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CIA Contribution to Intelligence Information Handling Committee

Annual Report

Chapter 1

No Agency Contribution Required

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Chapter 2 Highlights of Reporting Period

OCS

The Office of Computer Services (OCS) has installed an IBM 360/67 using CP/CMS to take over the interactive (time-sharing) services furnished by the CIA Computer Center. (See also Chapter 3).

CAPRI

The CAPRI software originally designed as a file management system for Project CHIVE was completed (See also Chapter 6).

RSM

CIA/CRS obtained on loan in May the first model of the General Electric Rapid Search Machine (RSM) pending delivery of an improved version in the late fall. A variety of applications are now under investigation with various CIA offices - some of which will involve the cooperation of other USIB member agencies. The device enables the user to search machine-readable files for logical combinations of keywords and to retrieve pertinent records on a very rapid basis. Initial user reaction to the RSM has been highly favorable (See Chapter 6.)

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National Agency Check

The Central Intelligence Agency (Office of Security) has established a Data Communications Link with the Army Intelligence Command, Fort Holabird, Maryland for the purpose of exchanging National Agency Check requirements in machine language. The system which has been under test over the past year became operational in May 1969. Details are set forth in Chapter 4.

ASPIN

The Central Intelligence Agency has funded and will undertake in FY 1970-71 a project to develop a broad conceptual design for automatic data processing support to intelligence production (ASPIN). (See Chapter 3)

Staffs

Several of the intelligence production offices in CIA have established Systems Development Staffs to assist in the design and development of automatic data processing applications in these offices and to increase the understanding and use of quantitative methods in the production of finished intelligence.

TRADER

CIA has completed the creation of a machine-readable file on several recent year's foreign trade data of the USSR. The file structure and existing programs permit a substantial computational capability against these files as well as information storage and retrieval functions in both on-line and batch processing modes.

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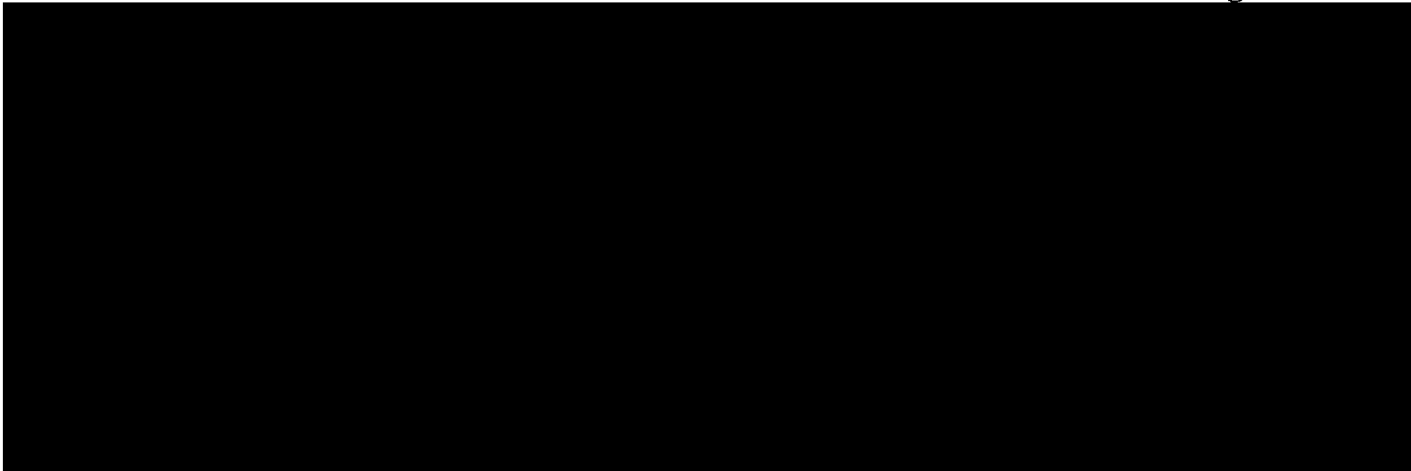
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Foreign Missile and Space Activity Center (FMSAC)

A direct link between the CDC 1700 computer system in FMSAC and an IBM 360/65 system in OCS has been installed and is under test. This link will provide a remote job entry (RJE) facility to the large scale processor from the center reducing both the turnaroundtime on center jobs and the elaborate tape handling requirement for the automatic dissemination system developed by the center. The CDC 1700 will be augmented by additional tape drives and a line printer to support the RJE capability. (See also Chapter 6)

Scientific Applications Development

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ELINT

During FY-69 the CIA Office of ELINT made some progress in the field of automatic signal analysis. Most of the progress related to software development and/or revision of previously established techniques for the extraction of signal parameters.

