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PILOT DOCUMENT CONTROL
DATA FILE

FINAL REPORT

Army Research Office
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Arlington, Virginia

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Chapter 1

INTRODUCTION

The objective of the effort described in this report was to establish a pilot Document Control Data (DD Form 1473) Reporting System compatible with the S&TI and TEL/TIPS data files and the Research and Technology Resume (DD Form 1498). The principal tasks accomplished in completing this effort were:

1. Establishment of a file of approximately 500 DD Forms 1473
2. Development of a draft manual for a Revised Form 1473
3. Development of interim formatting, editing, and conversion procedures
4. Test processing of the machine readable file
5. Analysis of keywords and descriptors contained in the TEL/TIPS and DD Form 1473 files.

A description of the conversion effort and formatted file system capabilities is contained in Chapter 2, "Document Control Data File System." Chapter 3 describes the test and data analysis effort; Chapter 4 and Appendix C present the draft revisions to the DD Form 1473. Conclusions reached from the data analysis and test effort are contained in Chapter 5.

Chapter 2

DOCUMENT CONTROL DATA FILE SYSTEM

The IBM Formatted File System (FFS) is a collection of specially developed intelligence data handling programs coupled with the 1410/7010 operating system, which provides FFS with a system monitor and a complete input-output control system. The system monitor controls sequencing and monitoring of the FFS programs and provides programs which are an integral part of the operating system.

The FFS was used to build the pilot Document Control Data File (DD Form 1473) consisting of 497 variable-length records. Each record contains all of the data included in a single Form 1473. More than 12,900 cards were punched and verified to properly convert the documents to a machine-readable form. Each form was assigned a unique identification number which was stamped at the top of the page. This number, carried in a 6-digit field, identified each document in the file. All cards were sorted, written on magnetic tape and entered in the preliminary processing program which reformatted the data, performed minimum editing by checking the validity of certain codified data, compiled statistics and produced the FFS master file consisting of almost 900,000 characters of data. Included were over 400,000 characters devoted to abstracts. The complete set of keypunching instructions and card formats were included in Appendix A of this report.

The FFS provides a highly flexible data handling system with several outstanding capabilities.

First, FFS provides the ability to process fixed, periodic, and variable information. Fixed data includes elements that can appear only once in each record. They are fixed in length, and when input data is absent for

any fixed field, the field is carried as blanks in the record. Data that may attain several values for the same element is termed periodic data. A periodic data field is fixed only in size, but the field may repeat a variable number of times. A string of one or more repeating fields in the same format is termed a periodic subset. The collection of identical subsets is termed a periodic set. When input data is absent for any periodic element, the field will not appear within that record.

Variable data cannot be readily formatted and is typified by narrative in the form of remarks, comments, additional information or, in the case of Form 1473, an abstract. It is the only data field in the file record which is not of fixed length and which does not constitute a retrieval parameter. The Form 1473 abstract is carried in the file record in such a format that it can be printed with proper hyphenation, spacing, and paragraph separation without breaking up words from one line of print to the next. The format of the records created for the Form 1473 file is depicted in Appendix B which identifies each of the data elements as Fixed, Periodic or Variable fields.

Second, FFS has the ability to accept new input data, conforming to certain basic requirements, in an almost limitless variety of formats. Additional Forms 1473 can routinely be added and entire records can be deleted or data fields changed or deleted. Although the major file maintenance effort would be devoted to adding new documents, the system provides the ability to make immediate changes to any fields that may undergo change, such as security classification, availability/limitation notices, group, and others.

Third, FFS provides the ability to logically retrieve information using a language similar to ordinary English. The language and format of the question as stated by the user closely resemble the machine-language query submitted to the retrieval programs of FFS. Any of the data elements in the file, with the exception of the abstract, may be searched during retrieval. A symbolic name is assigned to each data field and is used to reference the various data elements. A query may be devised using combinations of the fixed and periodic data elements, and the actual values being searched for will [illegible] stated in the user's original question.

The logic of the query will be dictated by the logic of the question. Retrieval allows the following logic comparisons:

1. File data EQUAL TO the test value
2. File data LESS THAN the test value
3. File data GREATER THAN the test value
4. File data LESS THAN OR EQUAL TO the test value
5. File data GREATER THAN OR EQUAL TO the test value
6. File data NOT EQUAL TO the test value

These logic comparisons may be grouped together using any one or a combination of "AND" or "OR" logic connectors.

The selection of data records from the file is based on the logic criteria and data values stated in the query. Retrieved records may then be ordered by sorting into any sequence requested by the user. Any fixed or periodic fields, and combinations thereof, may be used in formulating a query. Experimental retrievals performed in this area are discussed in another section of this report.

Finally, FFS provides the ability to produce an unlimited number of varying report formats. The output programs can accept as input all of the file records or only those selected by retrieval and print a report containing data in any format dictated by the user. Labels, headings, explanatory notes, and data can be manipulated to a wide degree. Data fields can be printed anywhere on a line or a series of lines both horizontally and vertically. Appearing with the data fields and labels can be results of totals, counts, and calculations. Data that is carried in the file in a coded form can be decoded and converted by subroutines during the output phase. For example, codes used to indicate security classification, report types, and availability/limitation notices associated with the Form 1473 are converted to word equivalents during the output phase.

The output phase of FFS also provides the capability for punching cards or producing magnetic tape for subsequent printing or as input to another program.

Chapter 3

DATA ANALYSIS

Following creation of the Form 1473 data file a series of retrieval and output operations were performed to test system capabilities and produce a data base for analysis of keyword and descriptor relationships. Tests were performed using selected keywords to retrieve records from the TEL/TIPS and Form 1473 data files. The outputs were analyzed together with Form 1498 descriptor information to determine the extent of the relationship between the three data sources. Keywords, as they relate to DD Forms 1473 and 1498 are, by definition, technically meaningful terms or short phrases that characterize a report or project. In the TEL/TIPS file, current assignment descriptors are similar to keywords by precisely and specifically describing, in a single word or word clusters, the technical, scientific or engineering nature of a respondants' current assignment. Personnel records and documents have been retrieved from their respective files by using descriptors or keywords as query parameters. The TEL/TIPS descriptors were restricted to 23 characters during the building of the FFS master file. Keywords in the 1473's are represented by up to 50 characters. Alphabetically ordered lists of all descriptors and keywords have been generated. Figures 1 and 2 illustrate typical pages from each of the two listings. Each unique word is listed with its frequency of occurrence in the file. The pilot 1473 Data Bank of 497 documents includes 3167 keywords of which 2640, or 83.6 percent, are unique. The highest frequency for any term is 12. Since the 497 forms constitute a very small sample, it can be expected that the percentage of total words that are unique would decrease substantially and the number of unique words would become almost constant as the size of the sample increased. The

DESCRIPTOR	NUMBER
INSTRUMENT LANDING SYS	1
INSTRUMENT MAINTANCE	1
INSTRUMENT MAKING	1
INSTRUMENT MEASUREMENT	2
INSTRUMENT MODIFICATION	3
INSTRUMENT PANEL CLUSTE	1
INSTRUMENT PANEL LAYOUT	1
INSTRUMENT PANELS	1
INSTRUMENT PARTS	1
INSTRUMENT POSITION SER	1
INSTRUMENT REPAIR	2
INSTRUMENT REPAIR MANAG	1
INSTRUMENT SYSTEMS	1
INSTRUMENT TESTING	1
INSTRUMENT TESTS	1
INSTRUMENT VELOCITY	1
INSTRUMENT-CALIBRATION	1
INSTRUMENT-DEVICES	1
INSTRUMENTAL ANALYSIS	7
INSTRUMENTAL ESR TECHNI	1
INSTRUMENTAL MEASUREMEN	5
INSTRUMENTAL METHODS	4
INSTRUMENTAL NEURON	1
INSTRUMENTAL RESEARCH	1
INSTRUMENTAL-VELOCITY	1
INSTRUMENTATION	245
INSTRUMENTATION & CONTR	1
INSTRUMENTATION & LABOR	1
INSTRUMENTATION & TEST	1
INSTRUMENTATION ANALYSI	2
INSTRUMENTATION BALLIST	1
INSTRUMENTATION BIOLOGI	1
INSTRUMENTATION CONSULT	1
INSTRUMENTATION DESIGN	3
INSTRUMENTATION DEVICES	1
INSTRUMENTATION DIGITAL	1
INSTRUMENTATION ENVIR	1
INSTRUMENTATION EQUIPME	1
INSTRUMENTATION EVALUAT	1
INSTRUMENTATION EXC COM	1
INSTRUMENTATION FACILIT	1
INSTRUMENTATION FOR SNO	1
INSTRUMENTATION FOR TES	1
INSTRUMENTATION FORMULA	1
INSTRUMENTATION GENERAL	1
INSTRUMENTATION LOCATIN	1
INSTRUMENTATION OF STRS	1
INSTRUMENTATION OF STRU	1
INSTRUMENTATION PLANNIN	2
INSTRUMENTATION PROCURE	1
INSTRUMENTATION PYROMET	1
INSTRUMENTATION PYROTEC	1

Figure 3-1. TEL/TIPS Current Assignment Descriptors

INFRARED SPECTRA	1
INFRARED TARGETS	1
INFRARED TELESCOPES	1
INFRARED,	1
INHIBITION	1
INITIATORS	1
INJECTION LASER	1
INORGANIC COATINGS	1
INORGANIC COMPOUNDS - STRUCTURAL	1
INPUT REQUIREMENTS	1
INPUT-OUTPUT DEVICES	2
INSERTS	1
INSTRON	1
INSTRUMENT FLIGHT	1
INSTRUMENTATION	4
INSTRUMENTATION EQUIPMENT	1
INSTRUMENTATION RADAR	1
INSULATED GATE	1
INTEGRAL TRANSFORMS	1
INTELLIGIBILITY	1
INTENSIFIER VIDICON	1
INTERACTION PICTURE	1
INTERCHANNEL INTERFERENCE	1
INTERDIGITAL FILTER	1
INTERDISCIPLINARY RESEARCH	2
INTERFERENCE CHARACTERISTICS	1
INTERFEROMETRY	3
INTERIOR BALLISTIC STUDIES	1
INTERIOR BALLISTICS	1
INTERMEDIATE INFRARED	1
INTERMODULATION DISTORTION	1
INTERNAL COMBUSTION ENGINE SABOTAGE	1
INTERNAL STRESS	1
INTERNATIONAL RELATIONS	2
INTERNATIONAL RUBBER HARDNESS	1
INTRAGASTRIC	1
INTRAPERITONEAL ADMINISTRATION	1
INTRAVENOUS	1
INTRAVENOUS ADMINISTRATION	2
INTRINSIC EFFICIENCY	1
INTUITIVE	1
INVERTED FILES	1
INVERTER	1
INVERTING	1
INVESTIGATION	1
ION BOMBARDMENT, ETCHING	1
IONOSPHERE	2
IONOSPHERIC WAVE	1
IRENA	1
IRRADIANCE	1
IRRADIATION	1
IR5A	1
ISOLATION	1

Figure 3-2. 1473 Keywords

TEL/TIPS File, on the other hand, includes the descriptors used by over 13,000 persons to describe their current assignments. Over 97,000 descriptors were used, 53,000 being precisely unique. Of this number, approximately 42,000 occurred only once, restricting retrieval to one person for each of these 42,000 terms. Only 912 terms, or less than two percent of the total, occurred more than 10 times, and the highest frequency was 245 for the word "instrumentation."

