent acknowledged complete answers from DMIC, 20 percent obtained partial answers, and 5 percent indicated that the DMIC reply did not answer their inquiries (however, this was not necessarily a criticism).

(2) An arithmatic average of time saved by a DMIC reply was 90 manhours. However, the time saved varied from less than 5 to as much as 1000 manhours. About 25 percent of those responding were unable to estimate the savings in manhours, and one respondent indicated that the DMIC reply "avoided the necessity of a $300,000 development program".

(3) The majority of respondents preferred direct answers to their inquiries by qualified technical specialists (Battelle scientists and engineers well established in their fields). The other service categories, extracts from DMIC files, reviews of recent developments, and DMIC reports and memoranda, were nearly equally divided in rank.

(4) Over 60 percent of the survey respondents were satisfied with DMIC services as currently available, and many included unsolicited compliments of the services rendered to them over the years. Some of the suggestions given to improve DMIC services included: expansion of subject index of DMIC publications; translations; new alloy properties; services tailored to businesses having little or no R&D facilities, expansion of the review scope; closer and more rapid communication with those working on programs; more publicity of services; general expansion of DMIC scope of materials and services; and expansion of DMIC funding.

NONTECHNICAL INQUIRIES

In addition to technical inquiries, DMIC receives many miscellaneous requests for assistance, information, and advice. During the contract period, these averaged over 144 per month. A record is maintained, providing the following breakdown:

Requests for reports supplied by DMIC	674
Inquiries regarding procedures for using DMIC	181
Applications to be added to DMIC distribution	389
Requests for reports referred to other sources	232
Total	1476

The last item falls in the category of 'courtesy service', and very often represents considerable effort by the DMIC staff to identify sources for the various reports sought. If possible, the AD number is identified so the publication can be requested from DDC or CFSTI; if not a government report, other identifying information is obtained, so the requester can contact the proper source of supply. Often, of course, it is possible to refer the inquirer to another of the DoD Information Centers having the appropriate scope. DMIC maintains up-to-date indexes of Information Centers throughout the country, in order to be able to make an effective referral when the subject of an inquiry is outside of the DMIC scope.

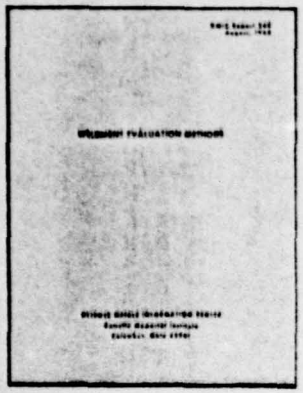
PUBLICATIONS

DMIC has issued a variety of technical reports and information. These fall into six general categories (Figure 10):

(1) formal state-of-the-art reports
(2) technical memoranda
(3) technical notes
(4) technical reviews
(5) handbooks
(6) contractual activity reports.

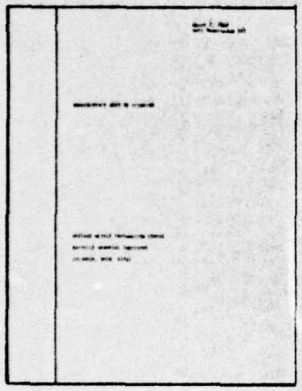
FIGURE 10.

DMIC TECHNICAL PUBLICATIONS



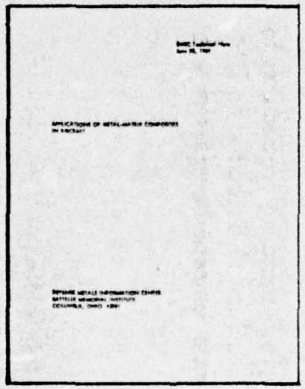
Formal State-of-the-Art Reports

Comprehensive studies of the current status of Selected Metals, Alloys or Processes



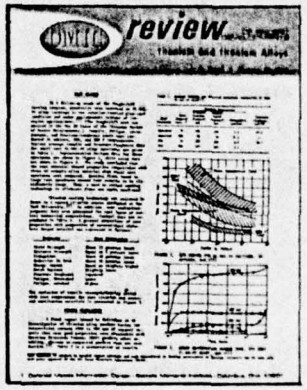
Technical Memoranda

Preliminary summaries of recent developments in specific aspects of Metals, Alloys or Processes



Technical Notes

Informal collections of timely information on topics of special interest to selected segments of the DMIC audience



Reviews

A series of newsletters providing brief resumes of important recent developments in the technology of advanced metals and processes



Handbooks

Condensed summaries of current information on the properties and processes of selected metals

With the exception of the contractual reports and technical notes, all publications are distributed to the individuals and companies on the DMIC mailing list, on the basis of designated fields of interest as registered by the subscriber. The average initial distribution of such technical publications is 2500 copies. Technical notes are provided to smaller lists of a few hundred individuals having specific need for this information.

Appendix B summarizes the technical publications issued or in preparation during the contract period.

Formal State-of-the-Art Reports

Subjects for formal reports are selected on several bases. They may result from a recognized gap in the technical literature which DMIC, with its resources, has a capability to fill. They may reflect an area of current keen technical interest, as demonstrated by numbers of similar requests for information received by DMIC. The subject may be one on which a definitive study is requested by one of the several technical activities with which DMIC cooperates (see "Other Activities", below). Or the report may be one requested by the DMIC sponsor, the Department of Defense, or by the Air Force Materials Laboratory. Such reports are prepared by professional specialists in the subject field on the Battelle staff, supported with DMIC funds. The fact that these 'formal state-of-the-art reports' represent significant contributions to the permanent technical literature is demonstrated by their wide utilization as reference material and by the continued requests for copies, often for reports dating back to 1960 and earlier.

During the contract period, DMIC issued two special reports, S-32, "Summary of Beryllium Research and Development Programs (Revised)", and S-33, "Fiber-Reinforced Metal-Matrix Composites -- 1969-1970. The last DMIC 'green cover' report, #245, was issued in September 1970 and sold through a commercial publisher (see Marketing Services below). Work on 14 additional formal reports was initiated (see Appendix B).

Technical Memoranda

Memoranda represent a less formal review of current information, usually with a narrower scope than a formal report. In general, the subject matter is chosen in a manner similar to the reports. In some instances, however, a memorandum will be a compilation of papers on a given subject, presented by one of the groups with whom DMIC cooperates. A memorandum may also be an upgraded technical note, or a preliminary summary of significant information which should be made available to the technical community as rapidly as possible. Memoranda are prepared both by specialists on the Battelle staff and by members of the DMIC management. Five memoranda were issued during the contract period.

Technical Notes

DMIC technical notes are wholly informal, prepared in a 'scrapbook' style, to disseminate as rapidly as possible, timely collections of information on specific subjects. The information usually is preliminary and subject to further expansion on confirmation. They are distributed only to individuals known to have a particular interest in the subject. A technical note often will result from an inquiry which required a collection of information, or as a convenient manner for response to several inquiries on the same subject. A number of technical notes are Advanced Material Information (AMI), prepared as a result of DMIC's cooperation with the SAE Awareness Committee (see "Other Activities"). Technical notes frequently are later 'upgraded' to memoranda or reports.

Four technical notes were issued by DMIC during the contract period.

Handbooks

Although DMIC does not regularly prepare engineering handbooks, comprehensive compilations of data and information on specific alloys, resulting from the daily DMIC activities, have in several instances been assembled into a useful technical guide to the use of those materials. Through 1970, five such Handbooks had been issued by DMIC on the following subjects:

High-Strength Steel, 9Ni-4Co
Nickel-Base Alloy 718
18 Ni Maraging Steels
Designer's Handbook for Titanium and Titanium Alloys
Elevated-Temperature Properties of Selected Superalloys.

The first three were loose-leaf handbooks, largely made up of collections of DMIC data sheets. The fourth was a special study, arising from the earlier FAA-AFML Titanium Handbook, revised by DMIC and later issued as AFML TR 67-142. The last was a cooperative compilation, cosponsored by an ASTM-ASME joint committee and distributed by ASTM.

A fourth special handbook, Titanium Alloy 6Al-4V, was issued in January 1971. Providing a needed basic reference to the properties and processing of this popular alloy, the handbook was distributed to approximately 3000 addressees in industry and government.

Acting on recommendations from a number of industrial and government sources, including a special National Materials Advisory Board study, DMIC initiated work toward the eventual publication of an engineering handbook on beryllium. The preliminary work, sponsored by DMIC, was to prepare an outline, determine availability of necessary data and

develop a plan for the assembly of an authoritative handbook. However, this preparatory work was undertaken with the understanding that an actual handbook program was beyond the resources of DMIC and would eventually require separate funding.

Joint Publications

In cooperation with the American Society for Testing and Materials (ASTM), DMIC sponsored the preparation of two special reports during this period. Subjects were: "Welding the HY Steels", STP 494, and "Introduction to Today's Ultrahigh-Strength Structural Steels", STP 498. Both were published by ASTM with credit to DMIC. From the sales of these publications, DMIC receives a royalty income (see Marketing, below).

In 1970, DMIC initiated, in cooperation with The Metal Properties Council, the publication of a special Review on Low-Temperature Properties of Metals. This joint program was continued in 1971.

Contractual Reports

In accordance with its contract, DMIC submits to the Department of Defense and the Air Force Materials Laboratory regularly monthly progress reports, quarterly financial summaries, and annual summary reports. Containing no technical information, these reports are distributed only to the sponsoring agencies and offices designated by them.

Reviews of Recent Developments

An important mission of the information analysis center is to alert its user audience on a timely basis to significant developments within its various fields of technology. The DMIC Reviews of Recent Developments have this objective, providing the Center's user audience with periodic summaries of new information on technical topics within the DMIC scope. Initiated in 1962, these newsletters currently cover fourteen metals and processes subjects.[a] Topics of DMIC Reviews of Recent Developments are:

Aluminum and Magnesium
Beryllium
Corrosion and Compatibility
Fiber-Reinforced Metals
High-Strength Steels
Low-Temperature Properties of Metals[b]
Mechanical Properties of Metals
Metalworking
Metals Joining
Nickel- and Cobalt-Base Alloys
Oxidation-Resistant Coatings for Refractory Metals
Powder Metallurgy
Refractory Metals
Titanium and Titanium Alloys

(a) Liquid Metals and High-Energy-Rate Processes are topics covered on an irregular schedule (usually once a year).
(b) Published in cooperation with The Metal Properties Council as a cosponsor.

Format for the Reviews is informal and the content purposely kept flexible in order to accommodate changing technology. The Reviews frequently report unpublished data and highlight important new trends in materials and processing. In general, each Review covers a period of three to six months, however, most are issued quarterly.

During the ten-month contract period, 40 Reviews of Recent Developments were issued; these are listed in Appendix C.

The DMIC Review of Low-Temperature Properties of Metals was introduced in 1970 as the first regular cooperative publication. Costs for the preparation and distribution of this Review are shared by The Metal Properties Council. Through such joint sponsorship, DMIC is able to provide increased service to the user community.

Distribution of DMIC Publications

During the contract period, the total DMIC distribution list included an average of 3,689 individuals, companies, and agencies. The organizational breakdown was as follows:

Industrial Organizations		1321
Technical Societies		34
Colleges and Universities		108
Government Agencies		398
DMIC Monitors	2	
Air Force	98	
Army	104	
Navy	64	
NASA	74	
AEC	8	
Department of the Interior	15	
Other Agencies	33	
Foreign*		4
Total		1865

*Special Air Force approval was obtained to supply the Australian, British, Canadian, and French Embassies with copies of DMIC Reviews only.

The DMIC mailing list is reviewed at regular intervals to assure that only those individuals having a continuing need for the information are retained on the distribution. Appendix F lists the companies currently receiving DMIC publications.

USER AND INFORMATION RESOURCE CONTACTS

In addition to that knowledge of contemporary technical activity which it obtains through the regular channels, a significant part of DMIC's input comes through personal contacts with industry and government agencies. It is this individual exchange, engineer to engineer and user to DMIC staff, which puts the information collected and the technical output generated in total perspective. Members of the permanent DMIC staff and Battelle specialists, on behalf of DMIC, each year visit a variety of companies and government installations, and participate in a number of technical meetings and committees. In addition, as mentioned above, DMIC maintains an intimate contact with the major aerospace concerns through its West Coast Representative.

Appendix E summarizes the visitors to DMIC during the past year; travel, meetings attended, and DMIC staff participation on various committees are listed in Appendix F. Comparing the totals for these activities over the history of DMIC offers the following:

Year	Visitors to DMIC	Visits by DMIC	Meetings	Committees
1958	183	457	62	17
1959	232	397	68	43
1960	288	385	69	36
1961	202	215	45	15
1962	175	271	57	13
1963*	196	245	48	10
1964	121	274	47	9
1965	121	256	47	16
1966	127	266	52	17
1967	355	211	38	29
1968	121	221	34	22
1969	74	213	38	7
1970**	44	171	23	7
1971**	40	210	16	7

*11-month period.
**10-month period.

THE TECHNICAL COOPERATION PROGRAM (TTCP)

For a number of years, DMIC -- at the request of ODDRE -- has provided technical assistance to this cooperative exchange program between the United States, the United Kingdom, Canada, and Australia. Such work has included the conduct of surveys, special studies, and the compilation of research program summaries. During the contract period, DMIC continued to provide support to TTCP Panel 1 on Metals of Subgroup P on Materials. This activity included:

(1) Summary Report on United States Project Sheets including highlights on these programs

(2) Critique of Current Research and Development on Stress-Corrosion Cracking

(3) Effects of Surface Condition on the Mechanical Properties of Titanium and Its Alloys

(4) Crack Propagation of Titanium and Titanium Alloys

OTHER ACTIVITIES

DMIC has continued to perform special services which it is qualified to provide because of its corps of active specialists and the fund of readily retrievable information in its Technical Files. Most of these activities were in direct response to requests from defense agencies. DMIC also provides service to committees of various technical groups engaged in work of special interest to the Department of Defense. This DMIC support has consisted of such functions as supplying technical information to committees, distributing information to committee members, and carrying out technical assignments of the committees. DMIC staff participation on such committees is listed in Appendix H. Highlights of these several special activities include the following.

Economic Defense Advisory Committee

DMIC provided the services of 19 Battelle-Columbus consultants for a 2-day meeting at Battelle of the Economic Defense Advisory Committee to discuss the current status of numerous items on the Mutual Defense Assistance Control (Battle Act) Lists. Information was provided on the current status of various materials and processes on the list, and advice was offered on the limitations imposed on the materials and processes as currently listed.

DMIC also responded to 13 separate inquiries from the U. S. Department of Commerce concerning materials covered by the Mutual Defense Assistance Control (Battle) Act. Five of these related to proposed changes in the definitions of various materials on the MDACA list. The balance of these inquiries related to the exporting of specific items.

U. S. Air Force

One of the state-of-the-art reports being prepared by DMIC is a summary of the current F-111/D6ac testing program. This major cooperative materials test and evaluation project involves several agencies and contractors. DMIC's report will collect, compare, and summarize the results of perhaps the largest program ever undertaken to evaluate the fracture behavior of a single alloy.

In conjunction with this task, DMIC assisted an Air Force contractor in the analysis of a fractured F-111 part by preparing a series of scanning electron microscope photographs of the failure surface. In effect, a technical inquiry involving some laboratory support, the results of the examination will contribute to the DMIC summary report.

DMIC also assisted another Air Force contractor in the evaluation of a prototype F-14, titanium alloy wing-skin panel which developed localized cracking during forming. Several possible contributing causes were identified and recommendations were given to eliminate conditions which might cause a recurrence of this problem.

Veterans Administration

DMIC has assisted the Veterans Administration in the selection of titanium alloys and shapes for use in surgical implant procedures and also succeeded in locating a source for the manufacture of special titanium fasteners for surgical repairs. While DMIC has some reservations regarding the general usefulness to the public of the advanced metals information in our files, these experiences with the Veterans Administration represent an encouraging opportunity to contribute to 'technology transfer'.

Metal Properties Council

DMIC cooperates with MPC in several respects. The Council has assisted in the collection of information for DMIC reports; it works with the MIL-HDBK-5 Committee to provide properties data; MPC is a cosupporter of the Joint Committee on Effect of Temperature on the Properties of Metals, to which DMIC regularly gives assistance. Of particular interest is the co-support of the Review of Recent Developments on Low-Temperature Properties of Metals, as mentioned above.

ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals, Gas Turbine Panel

The Gas Turbine Panel is made up of materials people in the gas-turbine industry, including the aircraft engine manufacturers and the airlines. The Panel meets semiannually to discuss mutual problems and to hold symposia on subjects of interest to the industry. Subpanels follow problem areas or other subject areas of special interest to the industry, and the Panel also sponsors some round-robin testing programs, such as one on hot corrosion of gas-turbine materials. DMIC has maintained liaison with this group.