Progress should be noted also in the adaptation and use of

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automated field collection and control systems. Most of these
control systems (designed as integral components of ELINT signal
collection systems) relate to receiver programming and/or antenna
orientation and control.

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Chapter 3 Systems, Techniques, or Activities of Community Interest
Not Covered in Other Portions of this Report

ASPIN

The conceptual design effort of CIA's Project ASPIN seeks to identify:

- (1) types of ADP applications which may be profitably undertaken
- (2) relationships among existing and proposed applications which ought to be preserved in their design, modification, and/or implementation.
- (3) specifications for the general system (s) which might bring together these processing activities
- (4) procedures for approval and development of component elements of this system.
- (5) organizational arrangements for the development and operation of this system.

Computer Systems - Hardware

Major changes in the Office of Computer Services' inventory of equipment were:

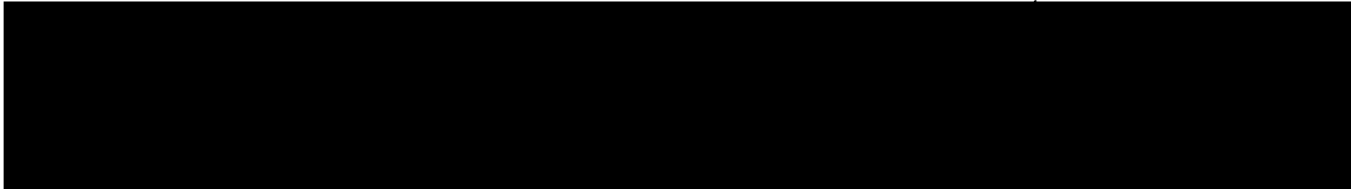
- September 1968 - Installed RCA Spectra 70/35 Computer System.
- September 1968 - Discontinued use of Agency-owned RCA 501 Computer System.
- October 1968 - Released leased RCA 301 System to RCA.
- March 1969 - Replaced IBM 360/50 System used for interactive services support with an IBM 360/67.
- April 1969 - Installed two IBM 2420 Model 7 tape units to increase the rate of input to an IBM 360/65 System for digitized analog data.

Data transfer rates for these tape units is 320,000 bytes per second, 3 1/2 times the transfer rate of other IBM tape units installed in OCS.

Computer Systems - Software

TSMON - A Time-Sharing Monitor which was developed by OCS was expanded to provide a batch processing capability whereby certain processes (such as a lengthy computer listing) could be initiated at a remote computer terminal and processed in a batch mode.

Control Program/Cambridge Monitor - After an extensive review and study of existing time-sharing software packages for the IBM 360/67, ^{25X1A}


greater flexibility than other time-sharing systems which allow programs to share time under a single operating system. CP/CMS permits a sharing of time between operating systems as well as application programs. ^{25X1A}

MINICARD

NPIC has begun to phase out its Minicard document image system in favor of a microfiche system with on-line access to computer-held indices to the collection. This changeover will be completed during the coming year.

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Photo Coverage Processing

The digitizer for the Area Coverage Program was completed, tested, and accepted during this year. This device permits an operator to manually contour areas of pan photography which are unacceptable for satisfaction of search requirements. The software to translate this output to WAC mosaic cells (nominally 18 x 12 n.mi.) was completed and testing of the over-all system is nearly finished.