In both the 1473 and TEL/TIPS lists, multiple forms of the same term, each with but a minor difference in spelling or format, account for some of the unique words. In the 1473 sample, this condition occurs less frequently. The words that make up both sets of terms were taken from the entire English-language. No thesaurus was used nor were any restrictions placed on the selection of words. In the case of the 1473's, the keywords are generally more descriptive and relevant than the TEL/TIPS descriptors, which include verbs, adjectives, adverbs and abbreviations which, appearing alone, have little or no retrieval value.

To evaluate the TEL/TIPS descriptors better, two randomly selected groups of terms were carefully analyzed. One sample consisted of 4116 unique and consecutive terms in alphabetical order. The second similar sample included 4845 terms. The descriptors were examined to reduce the lists without losing meaningful terms. All descriptors that were repeated with but a minor variation in form (such as plurals, abbreviations, etc.) were deleted. Only one grammatical form of a descriptor was retained. For example:

PERSONNEL MANAGEMENT
PERSONNEL MGMT
PERSONNEL MGNET
PERSONNEL MGNT
PERSONNEL MNGT

Keypunch errors and original spelling errors accounted for some of the duplication. The real key to the compression of the list lay in categorizing precise disciplines into broader divisions and in the recognition of both

grammatical and synonymous equivalents. Grammatical equivalents were readily found since they look alike. Terms that were closely grouped alphabetically could be visually detected and included under a broader, similarly-spelled term. To illustrate, the following terms could all be covered by the term, PRINTED CIRCUITS.

PRINTED CIRCUIT LAYOUT
PRINTED-CIRCUIT BOARDS
PRINTED-CIRCUIT LAYOUT
PRINTED-CIRCUITING

Since the lists were arranged in alphabetical order with no cross-reference to other terms of dissimilar spelling, there was no practical means of linking a descriptor beginning with an "a," for example, with a descriptor with an equivalent meaning starting with an "r." Therefore, CIRCUIT DESIGN and DESIGN OF CIRCUITS are physically widely separated on the list and both would be retained during the manual examination. When there was any doubt as to whether or not a term could be properly included under some major heading and thus be eliminated, the term was retained. Descriptors that could not be readily identified or defined were also retained.

The effort to group terms under grammatically similar headings resulted in a substantial list reduction. The two samples consisted of 8961 unique descriptors, or 17 percent of the total. The list reduction by means of grammatical group association resulted in the deletion of 2299 descriptors or 25.6 percent of the sample. Assuming this to be a representative sample, the rough list could be compressed to 39,500 initially. This number would still constitute a large volume of terms, many with little or no retrieval value. Careful analysis by professional indexers or an automated thesaurus match would be required to reduce the list further by grouping terms by meaning and application and thus producing a concise controlled vocabulary or thesaurus. Such a widely-used vocabulary of terms is the Thesaurus of ASTIA Descriptors which lists over 7000 scientific and technical descriptors in alphabetical order within descriptor groups. Analysis of small, randomly selected groups of TEL/TIPS terms from the compressed list indicates that virtually all TEL/TIPS descriptors can be

properly matched to an ASTIA descriptor. Some TEL/TIPS terms immediately fall under ASTIA headings while others might require reference to other terms from the same personnel record in order to extract their correct meaning. The low value, low frequency descriptors would probably be dropped entirely. There is little doubt that the 53,000 TEL/TIPS current assignment descriptors could be represented by ASTIA descriptors.

The descriptor-keyword languages constitute only one possible link between the data banks. A second link is the commonality of subject material. To illustrate the existence of fields of interest which are included both in current assignment descriptors and keywords and to demonstrate the ability of FFS to match personnel and documents in separate files, experimental computer retrievals were run. A subject was selected that was known to be related to at least one document in the pilot 1473 file . . . . development of ordnance fuzes. A query was submitted to the retrieval phase of FFS calling for all 1473's indicating keywords starting with "FUZE" or which were equal to "TIME FUZES" or equal to "PROXIMITY FUZES." In 48 seconds the system searched the entire master file of 497 records consisting of approximately 900,000 characters and retrieved 14 documents. Examination of their abstracts verified that all documents were pertinent. In total, keywords assigned to these 14 documents were:

FUZES ORDNANCE
FUZES
FUZE
FUZE, SELECTION
FUZE/FUZE SETTER CONCEPT
TIME FUZE

An identical query was run against the TEL/TIPS Data Bank. Current assignment descriptors were searched for the same values. In 24 minutes the system examined approximately 13,000 records containing 97,000 descriptors. A total of 164 persons, all indicating a current interest in fuze research and development effort were retrieved from the file. Examination of the 14 Form 1473 documents and the 164 TEL/TIPS records indicated that all of

the personnel would have been interested in the reports to which the 1473's pertained. The same keywords used in the 1473 sample run were matched against a list of the keywords included in approximately 4000 unclassified DD Forms 1498. Fifteen documents were retrieved.

Chapter 4

DOCUMENT CONTROL DATA FORM

Through discussions with personnel at the Army Research Office and other local offices, a revised From 1473 was designed which encompassed data elements considered necessary to satisfying information needs. The revisions would create a more comprehensive form by providing a means of reporting all document forms published in addition to the technical reports presently recorded on Forms 1473. Several meetings were held to refine the draft form. However, at the time of this report there are areas which were not completely resolved at those meetings. The draft form and instructions are contained in Appendix A of this report.

Chapter 5

CONCLUSIONS

Certain conclusions can be drawn from the analysis of the TEL/TIPS descriptors, the 1473 keywords and the experimental retrieval of TEL/TIPS personnel, and 1473 and 1498 documents.

- The TEL/TIPS descriptors in their present form have a low retrieval value and thus would not adequately serve as interest profiles in a selective dissemination of information system without refinement.
- The 1473 (and 1498) keywords have a higher retrieval value and are more descriptive of the subject material to which they pertain within their own data banks. They have only a common subject matter language link with the TEL/TIPS descriptors.
- A link exists between the three data files in the form of common subject material. Reports represented by 1473 and 1498 records would be of vital interest to TEL/TIPS personnel.
- A thesaurus of terms from which the TEL/TIPS descriptors could be translated to a common vocabulary would be required if the descriptors are to be used as interest profiles.
- The establishment of a file of Form 1473 data for all such forms would provide a capability for document retrieval on a retrospective basis using keywords from Forms 1498 as search criteria. This capability would facilitate improvements in information flow within the R&D community by making available a central master file of all technical document references for which a Form 1473 was prepared.

- The development of a similar file for Forms 1498 would provide additional means of improving information distribution since it could be searched on keywords selected from Forms 1473 to determine potentially interested document users.
- The relationship of Forms 1498 and 1473 is such that the establishment of the two files could provide useful management information pertaining to ongoing R&D projects and the reports issued as a result of those projects. The keywords used in each of the forms are closely related providing one means of searching for related information. The assignment of codes to the forms during preparation which would relate the 1498 to the 1473 originating from the same project would further enhance the value of such a system.

Appendix A

INSTRUCTIONS FOR PUNCHING DD FORM 1473 ADP CARDS

These instructions apply to punching of ADP cards using a hard copy DD Form 1473 as the source of all punch information. All punch cards must be verified.

The 11 different punch card formats used to record the data on DD Form 1473 are shown in Figures 1 through 6. Each card is identified by an alpha character, A through K, in column 80. An ID number, unique to each Form 1473 and stamped on the top of the page, will be punched in columns 1 through 6 of every card. If a form has no data for any single card, skip that card.

Card types A, B, D, E, G, H, and I will be punched a maximum of one time for each form. Card types C, F, and J contain data fields which are periodic in nature. They may occur a variable number of times requiring additional multiple cards of the same type. Card type K contains variable length narrative data also requiring, in most cases, multiple cards.

If any entry on a 1473 is unintelligible or if a condition is encountered which has not been covered by a specific rule or instruction, punch an asterisk (*) in the high-order position of that data field and skip to the next field. If the ID number on any form cannot be distinguished, reject the form entirely and separate it from the other forms.

Punch all punctuation as entered on the form. If "N/A," "NONE," or a similar entry implying no answer, treat field as all blank.

When words of explanation or other comments are entered along with a numeric answer, punch only the numeric quantity and ignore the comments. Example: "Total No. of pages = 199 w/covers . . . .," punch only "199."

Security codes are indicated by T, C, S, and U. Convert to Top Secret, Confidential, Secret and Unclassified, accordingly.

If any symbols are encountered for which there is no punch card code (such as the designation "±" or "a - b," "alpha-beta") substitute appropriate words or symbols so as to preserve the meaning ("±" equals "plus or minus"; "70°" equals "70 degrees"). In the case of chemical notations such as "H_2O, CO_2, H^+, etc." do not consider special positioning of characters. Punch H_2O as "H2O."

Table 1 summarizes the punch instructions for all card types.

NOTE 1 - Descriptive Notes: This item should provide the type of report and inclusive dates. Report type is to be indicated by a two-character A/N code in columns 9 and 10. A list of these codes follows this note. The inclusive dates are to be punched in the format DDMMYY - DDMMYY in column 12 through 24. If only one date appears, terminate punching in column 17. If day is omitted, leave columns 12 and 13 and/or 19 and 20 blank. Precede single character days and months with zeros. Skip all entries other than valid report types and dates.

Report Type Codes

Interim Report	- IR
Final Report	- FR
Status Report	- SR
Progress Report	- PR
Patent	- PT
Periodical	- PD
Research Report	- RR
Technical Report	- TR
Other	- OT

NOTE 2 - Originators Report Number(s): If more than one report number appears in item 9a, punch the first one in columns 37 through 51, card type "D" and treat the remaining numbers as "other report numbers," card type "F."

NOTE 3 - Availability/Limitation Notices: One of five standard statements is to be used in preparing this item. The appropriate code 1, 2, 3, 4, or 5, as selected from the statement list in the instructions on the back of the form, is to be punched in column 7. Three of these statements require additional concluding words which are to be punched in columns 8 through 47. If any other or additional statement is made in this item, it is to be punched in columns 48 through 77. This is form item 10.

