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AUTHORITY

Air Force Materials Lab ltr dtd 1 Sep 1970
MECHANIZATION STUDY
OF THE MECHANICAL PROPERTIES
DATA CENTER, TRAVERSE CITY, MICHIGAN

Submitted to
Defense Supply Agency
 Defense Documentation Center
 Cameron Station, Virginia

by
Booz, Allen Applied Research Inc.
4733 Bethesda Avenue
Bethesda, Maryland 20014

U.S. Government
DSA-7-15112

MACHING Report No. 914-1-6

September 1966
53 p.

OCT 17 1966
(060 750) 35
ABSTRACT

The Data Center employs the IBM 1440 in the search and retrieval of its data files. The files are maintained on EAM cards but are to be converted to disk during a search. The Center formerly utilized the IBM 101 Statistical Machine and the IBM 870 Document Writing System. The Center has data relating to more than 1/2 million material tests of metals and plastics. Use of the computer has permitted the Center to cope with the increasing demand on its services without increasing its budget by the same order of magnitude.
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I. SUMMARY
1. SUMMARY

The Mechanical Properties Data Center employs mechanized processes in the storage and retrieval of its data files which consist of the mechanical properties of metals and plastics. Data are stored on EAM punched cards and searched using the Center's IBM 1440 computer which was installed in late 1965. Prior to that time, processing was done with EAM techniques based upon the IBM 870 Document Writer system (for output formatting) and the IBM 101 Statistical Machine (for retrieval by selective file searching).

The Center has stored data relating to more than a half million material tests which is currently growing at the rate of about 8,000 records per month. The major source of this information is in documents from DDC. In addition, original test records are received from some companies. The Center's Director considers a test lab report to be the ideal form in which to receive information. At present no attempt is made to include classified material.

The services of the Mechanical Properties Data Center are available free of charge to DoD, NASA, and their contractors. More than 60 queries are answered in a typical month. The largest number
A typical search might produce 300 specimen tests from six different references and 10 references cited to documents that discuss the subject, but contain no data. Requests for information may be received by telephone, TWX, telegraph, or mail.

Figure 1 illustrates the flow of information to the Center.
ESTIMATED FLOW OF MATERIAL INFORMATION TO M.F.D.C. IN 1966

Item 4

75% INDUSTRY SPONSORED
$340,000,000/yr MATERIAL RESEARCH

75% GOV'T SPONSORED

75% USED IN NON-TESTING RESEARCH

25% USED IN PRODUCING TEST RESULTS

SUPPORTING INFO.

70% FOR METAL
30% FOR PLASTIC

M.P.D.C. LIBRARY

$50/TEST AVERAGE

4700,000 TEST/yr

50% LEADING TO DEAD ENDS

160,000 TEST/yr METALS

560,000/yr

220,000/yr

30% LEADING TO DEAD ENDS

63,000 P.N.T./yr PLASTIC
II. MECHANIZATION
II. MECHANIZATION

1. CHRONOLOGY

The Center was started in June 1959 with the award of a contract by the Air Force's Directorate of Materials and Processes, Aeronautical Systems Division. From the beginning, EAM punched cards were chosen as the storage medium. Retrieval of information and processing was done using electronic accounting machines, particularly the IBM 870 system and the IBM 101 Electronic Statistical Machine.

This arrangement was preferred to a computer because of problems associated with obtaining computer time and because of the difficulty of refining a search in mid-process through the data file. These disadvantages were considered greater than the limitation on the number of fields searchable per pass imposed by the IBM 101.

In 1965, after studying available systems, the Center acquired an IBM 1440 computer and developed programs to perform the searching and listing formerly done with the EAM equipment. No change, however, was made in the data storage format. The Center decided on the computer because they felt the level of work (both for the Center and
for Belfour-Stulen's other activities) justified the cost, and because the 1440 had the special feature of random access disk files that are easily changed.

Another reason for acquiring the computer was to lower the unit cost of searches, particularly to keep costs within the Center's budget. Since 1964, search requests have increased from an average of 12 per month to 60 per month (peak was 90 per month).

2. DESCRIPTION OF PROCESSES

(1) Input Procedures

The primary source of information for the Center is documented numerical data from tests such as tensile tests, compression tests, fracture toughness tests, and creep tests. These data are entered on EAM punched cards and filed by test type within material type. The process is illustrated in Figure 2 and has the following procedure:

1. A document which includes test results is selected, checked to see if it is already in the files, and then ordered. At this time a title card for the document is prepared manually.