(See also Chapter 3 Annex)

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Sex (1 alpha position)

Special Search Codes (2 alpha-numeric positions)

Name (35 positions)

Name Identifier - Subject, Alias, Nee Name, etc. (3 positions)

Card # 2 - Trailer Card, 1 per case

Control Data (Repeated)

D.O.B. - Mo/Day/Year (6 numeric positions)

Country/State of Birth - using Standard D.O.D. Geo-Political
Code (3 positions)

City of Birth (13 alpha positions)

Residence/Travel Year - Allowance for maximum of 3 (20 positions)

Citizenship (3 alpha positions)

The CIA reply to each individual request is a one card format utilizing Card #1 for "No Record" reporting only. Positive replies are forwarded direct to accredited investigative personnel resident within the CIA Headquarters.

CIA transmits individual request for searches in the Defense Central Index of Investigation (DCII) in a single card format containing the following data elements:

Card #1

Name (27 alpha positions)

Sex (1 alpha position)

Name Identifier - Subject, Alias, Nee (1 position)

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National Base of Imagery Derived Information

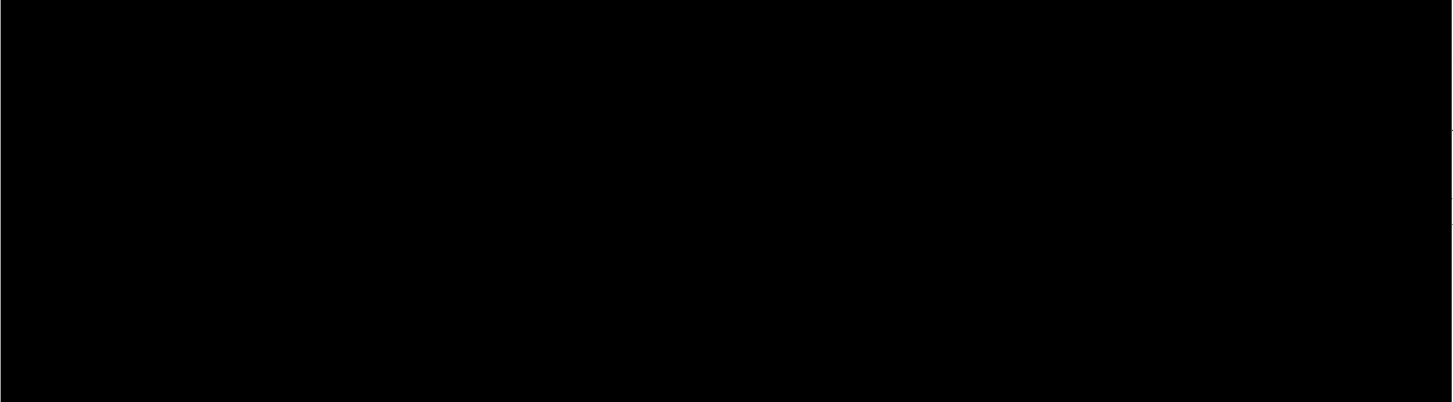
NPIC has participated in the development of general guidelines of the Service Center Concept with the Data Base Working Group (DBWG) of COMIREX. A magnetic tape of the total Installations Data File, the Index to the Exploitation Products Data File, and the Objects Data File will be provided by NPIC to the DIA and NSA Service Centers periodically so that they may respond to requests levied by components which they are responsible to service. Changes to this file will be provided periodically so that DIA and NSA may update the files in their possession.

The formats and specific procedures for this data exchange are presently being developed by the DBWG. 25X1A

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A CIA information analyst was co-located in NSA's central reference facility during the test period in an effort to identify NSA files and reference products that would be of value to CIA/CRS.

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Chapter 5 Research and Development

Interactive Text Processing

An interactive text-processing system designed to be used by analysts working with textual materials has been under development for several years. Its present experimental version runs on the IBM 360/50 in the IPRD and makes use of the 2260 display terminals. A variety of text-processing capabilities are being incorporated so that the system can be adapted to the needs of many different analysts. With it an analyst will be able to scan text that is in machine-readable form, extract passages of particular interest for his working file, index them in several ways, search either the index data or the complete texts and retrieve the original text, add comments, and compose and edit reports. The text-searching and editing portions of the system are now being used experimentally. Although the system will include provision for simple indexing, deeper and more discriminating indexing of semantic content will be possible with the "content representation" portion of the system, still under development. To provide "content representations" for any particular text, the analyst will select words from the text or any other words of his own choosing, to form simple sentences. The system will analyze the sentences automatically and store the concepts and interrelationships contained in them in a systematic structured form, reducing paraphrases to the same representation within the system. The system will also include a concordance generation capability for use in analyzing the terminology in a particular area of application, and compiling dictionaries of terms for internal use in the system.

