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CIA INTERNAL USE ONLY

23 April 1971

MEMORANDUM FOR: Holders of ASPIN Report

SUBJECT : Status of Final Report of Project ASPIN (Automated Systems for the Production of Intelligence, dated July 1970)

1. I noted recently a tendency to regard the ASPIN Report of July 1970 as a statement of the DDI position on the use of automatic data processing to support the production of intelligence. This is not the case.

2. While I agree or have no comment on the majority of the recommendations, I do disagree with certain key ASPIN recommendations, particularly those that opt for forcing centralization of data processing and management systems. I regard such centralization as premature in the light of present inadequacies in machines, technology, and systems programming.

3. I also disagree with the procedures the ASPIN Report recommends for CRS referring requesters directly to individuals or for expanding services to other agencies. I regard the recommendation for charging ADP costs to users as too expensive for the presumed benefits.

4. A more detailed discussion of these and other points is available in the DDI Information Processing Coordinator's memorandum for the Chairman of the Information Processing Board, dated 28 November 1970.

25X1A

[redacted]

R. J. SMITH
Deputy Director for Intelligence

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GROUP 1
Excluded from automatic downgrading and declassification

DD/S&T# 3944-70

1 DEC 1970

MEMORANDUM FOR: Chairman, Information Processing Board

SUBJECT: Comments on Report of Project ASPIN

1. The ASPIN Report has helped focus attention on the more nagging problems of computer and ADP management in the Agency. Some of the more important of these are addressed below. The rest are treated separately in an attachment.

2. Deficiencies that appear to need some urgent attention are:

- There is no clear mechanism to assess the real need for an ADP project.

- There is a tendency to attempt to solve line management problems by layering of staffs and coordinators.

- Present systems of determining the costs of a proposed application are inadequate and ADP costs usually do not get to the attention of line management the way other costs do.

- Present methods of cost accounting for ADP projects are inadequate because they do not accurately reflect the ADP resources used.

- Standards for professionalism in ADP personnel are ill-defined and are not uniformly applied in recruiting, performance evaluation, and career management.

- There has been inadequate planning over the long haul for the acquisition and updating of ADP resources.

3. Working within the general framework of the conclusions of the ASPIN Report, I urge that attention be focused on the following:

IP Board:

- Strengthen the IP Board as a central point for recommendations on the need for ADP applications whose projected costs are above some predetermined threshold.

- Strengthen the IP Board as the central point for long-range planning for Agency ADP resources--men, money, and machines.

- Reaffirm the coordinating and policy advisory functions of the Board, making it clear that these functions are not intended to usurp the functions of line management.

Costing:

- Generate and apply a good ADP costing model to existing and projected ADP applications.

- Bring these costs to the attention of higher management by requiring that they personally review in advance the costs for projected applications and review each final quarter the costs of ongoing projects.

Centralization:

- Encourage a higher degree of centralization for major data processing applications.

-Encourage a higher degree of centralization in ADP personnel management.

[redacted] 25X1A

JOHN D. IAMS
Information Processing Coordinator
DD/S&T

Attachment:
As stated

cc: IPC/DDI
IPC/DDP
IPC/DDS

CONCUR:

25X1A [redacted]
Deputy Director for Science and Technology

30 Dec 70
Date

DDS&T COMMENTS

ON

REPORT OF PROJECT ASPIN

November 1970

1. FMSAC

1.4. Agree.

2. OEL

2.4. To insure internal OEL coordination between collection and analysis operations, an internal Program Review Board takes up the matter of analysis whenever a new collection system is proposed. The recommendation to establish a Technical Review Panel is impractical and it is doubtful that it would perform a useful function if organized and staffed in the manner suggested.

3. OSI

3.7.1. We agree with the recommendations; OSI has been carrying them out for sometime.

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(a) Arrangements were made with Mr. [redacted] CRS, to use Project VIVAX interests in future development of the automated dissemination system. Since the subject area of VIVAX is narrow and highly specific (BW), it should prove a good test vehicle for Mr. [redacted] content analysis. 25X1A 25X1A

(b) OSI is using CAPRI. This system has potential for automation of personal files in a batch environment. Also, OSI will use as feasible the CRS work on personal file management suggested by Dr. [redacted] report. 25X1A

(c) OSI recognizes the magnitude of the input/output problem for ADP applications. The input problem is one of the reasons that OSI is moving slowly in automating analyst files. Optical character readers and computer output to microfilm are developments that are being followed with interest.

(d) OSI has been supporting ADP education and training for its personnel. During FY 1970, 12 students enrolled in 13 different ADP courses. Their training program for FY 1971 includes 29 personnel scheduled for 7 different ADP courses. Training has led to an increased number of terminal users and a growing number of application programs.

STATSPEC 5. [redacted]

5.6. A study of costs/benefits should be made for the suggested areas of automated assistance before establishing automation as an ultimate objective.