2. When the document is received, it is matched against the title card, and checked again for duplication. (This step is currently a manual process, but will be eventually converted to a computer process.)
FIGURE 2
Input Process

Document Acquisition

Preliminary Document Indexing

Priority Transfer

Document Indexing

Mechanical Properties Encoding Worksheets

Keypunch and Edit

Medals File

Plastics File

Materials Type File

Temporary Indexing Record
3. An accession number is assigned to the document. This is a five-digit number for a document containing information that directly relates to the collection. A four-digit number is assigned in the case of a document of a more general nature.

4. At this point, a preliminary indexing takes place in order to provide a means of retrieving the document's information before the document has been selected from the backlog and fully processed. This indexing will permit retrieval by means of one or more of the subject words most frequently mentioned in requests; e.g., alloy, property or test conditions. The information encoded and keypunched is material identification, test types, test conditions, title and author.

5. Documents are filed in numerical accession number order. They are selected for encoding into the data storage on a basis of subjects which are of greatest interest at the moment, or subjects in which the Center's stored data appears to be low.

6. A document containing information selected for routine processing goes to an encoder who extracts the information to be used and records it on encoding forms. Numerical data, such as actual mechanical properties, test temperature, etc. are directly keypunched (except for rounding off to the significant places consistent with desired accuracy) without encoding. Other information is assigned numeric or alphabetic symbols derived from a prepared code book. The code book is not a rigid thesaurus, and new codes are entered whenever necessary. Appendix A illustrates several of the work sheets which are used to format the information for keypunching.

There are two basic formats, A and B. The A format consists of the final test results together with a relatively complete summary of the material condition, manufacturing processes, test specimen configuration, specimen conditioning, and testing environments. All of this A format information is keypunched in a single card for each test. In most searches, this card is all that need be retrieved to obtain the principal information. Two examples of the A format worksheets are shown in Appendices A-1 and A-2. One is
labeled Format MTC-A for metals, tensile-creep test, A format. The other is labeled MBT-A for metals, bending fracture toughness test, A format.

The B format contains more information such as material composition and heat treatment. These cards are filed separately from the A cards and are related by a common serial number, which is a composite of the document accession number, the unit, set and specimen number. The number is discrete within test type (card columns 1-3), and by adding the test type code (columns 4, 5), it becomes unique.

The B format is divided into two types of cards, B and B_, the worksheets for which are shown in Appendices A-3 and A-4.

One A type card will normally exist for each material specimen and one B type card for each unit of material. Furthermore, the B type express only the basic material and are independent of test types. Thus, the same B cards will normally exist for several A cards.

In addition to the A and B formats, there are supplemental card formats referred to as A cards and an "encoder's card." There is also a format variation specifically for fatigue tests (which is not discussed). The former are supplemental to the basic A card; e.g., A_1 is the first supplement to its A card, A_2 is the second, etc. Note that each of these A_1's relate to a specific A card and to no other. The "encoder's card" is an 8-1/2" x 11" form which is generated for each document to contain significant information not covered in the standard format. The A_1 and encoders formats are shown in Appendices A-5 and A-6.

7. The encoded information is edited to catch obvious errors and interpretative discrepancies. The information is then keypunched on FAM cards and verified.

8. The cards prepared for the document are placed in a storage drawer at the keypunch station. When 8,000 to 10,000 cards are accumulated, a machine edit is made. The cards are sequenced by material and added to the already existing file. The inventory is modified, when necessary, by putting in delete cards.
User Delivers Query to Information Center

Query is Refined, Formulated, and Worksheet is Prepared

Initial Selection of Pertinent Data Cards

Mechanical Properties Files

Card to Disk Conversion

Computer Search and Print

"Blast out" Listing of Initial Selection

Deletion Selection and Cards

Refine Card Selection and Selection of Data on a Card

Cards to Disk Conversion

Computer Print

Final Printout of Properties

FIGURE 3
Retrieval Process
In practice, the center maintains three files. Since questions come in by materials type, one file is organized by materials type. The second file is organized by test type within materials type. The third file is completely random. Which file is searched depends upon the characteristics of a query.