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On-Line Text Editing

A general purpose, on-line text editing program has been designed and implemented in the IPRD. This program will accept either ASCII code or 1050 code from 8 level paper tape and will produce either paper tape or magnetic tape output.

There are currently more than twenty editing and searching commands available by use of the RAND tablet or light pen and display console. These include text positioning commands, the basic editing commands, (add, delete, and move) as well as several special commands to accommodate text in upper and lower case.

This program was written by employing modular programming techniques so as to facilitate making changes appropriate to specific applications, and is being tested for requirements of several Agency components.

Interactive Chinese-English Translation Aid

A prototype computer-based Chinese-to-English translation system has been designed and programmed for experimental use in the IPRD in evaluating a variety of translation-aid configurations. It operates on an IBM 360/50 and, in its initial implementation, employs an IBM 2260 display. The dictionary data base at present consists of approximately 200,000 entries. The translator enters a string of up to four characters by typing the standard telegraphic code number (4 digits) for each character. If there is an entry for that string in the dictionary, the English meaning is instantly displayed. If there is no entry, the program automatically segments the string and displays the meanings found in the dictionary for all lesser

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(1-, 2- and 3-character) strings. The system also displays the cross-reference information stored in the system for each of the characters, such as Romanizations, radical number, stroke counts, and entry numbers in manual dictionaries, all of which facilitate look-up in manual dictionaries.

A capability of displaying characters is now being added. For this purpose the system will be implemented on the IBM 2250 display. The display interface has been programmed in a new "Graphics Application Language," developed in the IPRD to facilitate moving programs from one display to another. Since looking up telegraphic code numbers is a time-consuming task for many translators, effort will be devoted in the next phase to experimentation with various means of achieving graphic input of characters.

Associative Processing Development

Basic research aimed at eventual exploitation of associative memory computers has been supported in the last year. The system being developed will permit the retrieval of data or the relating or "associating" of different data items where data and relations are explicitly stored in the system file. As a part of the project an Association Storing Processor (ASP) language has been designed and documented. ASP has been partially implemented for the IBM 360 in the IPRD. The techniques for storing relations have been implemented and a rule-of-inference capability is operable for certain cases. The present model will allow testing of an associative retrieval capability without the necessity of using truly associative memory

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(parallel processing) device. Further work will be done on derived inferences and searching for substrings in the next phases of the work. This work has been jointly funded by CIA and USAF-RADC.

Graphic Application Language (GAL)

In the FY 69 period, development has gone forward in the IPRD on a Graphic Application Language (GAL). GAL is designed to facilitate the programming and procedural changes which must take place where usage of computer display programs needs to be changed from one kind of display terminal equipment to usage on a different kind of display hardware. The language is designed to provide a degree of device independence to the programmer and to provide a common ground for display generation. The structure is modular, and additional devices can be supported with the programming of a few device-dependent routines. During the past year the design, programming, technical documentation, and much of the user documentation have been accomplished. The program debugging and system integration of GAL are currently in progress.

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Rapid Search Machine (RSM) Development

Having as an objective the implementation of small stand-alone digital storage devices which will permit large textual files, or unformatted files to be searched at extremely high speeds, An/ORD continued experimentation and further development of the Rapid Search Machine (RSM). After successful tests and further development by the contractor (General Electric), the design of a second generation RSM has been completed and a contract has been let for the fabrication of one RSM II unit to be delivered in late 1969. The RSM II incorporates faster and more sophisticated logic tailored to the Agency's requirements and will be installed for extensive operational tests in the Central Reference Service (CRS). (See also Chapter 6.)