NOTE 4 - Name: If first name exceeds 13 characters, abbreviate if possible or use initial only. If an appendage such as Jr., Sr., II, 3rd, etc., is part of name, skip one column after last character of last name and then punch appendage.

NOTE 5 - Items 8b, c, d: These items were intended to cover Project No., Task-Task Area No., and Subtask-Work Unit No., in that order. When entries are made under 8b, c, and d without further identification, punch them in their appropriate places in card type E. If they are identified through use of words such as "project, task, subtask, etc.," ignore positions on form under 8b, c, d and punch according to identifying words. Do not punch these words; punch only numbers.

ADDENDA TO KEYPUNCHING INSTRUCTIONS

ABSTRACT - Card Type K:

Hyphenate all words to be split between two cards. If hyphenation is not possible, end punching with last whole word and start next word on next card.

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)*	2a. REPORT SECURITY CLASSIFICATI[redacted]
	2b. GROUP
3. REPORT TITLE	
4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*	
5. AUTHOR(S) *(Last name, first name, initial)*	
6. REPORT DATE	7a. TOTAL NO. OF PAGES / 7b. NO. OF REFS
8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO.	
c.	9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*
d.	
10. AVAILABILITY/LIMITATION NOTICES	
11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
13. ABSTRACT	

DD FORM 1 JAN 64 1473

Table A-1. Keypunch Instructions (Sheet 1 of 13)

COMMON DATA ELEMENTS FOR ALL CARDS

Item No. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	Num	1-6	6	never	never	never	Unique ID Number with leading zeros will be stamped on top of each DD Form 1473
-	2	Card Type	Alpha	80	1	--	--	--	Punch one of following characters in appropriate type card: A, B, C, D, E, F, G, H, I, J, K.

Table A-1. Keypunch Instructions (Sheet 2 of 13)

DATA ELEMENTS FOR CARD TYPE "A"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	num	1-6	6	never	never	never	See Table I.
1	2	Originating Activity (Corporate Author)	A/N	7-79	73	skip	omit all over 73	punch left	
-	3	Card Type	alpha	80	1	--	--	--	Punch "A"

Table A-1. Keypunch Instructions (Sheet 3 of 13)

DATA ELEMENTS FOR CARD TYPE "B"

Item no. on Form	Fld. No	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
3	2	Report Title	A/N	7-79	73	never	omit all over 73	punch left	
-	3	Card Type	Alpha	80	1	--	--	--	Punch "B".

Table A-1. Keypunch Instructions (Sheet 4 of 13)

DATA ELEMENTS FOR CARD TYPE "C"

Item No. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations: missing	more	less	REMARKS
-	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
5	2	Author -	Alpha			skip	see Re-marks	punch left	Punch one Author per card. Punch additional cards for more Authors. See NOTE 4.
		Last Name		7-26	20				
		First Name		27-39	13				
		Middle Initial		40	1				
-	3	Card Type	Alpha	80	1	--	--	--	Punch "C".

Table A-1. Keypunch Instructions (Sheet 5 of 13)

DATA ELEMENTS FOR CARD TYPE "D"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
-	2	Security Classification	Alpha	7	1	never	never	never	Punch "T", "C", "S" or "U". Skip if other.
2a	3	Report Security Classification	Alpha	8	1	never	never	never	Punch "T", "C", "S" or "U". Skip if other.
2b	4	Group	Num	9	1	never	never	never	Punch "1", "2", "3", or "4". Skip if other.
4	5	Descriptive Notes (type of report and inclusive dates)	A/N	10-24	15	never	never	punch left	See Note 1.
6	6	Report Date	Num	25-30	6	skip	never	punch left	Convert to DDMMYY. Punch bbMMYY if day missing.
7a	7	Total No. of Pages	Num	31-33	3	skip	never	precede /zeros	Right justify.
7b	8	No. of References	Num	34-36	3	skip	never	precede /zeros	Right justify.
9a	9	Originators Report Number	A/N	37-51	15	never	never	punch left	See Note 2. Left justify.

(continued)

Table A-1. Keypunch Instructions (Sheet 6 of 13)

DATA ELEMENTS FOR CARD TYPE "D" (continuation)

Item No. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
8a	10	Contract or Grant Number	A/N	52-75	24	skip	never	punch left	When applicable, abbreviate. "AMC Management Structure Code No." to "AMCMS Cd".
-	11	Card Type	Alpha	80	1	--	--	--	Punch "D".

Table A-1. Keypunch Instructions (Sheet 7 of 13)

DATA ELEMENTS FOR CARD TYPE "E"

Item No. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
b	2	Project Number	A/N	7-30	24	skip	never	punch left	See NOTE 5.
8c	3	Task Area No. - Task No.	A/N	31-54	24	skip	never	punch left	See NOTE 5.
8d	4	Work Unit Number - Subtask No.	A/N	55-78	24	skip	never	punch left	See NOTE 5.
-	5	Card Type	Alpha	80	1	--	--	--	Punch "E".

Table A-1. Keypunch Instructions (Sheet 8 of 13)

DATA ELEMENTS FOR CARD TYPE "F"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
--	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
9a	2	Other Report Number	A/N	7-21	15	skip	never	punch left	See Note 2.
9a or 9b	3	Other Report Number	A/N	22-36	15	skip	never	punch left	See Note 2.
9a or 9b	4	Other Report Number	A/N	37-51	15	skip	never	punch left	See Note 2.
9a or 9b	5	Other Report Number	A/N	52-66	15	skip	never	punch left	See Note 2.
-	6	Card Type	Alpha	80	1	--	--	--	Punch "F".

Table A-1. Keypunch Instructions (Sheet 9 of 13)

DATA ELEMENTS FOR CARD TYPE "G"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
1	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
10	2	Availability/Limitation Notices - Code	Num	7	1	never	never	never	See Note 3.
10	3	Availability/Limitation Notices - Concluding Statement	Alpha	8-47	40	never	omit all over 40	punch left	See Note 3.
10	4	Distribution Statements - Additional Statement	A/N	48-77	30	skip	omit all over 30	punch left	See Note 3.
-	5	Card Type	Alpha	80	1	--	--	--	Punch "G".

Table A-1. Keypunch Instructions (Sheet 10 of 13)

DATA ELEMENTS FOR CARD TYPE "H"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
11	2	Supplementary Notes	A/N	7-79	73	skip	omit all over 73	punch left	Skip card if no entry for Form Item 11.
-	3	Card Type	Alpha	80	1	--	--	--	Punch "H".

Table A-1. Keypunch Instructions (Sheet 11 of 13)

DATA ELEMENTS FOR CARD TYPE "I"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number-Control	Num	1-6	6	never	never	never	See Table I.
12	2	Sponsoring Military Activity	A/N	7-79	73	never	omit all over 73	punch left	
-	3	Card Type	Alpha	80	1	--	--	--	Punch "I".

Table A-1. Keypunch Instructions (Sheet 12 of 13)

DATA ELEMENTS FOR CARD TYPE "J"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
14	2	Key Words	A/N	7-56	50	skip	omit all over 50	punch left	Punch one type "J" card for each key word line entry. (Including groups of words or phrases).
-	3	Card Type	Alpha	80	1	--	--	--	Punch "J". NOTE: Ignore all entries under links A, B, C.

Table A-1. Keypunch Instructions (Sheet 13 of 13)

DATA ELEMENTS FOR CARD TYPE "K"

Item no. on Form	Fld. No.	FIELD NAMES	Fld. Code	Cols. Assgn.	No. of Cols.	Instructions for Data Variations			REMARKS
						missing	more	less	
-	1	ID Number - Control	Num	1-6	6	never	never	never	See Table I.
-	2	Card Sequence Number	Num	7-8	2	--	--	--	Punch as many Type "K" cards as are required to complete abstract numbering each card sequentially starting with "01". Precede sequence numbers with "0" when less than "10".
13	3	Abstract	A/N	9-79	70	never	continue on add'l cards	punch left	See Above.
-	4	Card Type	Alpha	80	1	--	--	--	Punch "K".

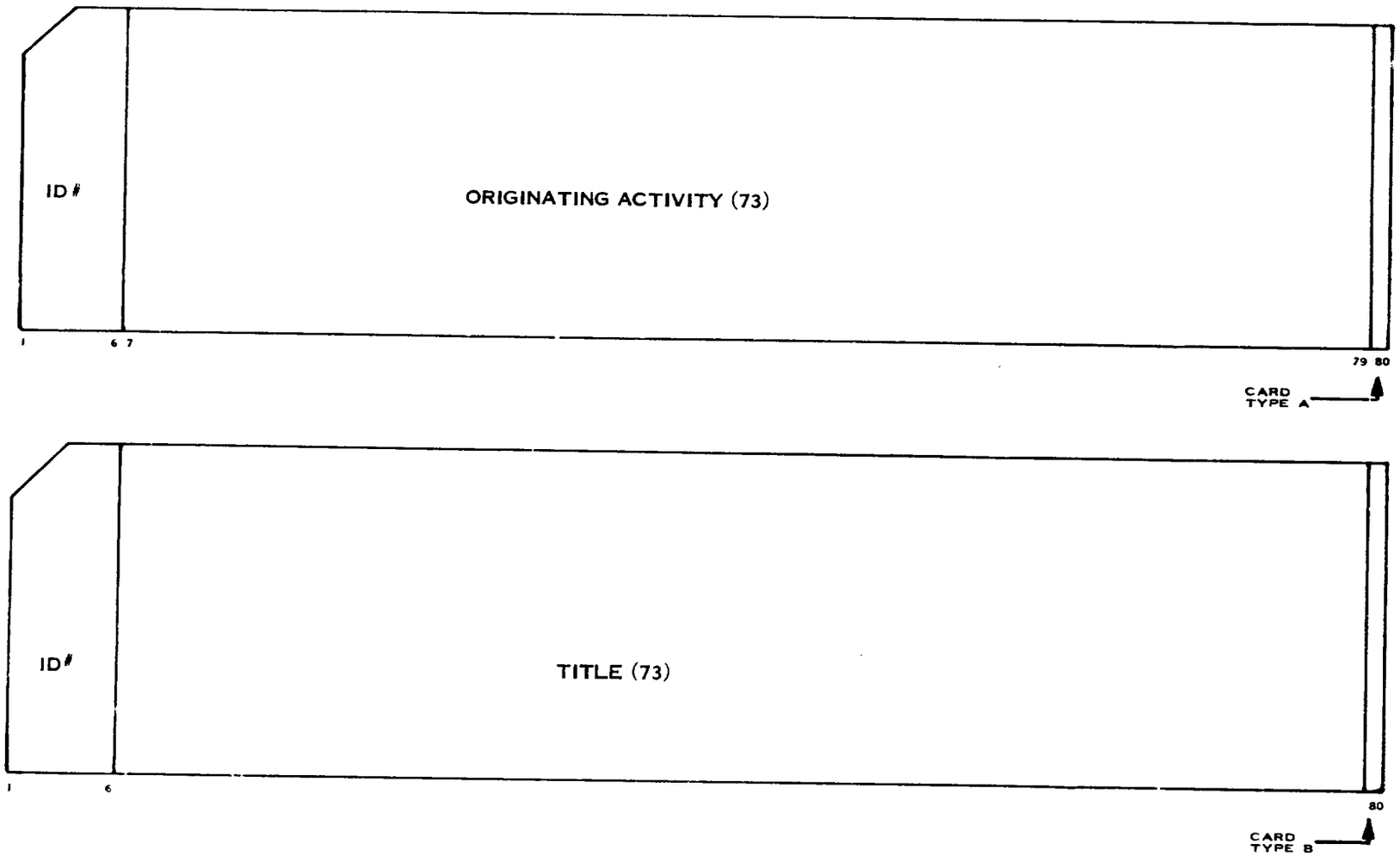


Figure A-1 Card Formats (Sheet 1 of 6)