(2) Query Preparation and Retrieval Outputs (See Figure 3)

1. A request for information is refined and initially recorded on the Search Request Form illustrated in B-1. The codes for the various parameters are determined and the request is redefined on the coded search form illustrated in B-2. The system will accommodate a maximum of 10 OR conditions and 5 AND conditions within each of these OR conditions. (A NOT parameter is indicated by a flag in the NOT column of a particular AND condition.)

2. Attribute cards are then keypunched with the coded search parameters.

3. Either pertinent data cards are selected from the materials or test type files, or the first group of cards to be searched is obtained from the random file. The computer then searches the data cards for the desired parameters based on the material field (card column 5) and the test type field (card column 4) using the attribute cards to define the desired information. The printout of the first rough sort is referred to as the "blast-out". An example may indicate that further refining or narrowing of the search is necessary. The search is run again using deletion cards to remove undesired information and format heading cards to obtain the desired output form in the final printout. An example of a final printout is shown in Appendix C. The Center is equipped with a card-to-graph x-y plotter which, along with the computer, provides the Center a capability of producing data tabulations, listings, graphic displays and other pre-programmed printouts.

4. From time to time, personnel at the Center retrieve the entire inventory of a particular subject test type. This is published and distributed to members of the aerospace and defense industries as a means of acquainting them with the resources of the Mechanical Properties Data Center.
3. **ACTIVITIES BEING PLANNED OR DEVELOPED FOR MECHANIZATION**

A KWIC index of document titles may be produced for in-house use. The KWIC index would be used as a tool for locating the contents of documents before indexing them in depth and as a duplicate-checking device. It would also give, as a by-product, some thesaurus information.

All of the data are now stored on punched cards. The Center will probably not convert these to tape files because of the relative ease of updating the cards and the low rate of use of many of them. Converting to tape, however, may be considered if the search rate exceeds about 30 per day. Certain groups of cards may also be converted to tape to create a portable file. Another possibility being considered is to put card groups on disks in order to permit long Boolean-type searches.
III. PROGRAM SYSTEM DATA
III. PROGRAM SYSTEM DATA

The IBM 1440 Computer is used to perform data search and retrieval processes on the Center's data card file. This activity has been done, until recently, semi-manually using EAM equipment centered around the IBM 101 Statistical Machine and the IBM 870 Document Writing System.

1. MAJOR FILES

(1) Data Card File

There are three basic types of EAM cards (denoted by A, A', and B) used to record the data. The formats are fixed and are described in Appendix A. The cards are filed manually by materials class (column 7), and within alloys by test type (column 4). Related cards are linked by a reference number (column 1-3) which is discrete within a test type, and a test type (column 4) which, taken with the reference number, form a unique code.

(2) Master Code Disk Pack

The format of this disk file is shown in D-1. The file is used as a code dictionary that relate card types and attributes to numerical codes.
2. **ROUTINES**

System flow diagrams are shown in Appendices D-2 through D-5. These are described as they appear in the retrieval process in the following paragraphs:

(1) **Attribute Cards to Disk**

This routine is illustrated in D-2. An attribute card, containing the codes to be later used in searching the data cards, is read and the first attribute is placed in main memory. Next, the Master Code Disk Pack is searched for the code strings that relate to the attribute. These are then added to the main memory. This process is iterated for all attributes.

(2) **Data Card to Disk**

D-3 illustrates the routine. To begin, the Master Code Disk Pack is replaced by a Scratch Disk Pack. The first data card is then read and tested for the desired attribute codes. As these are located, the attribute code is flagged with word marks in the main memory and the corresponding data are written on the scratch disk. This process is iterated until all data cards are read.
(3) **End of Job Routine**

This routine is illustrated in Appendix D-4. The last sector of the scratch disk that is used is recorded on the trailer sector of the scratch disk. The scratch disk now consists of all of the desired attribute codes with word marks flagging those which were encountered on the data cards. The scratch disk is then sorted, becoming the Organized Work Pack.

(4) **Blast Out Routine**

This routine is illustrated in Appendix D-5. The Organized Work Pack is then run with heading cards, and the Master Code Pack, and printed out. The heading cards identify the output format and the Master Code Pack supplies the alphabetic descriptions corresponding to the attribute codes.