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Signal Analysis System

A major objective of the An/ORD research program has been to provide, within the IPRD, a Signal Analysis System where all known techniques can be brought to bear on the analysis of recorded signals. The system which has been set up is hybrid in design allowing the flexibility of applying both analog and digital techniques to analysis problems. The system is also analyst-oriented in that the man-machine interface design provides the analyst with great flexibility in choosing the processing options available to him. An analyst can quickly reach an optimal strategy for attacking a signal based on a sampling of the various signal conditioning functions available to him. An important part of the system being presently installed is the coherent spectrum shaper, which allows signal spectrum analysis spectral shaping, and signal synthesis in real time. Major uses of the system particularly with audio and acoustic signals will be for signal classification and the enhancement of a signal imbedded in noise.

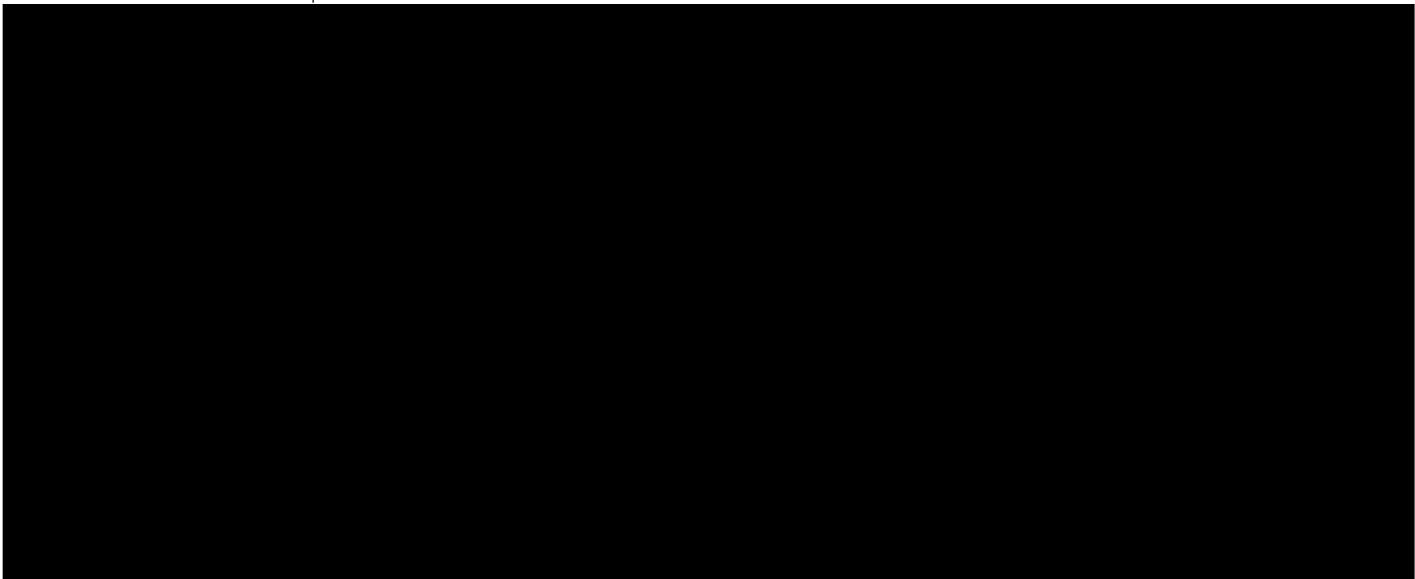
Speech Processing

Research has continued in the IPRD in FY 69 on the further development of a recognition process for selected key words in continuous, band limited, recorded speech. Coordinated with this work, progress has also been made on developing rules for translating the phonemic structure of words into the parameters required to adjust the recognition networks. Ultimately an analyst will be able to insert the required parameters into a device and then scan audio tapes at high speed to note the existence of information of interest. This will greatly

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reduce the time required to scan audio tapes. Feasibility has been demonstrated by identifying correctly several key words from telephone quality speech for two different speakers.