ASTM Committee E-24 on Fracture Toughness Testing

A representative of DMIC continued liaison with ASTM Committee E-24 during the past year, attending one meeting of the Main Committee, one executive session, and five meetings of E-24 subcommittees and task groups. The principal objective of Committee E-24 and its subcommittees is to develop standard specimens and testing methods for determining fracture toughness of high-strength and intermediate-strength alloys as sheet, plate, and forgings. The "Method of Test for Plane-Strain-Fracture Toughness of Metallic Materials", E-399-70T is a product of this Committee. Additional test methods for static and dynamic fracture testing under plane-strain and plane-stress conditions are being considered. These test methods are applicable to materials for aerospace vehicles, deep submergence vessels, and pressure vessels. Since a number of DMIC inquiries are concerned with fracture toughness testing methods and data, participation in this program has provided considerable information to aid in answering these inquiries.

ASTM Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys

DMIC has followed the activities of this Committee as well as its Subcommittee XII on Specifications for Superalloys. Active participation in the work of technical committees such as these is an excellent way for DMIC to keep current in these technical areas. This includes the acquisition of information and data as well as knowledge of problem areas as they develop in industry.

Subcommittee XII and DMIC jointly sponsored the "Compilation of Chemical Compositions and Rupture Strengths of Superalloys" (ASTM Data Series Publication DS 9E) which was prepared by DMIC and published by ASTM. ASTM supplied DMIC with 200 gratis copies of this publication and paid DMIC an advance royalty of $650. The selling price of DS 9E is $3.50.

Committee A-10 has given its approval to another joint ASTM-DMIC effort which would result in a second marketable publication. This is the revision of the "Compilation of Trade Names, Specifications, and Producers of Stainless Alloys and Superalloys" (ASTM Data Series Publication DS 45). The necessary information has been collected from the producers and the compilation is in progress.

MARKETING OF DMIC SERVICES

In July 1968, ODDRE issued a Directive requiring the implementation of charges for information services provided by its several information analysis centers. However, a

series of policy problems, both within government and in some of the contractor organizations, arose, and questions of common guidelines required study. In addition, a plan for a mutual marketing organization was taken under study. As a result of these issues, at the initiation of the contract period, all of the DoD Centers were under a general direction to delay further implementation of service charges until the important questions had been resolved.

In January 1971, ODDRE announced plans to consolidate the contractual control of several of its Centers, including DMIC, under the Defense Supply Agency. One reason for this move was to provide a basis for common guidelines and policies in service charges, and a workable mechanism for mutual marketing. A series of conferences with ODDRE, DSA, and AFML (the Technical Monitor) were held during the first months of 1971. A plan was designed and approved for the use of the National Technical Information Service (NTIS) to serve as the sales outlet of those centers chosing to use it; DMIC was among those finding this the most acceptable method for handling sales of publications.

At the same time, it was recognized that the current contractual work statement for DMIC did not, in fact, authorize sales and income in a manner compatible with the new policies and the use of NTIS. Discussions were initiated to agree on a new work statement for DMIC. Inherent in these plans was the merger of DMIC with the Defense Ceramic Information Center (DCIC), as mentioned in the Introduction above.

Although the revision of the DMIC work statement was not accomplished until sometime after the period reported herein, DMIC and Battelle, acting on the basis of the anticipated terms of the new authority, reached agreement in June 1971 with NTIS for the use of that agency for marketing publications of the Center, and as a billing agent for technical inquiry services. As the contract period closed, these arrangements were being implemented.

In the meantime, DMIC was engaged in two experiments in the sale of technical publications. In the first, DMIC Report 245, 'The Corrosion of Metals in Marine Environments', was published and offered for sale by Bayer & Company of Columbus, Ohio. Conventional advertising and marketing was undertaken by the publisher. A progressive royalty based on sales was negotiated.

In the second plan, arrangements were made for the joint publication of several technical reports with the American Society for Testing and Materials (ASTM). These included "Compilation of Chemical Compositions and Rupture Strengths of Superalloys", Welding the HY Steels", and "Introduction to Today's Ultrahigh-Strength Structural Steels". These were issued as ASTM DS-9E, STP 494, and STP 498, respectively. In each instance, an advance royalty payment, based on estimated sales, was negotiated.

The conclusions on these experiments to date are mixed: sales of Report 245 had approached 600 copies by the end of the contract period, and two of the three ASTM publications had been completed. Total royalty income from both sources, through July 31, 1971, was $3,595. As anticipated, this income represents only a fraction of the cost of preparation of the several publications. Although such income is available to be 'recycled' (a companion report to Report 245 was initiated, using these funds for support of the engineering preparation), it is apparent that technical publications sold in this manner cannot 'pay their own way'. It was with this experience in mind that DMIC favored the use of NTIS for the marketing of the majority of future publications.

DMIC PLANS FOR THE COMING YEAR

The DMIC program has been continued by a 23-month contract effective 16 September 1970 (F33615-71-C-1067). Due to overall limitations in DoD information program budgets, funding for DMIC has been reduced about 17 percent as compared to FY 70, or the equivalent of 26 percent when compared with its annual level of support through 1968. A very substantial further reduction in available funds will result from the merger of the DCIC program with DMIC. These reductions, coupled with the regular inflation in costs of operation (from 5 to 8 percent per year), suggest that (a) activities and services must be progressively curtailed, (b) substantial economies in operation must continue to be achieved, and (c) income from other sources -- including service charges--must be sought.

Economies in operations have been effected; for example, all extracting of accessed reports now is done by DMIC information specialists, rather than by engineers, and new accounting procedures have provided a more stringent control on distribution expenses. A new Battelle-Columbus Division, 'Materials Information Division', was formed with the DMIC/DCIC program as its primary effort. This divisional function, however, permits the separate contracting of related projects, utilizing the DMIC/DCIC information base as a primary resource. As the contract period closed, several such programs were under negotiation, offering related income and a degree of sharing in the operational costs of the Center.

In view of the significant but unpredictable effects of the major changes now taking place in the DMIC (and DCIC) programs, it is difficult to define the specifics of a long-range plan for the program. However, certain elements are apparent and important to the future success and continuing technical contributions of the Center.

(1) The merger of DMIC and DCIC, creating the new Metals and Ceramics Information Center (MCIC), will broaden the resources of the program and permit more efficient utilization of the staff and facilities. A physical move to new and consolidated quarters in Battelle's Columbus Laboratories will enhance the operations (that move was completed in September 1971).

(2) A consolidation of publications in two basic series -- technical reports and weekly reviews of developments in metals and ceramic technology -- will simplify the publication program and provide a basis for effective sales through NTIS.

(3) Revision of the contractual work authority will permit implementation of the service charge program and the use of NTIS as marketing agent.

(4) A new publication, a free monthly newsletter to the materials community, will provide an avenue for publicity on new publications and other services, as well as a means of bringing to the attention of that community important developments in materials R&D.

(5) A number of experimental new products are planned. For example, compilations of new materials R&D contracts will be issued, special bibliographies on timely metals and ceramics topics will be offered, joint sponsorship of significant symposia will be undertaken and some new concepts in technical communication will be tested.

(6) Total conversion to the computer information base is anticipated during the coming months, offering more efficient storage and retrieval, as well as optional additional products.

(7) At the same time, the effect of charging for output services is difficult to anticipate. The total value of the Center depends considerably on the extent to which its services are utilized and the breadth of dissemination of its products. A substantial reduction in total audience can be expected; the degree to which this can be recovered and the contributions of the program enhanced by a wider variety of services can only be determined with experience.

(8) Finally, the continuing dimensions of the Center and the scope of its services to industry and government will depend entirely on the base funding available under the DoD contract. Further reductions will increasingly compromise the value of the total effort.

The contributions of DMIC during the past seventeen years to improvement of military and space systems, to the advancement of the materials sciences, and to the prevention of costly duplication of effort, while difficult to measure, have in our judgment been invaluable. In a rapidly changing environment, both technologically and with regard to policy, the challenge faced by the new MCIC will be to maintain -- and continually build upon -- the precedent of technical service established by the DMIC program.

APPENDIX A

MAJOR TECHNICAL INQUIRIES ANSWERED
(October 1, 1970 to July 31, 1971)

APPENDIX A

MAJOR TECHNICAL INQUIRIES ANSWERED
(October 1, 1970 to July 31, 1971)

Subjects of Major Technical Inquiries

ABRASION

ABRASION RATE ON A RUNWAY OF 2024-T4 ALUMINUM, PROPERTIES 7/15/71

ABRASIVE BLASTING

METHODS AND MATERIALS USED IN ABRASIVE BLASTING OF METALS, CLEANING 4/9/71

ADHESIVE BONDING

ADHESIVE BONDING, JOINING 12/1/70

ADHESIVE BONDING OF TITANIUM, JOINING 10/15/70

PREPARATION OF MOLYBDENUM SURFACES FOR ADHESIVE BONDING, JOINING 3/19/71

SURFACE PREPARATION OF TITANIUM FOR ADHESIVE BONDING, JOINING 4/13/71

SURFACE PREPARATION OF TI-6AL-4V TITANIUM ALLOY FOR ADHESIVE BONDING, JOINING 7/22/71

SURFACE PREPARATION OF TITANIUM FOR ADHESIVE BONDING, JOINING 4/8/71

AIRCRAFT ENGINES

MATERIALS USED IN FIRST- AND SECOND-STAGE BLADES AND VANES IN ADVANCED GAS TURBINE AIRCRAFT ENGINES 2/5/71

AIRFRAME DESIGN AND MANUFACTURE

SOURCES OF INFORMATION ON AIRFRAME DESIGN AND MANUFACTURE 3/5/71-C

ALLOY STEELS

ALLOY STEELS WITH GOOD NOTCH TOUGHNESS PROPERTIES AT LOW TEMPERATURES 2/19/71

ALNICO 8

EFFECT OF VIBRATION AND SHOCK ON LOSS OF MAGNETIC PROPERTIES OF ALNICO 8 4/28/71

ALPHA SEGREGATION

ALPHA SEGREGATION IN TI-6AL-4V AND TI-6AL-6V-2SN TITANIUM ALLOYS, PRODUCTION 11/1/70

ALUMINUM

ABRASION RATE ON A RUNWAY OF 2024-T4 ALUMINUM, PROPERTIES 7/15/71

ALUMINUM WELDING PROCEDURE, JOINING 2/18/71-C

ALUMINUM COMPATIBILITY, CORROSION 3/23/71-C

ALUMINUM TUBE WELDING, JOINING 6/13/71

BIAXIAL STRENGTH PROPERTIES IN ALUMINUM PRESSURE VESSELS, TESTING 6/22/71

BRAZING OF ALUMINUM COLDPLATE, JOINING 6/22/71

CAST STEEL VS STAINLESS STEEL SHOT FOR PEENING STEEL AND ALUMINUM ALLOYS, SHOT PEENING 12/22/70

COMPARATIVE SMOOTH AND NOTCH FATIGUE PROPERTIES OF ALUMINUM WITH MAGNESIUM ALLOYS 1/26/71

COMPATIBILITY OF ALUMINUM AND STAINLESS STEEL ALLOYS IN HCl, HBR, AND HF GASES, CORROSION 12/8/70

COMPATIBILITY OF 2014-T6 ALUMINUM IN N2O4, CORROSION 4/1/71

COMPATIBILITY OF ALUMINUM, TITANIUM, AND BERYLLIUM ALLOYS WITH ETHYLENE GLYCOL, CORROSION 6/30/71

COMPATIBILITY OF MATERIALS IN RED FUMING NITRIC-ACID, CORROSION OF STAINLESS STEELS, NICKEL-BASE ALLOYS, AND ALUMINUM 8/16/71

COMPATIBILITY OF COPPER, STAINLESS STEEL, AND ALUMINUM IN DEIONIZED WATER, CORROSION 1/20/71

DEVELOPMENT AND USE OF BERYLLIUM / ALUMINUM LAMINATES, JOINING 8/23/71

DIFFUSION BONDING OF ALUMINUM ALLOYS, JOINING 12/14/70

DIFFUSION BONDING OF ALUMINUM, JOINING 11/13/70

DIMENSIONAL STABILITY OF 6061 ALUMINUM, PHYSICAL METALLURGY 3/8/71

EFFECT OF HIGH STRAIN-RATE LOADING ON THE MECHANICAL PROPERTIES OF AIRCRAFT STEELS, TITANIUM, AND ALUMINUM ALLOYS 2/2/71

EFFECT OF POROSITY ON FATIGUE PROPERTIES OF A-356-T6 CAST ALUMINUM 6/15/71

EFFECT OF STRETCH FORMING ON THE MECHANICAL PROPERTIES OF 2014 ALUMINUM 6/15/71

EFFECT OF SHOT PEENING ON THE STRESS-CORROSION AND FATIGUE PROPERTIES OF ALUMINUM ALLOYS 4/3/71

EFFECT OF PEENING ON THE TENSILE STRENGTH PROPERTIES OF ALUMINUM, SURFACE TREATMENTS 7/22/71

EFFECT OF THICKNESS OF 2024-T3 ALUMINUM PLATE ON THE FATIGUE PROPERTIES 6/15/71

EFFECT OF OXIDE CONTENT ON THE PROPERTIES OF 5086 ALUMINUM WELDS, JOINING 3/4/71

ELECTROPLATING OF 6061 ALUMINUM, COATINGS 12/2/70

FATIGUE PROPERTIES OF 6061 ALUMINUM BRAZED WITH 4047 BRAZING ALUMINUM, JOINING 12/7/70

FATIGUE PROPERTIES OF 7075-T76 ALUMINUM PLATE 6/10/71

FATIGUE PROPERTIES OF 7049-T73 ALUMINUM 4/5/71

FRACTURE TOUGHNESS PROPERTIES OF 2020 ALUMINUM IN THE T-6 CONDITION 7/8/71

FRACTURE TOUGHNESS AND LONGITUDINAL AND TRANSVERSE STRAIN RATE PROPERTIES OF ALUMINUM 2020 IN CONDITIONS OTHER THAN T-6 7/8/71

FRACTURE TOUGHNESS (K1C) PROPERTIES OF 2024-T351 ALUMINUM ALLOY PLATE 10/10/70

HIGH-TEMPERATURE COATINGS FOR ALUMINUM 12/18/70

HYDROGEN EMBRITTLEMENT OF STEELS AND ALUMINUM, CORROSION 4/22/71

IDENTIFICATION OF PLASTIC DEFORMATION IN SHOT PEENED ALUMINUM 7075-T73 6/9/71

INTERACTION DURING DIFFUSION BONDING OF ALUMINUM WITH BORON AND NORSIC FIBERS, COMPATIBILITY, FIBER-REINFORCED METALS, COMPOSITES 5/6/71

INVESTMENT CASTING OF ALUMINUM, PRODUCTION 2/24/71

JOINING ALUMINUM ELECTRICAL WIRING TO ITSELF OR TO COPPER 10/27/70

MACHINING OF TITANIUM AND ALUMINUM FORGINGS, SECONDARY FABRICATION 6/7/71

NONDESTRUCTIVE TESTING OF WELDS IN TUBES, ALUMINUM AND TITANIUM 4/13/71

OXIDE FORMATION DURING ALUMINUM WELDING, JOINING, SURFACE TREATMENT 6/17/71

PENNATION AND DIFFUSION RATE OF GASES IN NICKEL 201 AND 270 ALUMINUM 3/4/71

PLATING OF ELECTROLESS NICKEL ON ALUMINUM, COATINGS 12/16/70

PRECISION ELASTIC LIMIT FOR PURE GOLD AND 1100-0 ALUMINUM, PROPERTIES 12/16/70

PROPERTIES OF ALUMINUM CASTINGS 2/22/71-C

PROPERTIES AND HEAT TREATMENT OF ALUMINUM 5/20/71-C

RATE OF DIFFUSION OF HELIUM THROUGH A THIN METAL ALUMINUM STRUCTURE 1/19/71

REFLECTIVITY PROPERTIES OF ALUMINUM COATINGS 10/1/70

SALT BATHS FOR HEAT TREATING ALUMINUM, PHYSICAL METALLURGY 12/21/70

SOLDERING OF TITANIUM TO ALUMINUM, JOINING 6/15/71

SPINNING MANUFACTURERS OF ALUMINUM 2014 AND 2219 10/1/70

STRENGTH PROPERTIES AFTER RAPID HEATING OF ALUMINUM, MAGNESIUM, TITANIUM, AND STAINLESS STEEL ALLOYS 11/10/70

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APPENDIX B

SYNOPSES OF REPORTS, MEMORANDA, AND TECHNICAL NOTES
ISSUED AND IN PROGRESS
(October 1, 1970 to July 31, 1971)

APPENDIX B

SYNOPSES OF REPORTS, MEMORANDA, AND TECHNICAL NOTES ISSUED AND IN PROCESS
(October 1, 1970 to July 31, 1971)

Synopses of Reports and Memoranda Issued

Summary of Beryllium Research and Development Programs (Revised)
By A. N. Ashurst, H. D. Names, and R. J. Runck

DMIC Report S-32
February 1971

This summary of beryllium research and development programs is intended to update an earlier summary, DMIC Report S-15, published in June 1967. Programs are arranged according to the following major subdivisions: Processing, Metallurgical Variables, External Variables, Properties, Analysis, Safety, Composites, Applications, and Miscellaneous. For each program, the following information is given (if available): Contract Number, Contractor, Principal Investigators, Sponsor, Title, Objective, Approach, Progress, and Reports. Current programs are identified with an asterisk.