(5) **Final Report Routine**

This routine is shown in Appendix D-6. Following a review by the project engineer, the desired data deletions and format instructions are keypunched. These are run with the final report printout and x-y plotting cards (if needed).
IV. EQUIPMENT, COSTS, AND EVALUATIONS
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1. EQUIPMENT

IBM 1440 Computer:
- Central Processor with 8K character core memory
- 2-Model 131 Disk Storage Drives
  (Each disk file has 20,000 addressable locations, 100 characters per address, 7 bits per character.)
- Model 1442 Card Read Punch (400 cpm)
- Model 1403 High Speed Printer (340 lines per minute)

EAM Equipment:
- 026 Card Punch
- 047 Tape to card converter
- 083 Sorter with sort suppression
- 056 Verifier
- 053 Collator

IBM 870 Document Writing System:
Mosely X-Y Plotter with model 30A card translator connected to IBM 514 Reproducing Punch. (Reads 6 card columns per data print at 50 cards per minute.)
The following EAM equipments are to be eliminated with the introduction of the 1440 computer:

101 Electronic Statistical Machine
602 Calculating Punch
834 Control Unit
866 Non Trans. Typewriter

2. COSTS

Equipment Monthly Rental:

1440 Computer including processor, disk control, console, etc. - $1,800
1442 Card Read Punch - $445
1403 Printer with 1446 Control - $1,040
1311 Disk Storage Drives (2 units) - $745
083 Sorter with Sort-Suppression - $112
026 Printing Key Punch - $60
101 Electronic Statistical Machine - $275
602 Calculating Punch - $245
834 Control Unit - $124
866 Non Trans. Typewriter - $35
Development:

The Center has been developing its system of data storage and retrieval since its establishment in June, 1959. The recent computer program development was performed by the Center's full time program systems engineer who has spent approximately 2,000 man-hours developing it.

3. FACILITY'S EVALUATION

Experience has indicated to the Center that the cost equivalence point between computer and cam searching is about three to four searches per day. Beyond this rate, the EAM system becomes increasingly cumbersome to the point of impracticability.

The cost of an individual search is not directly related to the number of cards involved. Output form varies, and Data Center personnel review displays and references for each search in varying depth, depending on user requirements.

Both the previous EAM system and, to a greater extent, the present computer system permit the manipulation of data taken from many sources into various formats using a variety of test parameters. This flexibility in relating data gives the Center a capability of pseudo-testing.
Earlier computers were not suitable for the Center because of the long linear tape files and corresponding long search time that would have been required. The present computer has a random-access, high capacity disc memory which avoids this problem and has the additional advantage of simple disc file changing.

The various outputs of the Center have been intentionally restricted to requested information and a few published reports which are for the purpose of publicizing and stimulating the use of the Center. This restriction is due to the Center's policy "not to contribute to the volume of published literature competing for the attention of the technical community".
BIBLIOGRAPHY