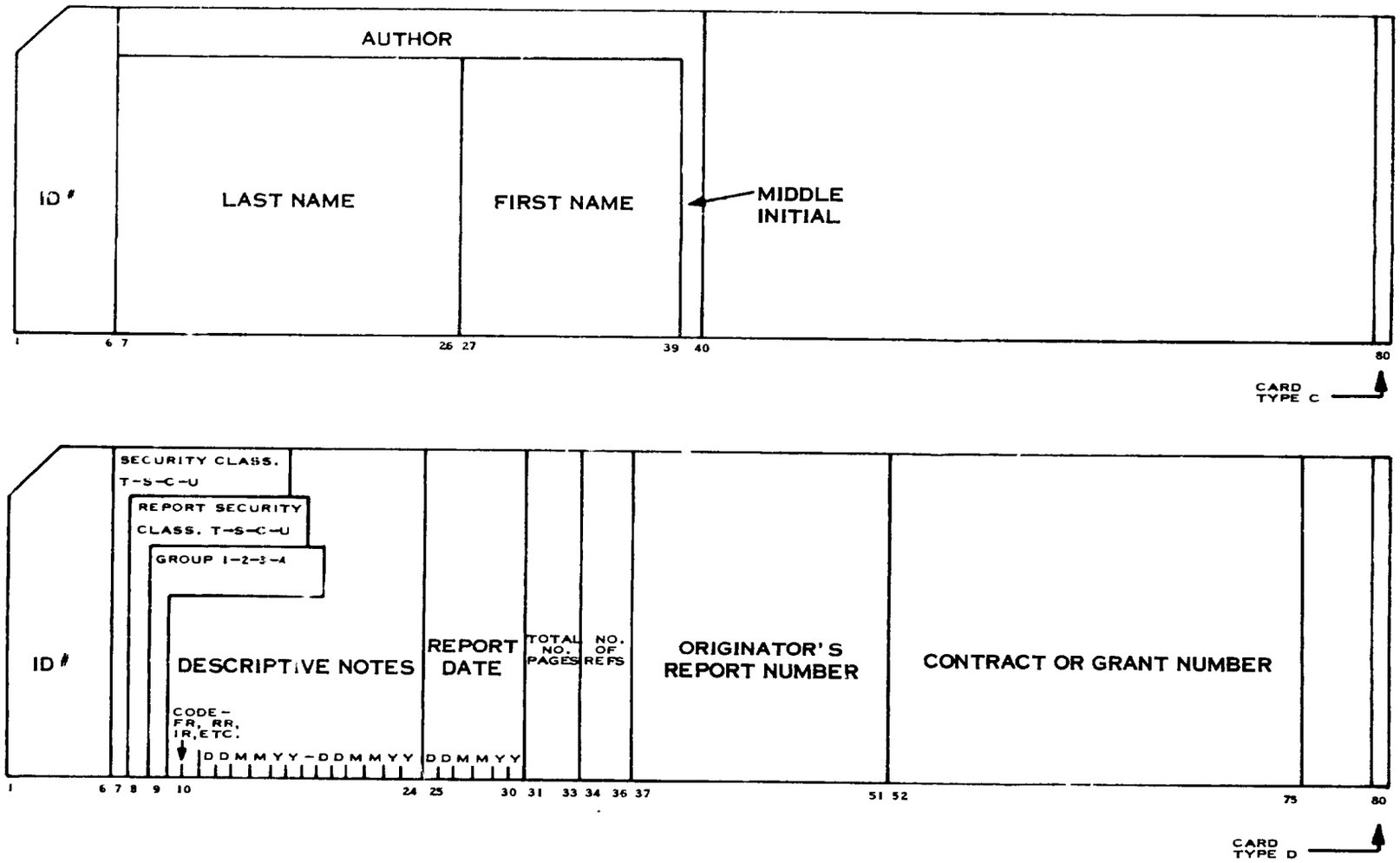


Figure A-1 Card Formats (Sheet 2 of 6)

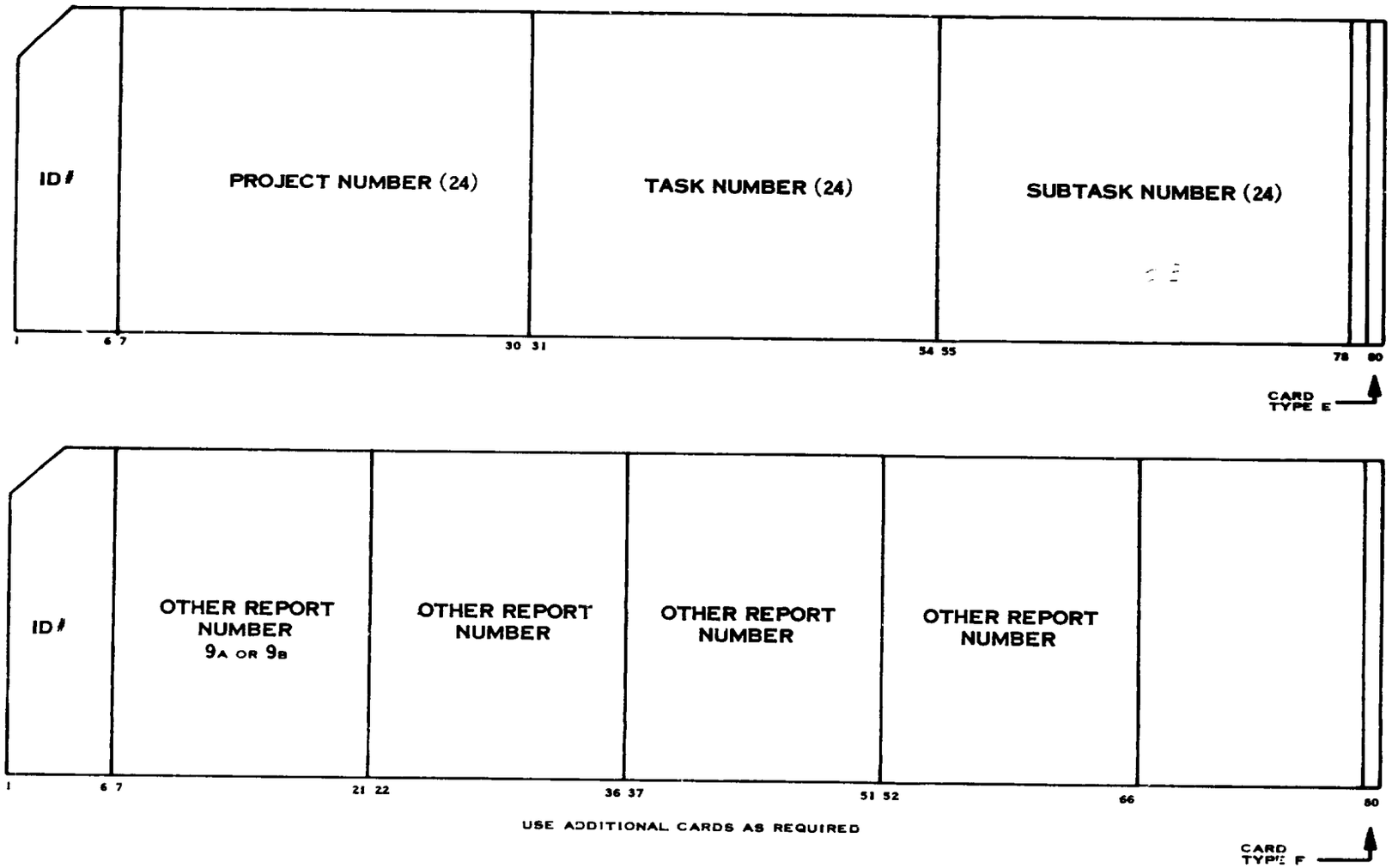


Figure A-1. Card Formats (Sheet 3 of 6)