Fiber-Reinforced Metal-Matrix Composites--1969-1970
By K. R. Hanby

DMIC Report S-33
July 1, 1971

This report is intended to update DMIC Report S-27 which described 1968 research on fiber-reinforced metal-matrix composites. A two-page summary outlines the current state-of-the-art of these composites, and is followed by a discussion of 1969-1970 research on the composites, arranged according to matrix- and fiber-materials. The bulk of the report consists of summaries of 1969-1970 research programs, arranged by programs.

Applications and Potential of Thermomechanical Treatment
By H. J. Henning

DMIC Memorandum 251
November 1970

This memorandum was adapted from a talk given by the author at a subgroup meeting of The Technical Cooperation Program (TTCP), London, April 1970. The author's primary theme is that there are sufficient data already available to permit the use of thermomechanical treatment (TMT) routinely in the manufacture of some alloy products. The use of TMT for products of low carbon steels, aluminum alloys, maraging steels, titanium alloys, nickel-base alloys and high-alloy steels is discussed briefly. Most of the memorandum deals with TMT of alloy steels. The future of TMT is forecast briefly, particularly with respect to alloy steels. An extensive bibliography includes sources of several languages, primarily English and Russian. A few sources in French, German, Czech, Serbo-Crotian, and Japanese are also cited.

Concepts in Fail-Safe Design of Aircraft Structures
By David Broek

DMIC Memorandum 252
March 1971

In order to obtain an appraisal of the state of the art of fail-safe design, the author made an inventory of fail-safe design methods applied by various aerospace companies and of research work relevant to the engineering approach of fatigue-crack propagation and residual strength. This memorandum is based on information from discussions with personnel of several companies and research laboratories, with the main emphasis on plane stress and transitional fracture behavior.

This memorandum presents a brief description of the general approach to the fail-safe problem, an analysis of several of the existing methods that use this approach, including their shortcomings, and a summary of the data required for a good fail-safe design. A specific approach proposed for the presentation in MIL-HDBK-5 of data pertinent to the fail-safe design concept is evaluated in terms of its applicability to that concept.

Dimensional Instability -- An Introduction
By R. E. Maringer

DMIC Memorandum 253
April 1971

The point of this memorandum is to emphasize the danger in accepting engineering data at face value. The definition of units used in the measurement of engineering parameters related to solid materials is discussed. A major portion of the memorandum is concerned with micromechanical strength parameters in solids such as yield strength, elastic limit, and proportional limit. Variation of elastic "constants" in ordinary engineering materials under various conditions is discussed. A final section of the memorandum discusses variation of the thermal expansion coefficient in materials.

Directory of High-Temperature Corrosion Research
(Organizations, Investigators, and Programs)

DMIC Memorandum 254
January 1971

This directory of research organizations, investigators, and research programs or areas of research was prepared from information gathered by the NATO/AGARD Working Group on Basic and Applied Research on High-Temperature Corrosion, and the European Federation of Corrosion's Working Group on Corrosion by Hot Gases and Products of Combustion.

The directory lists the organizations, together with the investigators and the research areas (or specific programs) in which they are working, alphabetically by countries. There are 178 organizations from eleven NATO countries included. A category index indicates the high-temperature corrosion research areas in which the various organizations are conducting research. The two research areas currently receiving the most attention are (1) material behavior under corrosion and (2) reaction kinetics and diffusion processes, in which 119 and 97 organizations, respectively, are working. An alphabetical index of investigators includes approximately 240 names.

Description and Engineering Characteristics of Eleven New High-Temperature Alloys
By W. F. Simmons

DMIC Memorandum 255
June 1971

This memorandum contains a description and summary of preliminary properties of eleven new alloys that are considered to be promising high-temperature materials. Most of them are in the experimental-application stage of their development; however, a few have reached the point where they can be considered commercial. Included are six nickel-base alloys, two iron-base alloys, one iron-nickel-base alloy, one cobalt-base alloy, and one multicomponent alloy that contains primarily nickel and chromium. Following descriptions of composition and microstructure of each alloy, a large section of the memorandum is concerned with physical and mechanical properties, predominantly stress-rupture and creep properties. Oxidation and sulfidation as well as elevated-temperature stability of the alloys is discussed. Information on processing and availability of the alloys is also given.

Technical Notes Issued

9/1/70	*High-Temperature* Corrosion Research -- Directory of U.S. and Canadian Programs
9/15/70	Special (Non-AISI) Stainless Steels
10/19/70	Tensile Properties of Titanium Alloys Up to 2500 F
2/71	Preliminary Properties of Aluminum Alloy 2021

Handbooks Issued

Titanium-Base Alloys/6Al-4V

Publications Issued Jointly

ASTM Special Technical Publication 494	Welding the HY Steels
ASTM Special Technical Publication 498	Introduction to Today's Ultrahigh-Strength Structural Steels

Reports and Memoranda in Process

Beryllium

Effects of Impurities on Mechanical Properties of Beryllium
Nontraditional Machining of Beryllium

Columbium

Characteristics of Coated Columbium Alloys

Steel

D6ac/F-111 Fracture Toughness Test Program
Compilation of Trade Names, Specifications, and Producers of Stainless Alloys and Superalloys

Titanium

Surface Effects on Titanium
Crack Propagation of Titanium
Beta Titanium Alloys

Other

Effects of Shot Peening
NDT Developments
Gun Barrel Materials
High-Temperature Corrosion of Structural Materials
Corrosion of Metals in Marine Atmospheres

APPENDIX C

REVIEWS OF RECENT DEVELOPMENTS ISSUED
(October 1, 1970 to July 31, 1971)

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REVIEWS OF RECENT DEVELOPMENTS ISSUED
(October 1, 1970 to July 31, 1971)

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October 16	Fiber-Reinforced Metals
November 4	Nickel- and Cobalt-Base Alloys
November 6	Powder Metallurgy
November 25	Corrosion and Compatibility
November 27	Beryllium
December 2	Mechanical Properties of Metals
December 6	Oxidation-Resistant Coatings for Refractory Metals
December 8	Metals Joining
December 11	Beryllium
December 16	Metalworking
December 18	Low-Temperature Properties of Metals
December 23	Fiber-Reinforced Metals
December 30	Refractory Metals
January 13	Nickel- and Cobalt-Base Alloys
January 15	Mechanical Properties of Metals
January 20	Titanium and Titanium Alloys
January 22	Powder Metallurgy
February 17	Metalworking
February 19	Corrosion and Compatibility
March 3	High-Strength Steels
March 5	Metals Joining
March 10	Titanium and Titanium Alloys
March 12	Low-Temperature Properties of Metals
March 19	Beryllium
March 26	Refractory Metals
April 7	Aluminum and Magnesium
April 28	Fiber-Reinforced Metals
April 30	Nickel- and Cobalt-Base Alloys
May 7	Mechanical Properties of Metals
May 21	Oxidation-Resistant Coatings for Refractory Metals
May 26	Metalworking
May 28	Titanium and Titanium Alloys
June 2	Low-Temperature Properties of Metals
June 9	Metals Joining
June 11	Corrosion and Compatibility
July 7	Powder Metallurgy
July 9	Refractory Metals
July 26	Fiber-Reinforced Metals
July 29	Metalworking

APPENDIX D

VISITORS TO THE DEFENSE METALS INFORMATION CENTER

(October 1, 1970 to July 31, 1971)

APPENDIX D

VISITORS TO THE DEFENSE METALS INFORMATION CENTER

ORGANIZATION AND VISITOR	PURPOSE OF VISIT OR SUBJECT DISCUSSED
I. INDUSTRIAL	
AMERICAN APPRAISAL COMPANY (MILWAUKEE, WISCONSIN)	
L.P. HACKETT	TITANIUM (FEB)
THE BABCOCK & WILCOX COMPANY (LYNCHBURG, VIRGINIA)	
J.L. LAUDERDALE	OPERATION AND SERVICES OF DMIC (MAY)
J.J. VAGI	
BENTHOS, INC. (NORTH FALMOUTH, MASS.)	
S. O. RAYMOND	CERAMICS (JUL)
MR. GEORGE BOEHM (NEW YORK, NEW YORK)	OPERATION OF DMIC (DEC)
THE BOEING COMPANY (SEATTLE, WASHINGTON)	
M. ISAACSON	HYDROGEN EMBRITTLEMENT OF HIGH-STRENGTH STEEL (MAY)
THE DOW CHEMICAL COMPANY (MIDLAND, MICHIGAN)	
T.E. LEONTIS	TITANIUM TECHNOLOGY (NOV)
GRUMMAN AEROSPACE COMPANY (BETHPAGE, NEW YORK)	
G.A. HENDRY	WELD CRACKING OF Ti-6Al-4V (NOV)
THE JOHNS-HOPKINS UNIVERSITY (SILVER SPRING, MARYLAND)	
DR. P.L. NICHOLS, JR. (CPIA)	OPERATION OF DMIC (APR)
KOLENE CORPORATION (DETROIT, MICHIGAN)	
J.R. KATTUS	METAL AND MATERIALS FINISHING OPERATIONS (MAY)
W.G. WOOD	
LOCKHEED-GEORGIA COMPANY (MARIETTA, GEORGIA)	
R. GREY	COMPOSITES (OCT)
W. G. JUREVIC	
W.G. JUREVIC	COMPOSITES (JAN)
W.G. JUREVIC	COMPOSITES (APR)
MCDONNELL-DOUGLAS CORPORATION MCAIR DIVISION (ST. LOUIS, MISSOURI)	
J. SPEER	STRESS-CORROSION CRACKING OF TITANIUM (JUN)
THE OHIO STATE UNIVERSITY (COLUMBUS, OHIO)	
J. W. SPRETNAK	DRY LUBRICANTS (OCT)
POLAROID CORPORATION (WATERTOWN, MASSACHUSETTS)	
A. BOGGS	TITANIUM TECHNOLOGY (DEC)
SANDIA CORPORATION (LIVERMORE, CALIFORNIA)	
D. ADOLPHSON	MECHANICAL PROPERTIES AND FRACTURE TOUGHNESS OF MARAGING STEELS (JUN)
SINGER-GENERAL PRECISION, INC. (LITTLE FALLS, NEW JERSEY)	
M. CARABE	ELGILOY (APR)
STRESSKIN PRODUCTS COMPANY (SANTA ANA, CALIFORNIA)	
M. MEJIA	STRESSKIN ACTIVITIES; MATERIALS PROPERTY DATA (OCT)
SYSTEMS CONSULTANTS, INC. (WASHINGTON, D.C.)	
C. SCHLEICHER	OPERATION OF DMIC (NOV)
TRW, INC. (CLEVELAND, OHIO)	
MR. COOK	BERYLLIUM IN COMPOSITES AND NUCLEAR FIELD (FEB)
II. GOVERNMENT	
DEPARTMENT OF THE AIR FORCE HOLLOMAN AFB (NEW MEXICO)	
D. KRUPOVAGE	HIGH-STRENGTH STEELS (MAY)
B. EMRICH	BASIS-70 (MAY)
AF MATERIALS LABORATORY (WPAFB, OHIO)	
LT. D. RICE	OXIDATION RESISTANCE OF COLUMBIUM ALLOYS (DEC)
CAPT. PURIAM	OPERATION OF DMIC (MAR)
E. DIGGER	PUBLICATION, DISTRIBUTION,
B. EMRICH	AND SALE OF DMIC SERVICES (JUL)
DEPARTMENT OF COMMERCE OFFICE OF EXPORT CONTROL (WASHINGTON, D.C.)	
COCOM COMMITTEE	MEETING OF COMMITTEE, COLUMBUS OHIO, APRIL 19-20, 1971
DEPARTMENT OF DEFENSE OODRE (WASHINGTON, D.C.)	
DR. J. PERSH	OPERATION OF DMIC (FEB)
FEDERAL RAILROAD ADMINISTRATION BUREAU OF SAFETY (WASHINGTON, D.C.)	
R. H. WRIGHT	OPERATION OF DMIC: COMPUTER INFORMATION STORAGE AND RETRIEVAL (JUL)
NATIONAL TECHNICAL INFORMATION SERVICES (SPRINGFIELD, VIRGINIA)	
J. G. COYNE	PUBLICATION, DISTRIBUTION, AND SALE OF DMIC SERVICES (JUL)
SMALL BUSINESS ADMINISTRATION (CLEVELAND, OHIO)	
J.E. SHONDEL	OPERATION OF DMIC (MAR)
III. FOREIGN	
DEFENSE METALLURGICAL RESEARCH LABORATORY (HYDERABAD, INDIA)	
R. V. TAMHANKAR, DIR.	SUPERALLOYS FOR GAS-TURBINE
S. M. GHUDE	SERVICE: OPERATION OF DMIC
V. N. MADHAV	(JUL)
R. K. MAHAPATRA	
NORWEGIAN FORESTRY RESEARCH INSTITUTE (OSLO, NORWAY)	
L. STRAND	OPERATION OF DMIC (MAR)
ST. LAWRENCE COLUMBIUM AND METALLURGICAL CORPORATION (MONTREAL, QUEBEC, CANADA)	
J.E. PONTBRIAND	COLUMBIUM AND COLUMBIUM ALLOYS (JAN)

APPENDIX E

TRAVEL AND TECHNICAL MEETINGS ATTENDED BY DMIC PERSONNEL

(October 1, 1970 to July 31, 1971)