APPENDIX A

EXAMPLES OF WORKSHEET FORMATS
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Test No.</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>Specimen No.</td>
<td>1</td>
</tr>
<tr>
<td>1.3</td>
<td>Test Prct.</td>
<td>H2.1A 3.6</td>
</tr>
<tr>
<td>1.4</td>
<td>Trim. Opn.</td>
<td>H2.2A 3.6</td>
</tr>
<tr>
<td>1.5</td>
<td>Second Opn.</td>
<td>H2.3A 3.6</td>
</tr>
<tr>
<td>1.6</td>
<td>Heat Treat.</td>
<td>H2.4A 3.6</td>
</tr>
<tr>
<td>1.7</td>
<td>Surf. Treat.</td>
<td>H2.5A 3.6</td>
</tr>
<tr>
<td>1.8</td>
<td>Surf. Finish</td>
<td>H2.6A 3.6</td>
</tr>
<tr>
<td>1.9</td>
<td>Spec. Config.</td>
<td>H2.7A 3.6</td>
</tr>
<tr>
<td>1.10</td>
<td>Spec. Th. x 10</td>
<td>- 2.3,4</td>
</tr>
<tr>
<td>1.11</td>
<td>Spec. Fabric.</td>
<td>H2.9A 3.4</td>
</tr>
<tr>
<td>1.12</td>
<td>Notch Config.</td>
<td>H2.9B 3.4</td>
</tr>
<tr>
<td>1.13</td>
<td>Notch Pac.</td>
<td>- A,3,4</td>
</tr>
<tr>
<td>1.14</td>
<td>Pre-test Condition</td>
<td>H3.1A 3.6</td>
</tr>
<tr>
<td>1.15</td>
<td>Pre-test Cond. Amount</td>
<td>- 3 A 6</td>
</tr>
<tr>
<td>1.16</td>
<td>Units</td>
<td>H3.3A 3.6</td>
</tr>
<tr>
<td>1.17</td>
<td>Pre-test Cond. Time</td>
<td>- 2.3,4</td>
</tr>
<tr>
<td>1.18</td>
<td>Type Hard.</td>
<td>H3.4A 3.6</td>
</tr>
<tr>
<td>1.19</td>
<td>Hard./100</td>
<td>H3.5A 3.6</td>
</tr>
<tr>
<td>1.20</td>
<td>Orient. - ID.</td>
<td>- 3.4,6</td>
</tr>
<tr>
<td>1.21</td>
<td>Rate Units</td>
<td>H3.6A 3.4</td>
</tr>
<tr>
<td>1.22</td>
<td>Test Rate</td>
<td>- 2.3,4</td>
</tr>
<tr>
<td>1.23</td>
<td>Environ. &amp; Unt.</td>
<td>H3.7A 3.4</td>
</tr>
<tr>
<td>1.24</td>
<td>Environ. Amount</td>
<td>- 2-6</td>
</tr>
<tr>
<td>1.25</td>
<td>Applied Stress, ksi</td>
<td>- 2.3,4</td>
</tr>
<tr>
<td>1.26</td>
<td>Time to Ru-</td>
<td>- 2.3,4</td>
</tr>
<tr>
<td>1.27</td>
<td>Multiplier</td>
<td>H3.8A 3.4</td>
</tr>
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<td>1.28</td>
<td>Cage Length</td>
<td>H3.9A 3.4</td>
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<td>1.29</td>
<td>Elong., GR.T</td>
<td>H4.1A 3.4</td>
</tr>
<tr>
<td>1.30</td>
<td>Red. Area</td>
<td>H4.2A 3.4</td>
</tr>
<tr>
<td>1.31</td>
<td>R.T.</td>
<td>H4.3A 3.4</td>
</tr>
<tr>
<td>1.32</td>
<td>Id. &amp; Temp. Seg.</td>
<td>H4.4A 3.4</td>
</tr>
<tr>
<td>1.33</td>
<td>Type, Uniax.</td>
<td>H4.5A 3.4</td>
</tr>
<tr>
<td>1.34</td>
<td>Fracture Site</td>
<td>H4.6A 3.4</td>
</tr>
<tr>
<td>1.35</td>
<td>Test Rod</td>
<td>- 3.4</td>
</tr>
<tr>
<td>1.36</td>
<td>Time to Test</td>
<td>- 2.3,4</td>
</tr>
<tr>
<td>1.37</td>
<td>Fracture</td>
<td>- 0.4A 3.4</td>
</tr>
<tr>
<td>1.38</td>
<td>Applied A Tension</td>
<td>- 0.5A 3.4</td>
</tr>
</tbody>
</table>

**Note:** The table contains various fields with corresponding values that are typical of a tensile creep test report.
APPENDIX B

QUERY FORMATS
SEARCH REQUEST FORM

Requester

Address

Reply by: Mail

Phone

Material Description

Material Fabrication

Test Type(s)

Specimen Description Notched Unnotched

Surface Treatment and/or Finish

Pre-test Conditioning

Test Environment Temperature

Type Loading and/or Rate Mean Stress

Additional Information and Suggested Displays
APPENDIX C

OUTPUT
<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Heat Treatment</th>
<th>Yield Tensile Strength, ksi</th>
<th>Ultimate Strength, ksi</th>
<th>% Elongation</th>
<th>Surface Finish, RMS</th>
<th>Primary Fabrication</th>
<th>Secondary Operations</th>
<th>Specimen Type</th>
<th>Cycling Speed, CPS</th>
<th>Test Temperature, °F</th>
<th>Mean Stress, ksi</th>
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<th>Fatigue Lifetime</th>
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<td>009 147 159 15 68 10 4 51 51 11 038 008 075 075</td>
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♦ Indicates Runout
* Could = see cont. sheet