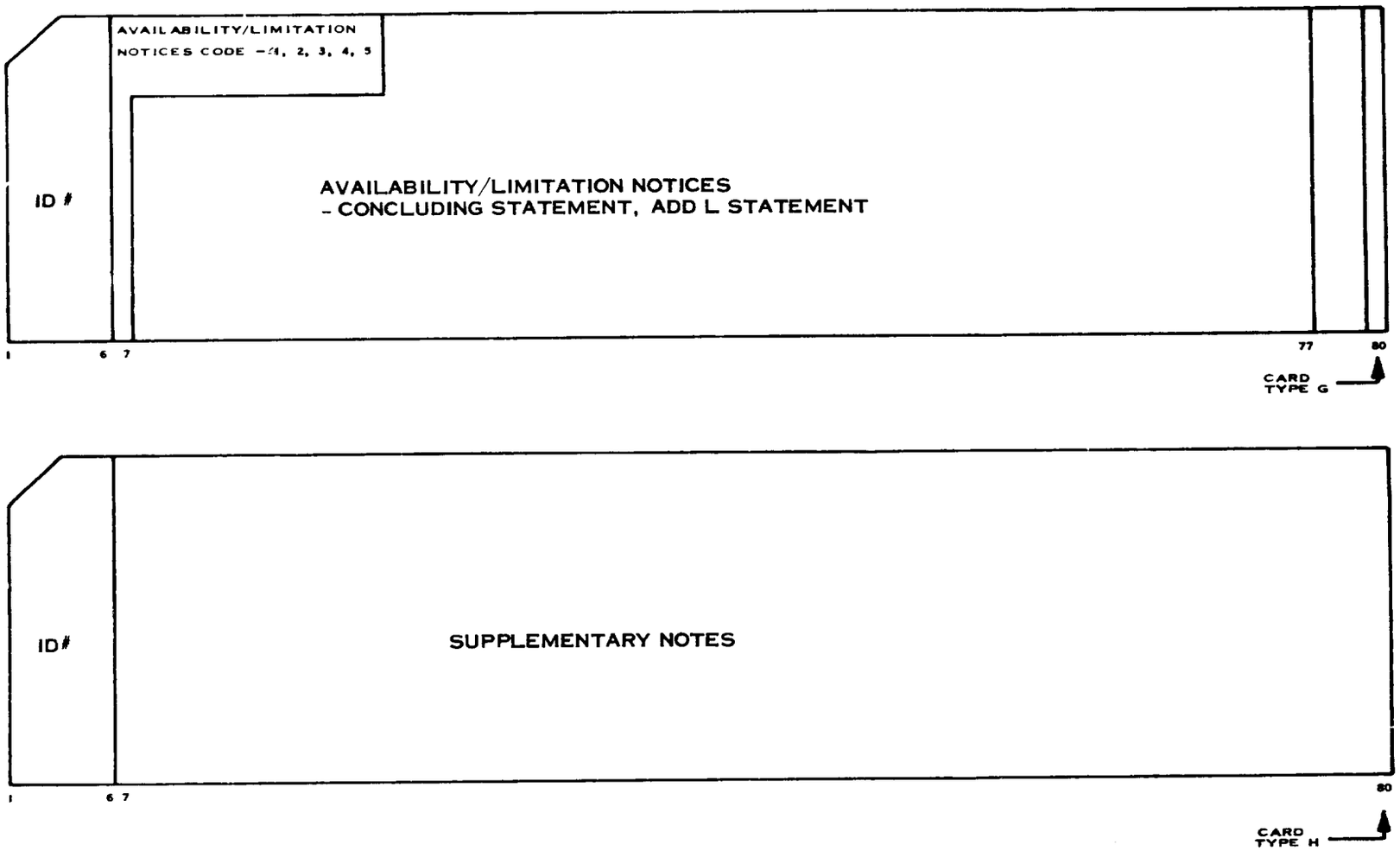


Figure A-1. Card Formats (Sheet 4 of 6)

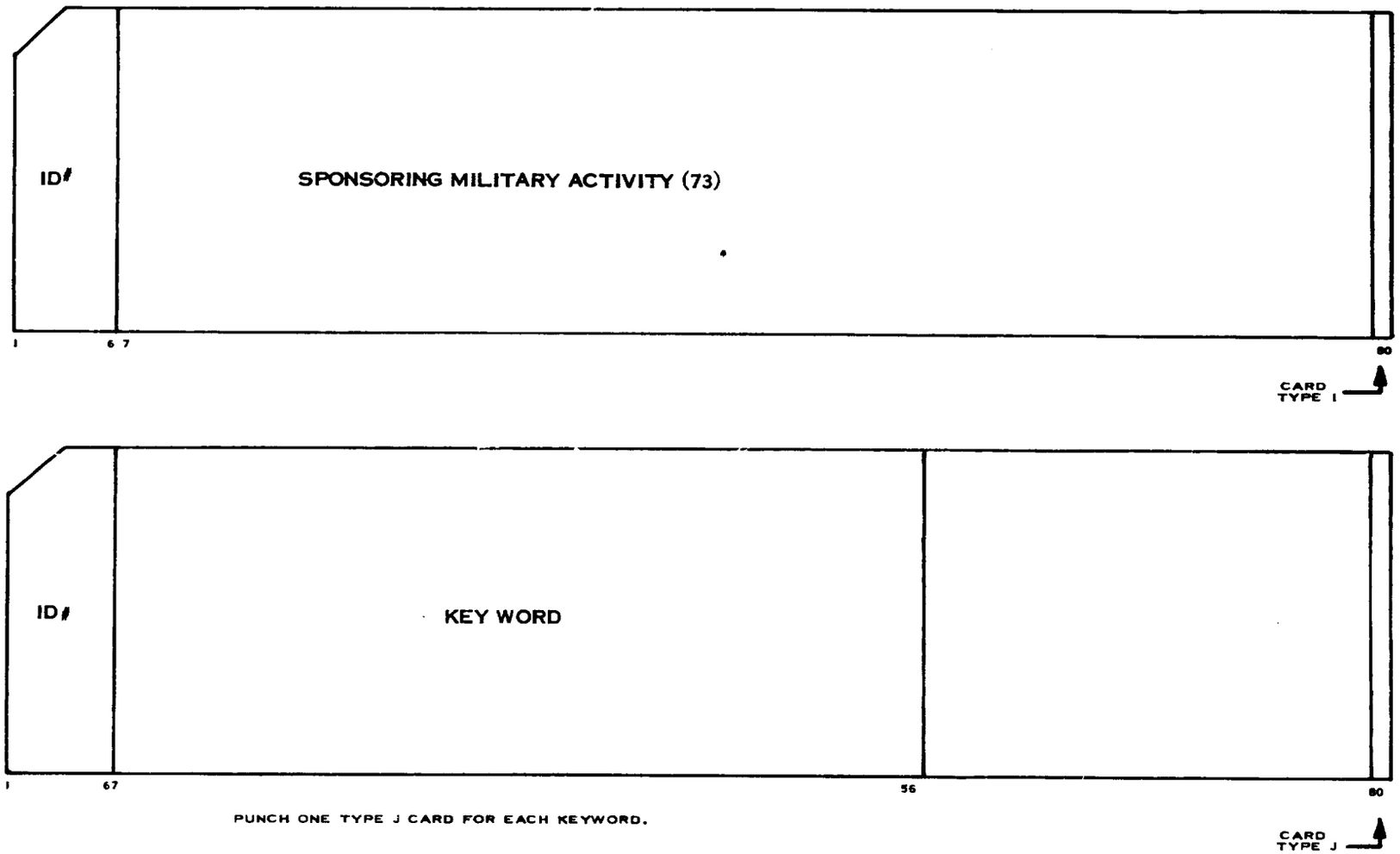


Figure A-1. Card Formats (Sheet 5 of 6)

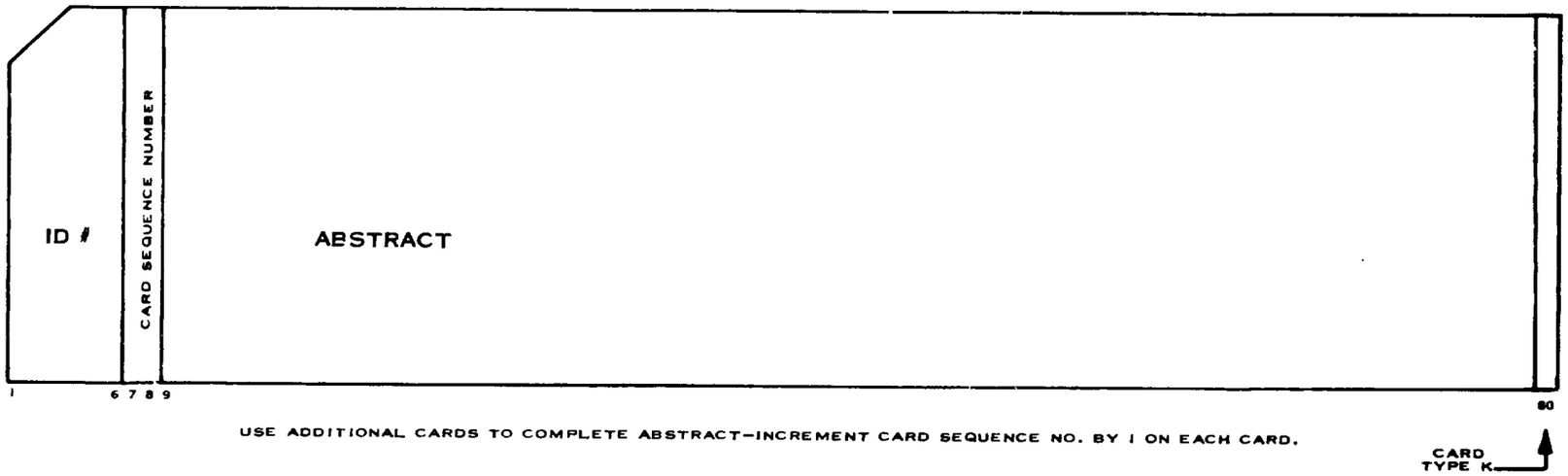


Figure A-1. Card Formats (Sheet 6 of 6)