IPRD - Computer Security R&D

A research and development program has been carried on in the IPRD during FY69 having as an objective the determination of requirements, constraints, and major characteristics of a security subsystem which may meet the Agency's needs for a secure interactive time-sharing computer processing system. In this program it is intended to include provisions for first-order security control of multiple files, programs, users and remote terminals at various security classification levels in a time-sharing mode. The results of the first phase of study and design are to be translated into operating hardware and software for test and evaluation in the IPRD facility.

During this year the principal effort has centered around the use of the ADEPT operating system which was developed by System Develop-

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ment Corporation with ARPA support. The ADEPT system has been installed in the IPRD and is being used as a means for experimentation and as a first-order base for the development of additional security control features. During the coming year it is planned to continue development, modification and future testing and evaluation with the use of the ADEPT system.

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Chapter 6 Information Storage, Retrieval and/or Dissemination.

CIA/CRS Information Storage and Retrieval System

Major improvements have been made to the AEGIS software supporting the CIA/CRS generalized, all-source document/information retrieval system. Nine new print formats now offer the requester a choice of arrangement of the retrieved data by subject, area, keyword, publication data, or document number in a sequence that best fits his research problem. Clear text, subject/area headings and security classification/dissemination caveats in lieu of codes is an additional improvement. A listing of hits in document number sequence to aid the requester in ordering documents also accompanies the new formats.

Optical Character Recognition (page reader) inputs of AEGIS subject index records to replace key punching was initiated in October 1968. The page reader transcription function has been decentralized among the CRS area divisions. CRS has determined that a typist maintains a higher hourly production rate when not required to type page reader forms full time, and also, that a low error rate in transcription results, in part, from the close proximity of the typist to the indexer. Initial experience indicates an increase in production rates over the rates achieved in card punching.

In order to accommodate the growing all-source document/information retrieval system data base and other ADP applications, CIA/CRS's IBM 360/40 is to be replaced in July 1969 by an IBM 360/50. Several EAM files are being converted to magnetic tape and programs are under development to permit querying of the converted files by computer.

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CIA/CRS's document storage and delivery system was upgraded qualitatively through the acquisition in early 1968 of four step and repeat cameras, two semiautomatic film mounters for the production of 35mm MIL D aperture cards, and two card-to-card reproducers. In late 1968 two automatic aperture card to hard copy printers were added to the equipment inventory, each with the capability of reproducing 20 pages per minute.

MT/ST Applications

CIA/CRS has acquired two Magnetic Tape Selectric Typewriters (MT/ST) for typing biographic intelligence memoranda, reports, handbooks, and reference aids. The magnetic tapes obtained in the production of CRS reference aids and handbooks are being preserved and experiments are underway for conversion to standard tape formats and subsequent retrospective searching of this material by the G.E. Rapid Search Machine. The first successful utilization of MTST tape files by CRS for purposes other than mat preparation was the conversion of a biographic publication tape and subsequent compilation of a name index for the publication by computer.

Rapid Search Machine

In May 1969 CIA/CRS acquired the prototype model of the G.E. Rapid Search Machine (RSM I) and is currently engaged in testing and evaluation, training potential users, identifying suitable new applications, and actual operational use. The RSM I is a unique, stand-alone device which provides users with an interactive information search and retrieval capability, enabling them to rapidly scan (83,400 characters per second) large volumes of free text or formatted data in order to identify those portions containing keywords or phrases

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germane to the search problem. Other than the minimal programming needed to prepare machine-readable data bases for RSM use (i.e., dividing the file into logical record and subrecord segments), no software is involved and little or no technical expertise is required of the operator.

RSM II is scheduled for delivery to CRS in November 1969. The new model will provide for even faster search and printing speeds, the creation of up to 30 subrecords within each record (only seven are possible with RSM I), sequential searching of up to seven tapes, and output display of keywords in context (14-510 characters on either side of the "hit") to facilitate browsing. An additional feature will be use of a CRT for composing queries. The RSM II may exert a profound influence on analysts' work habits and enhance their ability to cope with the mounting flow of information.

Automatic Dissemination

CIA/CRS investigation of automatic dissemination of SI teletype materials continued during the past year in an effort to determine whether suitable automatic dissemination controls, based on customer reading requirements, could be constructed and whether a satisfactory computer program could then be designed to automatically disseminate teletypes to as many as 300 different customer offices. Evaluation consisted of comparing the output of the specific automatic system under study to that of the present manual system.