APPENDIX E

TRAVEL OF DEFENSE METALS INFORMATION CENTER PERSONNEL

ORGANIZATION AND DMIC REPRESENTATIVE	PURPOSE OF VISIT OR SUBJECT DISCUSSED
1. INDUSTRIAL	
AEROSPACE CORPORATION (EL SEGUNDO, CALIFORNIA)	
E.W. CAWTHORNE	DMIC REPORTS AND SERVICES (MAR)
M.D. MORAN	DMIC REPORTS AND SERVICES; THEIR ACTIVITIES; GRAPHITE, CARBON AND METALLIC SURGICAL IMPLANTS (JUN)
E.W. CAWTHORNE	
AFFILIATED METALS COMPANY (LOS ANGELES, CALIFORNIA)	
E.W. CAWTHORNE	COLLECTION OF MATERIALS PROPERTY DATA; THEIR PRODUCTS AND ACTIVITIES (MAR)
AIRCRAFT HYDROFORMING, INC. (GARDENA, CALIFORNIA)	
E.W. CAWTHORNE	BOMB RACK FAILURES; ALUMINUM EXTRUSIONS (FEB)
E. W. CAWTHORNE	D6AC BOMB RACK HOOK FAILURES (JUL)
AIRESEARCH MANUFACTURING COMPANY (LOS ANGELES, CALIFORNIA)	
E. W. CAWTHORNE	MATERIALS PROPERTY DATA (OCT)
F.W. CAWTHORNE	MATERIALS USAGE; MATERIALS TESTING ACTIVITIES (NOV)
E.W. CAWTHORNE	COLLECTION OF MATERIALS PROPERTY DATA; THEIR ACTIVITIES (JAN)
E.W. CAWTHORNE	MATERIALS PROPERTY DATA; THEIR ACTIVITIES (FEB)
E. W. CAWTHORNE	AIRESEARCH ACTIVITIES: DATA FOR MIL-5 (JUL)
(TORRANCE, CALIFORNIA)	
E.W. CAWTHORNE	DMIC REPORTS AND SERVICES (JAN)
ALLOY INDUSTRIES, INC. (GARDEN GROVE, CALIFORNIA)	
E.W. CAWTHORNE	TITANIUM WIRE PRODUCTION AND MANUFACTURE OF TITANIUM SPRINGS (DEC)
ALLOY SPECIALTIES, LTD. (LOS ANGELES, CALIFORNIA)	
E. W. CAWTHORNE	COLLECTION OF PROPERTY DATA FOR MIL-HDBK-5 (OCT)
E.W. CAWTHORNE	MATERIALS PROPERTY DATA (FEB)
E.W. CAWTHORNE	COLLECTION OF MATERIALS PROPERTY DATA (MAR)
E.W. CAWTHORNE	MATERIALS PROPERTY DATA (APR)
AMERCOM COMPANY (LOS ANGELES, CALIFORNIA)	
K.R. HANBY	COMPOSITES (APR)
AMETEK CORPORATION CALMEC DIVISION (LOS ANGELES, CALIFORNIA)	
E. W. CAWTHORNE	THEIR ACTIVITIES; MATERIALS USAGE (OCT)
ARMCO (LOS ANGELES, CALIFORNIA)	
E.W. CAWTHORNE	DMIC REPORTS AND SERVICES; MATERIALS PROPERTY DATA (FEB)
ASSOCIATED SPRING COMPANY (GARDENA, CALIFORNIA)	
E.W. CAWTHORNE	TITANIUM SPRING MANUFACTURE AND USAGE (DEC)
E.W. CAWTHORNE	TITANIUM SPRING PROCESSING (JAN)
E.W. CAWTHORNE	TITANIUM SPRING PRODUCTION PROBLEMS (APR)
ASTRO-CUT ENGINEERING COMPANY (VAN NUYS, CALIFORNIA)	
E.W. CAWTHORNE	ELECTROCHEMICAL MACHINING OPERATIONS (JUN)
ATLAS TESTING LABORATORIES (LOS ANGELES, CALIFORNIA)	
E.W. CAWTHORNE	DMIC REPORTS AND SERVICES (FEB)
BELLCOM, INC. (WASHINGTON, D.C.)	
R.J. RUNCK	BERYLLIUM HANDBOOK (MAY)
F.L. BERGLUND COMPANY (CERRITOS, CALIFORNIA)	
E.W. CAWTHORNE	CAPABILITIES FOR PRODUCING PERFORATED TITANIUM SHEET (DEC)
BERTEA CORPORATION (IRVINE, CALIFORNIA)	
E. W. CAWTHORNE	DMIC REPORTS AND SERVICES; MATERIALS PROPERTY DATA (OCT)
THE BOEING COMPANY (SEATTLE, WASHINGTON)	
D. BROEK	MIL-HDBK-5 (NOV)
C.E. FEDDERSEN	
(RENTON, WASHINGTON)	
E. W. CAWTHORNE	DATA FOR TITANIUM HANDBOOK REVISION (JUL)
H. D. MORAN	
THE BRUSH BERYLLIUM COMPANY (CLEVELAND, OHIO)	
R.J. RUNCK	BERYLLIUM (MAR)
(ELMORE, OHIO)	
R.J. FAVOR	MIL-HDBK-5 (DEC)
(LAWNDALE, CALIFORNIA)	
E. W. CAWTHORNE	BERYLLIUM USAGE; INFORMATION SOURCES (OCT)
E. W. CAWTHORNE	BERYLLIUM USAGE (NOV)
E.W. CAWTHORNE	BERYLLIUM USAGE AND INFORMATION SOURCES (MAR)
E. W. CAWTHORNE	BERYLLIUM HANDBOOK (JUL)
R. J. RUNCK	
CABOT CORPORATION STELLITE DIVISION (NORWALK, CALIFORNIA)	
E.W. CAWTHORNE	PRODUCTION, USAGE, AND TESTING OF HA 188 ALLOY (APR)
CALSTRIP STEEL CORPORATION (LOS ANGELES, CALIFORNIA)	
E.W. CAWTHORNE	DMIC REPORTS AND SERVICES; THEIR PRODUCTS AND ACTIVITIES (MAR)
CARLTON FORGE COMPANY (PARAMOUNT, CALIFORNIA)	
E.W. CAWTHORNE	MATERIALS PROPERTY DATA (MAY)
CONRAD CORPORATION (GARDENA, CALIFORNIA)	
E.W. CAWTHORNE	DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (MAY)
CONTINENTAL METALS, INC. (GLENDALE, CALIFORNIA)	
E.W. CAWTHORNE	DATA ON ALLOY 718, RENE' 41, L-605, AND HASTELLOY X (NOV)
E.W. CAWTHORNE	COLLECTION OF MATERIALS PROPERTY DATA (JAN)
E.W. CAWTHORNE	MATERIALS TEST REPORT (FEB)
E.W. CAWTHORNE	MATERIALS PROPERTY DATA (APR)
E.W. CAWTHORNE	MATERIALS PROPERTY DATA (JUN)
E. W. CAWTHORNE	PROPERTY DATA FOR MIL-5 (JUL)
C.S. INDUSTRIES, INC. (LONG BEACH, CALIFORNIA)	
E.W. CAWTHORNE	DMIC SERVICES; THEIR ACTIVITIES (NOV)
EDCLIFF INSTRUMENTS, INC. (MONROVIA, CALIFORNIA)	
E. W. CAWTHORNE	INFORMATION CENTER SERVICES (OCT)
ELECTRON BEAM WELDING, INC. (LOS ANGELES, CALIFORNIA)	
E.W. CAWTHORNE	AVAILABILITY OF WELD PROPERTY DATA; ELECTRON-BEAM WELDING OF A-286 STAINLESS STEELS (NOV)

FUTURA TITANIUM SALES COMPANY
(WESTLAKE VILLAGE, CALIF.)
E.W. CAWTHORNE — THEIR ACTIVITIES (FEB)

GENERAL DYNAMICS/ASTRONAUTICS
(SAN DIEGO, CALIFORNIA)
E.S. BARTLETT — SPACE SHUTTLE MATERIALS (APR)

GENERAL MOTORS COMPANY
ALLISON DIVISION
(SHERMAN OAKS, CALIFORNIA)
E. W. CAWTHORNE — TITANIUM-CADMIUM STRESS CORROSION (OCT)

GLOBAL ENGINEERING
DOCUMENTATION SERVICES
(NEWPORT BEACH, CALIFORNIA)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (JAN)

GRUMMAN AEROSPACE CORPORATION
(BETHPAGE, NEW YORK)
J.A. GURKLIS — NONTRADITIONAL MACHINING METHODS (APR)

HARPER AER-O-LINE COMPANY
(BURBANK, CALIFORNIA)
E.W. CAWTHORNE — CAPABILITY FOR PRODUCING SMALL TITANIUM SCREWS FOR SURGICAL IMPLANT; DMIC SERVICES (DEC)

HARTCO METAL PRODUCTS COMPANY
(BURBANK, CALIFORNIA)
E. W. CAWTHORNE — MACHINING OF TITANIUM (JUL)

HARVEY ALUMINUM COMPANY
(TORRANCE, CALIFORNIA)
E. W. CAWTHORNE — TITANIUM BAR AND EXTRUDED SHAPES; TITANIUM EXTRUSION TEST DATA (OCT)
E.W. CAWTHORNE — TITANIUM EXTRUSION PROPERTY DATA (JUN)

HI-PRODUCTION FORGE COMPANY
(MONTEBELLO, CALIFORNIA)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES (DEC)

HI-SHEAR CORPORATION
(TORRANCE, CALIFORNIA)
E. W. CAWTHORNE — MATERIALS USAGE; MATERIALS PROPERTY DATA (OCT)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (NOV)
E.W. CAWTHORNE — COLLECTION OF MATERIALS PROPERTY DATA; THEIR ACTIVITIES (JAN)
E.W. CAWTHORNE — HYDROGEN-STRESS CRACKING OF STAINLESS STEEL FASTENERS; MATERIALS PROPERTY DATA (FEB)
E.W. CAWTHORNE — PH13-8MO FASTENER PROBLEMS; COATINGS FOR TITANIUM FASTENERS (MAR)
E.W. CAWTHORNE — TITANIUM SCREWS FOR SURGICAL IMPLANT USAGE (JUN)
E. W. CAWTHORNE — TITANIUM SURGICAL IMPLANT SCREWS (JUL)

HIGH STRESS CASTING CORP.
(SOUTH EL MONTE, CALIF.)
E.W. CAWTHORNE — PROPERTY DATA FOR 201.0 ALUMINUM CASTINGS (APR)

HUGHES AIRCRAFT COMPANY
(CULVER CITY, CALIFORNIA)
E. W. CAWTHORNE — DMIC AND EPIC ACTIVITIES; MIL-HDBK-5 (OCT)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES (JAN)
E.W. CAWTHORNE
M.D. MORAN — DMIC AND EPIC OPERATIONS (MAR)
E.W. CAWTHORNE — DMIC OPERATIONS; EPIC (MAY)
E. W. CAWTHORNE
M. D. MORAN — DMIC AND EPIC OPERATIONS AND SALES PROGRAMS (JUL)
(EL SEGUNDO, CALIFORNIA)
E. W. CAWTHORNE
R. J. RUNCK — BERYLLIUM HANDBOOK (JUL)

HUGHES TOOL COMPANY
(CULVER CITY, CALIFORNIA)
E. W. CAWTHORNE — MATERIALS USAGE; MATERIALS PROPERTY DATA (OCT)
E.W. CAWTHORNE — COLLECTION OF MATERIALS PROPERTY DATA; THEIR ACTIVITIES (JAN)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; MATERIALS USAGE (FEB)
E.W. CAWTHORNE
M.D. MORAN — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (MAR)

INTERFACE WELDING COMPANY
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — INERTIA WELDING PROGRAMS (NOV)

INTERNATIONAL HARVESTER CO.
SOLAR DIVISION
(SAN DIEGO, CALIFORNIA)
E. W. CAWTHORNE — BERYLLIUM HANDBOOK (JUL)
R. J. RUNCK

THE INTERNATIONAL NICKEL COMPANY, INC.
(TORRANCE, CALIFORNIA)
E.W. CAWTHORNE — DMIC SERVICES; MATERIALS USAGE AND SOURCES OF MATERIALS PROPERTY DATA (NOV)

ISOPRESSED PRODUCTS CORP.
(CANOGA PARK, CALIFORNIA)
E. W. CAWTHORNE — THEIR ACTIVITIES (OCT)
E.W. CAWTHORNE — ACTIVITIES AND CAPABILITIES FOR PRODUCTION OF POWDER-METALLURGY TITANIUM PRODUCTS (DEC)

I. W. KOSACOFF COMPANY
(VENICE, CALIFORNIA)
E. W. CAWTHORNE — INFORMATION CENTER SERVICE (OCT)

KAMAN AIRCRAFT CORPORATION
(BLOOMFIELD, CONNECTICUT)
J.A. GURKLIS — NONTRADITIONAL MACHINING METHODS (APR)

KAWECKI BERYLCO INDUSTRIES, INC.
(NEW YORK, NEW YORK)
R.J. RUNCK — BERYLLIUM (MAR)

LITTON INDUSTRIES, INC.
SHIP SYSTEMS DIVISION
(CULVER CITY, CALIFORNIA)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (MAR)
E.W. CAWTHORNE — COMPUTERIZED FILING SYSTEM; DMIC REPORTS AND SERVICES (JUN)
E. W. CAWTHORNE — DMIC COMPUTERIZATION (JUL)

LOCKHEED-CALIFORNIA COMPANY
(BURBANK, CALIFORNIA)
D. BROEK
C.E. FEDDERSEN
E.W. CAWTHORNE
M.D. MORAN
E.W. CAWTHORNE — MIL-HDBK-5 (NOV)

LOCKHEED MISSILES AND SPACE COMPANY
(SUNNYVALE, CALIFORNIA)
R. J. RUNCK — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (MAR)
PROPERTIES OF ALUMINUM EXTRUSIONS (JUN)

MAGNA MILL PRODUCTS COMPANY
(SOUTH GATE, CALIFORNIA)
E. W. CAWTHORNE — BERYLLIUM HANDBOOK (JUL)

MARTIN-MARIETTA CORPORATION
(DENVER, COLORADO)
E.S. BARTLETT — DMIC REPORTS AND SERVICES (OCT)

MATCO, INC.
(GLENDALE, CALIFORNIA)
E.W. CAWTHORNE — SPACE SHUTTLE MATERIALS (APR)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (APR)
E.W. CAWTHORNE — USAGE AND MANUFACTURE OF SURGICAL IMPLANT DEVICES (MAY)
E.W. CAWTHORNE — USE OF TITANIUM FOR SURGICAL IMPLANTS (JUN)

MCDONNELL-DOUGLAS CORPORATION
(HUNTINGTON BEACH, CALIF.)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (MAR)
E.S. BARTLETT — SPACE SHUTTLE MATERIALS (APR)
(LONG BEACH, CALIFORNIA)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (NOV)
D. BROEK — MIL-HDBK-5 (NOV)
C.E. FEDDERSEN
E.W. CAWTHORNE — COLLECTION OF MATERIALS PROPERTY DATA (JAN)
E.W. CAWTHORNE — MATERIALS TEST REPORTS (FEB)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (MAR)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (APR)
E.S. BARTLETT — SPACE SHUTTLE MATERIALS (APR)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (JUN)

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METAL RESOURCES, INC.
(GARDENA, CALIFORNIA)
E.W. CAWTHORNE — TITANIUM FORMING PROCESSES AND TOOLING (MAY)

MINNEAPOLIS-HONEYWELL CORP.
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — OPERATION OF EXECUPORT 300 COMPUTER (MAY)

MOLECTRICS, INC.
(EL SEGUNDO, CALIFORNIA)
E.W. CAWTHORNE — ELECTROPOLISHING OF TITANIUM SURGICAL IMPLANTS; THEIR ACTIVITIES (DEC)

MONARCH MACHINE COMPANY
(SANTA FE SPRINGS, CALIF.)
E. W. CAWTHORNE — INFORMATION CENTER SERVICES (OCT)

NAHDON MANUFACTURING COMPANY
(ALHAMBRA, CALIFORNIA)
E. W. CAWTHORNE — DMIC REPORTS AND SERVICES (OCT)

NORRIS INDUSTRIES, INC.
(VERNON, CALIFORNIA)
E.W. CAWTHORNE — THEIR ACTIVITIES; MATERIALS USAGE (FEB)

NORTH AMERICAN-ROCKWELL CORP.
AUTONETICS DIVISION
(ANAHEIM, CALIFORNIA)
E. W. CAWTHORNE — BERYLLIUM HANDBOOK (JUL)
R. J. RUNCK
ROCKETDYNE DIVISION
(CANOGA PARK, CALIFORNIA)
E. W. CAWTHORNE — MATERIALS PROPERTY DATA (OCT)
E. W. CAWTHORNE — BERYLLIUM HANDBOOK (JUL)
(DOWNEY, CALIFORNIA)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (FEB)
E.W. CAWTHORNE — MATERIALS USAGE AND DATA (APR)
R.J. FAVOR
K.R. HANDY
E.W. CAWTHORNE — COMPOSITES (APR)
(LOS ANGELES, CALIFORNIA) — MATERIALS PROPERTY DATA (MAY)
E. W. CAWTHORNE — NICKEL-BASE ALLOY SHEET (OCT)
E.W. CAWTHORNE — MATERIALS FOR CONTAINMENT OF HIGH-PRESSURE HYDROGEN (NOV)
D. BROEK — MIL-HDBK-5 (NOV)
C.E. FEDDERSEN
E.W. CAWTHORNE — B-1 MATERIALS USAGE DATA; MIL-HDBK-5 DATA (DEC)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES (JAN)
E.W. CAWTHORNE — B-1 MATERIALS USAGE AND DATA (APR)
R.J. FAVOR — COMPOSITES (APR)
K.H. HANDY
(SEAL BEACH, CALIFORNIA)
E.W. CAWTHORNE — CRYOGENIC PROPERTIES OF Ti-6Al-4V (DEC)

NORTHROP CORPORATION
NORAIR DIVISION
(HAWTHORNE, CALIFORNIA)
E. W. CAWTHORNE — FORMING ALUMINUM EXTRUSIONS; MATERIALS PROPERTY DATA (OCT)
E.W. CAWTHORNE — MATERIALS USAGE AND DATA (APR)
R.J. FAVOR

OLYMPIC FASTENING SYSTEMS, INC
(DOWNEY, CALIFORNIA)
E.W. CAWTHORNE — MANUFACTURE OF TITANIUM AND COBALT-BASE ALLOY FASTENERS L-605 RIVETS (JUN)

OMARK INDUSTRIES, INC.
(EL SEGUNDO, CALIFORNIA)
E.W. CAWTHORNE — PLATING AND COATING OF TITANIUM FASTENERS; MATERIALS PROPERTY DATA (MAR)

PHILCO-FORD CORPORATION
AERONUTRONICS DIVISION
(NEWPORT BEACH, CALIFORNIA)
E. W. CAWTHORNE — THEIR ACTIVITIES; MATERIALS PROPERTY DATA (OCT)
E.W. CAWTHORNE — COMPUTERIZED FILING SYSTEM; THEIR ACTIVITIES (JUN)

PRECISION COIL SPRING COMPANY
(EL MONTE, CALIFORNIA)
E.W. CAWTHORNE — TITANIUM SPRING PRODUCTION PROBLEMS (DEC)