Appendix B

DD FORM 1473 RECORD FORMAT

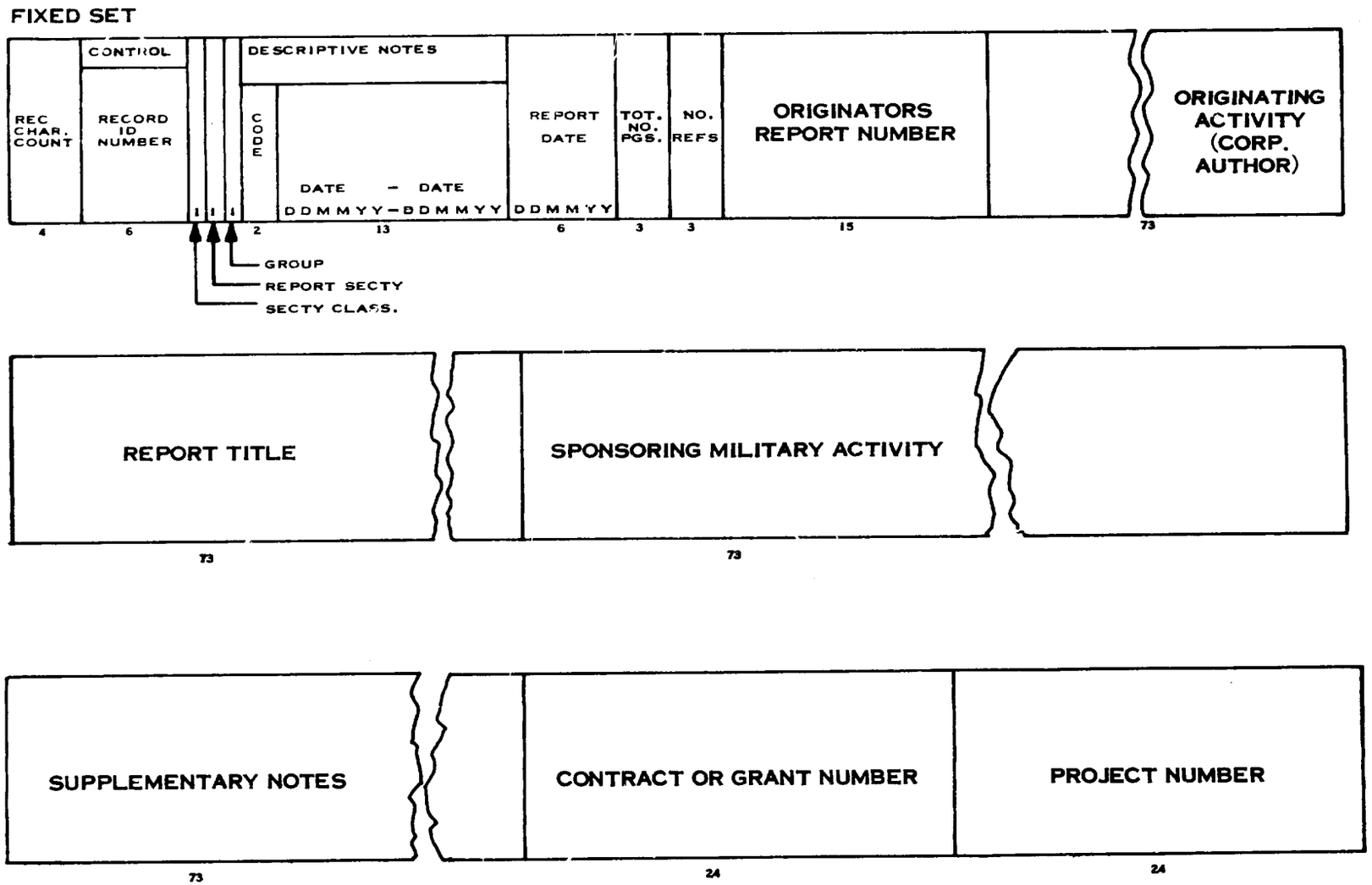


Figure B-1. 1473 FFS Record (Sheet 1 of 6)

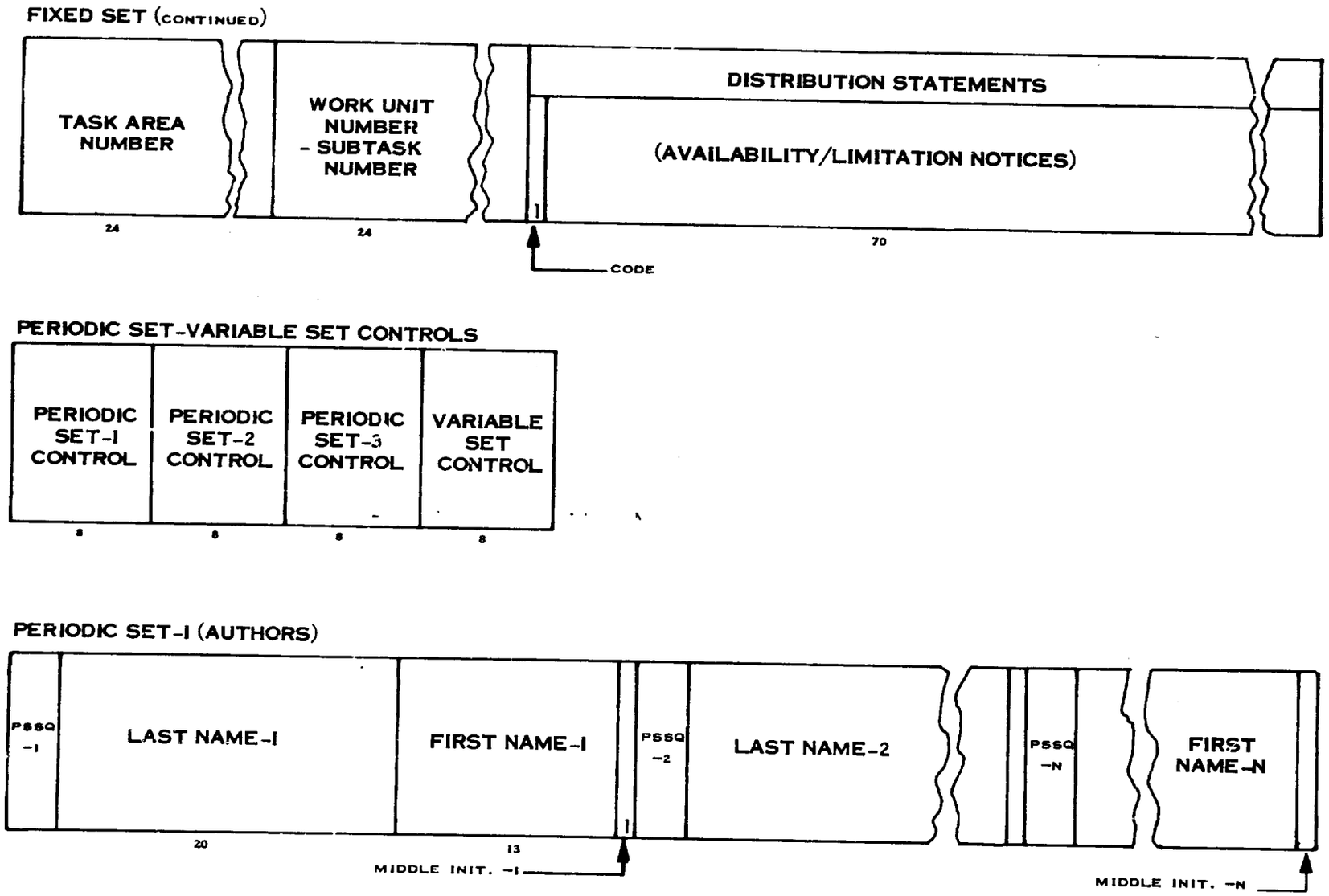
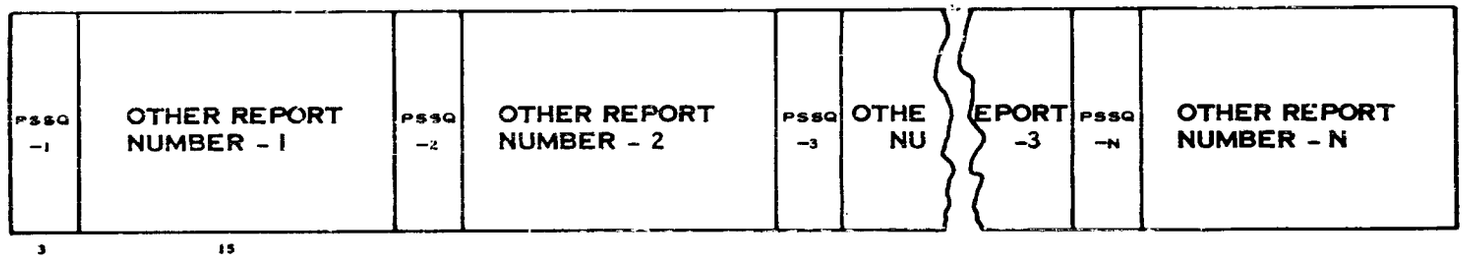
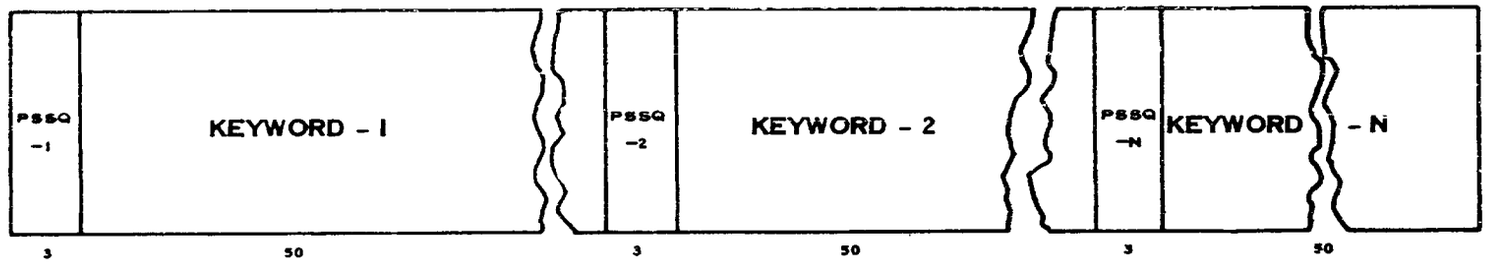


Figure B-1. 1473 FFS Records (Sheet 2 of 6)

PERIODIC SET-2–OTHER REPORT NUMBERS



PERIODIC SET-3–KEYWORDS



VARIABLE SET-ABSTRACT

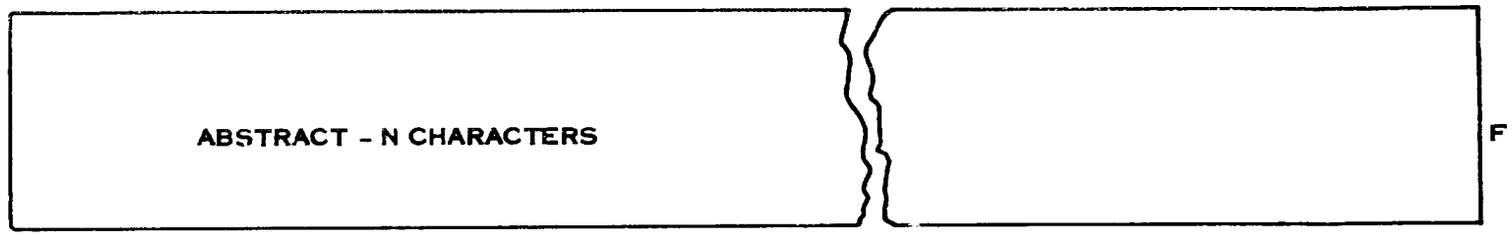


Figure B-1. 1473 FFS Records (Sheet 3 of 6)

DATA ELEMENT	FFS SYMBOLIC NAME	NUMBER OF CHARACTERS	JUSTIFICATION	ALPHA-NUMERIC	PERIODIC, FIXED OR VARIABLE	PERIODIC SET NUMBER	REMARKS
IDENTIFICATION NUMBER	IDNUM	6	R	N	F		THIS UNIQUE NUMBER IS STAMPED AT THE TOP OF EACH FORM 1473 PRIOR TO KEYPUNCHING. THE FILE IS MAINTAINED IN ASCENDING IDENTIFICATION NUMBER SEQUENCE.
SECURITY CLASSIFICATION	SCLAS	1		A	F		T, S, C, U, ETC.
REPORT SECURITY CLASSIFICATION	SECTY	1		A	F		T, S, C, U, ETC.
GROUP	GROUP	1		N	F		1, 2, 3, 4
DESCRIPTIVE NOTES – CODE	DCODE	2	L	A/N	F		REPORT TYPE CODE – IR (INTERIM REPORT), FR (FINAL REPORT), ETC.
DESCRIPTIVE NOTES	DATES	13	L	N	F		REPORT DATES
	DESCN				F		GROUP SYMBOL FOR DCODE AND DATES
REPORT DATE	RDATE	6	L	N	F		DDMMYY
TOTAL NUMBER OF PAGES	PAGES	3	R	N	F		