TABLE VII
TABULAR OUTPUT - FATIGUE TEST DATA
SAE 4340 STEEL
APPENDIX D

COMPUTER FILE STRUCTURE
AND PROGRAM SYSTEM
FLOW CHARTS
<table>
<thead>
<tr>
<th>Code Descriptions</th>
<th>Ref. No. &amp; Title Descriptions</th>
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A. Core Descriptions

- A
- A2
- A2
- A3
- B
- B1
Attribute Card Input Routine

1. Attributes Cards
   \[\rightarrow\]
2. Place Attributes in Main Memory
   \[\rightarrow\]
3. Search Master Disk Pack for Attributes Codes
   \[\rightarrow\]
4. Place Attributes Codes in Main Memory
   \[\rightarrow\]
5. No Last Attribute?
   \[\rightarrow\]
6. Yes
   \[\rightarrow\]
7. End
Blast Out Routine

FROM END OF
JOB ROUTINE

ORGANIZED
WORK PACK

HEADINGS
CONTROL

"BLAST OUT"
PROGRAM
PRINT

"BLAST OUT"

TO PROJECT
ENGINEER FOR
REVIEW

MASTER
CODE PACK
The Data Center employs the IBM 1440 in the search and retrieval of its data files. The files are maintained on EAM cards but are to be converted to disk during a search. The Center formerly utilized the IBM 101 Statistical Machine and the IBM 870 Document Writing System. The Center has data relating to more than 1/2 million material tests of metals and plastics. Use of the computer has permitted the Center to cope with the increasing demand on its services without increasing its budget by the same order of magnitude.
<table>
<thead>
<tr>
<th>KEY WORDS</th>
<th>LINK A</th>
<th>LINK B</th>
<th>LINK C</th>
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<td>Digital Computers</td>
<td>Data</td>
<td>Analysis</td>
<td>Information Retrieval</td>
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**INSTRUCTIONS**

1. **ORIGINATING MILITARY:** Enter the name and address of the contractor, Subcontractor, grating, Department of Defense, activity or other appropriate office or contractor party preparing the report.

2. **RECIPIENT MILITARY CLASSIFICATION:** Enter the code or codes for accordance or the department. Do not enter any other code or code number in this column. Refer to yellow pages of the government and the department or activity and enter the appropriate military classification code(s).

3. **REPORT SECURITY CLASSIFICATION:** Enter the code or codes for accordance for the report. Do not enter any other code or code number in this column. Refer to yellow pages of the government and the department or activity and enter the appropriate military classification code(s).

4. **REPORT TITLE:** Enter the complete report title in the capital letters below in all cases, should be no less than 40 characters.

5. **DEPARTMENT:** Enter the type of report, i.e., technical progress, technical, annual, final, final, etc., as determined by the reporting period or document.

6. **AUTHOR:** Enter the personal name, first name, middle initial, last name, where such is not known to the department.

7. **RECIPIENT:** Enter the name of the recipient, i.e., technical progress, technical, annual, final, final, etc., as determined by the reporting period or document.

8. **REPORT NUMBER:** Enter the date of the report as it appears on the report, i.e., final, final, etc., as determined by the reporting period or document.

9. **TOTAL NUMBER OF PAGES:** Enter the number of pages of the report, i.e., final, final, etc., as determined by the reporting period or document.

10. **IV. SUMMARY:** Enter the number of the page, i.e., final, final, etc., as determined by the reporting period or document.

11. **MILITARY SECURITY CLASSIFICATION:** Enter the appropriate military classification code(s) for the report, i.e., final, final, etc., as determined by the reporting period or document.

12. **KEY WORDS:** Enter the key words for the report, i.e., final, final, etc., as determined by the reporting period or document.

13. **ABSTRACT:** Enter the abstract, i.e., final, final, etc., as determined by the reporting period or document.

14. **DATE:** Enter the date of the report, i.e., final, final, etc., as determined by the reporting period or document.

15. **COPY NUMBER:** Enter the copy number of the report, i.e., final, final, etc., as determined by the reporting period or document.

16. **ADDITIONAL INFORMATION:** Enter any additional information, i.e., final, final, etc., as determined by the reporting period or document.

17. **SECURITY CLASSIFICATION:** Enter the security classification, i.e., final, final, etc., as determined by the reporting period or document.

18. **REFERENCES:** Enter any references, i.e., final, final, etc., as determined by the reporting period or document.