PRESSURE SYSTEMS, INC.
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA; THEIR ACTIVITIES (MAR)

PROGRESSIVE METAL INDUSTRIES
(TORRANCE, CALIFORNIA)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (MAR)

REACTIVE METALS, INC.
(MONTEBELLO, CALIFORNIA)
E. W. CAWTHORNE — TITANIUM USAGE AND DATA SOURCES (OCT)
E.W. CAWTHORNE — SOURCE OF TITANIUM PROPERTY DATA (JAN)
E.W. CAWTHORNE — TITANIUM USAGE AND DATA SOURCES (FEB)
E.W. CAWTHORNE — TITANIUM USAGE AND SOURCES OF MATERIALS DATA (APR)
E.W. CAWTHORNE — TITANIUM USAGE AND DATA SOURCES (MAY)

RELIANCE ELECTRIC COMPANY
(TOLEDO, OHIO)
R. J. RUNCK — DMIC OPERATIONS; GRAY IRON (OCT)

REISNER METALS COMPANY
(SOUTH GATE, CALIFORNIA)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA (MAY)

REYNOLDS ALUMINUM COMPANY
(RICHMOND, VIRGINIA)
R.J. RUNCK — TOUR OF PLANT (JUN)

RMD METALS COMPANY
(DOWNEY, CALIFORNIA)
E.W. CAWTHORNE — MATERIALS USAGE AND SOURCES OF MATERIALS PROPERTY DATA (FEB)

ROHR CORPORATION
(CHULA VISTA, CALIFORNIA)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA; CHEMICAL MILLING PROBLEMS WITH Ti-6Al-6V-2Sn (NOV)
E.W. CAWTHORNE — COMPUTERIZED FILING SYSTEM; MATERIALS PROPERTY DATA (JUN)
R. J. RUNCK — BERYLLIUM HANDBOOK (JUL)

ROLLMET, INC.
(SANTA ANA, CALIFORNIA)
E.W. CAWTHORNE — THEIR ACTIVITIES; DMIC REPORTS AND SERVICES (JUN)

SARGENT INDUSTRIES
AIRITE DIVISION
(EL SEGUNDO, CALIFORNIA)
E.W. CAWTHORNE — THEIR ACTIVITIES; WELDING A-286 STAINLESS STEEL (NOV)
E. W. CAWTHORNE — TITANIUM (JUL)

SCHULTZ STEEL COMPANY
(SOUTH GATE, CALIFORNIA)
E.W. CAWTHORNE — PROPERTIES OF 300M STEEL; MIL-HDBK-5 (DEC)

SCIENTIFIC METALCRAFT COMPANY
(FULLERTON, CALIFORNIA)
E.W. CAWTHORNE — THEIR ACTIVITIES; DMIC REPORTS AND SERVICES (JUN)

SMITHFORD PRODUCTS COMPANY
(ONTARIO, CALIFORNIA)
E.W. CAWTHORNE — ALUMINUM CASTINGS PROPERTY DATA (FEB)

STERER ENGINEERING AND MANUFACTURING COMPANY
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES (MAR)

STRESSKIN PRODUCTS COMPANY
(SANTA ANA, CALIFORNIA)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA; THEIR ACTIVITIES (NOV)
E.W. CAWTHORNE — COLLECTION OF MATERIALS PROPERTY DATA (JAN)
E.W. CAWTHORNE — MATERIALS PROPERTY DATA; THEIR ACTIVITIES (FEB)
E.W. CAWTHORNE — THEIR ACTIVITIES; MATERIALS PROPERTY DATA (JUN)

SUPER-TEMP CORPORATION
(SANTA FE SPRINGS, CALIF.)
E.W. CAWTHORNE — THEIR ACTIVITIES; DMIC REPORTS AND SERVICES (JUN)

TAVCO, INC.
(SANTA MONICA, CALIFORNIA)
E. W. CAWTHORNE — TITANIUM PRESSURE VESSEL WORK (JUL)

TECHNI-BRAZE, INC.
(SANTA FE SPRINGS, CALIF.)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (MAY)

TIODIZE COMPANY
(BURBANK, CALIFORNIA)
E.W. CAWTHORNE — "TIODIZE" COATINGS ON FASTENERS AND BEARINGS; PRODUCTION AND USAGE OF TITANIUM TUBING (DEC)

TITANIUM METALLURGICAL, INC.
(LONG BEACH, CALIFORNIA)
E. W. CAWTHORNE — TITANIUM WIRE AND ROD PRODUCTION (OCT)
E.W. CAWTHORNE — TITANIUM WIRE PRODUCTION (DEC)
E.W. CAWTHORNE — TITANIUM WIRE PRODUCTION (JAN)
E.W. CAWTHORNE — TITANIUM WIRE AND SPRINGS
E.W. CAWTHORNE — COLLECTION OF PROPERTY DATA; THEIR ACTIVITIES (MAY)
E.W. CAWTHORNE — THEIR ACTIVITIES; DMIC REPORTS AND SERVICES (JUN)

TITANIUM METALS CORPORATION OF AMERICA
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — TITANIUM COMPATIBILITY DATA (JAN)
E.W. CAWTHORNE — USAGE OF TITANIUM PROSTHETIC DEVICES; TITANIUM SHEET AND PLATE PRODUCTION PROBLEMS (FEB)
E.W. CAWTHORNE — TITANIUM USAGE, DATA SOURCES AND FABRICATION PROBLEMS (MAR)
E.W. CAWTHORNE — TITANIUM USAGE AND DATA SOURCES (MAY)
E.W. CAWTHORNE — COMPUTERIZED FILING SYSTEM (JUN)

TOWNSEND COMPANY
(SANTA ANA, CALIFORNIA)
E.W. CAWTHORNE — BIMETALLIC TITANIUM RIVETS; RIVETS SUITABLE FOR SURGICAL IMPLANT USAGE (DEC)

UNITED STATES STEEL CORP.
(PITTSBURGH, PENNSYLVANIA)
W.F. SIMMONS — REVISION OF US-45

UNIVERSAL TITANIUM COMPANY
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — THEIR ACTIVITIES; DMIC SERVICES; MIL-HDBK-5 (DEC)
E.W. CAWTHORNE — PROPERTY DATA FOR TITANIUM SHEET AND PLATE (FEB)

UNIVERSAL TITANIUM COMPANY
(PLESSEY LTD.)
(LOS ANGELES, CALIFORNIA)
E. W. CAWTHORNE — DMIC SERVICES; MECHANICAL PROPERTY DATA (JUL)

WEBER METALS AND SUPPLY CO.
(PARAMOUNT, CALIFORNIA)
E. W. CAWTHORNE — MATERIALS PROPERTY DATA; THEIR ACTIVITIES (OCT)

II. GOVERNMENT

DEFENSE DOCUMENTATION CENTER
(ALEXANDRIA, VIRGINIA)
M.D. MORAN — OPERATION OF DDC (MAY)

DEPARTMENT OF THE AIR FORCE
EGLIN AFB, FLORIDA
J. G. DUNLEAVY
S. A. GODDARD — GUN BARREL TECHNOLOGY (OCT)
AF MATERIALS LABORATORY
(WPAFB, OHIO)
M.D. MORAN — OPERATION OF DMIC (JAN)
M.D. MORAN — OPERATION OF DMIC (FEB)
K.R. MANBY — METAL-MATRIX COMPOSITES (APR)
M.D. MORAN — OPERATION OF DMIC (APR)
M.D. MORAN — OPERATION OF DMIC (JUN)
J. F. LYNCH — OPERATION OF DMIC (JUL)
M. D. MORAN

DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
(BOULDER, CALIFORNIA)
H. J. RONCK — BERYLLIUM HANDBOOK (JUL)

DEPARTMENT OF DEFENSE
DEFENSE SUPPLY AGENCY
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES (JAN)

DDDRE
(WASHINGTON, D.C.)
M.D. MORAN — OPERATION OF DMIC (JAN)
M.D. MORAN — OPERATION OF DMIC (FEB)
M.D. MORAN — OPERATION OF DMIC (MAR)

DEPARTMENT OF THE NAVY
PACIFIC MISSILE RANGE
(POINT MUGU, CALIFORNIA)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; THEIR ACTIVITIES (JAN)

FEDERAL AVIATION AGENCY
(INGLEWOOD, CALIFORNIA)
E. W. CAWTHORNE — DMIC REPORTS AND SERVICES (OCT)
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — DMIC SERVICES; TITANIUM FIRES; AIRCRAFT MATERIALS PROBLEMS (MAR)
E.W. CAWTHORNE — DMIC REPORTS AND SERVICES; MATERIALS PROBLEMS (APR)

NASA/HEADQUARTERS
(WASHINGTON, D.C.)
M. D. MORAN — OPERATION OF DMIC (JUL)

NASA/LANGLEY RESEARCH CENTER
(HAMPTON, VIRGINIA)
D. BROER
W. S. HYLER
C. E. FEDDERSEN — MIL-HDBK-5

NASA/MANNED SPACE CENTER
(HOUSTON, TEXAS)
E.S. HARTLETT — SPACE SHUTTLE MATERIALS (APR)

NASA/MARSHALL SPACE FLIGHT CENTER
(HUNTSVILLE, ALABAMA)
E.S. HARTLETT — SPACE SHUTTLE MATERIALS (JUN)

NATIONAL TECHNICAL INFORMATION SERVICE
(WASHINGTON, D.C.)
K.R. MANBY
M.D. MORAN — SALE OF DMIC PUBLICATIONS (MAY)

U.S. VETERANS ADMINISTRATION CENTER
(LOS ANGELES, CALIFORNIA)
E.W. CAWTHORNE — TITANIUM SURGICAL IMPLANT PROJECTS; TITANIUM FORMING AND FASTENER MANUFACTURE (MAY)
E.W. CAWTHORNE — POROUS MATERIALS FOR SURGICAL IMPLANTS (JUN)
E. W. CAWTHORNE
M. D. MORAN — USAGE OF NITINOL AND TITANIUM FOR SURGICAL IMPLANT HARDWARE (JUL)

MEETINGS ATTENDED BY DMIC STAFF MEMBERS

ORGANIZATION AND DMIC REPRESENTATIVE	MEETING OR ACTIVITY
I. INDUSTRIAL	
AIAA/ASME	
E.W. CANTRONNE	12TH STRUCTURES, STRUCTURAL DYNAMICS AND MATERIALS CONFERENCE, ANAHEIM, CALIF. APRIL 19, 1971
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS	
M. D. MORAN	ANNUAL MEETING, HOUSTON, TEXAS OCTOBER 19-23, 1970
M.D. MORAN	SEMIANNUAL MEETING, PHOENIX, ARIZONA, MARCH 15-17, 1971
E. W. CANTRONNE	AIRCRAFT DESIGN AND OPERATIONS MEETING, SEATTLE, WASHINGTON, JULY 12-15, 1971
AMERICAN SOCIETY FOR METALS	
K. R. HANBY	METALS SHOW, CLEVELAND, OHIO, OCTOBER 20-21, 1970
R. A. WOOD	WESTERN METAL AND TOOL CONFERENCE, LOS ANGELES, CALIFORNIA, MARCH 8-12, 1971
E.W. CANTRONNE	
ASTM/AIME	
E.W. CANTRONNE	SECOND CONFERENCE ON COMPOSITE MATERIALS, ANAHEIM, CALIF. APRIL 19-23, 1971
K.R. HANBY	
AMERICAN SOCIETY FOR TESTING AND MATERIALS	
W.F. SIMMONS	ANNUAL MEETING, WILLIAMSBURG, VIRGINIA, NOVEMBER 16-18, 1970
D.W. JOHNSON	ANNUAL AND COMMITTEE MEETINGS, ATLANTIC CITY, NEW JERSEY, JUNE 28-30, 1971
BATTELLE/NORTHROP/OLIN CORP.	
E.W. CANTRONNE	KO-1 (201.0) CASTINGS MEETING, TORRANCE, CALIFORNIA, APRIL 15, 1971
R.J. FAVOR	
COSATI	
M.D. MORAN	FORUM ON FEDERALLY SPONSORED *INFORMATION ANALYSIS* CENTERS, GAITHERSBURG, MARYLAND, MAY 17-19, 1971
S.A. RUBIN	
KAWECKI BERYLCO INDUSTRIES, INC.	
R.J. RUNCK	BERYLLIUM CONFERENCE, WASHINGTON, D.C., MARCH 24, 1971
SAMPE	
E.W. CANTRONNE	16TH NATIONAL SYMPOSIUM AND EXHIBITION, ANAHEIM, CALIF. APRIL 19-23, 1971
K.R. HANBY	
SME	
J.A. GURKLIS	INTERNATIONAL ENGINEERING CONFERENCE AND TOOL EXPOSITION, PHILADELPHIA, PENNSYLVANIA, APRIL 27-28, 1971
UNIVERSITY OF DENVER/MARTIN METALS	
E. G. SMITH	THIRD INTERNATIONAL CONFERENCE OF THE CENTER FOR HIGH-ENERGY FORMING, VAIL, COLORADO, JULY 12-15, 1971

DMIC STAFF PARTICIPATION ON COMMITTEES

I. INDUSTRIAL	
AMERICAN SOCIETY FOR TESTING AND MATERIALS	
W.F. SIMMONS	ASTM-ASME JOINT COMMITTEE ON EFFECT OF TEMPERATURE ON THE PROPERTIES OF METALS, GAS TURBINE PANEL, NEW YORK, NEW YORK DECEMBER 1-2, 1970
J.E. CAMPBELL	MEETING OF COMMITTEE E-24 ON *FRACTURE TESTING*, ATLANTA, GEORGIA, MARCH 2-3, 1971
W.F. SIMMONS	MEETING OF GAS-TURBINE PANEL AND COMMITTEE A-10, ATLANTIC CITY, NEW JERSEY, JUNE 29-30, 1971
SOCIETY OF AUTOMOTIVE ENGINEERS, INC.	
R.J. RUNCK	AMS MEETINGS, AWARENESS COMMITTEE, AND VARIOUS COMMODITY COMMITTEE MEETINGS, INDIANAPOLIS, INDIANA, APRIL 26-28, 1971
METAL PROPERTIES COUNCIL	
J.E. CAMPBELL	MEETING OF COMMITTEE 7 ON TOUGHNESS OF METALS PITTSBURGH, PENNSYLVANIA, NOVEMBER 5, 1970
II. GOVERNMENT	
DEPARTMENT OF THE AIR FORCE	
R.J. FAVOR	MEETING OF MIL-HDBK-5
W.S. HYLER	CORRDINATION GROUP, WARREN,
D.P. MOON	OHIO, NOVEMBER 9-12, 1970
DEPARTMENT OF DEFENSE	
R.J. RUNCK	MEETING OF THE TECHNICAL COOPERATION PROGRAM (TTCP), DURHAM, NORTH CAROLINA, JUNE 7-10, 1971

APPENDIX F

COMPANIES RECEIVING DMIC PUBLICATIONS

(October 1, 1971 to July 31, 1971)

APPENDIX F

COMPANIES RECEIVING DMIC PUBLICATIONS
(October 1, 1971, to July 31, 1971)