Figure B-1 1473 FFS Records (Sheet 4 of 6)

DATA ELEMENT	FFS SYMBOLIC NAME	NUMBER OF CHARACTERS	JUSTIFICATION	ALPHA-NUMERIC	PERIODIC, FIXED OR VARIABLE	PERIODIC SET NUMBER	REMARKS
NUMBER OF REFERENCES	REFFS	3	R	N	F		
ORIGINATOR'S REPORT NUMBER	REPNO	15	L	A/N	F		FIRST REPORT NUMBER ENTERED IN FORM ITEM NO. 99
ORIGINATING ACTIVITY (CORPORATE AUTHOR)	ORIGA	73	L	A/N	F		
REPORT TITLE	TITLE	73	L	A/N	F		
SPONSORING MILITARY ACTIVITY	SPONS	73	L	A/N	F		
SUPPLEMENTARY NOTES	SUPPL	73	L	A/N	F		
CONTRACT OR GRANT NUMBER	GRANT	24	L	A/N	F		
PROJECT NUMBER	PROJN	24	L	A/N	F		
TASK NUMBER	TASKN	24	L	A/N	F		
WORK UNIT NUMBER - SUBTASK NUMBER	SUBTN	24	L	A/N	F		
AVAILABILITY/ LIMITATION NOTICES	DISTC	1		N	F		1, 2, 3, 4 OR 5 RELATING TO STANDARD STATEMENTS LISTED ON REVERSE SIDE OF FORM 1473.

Figure B-1. 1473 FFS Records (Sheet 5 of 6)

DATA ELEMENT	FFS SYMBOLIC NAME	NUMBER OF CHARACTERS	JUSTIFICATION	ALPHA-NUMERIC	PERIODIC, FIXED OR VARIABLE	PERIODIC SET NUMBER	REMARKS
AVAILABILITY/ LIMITATION NOTICES	CONCL	70	L	A/N	F		CONCLUDING STATEMENT(S)
	DISTS	71			F		GROUP SYMBOL FOR DISTC AND CONCL
AUTHOR - LAST NAME	LSTNM	20	L	A	F	1	LAST NAME PLUS APPENDAGES SUCH AS JR., SR., II, ETC.
AUTHOR - FIRST NAME	FSTNM	13	L	A	P	1	ABBREVIATED TO INITIAL IF NAME EXCEEDED 13 CHARACTERS
AUTHOR - MIDDLE INITIAL	MIDIN	1		A	P	1	
	SET 1	34				1	GROUP SYMBOL FOR AUTHOR WHEN PRESENT EACH RECORD WITH PERIODIC SET 1 CONTAINS FROM 0 TO N AUTHORS.
OTHER REPORT NUMBERS	OTHER	15	L	A/N	P	2	SECOND THRU NTH REPORT NUMBERS ENTERED IN FORM ITEM 9A AND/OR ALL REPORT NUMBERS ENTERED IN FORM ITEM 9B.
KEYWORDS	KEYWD	50	L	A/N	P	3	
ABSTRACT	ABSTR	VARIABLE	L	A/N	V		PROPER PRINT JUSTIFICATION ENSURED BY PRINTING 71 CHARACTERS PER LINE.

Figure B-1. 1473 FFS Records (Sheet 6 of 6)

Appendix C

INSTRUCTIONS FOR COMPLETING DD FORM 1473 (DOCUMENT CONTROL DATA - R&D)

The controlling DoD component will insure that a properly executed DD Form 1473 (Figure 2) is included in each technical document before the document is sent to the printer for reproduction. Three copies of the form and one copy of each supporting ADP punched card, appropriately marked as to security classification, will be forwarded to an office designated by the agency concerned.

The form will be reproduced as the final page in all copies of the technical document. Questions concerning completion of data elements will be resolved by the sponsoring military authority.

Section A. Instructions for completing DD Form 1473 follow: (Paragraph numbers used in this section refer to the item numbers reflected on the form).

1. DDC - AD Number. Leave blank
2. Agency Accession.

a. The Agency Accession number is a unique number assigned to each document to identify it throughout the reporting system. The accession number assigned to the first DD Form 1473 submitted for a document will be used for all REVISED forms dealing with that document.

b. The Agency Accession number is represented by a two-letter code (referred to as the agency digraph), a 6-digit serial number and the last two digits of the year in which the document was originated. The agency digraphs for all reports are listed below:

DA	Army
DB	DASA

DC	DCA
DD	OSD
DF	Air Force
DI	DIA
DJ	JCS
DN	Navy
DR	ARPA
DS	DSA
DW	WSEG
DY	NSA
A-*/	AEC
B-	Department of Agriculture
C-	Department of Commerce
F-	Federal Aviation Agency
H-	HEW
I-	Department of Interior
J-	Department of Justice
NM	NASA, OMSF
NR	NASA, OART
NS	NASA, OSSA
NT	NASA, OTDA
S-	National Science Foundation
T-	Treasury Department
V-	Veterans Administration

c. A block of serial numbers will be assigned to each developing agency by a control office designated by the Agency.

d. Enter the digraph, assigned serial number and last two digits of the year in block 2 of the form.

*/ The second letter of some digraphs has not been assigned. This is indicated above by the "-" symbol. If use of these digraphs is necessary follow this convention in typing the resume and in punching ADP cards.

3. Security.

a. Enter code letters from the following list to indicate the security classification of both the form and the document. The entry for the security classification of the document should be entered immediately after the letters "DOC" in block 3. The entry for the security classification of the DD Form 1473 should be entered immediately after the number "1473" in block 3. Separate entries are required even if both entries are the same.

Code	Security Classification
T	Top Secret
S	Secret
C	Confidential
U	Unclassified

b. If any data on the form is classified the form should be stamped to indicate its security classification in accordance with AR 380-5.

4. Regrading.

a. If either the Form or the Document is classified, enter a code number from the following list to indicate the security regrading group that applies to the Document or to the Form. If either is unclassified, enter NA in appropriate space.

Code	Group	
1	Group 1:	Excluded from automatic downgrading and declassification.
2	Group 2:	Exempted from automatic downgrading
3	Group 3:	Downgraded at 12-year intervals, not automatically declassified.
4	Group 4:	Downgraded at 3-year intervals, declassified after 12 years.

b. If the Form is classified it should also be stamped in the bottom right corner with regrading instructions in accordance with AR 380-6.

5. Distribution Statement.

a. Enter the appropriate distribution statement code from Table 4, including the name of the controlling DoD office. The proper use of the

distribution statement depends upon circumstances connected with each individual document. Specific justification must exist for each document whose availability to the public is prevented by a controlling statement or whose use is restricted or limited within the Government.

b. In addition to the entry in block 5, the Form will also be stamped with a distribution statement if required by regulations or instructions.

6. Sponsoring Military Activity. Enter the name(s) and address(es) of the departmental project office or laboratory sponsoring (paying for) the research and development.

7. Performing Organization.

a. Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization (corporate performing the work).

b. Enter the appropriate code for the type of performing organization opposite "TYPE" in the lower right corner of block 7. If the performing organization is a Government laboratory, enter the appropriate digraph. See block 2 instructions. If the performing organization is not a Government laboratory, enter the appropriate code letter from the list below, preceded by the letter "U" for U.S. organizations or the letter "Z" for foreign organizations. Definitions for the organization types are given in Table 1.

Code	Organization Type
	Academic program:
A	Public or state college or university.
B	Private college or university.
	Academic center:
C	Public or state college or university.
D	Private college or university.

Code	Organization Type
	Government Laboratory:
E	Public or state college or university operated.
F	Private college or university operated.
G	Industry operated.
H	Independent.
	Not-for-profit laboratory: (Cost plus fee)
J	Public or state college or university operated.
K	Private college or university operated.
L	Hospital operated.
M	Independent operated.
	For-Profit laboratory: ~~(Cost)~~
N	Industry operated.
P	Private operated.
	Non-Profit laboratory: (Cost)
Q	Public or state college or university operated.
R	Private college or university or foundation operated.
S	Hospital operated.
T	Other (e.g., international, private, industrial, etc.).

Examples: DA For an Army laboratory.

ZS For a foreign, nonprofit, hospital-operated laboratory.

c. The boxes in the upper right corner of block 7 will be used for entry of codes which identify the organization and its general geographic location when standard interdepartmental codes are adopted. At this time, these boxes should be left blank.

8. a. Contract or Grant Number. If appropriate, enter the applicable number of the contract(s) or grant(s) under which the report was written.

b. Project Number. Enter the appropriate military department identification, such as project number, task area number, work unit number. Example: Project No. 7381; Task Area No. 738103; Work Unit No. 73810384.

Bad Example

9. a. Performing Organization Document Number. Enter the official number by which the document will be identified and controlled by the performing activity. This number must be unique to the document.

b. Sponsoring Agency Document Number. Enter any document number assigned by the sponsor.

10. Document Date. Enter the date of the document in arabic numerals, as day, month, year; month, year. If more than one date appears on the document, use the date of publication. Example: 08-10-63 or 10-63, meaning 8 October 1963, or October 1963.

11. Type of Document.

a. The type of document identification consists of a 6-character code comprised of two characters for the administrative category, two characters for document form, and two characters for content classification.

b. Enter the appropriate 6-character code from Table 2.

12. a. Total Number of Pages. The total page count entered should follow normal pagination procedures, i.e., the number of pages containing printed information. Example: 21 pages.

b. Number of References. Enter the total number of references cited in the report. Example: 23 references.

13. Document Title. Enter the complete document title in all capital letters. Show title classification (code) in parentheses immediately preceding the title. Example: (U) STUDY IN DISPERSION OF MISTS. Unclassified titles will be used whenever possible as a matter of policy.

14. Author(s). Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. Example: Smith, John B., Col., Ord C.

15. Abstract. The abstract of the document is to be inserted on DD Form 1473, even though it may also appear elsewhere in the body of the technical document. If additional space is required, a continuation sheet will be included immediately after the DD Form 1473. If more than one technical subject is covered by the document, each subject will be presented in a separate paragraph of the abstract. Whenever possible, the abstract of classified documents will be unclassified. Every effort, consistent with common sense and the necessity to convey information, should be made to write an informative abstract. Each paragraph of the abstract will begin with an indication of the military security classification of the information in the paragraph, represented as (TS), (S), (C), or (U). There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

Example:

(U) Investigation was made of ways to apply findings of behavioral sciences research to interests regarding the management of in-house laboratories in the Office of Aerospace Research. The method of the study included collection of data by use of personal interviews, a standard written questionnaire, and review of management records, and also included inputs of information from the behavioral sciences to OAR management during the twelve-month period covered by the study. Findings on research organization substantiate the importance of protecting the integrity of research activities and to differentiate them from development, to maintain a participatory style of leadership, to support methods to translate research findings into rapid utilization, and to assure a sense of continuity in laboratory structure and research programs. Findings on the evaluation of research productivity point out methods to measure the quality of research products, as well as quantity, through examining subsequent citations of publications and the source of original publication. Findings on the recruitment, retention, and utilization of scientists suggest the importance of freedom in the conduct of research as a general incentive related to research productivity and job satisfaction and also indicate the importance of further research to analyze effectiveness of different incentives for different types of civilian and military scientists identified in this study.