The most successful test results to date have been obtained when "two-level" dissemination controls were used. This two-level control involves the use of the USIB Content Control Code (CCC) expressions in combination with keywords or keyword phrases, with the requirement

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that both must occur in a message before dissemination can be effected. This two-level approach permits the use of more exact text searching strategies inasmuch as it reduces the semantic ambiguity inherent in keyword text searching systems. The computer programming system to process messages for dissemination by utilizing two-level dissemination controls is now being defined. Further testing is needed before definitive judgments on the system's feasibility are possible.

Economic Applications

The AEGIS system is also being used for the creation (and subsequent processing) of a detailed file of Mainland Chinese imports of electronic equipment which is being developed by CIA/OER. The latter is also developing a file on computer installations in the USSR and Eastern Europe using the CAPRI general file management system.

Project QUIKTRAK

QUIKTRAK is a complex, on-line information storage, retrieval, and processing project to support OSR analysis of data on foreign ground forces and installations. An initial data base has been created and query procedures using graphic display techniques are presently being evaluated. Work is planned to expand the data base and to provide additional query capabilities.

CS Files

Significant refinements in the search strategies used in the Clandestine Services' biographic data file have resulted in improvements in throughput. The analyses which produced these changes will be incorporated in the design of the new name trace system which is underway.

A pilot study on the utilization of a microfiche system to reduce

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paper storage requirements in the field and in Headquarters is under-way within the Clandestine Services.

CAPRI

The CAPRI file management system was completed in November 1968. It has undergone extensive shakedown (14 different pilot applications were tested). Currently, there are three applications of this system in an operational status.

Target Oriented Display System (TOD)

For the second year, computer processing of data for the TOD system was accomplished. Numerous reports were provided showing distribution of intelligence resources by geographic target areas, intelligence functions and missions. An expansion of this year's data call to the intelligence community over last year's resulted in a larger amount of data in the system and increased the variety of reports that could be produced.

Current Intelligence Support

The system which was described in last year's report for processing textual material in the form of extracts from speeches and other intelligence sources has been extended to additional subject areas.

Foreign Missile and Space Analysis Center (FMSAC)

FMSAC has been engaged in the transfer of a major portion of its 8 basic files to the OCS time sharing system during this period. Use of the time sharing system has disclosed a number of problem areas

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in file structures and file holdings which prompted a complete reexamination of the data base and its maintenance. This reexamination has led to a significant simplification of file formats, systematic purge criteria for many of the files, and a more responsive and more manageable system. Fundamentally this effort has sought improvement in or implementation of the following system functions:

(1) message recognition - picking messages of primary interest by using key words.

(2) editing - making changes to messages on a CRT before printing occurs.

(3) file structuring - changing file formats to improve input and accessing function.

(4) remote accessing - interrogation input and correction of files.

(5) predictions - selection of information from files for matching with event indicators.

(6) retrosearching - accessing files of complete messages.

(7) dissemination - automatic collection, collation and printing of interest messages.

(8) trajectory analysis - revision of basic trajectory programs to permit quick use in event recognition.

(9) interface - linking small computer to a larger one to improve smaller one's capacity.

Integrated Information System

During the year work on the implementation of the NPIC project that has been generally referred to as the Integrated Information System (IIS) has continued. This project is aimed at providing the

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Center the following capabilities:

a. "Automated" reporting by the analysts of information derived from imagery. Guided by requirements output from a computer-held file, the analysts' interpretations of the imagery at hand is forwarded, in highly formatted and stylized form, directly to the central processing facility by use of on-line data entry devices. Once entered, the processes of review and approval will be carried out using CRT display equipments. Newly approved data is assembled and output in hard copy form for dissemination to the intelligence community and is also incorporated back into the data base.

b. On-line querying of the data base by imagery analysts and "information specialists" using a query language developed specifically for this system. Responses to most simple queries will be immediate (less than 5 seconds) thus greatly speeding up the performance of the imagery interpreter in first and second-phase reporting. Complex queries against the data base that may arise in third-phase exploitation will be expressed in a considerably more general (and hence more powerful) query language and will be executed as batch processes.