AAI Corporation
Abex Corporation
R. H. Aborn
Accurate Automatic Parts, Inc.
ACF Industries, Inc.
Acheson Colloids Company
Acro Tech Machine Company
Acroscope Engineering, Inc.
Adams Russell Company, Inc.
E. F. Adkins
Advanced Kinetics, Inc.
Aerochem, Inc.
Aerodex, Inc.
Aerojet-General Corporation
  Azusa, California
  Downey, California
  El Monte, California
  Fullerton, California
  Sacramento, California
Aeronca, Inc.
Aeronca Manufacturing Corporation
Aeroprojects Incorporated
Aeroquip Corporation
  Jackson, Michigan
  West Los Angeles, California
Aerospace Corporation
  El Segundo, California
  Los Angeles, California
  San Bernardino, California
Aerospace Electric Corporation
Aerospace Technology Corporation
Aerospex Company
Aerostructures, Inc.
Affiliated Metal Products, Inc.
Agmet, Inc.
Airco Vacuum Metals
Air Industries Corporation
Airline Welding & Engineering
Airmotive Suppliers Corporation
Air Reduction Company, Inc.
  Berkeley, California
  Mount Prospect, Illinois
  Murray Hill, New Jersey
  Niagara Falls, New York
  Sparrows Point, Maryland
  Union, New Jersey
Ajax Magnothermic Corporation
Alco Products, Inc.
Alco Standard Corporation
All American Engineering Company
All Design Screw Manufacturing Company, Inc.
Allegheny Ludlum Steel Corporation
  Brackenridge, Pennsylvania
  Dunkirk, New York
  Leechburg, Pennsylvania
  New Hartford, New York
  Pittsburgh, Pennsylvania
  Watervliet, New York
Allen Aircraft Supply Company
D. R. Allen
Allied Chemical Corporation
Allis Chalmers Manufacturing Company
Alloy Industries, Inc.
Alloy Metal Products, Inc.
Alloy Specialties, Ltd.
Alloy Surfaces Company, Inc.
Alloys Unlimited, Inc.
  Marshfield, Missouri
  Melville, New York
Almay Research & Testing Corporation
Alpha Research & Development, Inc.
Altimil Corporation
  Indianapolis, Indiana
  Santa Ana, California
Aluminum Company of America
  Cleveland, Ohio
  Corona, California
  Los Angeles, California
  New Kensington, Pennsylvania
  Pittsburgh, Pennsylvania
Aluminum Precision Products, Inc.
AMAX Specialty Metals, Inc.
AMBAC Industries, Inc.
Amercon Inc.
American Airlines
American Beryllium Company, Inc.
American Can Company
American Machine & Foundry Company
American Oil Company
American Standard Corporation
  Louisville, Kentucky
  Monrovia, California
American Ti-Tan Corporation
American Welding & Manufacturing Company
AMF Beard Engineering
AMP, Incorporated
Amphenol Corporation
Amsted Industries, Inc.
  Bensenville, Illinois
  Indianapolis, Indiana
Anaconda Company
Anchor Hocking Glass Corporation
Anamet Laboratories, Inc.
Anderson Electric Corporation
Andrew Corporation
Applied Power Industries, Inc.
API Corporation
Apex Alkali Products Company
Anocut Engineering Company
Arcos Corporation
Arcturus Manufacturing Company, Inc.
Arkwin Industries, Inc.
Armco Steel Corporation
  Baltimore, Maryland
  Middletown, Ohio
  Torrance, California
Armor Technology Corporation
Arnold Greene Testing Laboratories
L. R. Aronin
Artech Corporation
Arrowhead Products, Inc.
  Detroit, Michigan
  Los Alamitos, California
Arwood Corporation
  City of Industry, California
  Rockleigh, New Jersey
  Tilton, New Hampshire
Ashland Chemical Company
Associated Spring Corporation
Astro-Arc Company
Astro Met Associates, Inc.
Astronic Company
Astro Research Corporation
Astro-Space Laboratories, Inc.
Astrosystems International, Inc.
Atlantic Research Corporation
Atlantic Richfield Company
  Apollo, Pennsylvania
  Richland, Washington
Atomic Power Development Associates, Inc.
AVCO Corporation
  Charleston, South Carolina
  Everett, Massachusetts
  Lowell, Massachusetts
  Nashville, Tennessee
  Stratford, Connecticut
AZTEC Metals, Inc.
Babcock & Wilcox Company
  Alliance, Ohio
  Barberton, Ohio
  Beaver Falls, Pennsylvania
  Lynchburg, Virginia
Bachan Manufacturing Company, Inc.
Bailey Meter Company
Baldwin-Lima-Hamilton Corporation
John T. Ballass & Associates
Frank Bancroft Company, Inc.
Barber-Colman Company
Barden Corporation
Barogenics, Inc.
Beckman Instruments, Inc.
Beech Aircraft Corporation
Bechtel Corporation
Belfour Stulen, Inc.
Bell Aerosystems Company
Bellcomm, Inc.
Bell Helicopter Company
Bell & Howell Corporation
Bell Telephone Laboratories, Inc.
  Allentown, Pennsylvania
  Columbus, Ohio
  Murray Hill, New Jersey
Bendix Corporation
  Davenport, Iowa
  Eatontown, New Jersey
  Kansas City, Missouri
  North Hollywood, California
  Sidney, New York
  South Bend, Indiana
  Southfield, Michigan
  Utica, New York
J. W. Berg
Bertea Corporation
Beryllium Unlimited
Bethlehem Steel Corporation
Bjorksten Research Laboratories, Inc.
Blake Rivet Company
Blaw-Knox Company
  East Chicago, Indiana
  Lake City, Pennsylvania
  Pittsburgh, Pennsylvania
E. W. Bliss Company
The Boeing Company
  Bellevue, Washington,
  Des Moines, Washington

The Boeing Company (continued)
Hollywood, California
Houston, Texas
Kent, Washington
New Orleans, Louisiana
Philadelphia, Pennsylvania
Renton, Washington
Seattle, Washington
Wichita, Kansas
Booz, Allen & Hamilton, Inc.
Borg-Warner Corporation
Des Plaines, Illinois
New Castle, Indiana
Bourns, Inc.
J. A. Bozung Company
Branford Wire & Manufacturing Company
C. F. Braun & Company
Brenner Company
Richard D. Brew & Company, Inc.
Paul R. Briles, Inc.
Briles Manufacturing Company
Brown & Sharpe Manufacturing Company
Brown Technical Consulting
Wm. Bruckart
Brunswick Corporation
Brush Beryllium Company
Cleveland, Ohio
Elmore, Ohio
Cabot Corporation
Billeria, Massachusetts
Boston, Massachusetts
Fullerton, California
Kokomo, Indiana
Norwalk, Connecticut
Cal Doran Metallurgical Services
California-Doran Metallurgical Services
California Hydroforming Company, Inc.
Calmec Manufacturing Corporation
Calumet & Hecla, Inc.
Allen Park, Michigan
Bartlett, Illinois
Cameron Iron Works, Inc.
J. W. Campbell
Cannon-Muskegon Corporation
Canton Drop Forging & Manufacturing Co.
Caral, Inc.
Carbond Corporation
G. O. Carlson, Inc.
Cincinnati, Ohio
Thorndale, Pennsylvania
Carlton Forge Works
Carman Sapphire Corporation
Carpenter Steel Company
Reading, Pennsylvania
San Diego, California
Union, New Jersey
Carrier Corporation
J. C. Carter Company
Catepillar Tractor Company
Cee-Bee Chemical Company, Inc.
Celanese Research Company
Bay City, Texas
Corpus Christi, Texas
Summit, New Jersey
Centar Associates, Inc.
Cerac, Inc.
Ceramic Finishing Laboratory
Centrifugal Products, Inc.
Cessna Aircraft Company
Chamberlain Manufacturing Corporation.
Chambersburg Engineering Company
Champion Commercial Industries, Inc.
Chase Brass & Copper Company
Cleveland, Ohio
Los Angeles, California
Solon, Ohio
Chemetron Corporation
Elk Grove Village, Illinois
Louisville, Kentucky
White Plains, New York
York, Pennsylvania
Chemical & Metallurgical Research, Inc.
Chem-Nickel Company, Inc.
Chemstrand Research Center, Inc.
Chem-tronics, Inc.
Chicago Aerial Industries
Chicago Bridge & Iron Company
Chicago Development Corporation
J. J. Christiana
Chromalloy American Corporation
Gardena, California
Orangeburg, New York
San Antonio, Texas
West Nyack, New York
Chrysler Corporation
Detroit, Michigan
New Orleans, Louisiana
Chrysler Outboard Corporation
Cincinnati, Inc.
Cincinnati Milling Machine Company
Clad Metals, Inc.
Cleveland Pneumatic Tool Company
Cleveland Twist Drill Company
Clevite Corporation
Climax Molybdenum Company
Ann Arbor, Michigan
Greenwich, Connecticut
Los Angeles, California
New York, New York
Colt Industries
Columbia Gas System Service Corporation
Columbia-Great Lakes Corporation
New York, New York
Niagara Falls, New York
Columbia Tool Steel Company
Columbian Bronze Corporation
Columbus Auto Parts
Combustion Engineering, Inc.
Chattanooga, Tennessee
Windsor, Connecticut
Commonwealth Scientific Corporation
Compax, Inc.
Computer Communications, Inc.
Connecticut Metallurgical Corporation
Conrac Corporation
Consarc Corporation
Consolidated Controls Corporation
Contemporary Research
Continental Aviation & Engineering Corporation
Continental Can Company
Continental Emsco Company
Continental Metals, Inc.
Continental Oil Company
Continental Ore Corporation
Cook Heat Treating Company of Texas
Copper Range Company
Copperweld Steel Company
Corbett Associates, Inc.
Cornell Aeronautical Laboratory, Inc.
Corning Glass Works
Cosmos Minerals Corporation
Crane Company
Burbank, California
Chattanooga, Tennessee
Chicago, Illinois
Crucible, Inc.
Harrison, New Jersey
Midland, Pennsylvania
Pittsburgh, Pennsylvania
St. Louis, Missouri
Syracuse, New York
CTL-Dixie, Inc.
Cummins Engine Company, Inc.
Curtiss-Wright Corporation
Buffalo, New York
Caldwell, New Jersey
Wood-Ridge, New
Cutler Hammer, Inc.
Cybermetals Corporation
Cyclops Corporation
Bridgeville, Pennsylvania
Los Angeles, California
Pittsburgh, Pennsylvania
Titusville, Pennsylvania
Dalmo Victor Company
Davis Tool Company
DeLaval Turbine, Inc.
Burbank, California
Trenton, New Jersey
DeLavan Manufacturing Company
Del Electronics Corporation
Delron Company
Delsen Corporation
Delta Air Lines, Inc.
D. R. DeMarce
DeSoto, Inc.
Berkeley, California
Palos Verdes Peninsula, California
Detroit Edison Company
Deutsch Company
Deutsch Fastener Corporation
Diamond Power Specialty Corporation
J. N. Dick
Diversified Materials, Inc.
Donbar Development Corporation
A. V. Doran Company
Dorr-Oliver, Inc.
Douglas Nuclear Inc.
Dow Chemical Company
Golden, Colorado
Midland, Michigan
Russellville, Arkansas
Dravo Corporation
Dresser-Clark
Dresser Industries, Inc.
Bradford, Pennsylvania
Dallas, Texas
Stratford, Connecticut
West Mifflin, Pennsylvania
Drever Company
Ducommun, Inc.
Ducommun Metals & Supply Company
E. I. du Pont de Nemours & Company, Inc.
Aiken, South Carolina
Beaumont, Texas
Deepwater, New Jersey
Edge Moor, Delaware
Gibbstown, New Jersey
Newark, Delaware
Wilmington, Delaware

Durkee Testing Laboratories, Inc.
Dynaflare Industries, Inc.
City of Commerce, California
Los Angeles, California
Eastern Airlines, Inc.
Eastern Stainless Steel Corporation
Eastman Kodak Company
Eaton Precision Tube
Eaton Yale & Towne, Inc.
Ebasco Services, Inc.
Edcliff Instruments, Inc.
Edgewater Steel Company
Philadelphia, Pennsylvania
Pittsburgh, Pennsylvania
Effects Technology, Inc.
Elando Corporation
Elastic Stop Nut Corporation of America
Electrochimica Corporation
Electroforms, Inc.
Electron Beam Welding, Inc.
Electronic Memories, Inc.
Electronic Specialty, Inc.
Los Angeles, California
Portland, Oregon
San Fafel, California
Electronic Research Inc.
Electro Nucleonics, Inc.
Electro-Optical Systems Inc.
Elgiloy Company
Ellanee Manufacturing Corporation
Emerson Electric Company
Emhart Corporation
Emtech Research Products Corporation
Engelhard Industries, Inc.
Carteret, New Jersey
East Newark, New Jersey
Newark, New Jersey
Engineered Precision Casting Company
Ensanian Physiochemical Institute
Environmental Container Corporation
Erie Forge & Steel Corporation
ESB Incorporated
Esco Corporation
Esso Research & Engineering Company
Ethicon, Inc.
Etna Products, Inc.
Eutectic Corporation
Eutectic Welding Alloys Corporation
Ex-Cell-O Corporation
Detroit, Michigan
Lima, Ohio
Fairbanks Morse, Inc.
Fairchild Hiller Corporation
Farmingdale, New York
Hagerstown, Maryland
Manhattan Beach, California
Falk Corporation
Fansteel, Inc.
Baltimore, Maryland
Harbor City, California
Los Angeles, California
Muskogee, Oklahoma
North Chicago, Illinois
Pacoima, California
Rancho Santa Fe, California
Torrance, California
Federal-Mogul Corporation
Ann Arbor, Michigan
Detroit, Michigan
Los Alamitos, California
Fennell Corporation
Fiber Materials, Inc.
A. Finkl & Sons Company
Firestone Tire & Rubber Company
Akron, Ohio
Wyandotte, Michigan
Firestone Steel Products Company
Flexible Metal Hose Manufacturing Co.
D. T. Flood
Floturn, Inc.
Flowform Manufacturing Company
FMC Corporation
Marcus Hook, Pennsylvania
Princeton, New Jersey
San Jose, California
E. J. Foley
Foote Mineral Company
Ford Motor Company
Formsprag Company
Foster Wheeler Corporation
Foxboro Company
Frankel Company, Inc.
Fruehauf Corporation
Fresno, California
Fullerton, California
Futura Titanium Manufacturing Corporation
Futura Titanium Sales Corporation
G. W. Galloway Company
Garrett Corporation
Los Angeles, California
Phoenix, Arizona
Torrance, California
L. Gatzek
Gaylord-Rives Company
Gem Heat Treating Company, Inc.
General American Transportation Corporation
General Astrometals Corporation
General Dynamics Corporation
New York, New York
Quincy, Massachusetts
Rocky River, Ohio
General Dynamics/Convair
General Dynamics/Electric Boat
General Dynamics/Fort Worth
General Dynamics/Pomona
General Electric Company
Albuquerque, New Mexico
Binghamton, New York
Burlington, Vermont
Cincinnati, Ohio
Cleveland, Ohio
Daytona Beach, Florida
Detroit, Michigan
Erie, Pennsylvania
Everett, Massachusetts
Fitchburg, Massachusetts
Hendersonville, North Carolina
Houston, Texas
King of Prussia, Pennsylvania
Lynn, Massachusetts
Mt. Vernon, Indiana
Philadelphia, Pennsylvania
Pittsfield, Massachusetts
Pleasanton, California
Rutland, Vermont
San Jose, California
Schenectady, New York
St. Petersburg, Florida
Sunnyvale, California
Utica, New York
General Metal Heat Treating, Inc.
General Motors Corporation
Burbank, California
Detroit, Michigan
Goleta, California
Indianapolis, Indiana
Lockport, New York
Milford, Michigan
Milwaukee, Wisconsin
Sandusky, Ohio
Warren, Michigan
General Plasma Associates
General Precision Systems, Inc.
General Research Corporation
General Technical Services, Inc.
General Technologies Corporation
General Telephone & Electronics Labs, Inc.
Getcheel Steel Treating Company, Inc.
Gianni Scientific Corporation
Gillette Research Corporation
Gleason Works
Global Marine, Inc.
Globe-Union, Inc.
Goerz Optical Co., Inc.
Gold Leaf & Metallic Powders, Inc.
B. F. Goodrich Company
Greer Hydraulics, Inc.
Grinnell Corporation
Grumman Aerospace Corporation
Bethpage, New York
Kennedy Space Center, Florida
Gulf General Atomic, Inc.
Gulf Research & Development Company
Gulf States Tube Corporation
Gull Airborne Instruments, Inc.
H & H Parts Co., Inc.
Hamilton Watch Company
Handy & Harman
Handy & Harman Tube Company, Inc.
Harco Laboratories, Inc.
H. M. Harper Company
Harshaw Chemical Company
Hartwell Corporation
Harvard Precision Components Engineering
Harvey Aluminum, Inc.
Adrian, Michigan
Dayton, Ohio
Torrance, California
Hayes International Corporation
Heatbath Corporation
Heli-Coil Corporation
Heppenstall Company
Hercules, Inc.
Magna, Utah
Wilmington, Delaware
Hewlett-Packard Company
Hexcel Corporation
R. N. Higgs
Hiller Aircraft Corporation, Inc.
Hills McCanna Company
Hilti, Inc.
Hi-Shear Corporation
Hitchiner Manufacturing Company, Inc.
Bensenville, Illinois
Milford, New Hampshire
HITCO
Hittman Associates, Inc.
Hobart Brothers Company
Hoeganaes Corporation
Hogen Industries