16. Scientific or Technological Areas: Identify the scientific and/or technological area(s) to which the document directly relates by entering up to three descriptive codes from Table 3 in block 16. If the document relates to more than three areas, identify the additional area(s) by entering the scientific and technological area nomenclature(s) (without codes) as keywords in block 17.

17. Keywords.

a. Keywords are words or short phrases that characterize the data contained in the report. They are used as index entries for cataloging and for retrieving the report. They are also used in various selective dissemination systems. Efficient keywording requires an intimate knowledge not only of what is in the report, but also its significance in other disciplines.

Keywords are to be freely selected but use of slang terminology, unauthorized abbreviations, unmodified numerical designators, ambiguous or original technical terms, highly generic terms (e.g., physics, research, etc.) should be avoided.

Important keywords often can be found in the title, abstract, table of contents, introduction, figures, tables, conclusions and recommendations. Particular attention should be given to the following:

- Specific materials, data theories and theses used.
- Specific properties determined experimentally or theoretically.
- Specific methods or processes investigated.
- Equipment used.
- Specific applications for materials, methods, processes, or equipment where they show promise beyond the particular experiment.

Designate your subject as precisely and specifically as possible. For example, if "high temperature metals" are discussed without reference to a particular metal, "high temperature metals" would be the proper entry in the list. However, if "Rene 41," "A286" and "Inconel X," as well as other high temperature metals, are dealt with, list each specific alloy.

b. Enter keywords to accurately describe and categorize the document being reported. A minimum of three keywords should be entered. Keywords should be separated by semicolons. If a keyword is classified, the security classification should be shown in parentheses before the term; unclassified keywords need not be preceded by "(U)".

18. Supplementary Notes. Use for additional explanatory notes.

Table C-1. Definitions of Types of Organizations (Sheet 1 of 2)

A, B	Academic Program - Those research and development activities performed by faculty and students at universities and colleges which are related to academic graduate research.
C, D	Academic Center - Those research and development activities performed by faculty and students at research centers or laboratories of universities or colleges, which are related to academic graduate research.
	Government Laboratory:
E, F	University Operated - Those research and development laboratories managed by universities having mission assignments from Government agencies.
G	Industry Operated - Those research and development laboratories owned by the government and operated and managed by profit making industrial corporations and having assigned missions in research and development.
H	Independent - Those research and development laboratories licensed or incorporated as separate corporate entities for the purpose of conducting Government research and development only, whose facilities are not government owned.
	Not-For-Profit Laboratory:
J, K	University Operated - Those research and development offices, centers, or laboratories which may be organized by universities primarily for consulting, research and development for other requesting institutions or sponsors and operated on a cost plus fee basis.
L	Hospital Operated - Those research and development offices, centers, or laboratories which may be organized by hospitals for consulting, research and development for other requesting institutions or sponsors and operated on a cost reimbursable plus fee basis.

Table C-1. Definitions of Types of Organizations (Sheet 2 of 2)

M	Independent - Those laboratories, independently chartered or incorporated which may be organized primarily to supply consulting services, research and development to any requesting institution, and which are chartered or incorporated as non-profit organizations and operated on a cost reimbursable plus fee basis.
	For-Profit Laboratory:
N	Industry Operated - Those research and developmer laboratories owned and operated by private industrial organizations engaged in manufacturing.
P	Private Operated - Those research and development laboratories organized as independent profit-making laboratories whose business is consulting, research, development or testing.
	Non-Profit Laboratory:
Q, R	University Operated - Those R&D labs operated by universities on a cost reimbursable basis (without a fee) for consulting, R&D, etc.
S	Hospital Operated - Those research and development laboratories operated on a cost reimbursable basis (without a fee) for consulting, research, development or testing.

Table C-2. Type of Technical Document Categories

Code	Document Form
BK	Book
JO	Journal
RP	Report

Code	Administrative Category
FN	Final
PR	Progress
DI	Disclosure

Code	Content Classification
PA	Patent
SA	State of Art
TE	Test and Evaluation
OW	Original Work

The required six (6) character code set is formed by selecting the appropriate 2 character code from each group above in the group order indicated.

Example: A state of art progress report would be: RPPRSA.

Table C-3. SCIENTIFIC AND TECHNOLOGICAL FIELDS AND GROUPS

AERONAUTICS

000500 Aerodynamics
000600 Aeronautics
001300 Aircraft
001400 Aircraft flight control and instrumentation
001500 Air facilities

AGRICULTURE

000700 Agricultural chemistry
000800 Agricultural economics
000900 Agricultural engineering
001000 Agronomy and horticulture
001700 Animal husbandry
006600 Forestry

ASTRONOMY AND ASTROPHYSICS

002000 Astronomy
002100 Astrophysics
003000 Celestial mechanics

ATMOSPHERIC SCIENCES

002200 Atmospheric physics
010000 Meteorology

BEHAVIORAL AND SOCIAL SCIENCES

000400 Administration and management
005100 Documentation and information technology
005300 Economics
007400 History, law, and political science
007500 Human factors engineering
007600 Humanities
009000 Linguistics
009400 Man-machine relations
012500 Personnel selection training and evaluation
013400 Psychology (individual and group behavior)
015400 Sociology

BIOLOGICAL AND MEDICAL SCIENCES

002300 Biochemistry
002400 Bioengineering
002600 Biology
002700 Bionics
003500 Clinical medicine
005900 Environmental biology
006000 Escape, rescue and survival
006500 Food management
007800 Hygiene and sanitation
007900 Industrial (occupational) medicine
008800 Life support
009800 Medical and hospital equipment
010100 Microbiology
012400 Personnel selection and maintenance (medical)
012600 Pharmacology
012900 Physiology
013300 Protective equipment
014100 Radiobiology
016200 Stress physiology
016800 Toxicology
017100 Weapons effects

CHEMISTRY

003300 Chemical engineering
008300 Inorganic chemistry
012100 Organic chemistry
012700 Physical chemistry
014000 Radio and radiation chemistry

EARTH SCIENCES AND OCEANOGRAPHY

002500 Biological oceanography
002900 Cartography
005200 Dynamic oceanography
006800 Geochemistry
006900 Geodesy
007000 Geography
007100 Geology and mineralogy
008900 Limnology & Hydrology
010200 Mining engineering
012800 Physical oceanography
015200 Seismology
015300 Snow, ice and permafrost
015500 Soil mechanics
016600 Terrestrial magnetism

ELECTRONICS AND ELECTRICAL ENGINEERING

004000 Components
004200 Computers
005700 Electronic and electrical engineering
008100 Information theory
016400 Subsystems
016500 Telemetry

ENERGY CONVERSION (NON-PROPULSIVE)

004500 Conversion techniques
013200 Power sources
005800 Energy storage

MATERIALS

000300 Adhesives and seals
003100 Ceramics, refractories, and glass
003600 Coatings, colorants, and finishes
004100 Composite materials
006200 Fibers and textiles
009900 Metallurgy and metallography
010500 Miscellaneous materials
011600 Oils, lubricants, and hydraulic fluids
013100 Plastics
014900 Rubber
015800 Solvents, cleaners, and abrasives
017200 Wood and paper products

MATHEMATICAL SCIENCES

009700 Mathematics and statistics
011700 Operations research

MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING

001200 Air conditioning, heating, lighting, and ventilating
003400 Civil engineering
004300 Construction equipment, materials and supplies
004400 Containers and packaging
004700 Couplings, fittings, fasteners, and joints
007200 Ground transportation equipment
007700 Hydraulic and pneumatic equipment
008000 Industrial processes
009200 Machinery and tools
009500 Marine engineering
013500 Pumps, filters, pipes, fittings, tubing, and valves
015000 Safety engineering
016300 Structural engineering

METHODS AND EQUIPMENT

004600 Cost effectiveness
008700 Laboratories, test facilities, and test equipment
014300 Recording devices
014400 Reliability
014500 Reprography

MILITARY SCIENCES

001800 Antisubmarine warfare
003200 Chemical, biological, and radiological warfare
004900 Defense
008400 Intelligence
009100 Logistics
011400 Nuclear warfare
011800 Operations, strategy, and tactics

MISSILE TECHNOLOGY

010400 Missile launching and ground support
010500 Missile trajectories
010600 Missile warheads and fuses
010700 Missiles

NAVIGATION, COMMUNICATIONS, DETECTION, AND COUNTERMEASURES

000100 Acoustic detection
003900 Communications
005000 Direction finding
005600 Electromagnetic and acoustic countermeasures
008200 Infrared and ultraviolet detection
009300 Magnetic detection
010800 Navigation and guidance
011900 Optical detection
013700 Radar detection
015100 Seismic detection

NUCLEAR SCIENCE AND TECHNOLOGY

008500 Isotopes
010900 Nuclear explosions
011000 Nuclear instrumentation
011100 Nuclear power plants
011200 Nuclear propulsion
011300 Nuclear reactors
011500 Nuclear weapons effects
013800 Radiation shielding and protection
013900 Radioactivity

ORDNANCE

001600 Ammunition, explosives, and pyrotechnics
002800 Bombs
003700 Combat vehicles
006100 Explosions, ballistics, and armor
006300 Fire control and bombing systems
007300 Guns
014800 Rockets
016900 Underwater ordnance

PHYSICS

000200 Acoustics
004800 Crystallography
005500 Electricity and magnetism
006400 Fluid mechanics
009600 Masers and lasers
012000 Optics
012200 Particle accelerators
012300 Particle physics
013000 Plasma physics
013600 Quantum theory
015600 Solid mechanics
015700 Solid state physics
016700 Thermodynamics
017000 Wave propagation

PROPULSION AND FUELS

001100 Air breathing engines
003800 Combustion and ignition
005400 Electric propulsion
006700 Fuels
008600 Jet and gas turbine engines
014200 Reciprocating engines
014600 Rocket motors and engines
014700 Rocket propellants

SPACE TECHNOLOGY

001900 Astronautics
015900 Spacecraft
016000 Spacecraft launch vehicles and ground support
016100 Spacecraft trajectories and reentry

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