The implementation of this system requires extensive augmentation of our initial hardware configuration as well as a major programming effort. Of particular interest on the hardware side in the past year has been the development of our specifications of a very flexible alpha-numeric CRT I/O device satisfying FS 222. This device is currently under test.

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SANCA

The Security Automated Name Check Activity (SANCA) computer index system serving the CIA/Office of Security has been converted to a remote random access system utilizing a 360/67 time shared computer and an IBM 2321 Data Cell for file storage. Three IBM 2260 CRT displays are used to access the file for priority-type name check requests. The 2260 displays can also be used to change and delete records.

Routine name checks are initiated by submitting punched cards to the 360/67 system. Hard copy output is received for the routine checks. The computer processes the routine checks in a background batch-processing mode while it services terminal users. The SANCA file now contains approximately 1.9 million index records and it processes approximately 3,000 name checks daily.

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Chapter 7 Preliminary Plan to Improve the Community Information
Handling System

To be prepared by the IHC Support Staff- No direct
contribution required

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Chapter 8 Education and Training

To be prepared by the IHC Support Staff -- Agency contribution
furnished via its representative on the IHC Education and Training
Subcommittee

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Chapter 9 Information Handling System for the National Indications
Center (NIC)

Project BAYES

CIA has been conducting a modest (essentially 1 person full-time) research effort into the use of various probability measures (principally Bayes Theorem and Entropy Maximization) in conjunction with a wide range of analyst functions. Our initial preoccupation has been the indications and warning problem. These measures basically provide a better means for the analyst to check the consistency of his estimates and to delineate more specifically both the relevance of his information and the probability of his estimates.

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Chapter 10 Security in Information Handling Systems

Security in Information Handling Systems

The development of a time-sharing system with remote terminal access capability has compounded the security problems associated with conventional computer batch processing. The security problems can be categorized according to physical, personnel, technical and software security. However, the most profitable approach has been to view the time-sharing system in its totality with emphasis upon the inter-relationship of the several security parameters.

Communication lines between the CIA Computer Center and the remote terminals have been secured to a degree commensurate with the classification of the most sensitive information being processed on the system, regardless of individual terminal use. Lines within the CIA Headquarters Building are shielded cables enclosed in ferrous conduit. Lines outside the building, e.g. to the DIA COINS switch, are protected by the TSEC/KG-13 cryptographic system. The terminals have either been installed in secure areas or provisions have been made to disconnect them at the Computer Center when they are not attended by personnel authorized to use them.

The assignment of terminal monitors, similar to safe custodians, has been a fundamental tenet in the security of remote terminal operations. The monitors are responsible for controlling access to the terminals during operating hours. The system security officer is responsible for verifying the clearances of prospective users and assigning to each user a unique identifier which is checked for validity

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by the system during log-on.

Even though all users are cleared through Top Secret, access to information must be restricted on a need-to-know basis. Classified files are password protected. In addition, provision can be made to restrict access to certain files to particular terminals and, if necessary, to particular users at those terminals. Several features which have been built into the system software, such as password protection and user identification, are continually being improved and are in the process of being tested and evaluated.

As in other Community computer applications, the problem of emanation security requires additional efforts to determine the actual threat posed by equipment emanations and to devise practical countermeasures.

A system log is generated for security audit purposes. The log contains information about users, files and programs accessed, terminals used, invalid log-on attempts and file password failures.

A current problem is the lack of a standard procedure for thoroughly evaluating a computer software package with respect to security features.

EMSEC

That electromechanical equipments often emit spurious radio and acoustic signals has been known for many years. In some instances, these signals, or radiations, can be directly related to special functions or processes of the machinery. If this machinery processes classified information, it is often possible to intercept, analyze and recover the classified data from these signals. The security

implications are obvious, especially where the U.S. can directly control only a limited area surrounding its classified data processors. CIA is examining this problem for many classes of machines. Emphasis is being placed specifically on computer-type systems. The goal is to provide effective countermeasures which will eliminate this special security hazard and to encourage manufacturer design of technically secure equipment.

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