Holo-Krome Company
Homogeneous Metals, Inc.
Honeywell, Inc.
  Denver, Colorado
  Freeport, Illinois
  Hopkins, Minnesota
  Minneapolis, Minnesota
  St. Paul, Minnesota
  St. Petersburg, Florida
  West Covina, California
Hooker Chemical Corporation
  Detroit, Michigan
  Niagara Falls, New York
Hookey Welding & Engineering Company
Horizons, Inc.
Hoskins Manufacturing Company
Houston Research Institute, Inc.
Howmet Corporation
  Dover, New Jersey
  Lancaster, Pennsylvania
  Pomona, California
  Plymouth, Michigan
  Whitehall, Michigan
S. L. Hoyt
Huck Manufacturing Company
  Carson, California
  Detroit, Michigan
Hudson Wire Company
Hughes Aircraft Company
  Canoga Park, California
  Culver City, California
  El Segundo, California
  Fullerton, California
  Los Angeles, California
  Newport Beach, California
  Torrance, California
  Tucson, California
Hughes Tool Company
Huyck Metals Company
Hydro-Electric Company
Hydronautics Incorporated
IBM Corporation
  Boulder, Colorado
  Hopewell Junction, New York
  Huntsville, Alabama
  Rochester, Minnesota
  Rockville, Maryland
  San Jose, California
  Yorktown Heights, New York
Idaho Nuclear Corporation
H. C. Ihsen
Ilikon Corporation
Industrial Steel Treating Company
Ingalls Shipbuilding Corporation
Ingersoll-Rand Research, Inc.
Ingersoll-Rand Company
Inland Steel Company
Interchemical Corporation
Interface Welding
Interlake Steel Corporation
International Harvester Company
International Nickel Company, Inc.
  Clinton, Massachusetts
  Cincinnati, Ohio
  Easton, Pennsylvania
  Glendale, California
  Huntington, West Virginia
  Los Angeles, California
  New York, New York
  Suffern, New York
International Nickel Company, Inc.
  Torrance, California
  Wetherfield, Connecticut
International Telephone & Telegraph Corporation
Ion Physics Corporation
Ipsen Industries, Inc.
  Pecatonica, Illinois
  Rockford, Illinois
Itek Corporation
  Burlington, Massachusetts
  Lexington, Massachusetts
Jade Enterprises
Jervis Corporation
Jetshapes, Inc.
J.M.W. Research & Development
Johns Manville Research Center
A. I. Johnson
Johnson Engineering Company
Jones & Laughlin Steel Corporation
  Pittsburgh, Pennsylvania
  Warren, Michigan
Earle M. Jorgensen Company
  Houston, Texas
  Los Angeles, California
  Oakland, California
  Tulsa, Oklahoma
J & P Leasing Company, Inc.
Kaiser Aluminum & Chemical Corporation
  Erie, Pennsylvania
  Pleasanton, California
  Ravenswood, West Virginia
Kaiser Steel Corporation
Kaman Aircraft Corporation
Kaman Aerospace Corporation
Kaman Corporation
Kanarr Corporation
J. R. Kattus
Kawecki Berylco Industries, Inc.
  Boyertown, Pennsylvania
  Hazleton, Pennsylvania
  Long Beach, California
  New York, New York
  Reading, Pennsylvania
Kaynar Manufacturing Company, Inc.
KDI Corporation
Kelsey Hayes Corporation
  Ann Arbor, Michigan
  Philadelphia, Pennsylvania
  Romulus, Michigan
  Whitesboro, New York
Kenett Corporation
Kennametal, Inc.
Kennecott Corporation
  Houston, Texas
  Lexington, Massachusetts
Kentucky Metals, Inc.
The Samuel G. Keywell Company, Inc.
Walter Kidde & Company, Inc.
King Fifth Wheel Company
S. S. Kingsbury
A. J. Kish
Klock Company
Kolene Corporation
  Detroit, Michigan
  Pittsburgh, Pennsylvania
Kollsman Instrument Corporation
J. F. Koon
S. Kopp
J. Kozianski
Kressilk Products, Inc.
J. William Krohn Company, Inc.
Kropp Forge Company
Kulite Tungsten Company
Laboratory Equipment Corporation
Ladish Company
  Cudahy, Wisconsin
  Los Angeles, California
Lamson & Sessions Company
  Cleveland, Ohio
  Sylmar, California
Landis Machine Company
LaPointe Machine Tool Company
Charles E. Larson & Sons, Inc.
LaSalle Steel Company
LaTrobe Steel Company
Laurel Sheet Metal Products, Inc.
Lawrence Laboratory, Inc.
Leach Corporation
Lear Siegler, Inc.
  Cleveland, Ohio
  Detroit, Michigan
  Grand Rapids, Michigan
Lebanon Steel Foundry
Lectrokem, Inc.
Leemath, Inc.
Leesona Corporation
LeFiell Manufacturing Company
N. Lenamond
Wallace O. Leonard, Inc.
Ward Leonard Electric Company
Lepel High Frequency Laboratories
Lexington Laboratories, Inc.
G. A. Liadis
Libbey-Owens-Ford Glass Company
Lindberg Corporation
C. A. Lindstrom
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Liquid Metals Information Center
Arthur D. Little, Inc.
Litton Industries
Litton Systems, Inc.
Lockheed Aircraft Corporation
Lockheed-California Company
Lockheed Electronics Company
Lockheed-Georgia Company
Lockheed Missiles & Space Company
  Palo Alto, California
  Saratoga, California
  Sunnyvale, California
Lockheed Propulsion Company
Lone Star Steel Company
LTV Aerospace Corporation
  Anaheim, California
  Dallas, Texas
Lukens Steel Company
Lund, McCutcheon, McBride, Inc.
Lundy Electronics ¢ Systems, Inc.
3M Company
  Roseville, Minnesota
  St. Paul, Minnesota
Mack Trucks, Inc.
Macradyne, Inc.
Magnaflux Corporation
P. R. Mallory & Company
  Burlington, Massachusetts
  Indianapolis, Indiana
Mallory Metallurgical Company
Mangone Laboratory, Inc.
ManLabs, Inc.
Mannesmann-Meer, Inc.

Maremont Corporation
Marquardt Corporation
  Ogden, Utah
  Van Nuys, California
Martin-Marietta Corporation
  Baltimore, Maryland
  Denver, Colorado
  Orlando, Florida
  Portland, Oregon
  Wheeling, Illinois
Marvaland Metallurgy, Inc.
Maryland Specialty Wire, Inc.
Massachusetts Materials Research, Inc.
Materials Research Corporation
Materials Resources Company
Melpar, Inc.
Matthey Bishop, Inc.
MB Associates
McDonnell Douglas Corporation
  Canoga Park, California
  Granada Hills, California
  Huntington Beach, California
  Irvine, California
  Long Beach, California
  Los Angeles, California
  Northridge, California
  Richland, Washington
  St. Louis, Missouri
  Santa Monica, California
  Titusville, Florida
  Torrance, California
  Tulsa, Oklahoma
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McGraw-Edison Company
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A. R. McKinney Associates
McLouth Steel Corporation
McQuay, Inc.
McWilliams Forge Company
Mechanical Technology, Inc.
Mechanics Research, Inc.
  Albuquerque, New Mexico
  Los Angeles, California
Memorex Equipment Group
Menasco Manufacturing Company
Metachem Laboratories, Inc.
Metal Bellows Corporation
Metal Flo Corporation
Metal Improvement Company
Metallurgical Consultants, Inc.
Metallurgical, Inc.
Metallurgical International, Inc.
Metallurgical Service, Inc.
Metallurgy Plus
Metals Sintering Corporation
Metals Technology, Inc.
Metatronics, Inc.
Metalube Corporation
Metcut Research Associates, Inc.
Wm. B. Micks
Microwire Corporation
Midland-Ross Corporation
  Columbus, Ohio
  Toledo, Ohio
Minerals Exploration Company
W. H. Minnick
MissTicraft Corporation
Mitron-Rado, Inc.
Moline Malleable Iron Company
Molybdenum Corporation of America
Monjoe Scientific
Monroe Forgings, Inc.
Monsanto Company
Monsanto Research Corporation
Moog, Inc.
  Aurora, New York
  Monterey Park, California
Moore Drop Forging Company
Mosler Safe Company
Nalco Chemical Company
Nardon Manufacturing Company, Inc.
National Beryllia Corporation
National Cash Register Company
National Distillers & Chemical Corporation
National Lead Company
  Hightstown, New Jersey
  Salt Lake City, Utah
National Lead Company of Ohio
  Cincinnati, Ohio
  Niagara Falls, New York
National Presto Industries, Inc.
National Screw & Manufacturing Company
National Steel Corporation
National Twist Drill & Tool Company
National Water Lift Company
Nevada-Massachusetts Company
New England Hard Facing Company, Inc.
New England Metallurgical Corporation
  Berlin, Connecticut
  Norwood, Massachusetts
  Springfield, Massachusetts
  Worcester, Massachusetts
New Hampshire Ball Bearings, Inc.
New Jersey Zinc Company
Newport News Shipbuilding & Dry Dock Co.
The J. M. Ney Company
Nordberg Manufacturing Company
Norris Industries
North American-Rockwell Corporation
  Anaheim, California
  Calabasas, California
  Canoga Park, California
  Columbus, Ohio
  Downey, California
  Granada Hills, California
  Hopedale, Massachusetts
  Los Angeles, California
  McGregor, Texas
  North Hollywood, California
  Orange, California
  Palos Verdes Penninsula, California
  Pittsburgh, Pennsylvania
  Thousand Oaks, California
  Tulsa, Oklahoma
Northern Research & Engineering Corporation
Northrop Corporation
  Anaheim, California
  Hawthorne, California
  Inglewood, California
  Needham Heights, Massachusetts
  Newbury Park, California
  Norwood, Massachusetts
Norton Company
  Newton, Massachusetts
  Worcester, Massachusetts
Norton Research Corporation
Nuclear Components, Inc.
Nuclear Materials & Equipment Corporation
  Apollo, Pennsylvania
  Leechburg, Pennsylvania
Nuclide Corporation
Oak Electro/Netics Corporation
D.G. O'Brien, Inc.
Ohmite Manufacturing Company
Olin Mathieson Chemical Corporation
  Hannibal, Ohio
  Marion, Illinois
  New Haven, Connecticut
Omark Industries
Omega Industries
Ontario Corporation
Ordnance Research, Inc.
Oregon Metallurgical Corporation
Otis Engineering Corporation
Owens-Corning Fiberglas Corporation
Owens-Illinois, Inc.
Pacific Car & Foundry Company
Pacific Metals Company
Pacific Steel Treating Company
Pacific Valves, Inc.
Packer Engineering Associates, Inc.
Pall Corporation
Pall Trinity Micro Corporation
Panametrics, Inc.
Ralph M. Parsons Company
Parsons Corporation
Parsons-Jurden Corporation
PCM, Inc.
Pendleton Tool Industries, Inc.
Pennsalt Chemicals Corporation
  King of Prussia, Pennsylvania
  Warminster, Pennsylvania
Perkin-Elmer Corporation
  Danbury, Connecticut
  Norwalk, Connecticut
  Wilton, Connecticut
Pfaudler Company
Charles Pfizer Company, Inc.
Phelps Dodge Industries
Philco-Ford Corporation
  Newport Beach, California
  Palo Alto, California
Philips Electronics & Pharmaceutical Inds. Corp.
Physics International Company
Pioneer Astro Industries Inc.
Pioneer Service & Engineering Company
Pirgo Electronics, Inc.
Pittsburgh Tool Steel Wire Company
P & J Engineering, Inc.
Pneumo-Dynamics Corporation
  Kalamazoo, Michigan
  Richmond, Illinois
Polymer Corporation
Polymet Corporation
Wm. Powell Company
PPG Industries
  New Martinsville, West Virginia
  Pittsburgh, Pennsylvania
Precision Castings of California
Precision Castparts Corporation
  Los Alamitos, California
  Portland, Oregon
Precision Sheet Metal, Inc.
Preco, Inc.
Preformed Line Products Company
Pressure Systems, Inc.
Pressure Technology Corporation
Princeton-Pennsylvania Accelerator
Product Systems Engineering
Product Techniques, Inc.

Progressive Metallurgical Industries, Inc.
Purex Corporation
Purolator Products, Inc.
Pyromet Industries, Inc.
Quality Heat Treat, Inc.
Quality Steel Treating Co., Inc.
Quantum Incorporated
RCA Corporation
  Camden, New Jersey
  Harrison, New Jersey
  Lancaster, Pennsylvania
  Marlboro, Massachusetts
  Princeton, New Jersey
  Somerville, New Jersey
Rametco, Inc.
RAND Corporation
Raytheon Company
  Andover, Massachusetts
  Bedford, Massachusetts
  Bristol, Tennessee
  Lowell, Massachusetts
  Stamford, Connecticut
  Sudbury, Massachusetts
  Waltham, Massachusetts
  Wayland, Massachusetts
RCL Electronics, Inc.
R & D Metals Corporation
Reactive Metals, Inc.
  Dallas, Texas
  Montebello, California
  Niles, Ohio
Reading Industries
M. J. Rebholz
Reeves Instruments Company
Reilly-Whiteman-Walton Company
Reisner Metals, Inc.
REM Metals Corporation
Republic Steel Corporation
  Canton, Ohio
  Cleveland, Ohio
  Independence, Ohio
  Los Angeles, California
  Massillon, Ohio
Resistoflex Corporation
Reuter, Inc.
Rex Chainbelt, Inc.
  Downers Grove, Illinois
  Paramus, New Jersey
J. W. Rex Company
Reynolds Metals Company
G. Whitfield Richards Company
Richards Industries, Inc.
Ritter Pfaudler Corporation
Roblin Steel Company
Rockwell Manufacturing Company
Rodney Metals, Inc.
Rohr Corporation
Rollmet, Inc.
R. F. Rolsten
Ronson Hydraulic Units Corporation
Rosan, Inc.
Rosemount Engineering Company
C. Rosenkranz
Royal Industries
Russell, Burdsall & Ward Bolt & Nut Co.
Rust-Lick of California
L. Ruszkowski
Ryan Aeronautical Company
Joseph T. Ryerson & Son, Inc.
Rytek, Inc.

Salkover Metal Processing of Illinois, Inc.
Sanders Associates, Inc.
  Bedford, Massachusetts
  Nashua, New Hampshire
Sandia Corporation
  Albuquerque, New Mexico
  Livermore, California
San Diego Aircraft Engineering, Inc.
Sargent Industries
  El Segundo, California
  Huntington Park, California
A. Saunders & Company, Inc.
Sawhill Tubular Product, Inc.
Schlumberger Limited
Sciaky Brothers, Inc.
Scientific Design Company, Inc.
SCM Corporation
  Baltimore, Maryland
  Cleveland, Ohio
  Deerfield, Illinois
Scoville Manufacturing Company
Sealol, Inc.
Selectrons Limited
Servonic Instruments
Amos J. Shaler, Inc.
Shankman Associates
Sharon Steel Corporation
Shell Development Company
Shell Pipeline Corporation
Shenango Company, Inc.
Sherman Industries
Sherwin-Williams Company
H. J. Sherwood, Inc.
Sherwood Refractories, Inc.
Shieldalloy Corporation
Shira Welding Supply Company
Shock Hydrodynamics, Inc.
Shultz Steel Company
C. A. Shumaker
Siebel Air Company
Sifco Industries
Silicon Transistor Corporation
Singer-General Precision, Inc.
Singer-Kearfott
W. J. Sjoberg
S.K.F. Industries, Inc.
A. O. Smith Corporation
P. Glenn Smith Company
Smithford Products, Inc.
Smith Tool Company
Smith & Wesson-Fiocchi, Inc.
J. Soja
Solar Laboratories
Southern California Aluminum Treating Co.
Southern California Metal Spinning Co., Inc.
J. G. Sparks
Spartan Aviation, Inc.
Special Metals Corporation
  Los Angeles, California
  New Hartford, New York
Spectra-Mat, Inc.
Speedring Corporation
Sperry Rand Corporation
  Great Neck, New York
  Huntsville, Alabama
  Roseville, Minnesota
  Troy, Michigan
Spin Physics, Inc.
SPS Western
S & Q Construction Company

Standard Oil Company of California
Standard Oil of New Jersey
Standard Oil of Ohio
Standard Pressed Steel Company
  Jenkintown, Pennsylvania
  Santa Ana, California
Standard Screw Company
Stanray Corporation
Stauffer Chemical Company
Steel Industries, Inc.
Stewart Warner Corporation
Straza Industries, Inc.
Stresskin Products Company
Sturm, Ruger & Company
Sunbeam Corporation
Sundstrand Corporation
  Denver, Colorado
  Rockford, Illinois
Sun Heat Treating
Sun Oil Company
Superior Plating Company
Superior Tube Company
Super-Temp Company
Superweld Corporation
Surface Technology Corporation
Swift Laboratories, Inc.
Sylvania Electric Products, Inc.
  Hicksville, New York
  Towanda, Pennsylvania
  Waltham, Massachusetts
  Whippany, New Jersey
Symington Wayne Corporation
Systems Consultants, Inc.
Systems Research Laboratories
Talley Corporation
Target Rock Corporation
Tavco, Inc.
Techni-Braze, Inc.
Technical Metals, Inc.
TEEG Research, Inc.
Teledyne, Inc.
  Allvac Division
  CAE Division
  Computer Systems Division
  Isotopes Division
  Linair Engineering Division
  Microwave Electronics Division
  Neosho Division
  Picco Industries Division
  Taber Engineering Division
  Titanium Division
  Vasco Metals Division
  Wah Chang Division
Terry Steam Turbine Company
Testing Engineers, Inc.
Texaco, Inc.
Texas Instruments, Inc.
  Attleboro, Massachusetts
  Dallas, Texas
Textron Corporation
Textron, Inc.
Thermo Electric Company, Inc.
Thermo Electron Corporation
  Waltham, Massachusetts
  Woburn, Massachusetts
Theta Industries, Inc.
Thiokol Chemical Corporation
  Brigham City, Utah
  Elkton, Maryland
Henry G. Thompson Company

Tiline Corporation
Timken Roller Bearing Company
Titanium Forming, Inc.
Titanium Metal Forming Company
Titanium Metallurgical, Inc.
Titanium Metals Corporation of America
  Bellevue, Washington
  Cleveland, Ohio
  Henderson, Nevada
  Los Angeles, California
  Toronto, Ohio
  West Caldwell, New Jersey
Titanium Technology Corporation
Titanium West, Inc.
Tool Research & Engineering Corporation
Torrington Company
Torr Vacuum Products
Sam Tour & Company, Inc.
J. J. Tourek Manufacturing Company
Townsend Company
  Ellwood City, Pennsylvania
  Santa Ana, California
S. M. Toy
Tracor, Inc.
Trans World Airlines, Inc.
Tridair Industries
Trifflеman Industries, Inc.
Tri-Metals Company
TRW, Inc.
  Cleveland, Ohio
  Dayton, Ohio
  Harrisburg, Pennsylvania
  Minerva, Ohio
  Redondo Beach, California
H. I. Tullis Company, Inc.
Turbocast Industries, Inc.
Turco Products, Inc.
Tyco Laboratories, Inc.
A. J. Ulichny Machine & Tool Company
Unidynamics/Phoenix
Union Carbide Corporation
  Cleveland, Ohio
  Indianapolis, Indiana
  Kokomo, Indiana
  New York, New York
  Niagara Falls, New York
  Oak Ridge, Tennessee
  Paducah, Kentucky
  South Charleston, West Virginia
  Tarrytown, New York
  Tonawanda, New York
United Aircraft Corporation
  Bridgeport, Connecticut
  East Hartford, Connecticut
  Farmington, Connecticut
  Horsham, Pennsylvania
  Middletown, Connecticut
  Southington, Connecticut
  Stratford, Connecticut
  Sunnyvale, California
  Trevose, Pennsylvania
  Wallingford, Connecticut
  West Palm Beach, Florida
  Windsor Locks, Connecticut
United Aircraft Products, Inc.
United Air Lines, Inc.
United Engineers & Constructors, Inc.
United Nuclear Corporation
  Elmsford, New York
  New Haven, Connecticut
United States Crown Corporation
United States Filter Corporation
United States Industrial Chemical Company
United States Steel Corporation
  Gary, Indiana
  Monroeville, Pennsylvania
  Pittsburgh, Pennsylvania
  San Francisco, California
  Worcester, Massachusetts
United States Steel Supply
United States Time Corporation
United States Welding Corporation
Universal Oil Products Company
  Bantam, Connecticut
  Des Plaines, Illinois
Universal Technology Corporation
Universal Titanium, Inc.
USM Corporation
Vacco Industries
Vac-Hyd Processing Corporation
Vacu-Blast Corporation
Valley Bolt Corporation
Value Engineering Company
Vanadium-Pacific Steel Company
Vanguard Engineering
Vanguard-Pacific, Inc.
  Redwood City, California
  Santa Monica, California
Van Petty Manufacturing Company
Van Straaten Chemical Company
Vapor Corporation
Vapor Blast Manufacturing Company
Varian Associates, Inc.
  Palo Alto, California
  San Carlos, California
Ventron Corporation
Vermont American Corporation
Vickers, Inc.
Viking Forge & Steel Company
Voi-Shan Manufacturing Company
Vulcan-Cincinnati, Inc.
Vulcan Testing Laboratory
Wall Colmonoy Corporation
Wallace-Murray Corporation
Wallingford Steel Company
Warner & Swasey Company
Washington Steel Corporation
Watkins-Johnson Company
Watlow Electric
Waukesha Foundry Company
Weber Metals & Supply Company
Weiner Associates, Inc.
Western Electric Company, Inc.
  Baltimore, Maryland
  Chicago, Illinois
  North Andover, Massachusetts
  Princeton, New Jersey
Western Gear Corporation
  Lynwood, California
  South Gate, California
Western Gold & Platinum Company
  Belmont, California
  Edina, Minnesota
Western Pneumatic Tube Company
Westinghouse Air Brake Company
Westinghouse Electric Company
  Annapolis, Maryland
  Baltimore, Maryland
  Blairsville, Pennsylvania
  Bloomfield, New Jersey
  Cheswick, Pennsylvania
  Lester, Pennsylvania
  Lima, Ohio
  Madison, Pennsylvania
  Pittsburgh, Pennsylvania
  Sunnyvale, California
  Tampa, Florida
  West Mifflin, Pennsylvania
Weston Hydraulics Limited
Whittaker Corporation
  Culver City, California
  Detroit, Michigan
  LaJolla, California
  San Diego, California
  West Concord, California
Williams Research Corporation
Windsor Manufacturing Company
Wintec Corporation
Winters Foundry & Machine Co., Inc.
Wisconsin Electric Power Company
C. Wohlberg
Alan Wood Steel Company
Woodward Governor Company
Worthington Corporation
B. M. Wundt
Wyatt Industries, Inc.
Wyle Laboratories
Wyman-Gordon Company
  Harvey, Illinois
  North Grafton, Massachusetts
  Worcester, Massachusetts
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TECHNICAL SOCIETIES AND TRADE JOURNALS

Aerospace Industries Association
The Aluminum Association
American Foundrymen's Society
American Iron & Steel Institute
American Machinist
American Metal Market
American Society for Metals
  Dayton, Ohio
  Metals Park, Ohio
American Society for Testing and Materials
American Society of Tool & Manufacturing Engineers
American Welding Society
Aviation Week
Chemical Engineering Magazine
Copper Development Associates, Inc.
Engineering Alloys Digest, Inc.
Engineering Societies Library
Industrial Publishing Company
Industry Week
International Copper Research Association
International Lead Zinc Research Organization
Light Metal Age
Machinery Magazine
The Magnesium Association
Materials Engineering
The Metal Properties Council
Metalworking Magazine
National Association of Secondary Material Industries, Inc.
Northwest Technical Industries, Inc.
Penton Publishing Company
Product Engineering
Science Information Exchange
Tooling & Production Magazine
Trends Publishing, Inc.
Welding Design & Fabrication Magazine

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  Columbus Laboratories
  Pacific Northwest Laboratories
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  Berkeley, California
  Livermore, California
  Los Angeles, California
California Institute of Technology
California State College at Long Beach
California State Polytechnic College
Carnegie Library of Pittsburgh
Carnegie-Mellon University
Case-Western Reserve University
Cast Metals Research Institute
University of Cincinnati
Colorado State University
Columbia University
University of Connecticut
Cornell University
University of Dayton
University of Delaware
University of Denver
Denver Research Institute
University of Detroit
Drexel Institute of Technology
Duke University
University of Florida
Florida Technicological University
University of South Florida
The Franklin Institute Research Laboratories
Fullerton Junior College
Georgia Institute of Technology
Graduate Institute of Technology
Illinois Institute of Technology
IIT Research Institute
University of Illinois
  Chicago, Illinois
  Urbana, Illinois
Indiana University
Industrial Fasteners Institute
Institute for Composite Materials, Inc.
Investment Casting Institute
Iowa State University
The Johns Hopkins University
University of Kansas
Kansas University
University of Kentucky
Lamar State College of Technology
Lehigh University
Los Angeles Trade Technical College
Lowell Technical Institute
Massachusetts Institute of Technology
University of Maryland
Memphis State University
University of Michigan
  Ann Arbor, Michigan
  Dearborn, Michigan
Michigan State University
Michigan Technology University
Milwaukee School of Engineering
University of Minnesota
Mississippi State University
University of Missouri
Montana College of Mineral Sci & Tech
University of Nebraska
Nevada Southern University
University of New Mexico
New Mexico Inst of Mining & Technology
New Mexico State University
City College of New York
State University of New York
New York University
North Carolina State University
Northeastern University
Norwich University
The Ohio State University
University of Oklahoma
Oregon State University
Pennsylvania State University
University of Pennsylvania
University of Pittsburgh
Purdue University
Rensselaer Polytechnic Institute
Rice University
Santa Barbara Research Center
Seattle, University
University of South Carolina
Southern Research Institute
Southwest Research Institute
Stanford Research Institute
Stanford University
Stevens Institute of Technology
Syracuse University
Syracuse University Research Corporation
University of Tennessee
University of Texas at Austin
University of Toledo
Tulane University
University of Utah
University of Virginia
University of Washington
Wentworth Institute
West Virginia University
University of Wisconsin

FOREIGN

Australian Embassy
British Embassy
Canadian Defence Research Staff
French Embassy

APPENDIX G

BATTELLE PERSONNEL ASSIGNED TO DMIC
(October 1, 1970 to July 31, 1971)

APPENDIX G

BATTELLE PERSONNEL ASSIGNED TO DMIC
(October 1, 1970 to July 31, 1971)

DMIC Coordination Office

Director	H. Dana Moran
West Coast Representative	E. W. Cawthorne
Manager, Technical Inquiries	R. W. Endebrock
Manager, Technical Publications	K. R. Hanby
Consultants	R. J. Runck, W. F. Simmons, D. J. Maykuth J. E. Campbell

DMIC Technical Files

Manager	S. A. Rubin
Associate Manager	R. T. Niehoff
Information Specialists	K. B. Barnes, V. D. Barth, A. R. Glenn

Biology, Environment, and Chemistry
C. J. Lyons, Manager

Environmental and Materials Characterization

W. M. Henry, Chief
D. L. Chase, Service Supervisor

Engineering Systems
G. M. McClure, Manager

Lubrication Mechanics

R. L. Jentgen, Chief
W. A. Glaeser, Fellow

Nuclear Systems

W. A. Carbiener, Chief
E. M. Simons, Fellow

Structural Materials

H. Mindlin, Chief
O. L. Deel, Senior Technologist
C. E. Feddersen, Research Engineer
W. S. Hyler, Senior Advisor (Mil-Hdbk-5)

Materials Processing and Fabrication
S. J. Paprocki, Manager
F. W. Boulger, Senior Advisor

Materials Processing

H. D. Hanes, Chief
A. N. Ashurst, Research Engineer
J. F. Joyce, Research Metallurgical Engineer
H. O. McIntire, Associate Chief

Explosive Fabrication and Composites

M. J. Ryan, Chief
J. N. Fleck, Associate Chief
V. D. Linse, Associate Chief

Materials Processing and Fabrication (continued)

Joining Technology

R. E. Monroe, Chief
R. M. Evans, Associate Chief
D. Houser, Senior Metallurgical Engineer
D. G. Howden, Associate Chief
J. E. Mortland, Senior Writer
H. E. Pottee, Senior Electrical Engineer

Quality Assurance

M. D. Randall, Chief
R. P. Meister, Associate Chief
H. W. Mishler, Service Engineer

Metalworking

R. J. Fiorentino, Chief
T. G. Byrer, Associate Chief
H. J. Henning, Associate Chief
G. F. Meyer, Research Metallurgical Engineer
C. T. Olofson, Senior Metallurgist
A. A. Popoff, Research Metallurgical Engineer

Electrochemical Engineering Technology

W. H. Safranek, Chief
J. A. Gurklis, Senior Chemical Engineer

Physics and Metallurgy

W. H. Goldthwaite, Manager
A. M. Hall, Senior Advisor

Nonferrous Metallurgy

H. R. Ogden, Chief
B. C. Allen, Senior Metallurgist
E. S. Bartlett, Senior Metallurgist
D. C. Drennen, Senior Physicist
J. B. Hallowell, Senior Metallurgist
C. M. Jackson, Associate Chief
D. B. Roach, Advisor
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APPENDIX H

DMIC WORK STATEMENT AND SCOPE
(October 1, 1970 to July 31, 1971)

APPENDIX H

WORK STATEMENT AND SCOPE OF THE DEFENSE METALS INFORMATION CENTER

The Defense Metals Information Center is an outgrowth of the Titanium Metallurgical Laboratory which was established at Battelle by the Department of Defense in January, 1955. The present program, with its expanded scope, was initiated in May 1958, under Supplemental Agreement No. 5 to Contract No. AF 18(600)-1375. That agreement was superseded by Contract No. AF 33(616)-7747, continuing DMIC through December 31, 1963. Contract No. AF 33(615)-1121 provided for support of DMIC to November 15, 1965. The program was then continued under Contract No. AF 33(615)-3408 through November 1967, and by Contract F33615-68-C-1325 through November 14, 1968. Contract No. F33615-69-C-1343 provided for support of the operations through November 15, 1969. The present contract, No. F33615-71-C-1067 provided support through the present period to July 31, 1971.

The purpose of DMIC is to provide specialized information services, including answers to inquiries, state-of-the-art reports, critical reviews, and related technical information and assistance to DoD agencies and defense contractors in the ODDRE-sponsored materials program.

The contractual work statement of DMIC is as follows:

(1) "The contractor will provide technical information service in the following manner:

(a) "As requested by the AFML project engineer provide technical information services on materials as may be mutually agreed upon between the contractor and the project engineer or his designee

(b) "Assist the Government agencies and their contractors in developing data required for preparation of specifications for materials

(c) "Collect, evaluate, and disseminate available information on the current status of materials research and development

(d) "Provide technical consulting services on materials utilization problems

(e) "Provide assistance and advice to ODDRE in its appraisal of the Department of Defense research and development program on materials and make recommendations with respect to the program.

(2) "The contractor will receive administrative and technical guidance from the AFML project engineer at Wright-Patterson AFB. However, work requirements can be received from ODDRE, since this is a DoD Information Center. As heretofore, program and policy direction will come from ODDRE. In addition, technical inquiries will be accepted from other Government agencies and the defense industry as part of the normal workload of the Center.

"The scope of DMIC includes those metals and related protective materials which are of interest in promoting the defense effort, and are included in the following general definitions of metals areas

(a) "Titanium and titanium-base alloys

(b) "All nonnuclear applications of beryllium and beryllium-base alloys

(c) "High-strength steels

(d) "High-strength aluminum alloys

(e) "High-strength alloys for elevated-temperature service (primarily nickel- and cobalt-base alloys)

(f) "Refractory metals

(g) "Limited activity in some of the refractory and lightweight metals such as rhenium, vanadium, platinum-group metals, and magnesium that may become of interest as structural materials in missiles and aircraft

(h) "Limited activity on metals for new applications such as space power systems, space vehicles, and associated electronic systems

(i) "Coatings to improve corrosion and oxidation resistance of these materials in military service

(j) "Other materials mutually agreed upon by the contractor and the Government.

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Defense Metals Information Center Battelle Memorial Institute 505 King Avenue, Columbus, Ohio 43201	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

Seventeenth Annual Report

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final report on Defense Metals Information Center (October 1, 1970 to July 31, 1971)

5. AUTHOR(S) (First name, middle initial, last name)

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6. REPORT DATE February 1972	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS 0
8a. CONTRACT OR GRANT NO. F33615-71-C-1067 b. PROJECT NO. c. 8975 d.	9a. ORIGINATOR'S REPORT NUMBER(S) 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	

10. DISTRIBUTION STATEMENT

This document has been approved for public release and sale; its distribution is unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY Air Force Materials Laboratory Materials Information Branch Wright-Patterson Air Force Base, Ohio 45433

13. ABSTRACT

The following report summarizes the activities of the fourteenth annual period of the Defense Metals Information Center (DMIC), the seventeenth year of operations including the predecessor Titanium Metallurgical Laboratory, established at Battelle in January 1955. Because the DMIC contract in this instance initiated on September 16, 1970, this report covers the remaining period of FY71 and July 1971, 10-1/2 months, rather than the usual 12 months.

DMIC continued in its objective of providing to industry and Government timely, authoritative information services on a variety of advanced metals and related processes. These services included response to technical inquiries, issuance of regular newsletters, summarizing recent developments, and publication of a series of technical reports, memoranda, and notes and other literature. Reductions in the level of funding combined with increases in operating costs were reflected in a general decrease in output during the fiscal period.

During the contract period reported herein, DMIC continued its conversion to computerized storage and retrieval of technical information. First steps were taken in the introduction of charges for DMIC services, including the sale of publications to the general public. A variety of special studies were undertaken for ODDRE, the Department of Commerce, the Air Force, and The Technical Cooperation Program (~~TTCP~~).

DD FORM 1 NOV 68 1473

107350

Unclassified

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Information Center						
Metals						
Management						
Operations						