9. OSR

9.5. Agree. We understand OSR is conducting such a test now.

25X1A [redacted]

Text Processing Systems

V. A. The major thrust of the recommendations on the development of ADP systems for text processing is that this effort should be consolidated. This is probably a worthwhile recommendation when viewed in the light of altrustic goals such as eliminating duplication, pooling skills, and producing a single, coordinated plan. Elsewhere in the ASPIN Report the comment is

made that the user/analyst is responsible for designing his own system. It is precisely this responsibility that will make any consolidation of effort on text processing difficult. Analysts tend to view their requirements as unique. We agree that coordination of these activities needs strengthening, but structuring a group with Agency-wide responsibility for text processing may be as difficult as establishing a single computer center.

Computer Graphics

II. D. This would introduce increased flexibility but for the present we should be satisfied to get QUIKTRAK operational, get data files built, and make some evaluation of the system before enhancing it in this fashion.

II. E. Agree.

II. F. Agree.

Organizational and Management Aspects

IV. A. Agree.

IV. B. Disagree; the recommendation is significantly weakened -- to the point of being unmeaningful -- by the hedge of including another unspecified computer center in the Agency. Let's worry less about machine consolidation and more about policy, planning, management, and people.

IV. C. An ADP career service is a red herring and should be a low priority issue.

IV. D. Disagree; involves major organizational changes which would need a lot more discussion and greater consideration of pros and cons. The method of operation also suggests responsibility without authority. This won't lead to the kind of improvements in application development that the recommendation seeks.

F. Organizational Implications

The second recommendation applying to the duties of a proposed ADP advisor to the Executive Director-Comptroller suggests that this advisor be

the ex officio member of the IPB. We note that this differs from the ASPIN recommendation that he be Chairman of the IPB. We prefer the latter if he stays out of line management responsibilities in the technical review and personnel fields. He should understand that if he is a substantive person of some stature in ADP, he will want to abolish his job in a fairly short time. If not, he shouldn't be hired in the first place.

Structural File Systems

V. A. Agree.

V. D. Agree.

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	COMMENT		FILE		RETURN
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FORM NO. 237 1-67 Use previous editions

(40)

25 November 1970
SG-70/402

MEMORANDUM FOR: Chairman, Information Processing Board

SUBJECT : Plans Directorate's Comments on ASPIN Recommendations

1. The Plans Directorate either agrees with or has no comments on the majority of the ASPIN recommendations. Our comments will be confined to those concerning the management of of ADP resources for the Agency. In paragraph 21 of the summary dated 2 October the central management review of major ADP projects was recommended. The DDP, as is known, has for years had a committee of senior officers, the CS Record Committee, which considers all proposals for computer applications and which gives management guidance to the development of the CS's computer resources. Additional central management review of major activities would be welcomed.

2. This paragraph also recommends the establishment of an Agency-wide ADP career service. While I feel that there are general benefits for the individual and the service to be derived from rotating individuals among ADP centers, I question the concept of the centralized career service. The DDP has not been satisfied with the functioning of this concept for its support officers. Since support officers are rotated by, and promoted by organizations other than the DDP they are not always responsive to the DDP's needs. If rotation while maintaining basic directorate affiliation becomes the practice, it would be necessary to assure that personnel, particularly systems analysts, assigned to our Directorate be given sufficient time to become thoroughly familiar with its peculiar problems.

3. While the economies of scale for large processors are very great, it appears to us that the software problems are such as to preclude centralization of the Agency's computing powers. The CS's requirements to maintain and search a very large file with a very high volume of inquiries and to expand the support of its overseas activities from its computer center calls for the continued existence of a facility adequate to fulfill the CS's needs.

4. The DDP's project justification system provides adequate management review and the control of ADP costs, and therefore, the proposal to charge users is an unnecessary complication in our judgment.

25X1A [redacted]

IPC/DDP

cc: IP Board Members:

25X1A [redacted]

A/IPC/DDS&T, Mr. Iams

ROUTING AND RECORD SHEET

SUBJECT: (Optional)

Nov 27 3 59 PM '70

FROM:	EXTENSION	NO.
IPC/DDP 1 H 5113	7833	DATE 25 November 1970

TO: (Officer designation, room number, and building)	DATE RECEIVED	DATE FORWARDED	OFFICER'S INITIALS	COMMENTS (Number each comment to show from whom to whom. Draw a line across column after each comment.)
1. IPC/DDS 710 Magazine				
2.				
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23 November 1970

MEMORANDUM FOR: Chairman, Information Processing Board

SUBJECT : Intelligence Directorate Comments on ASPIN Recommendations

We either agree or have no comment on the majority of ASPIN recommendations. Our comments on those with which we disagree either wholly or in part are attached. These comments are keyed to the attached set of consolidated general conclusions and recommendations and not to the original ASPIN report.

[redacted] 25X1A

DDI Information Processing Coordinator

Attachments: a/s

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ATTACHMENT

RECOMMENDATIONS 4, 6, 7, AND 22

1. These recommendations call for:

a. A single interactive system at headquarters;

b. The utilization of general data management systems;

c. The provision by OCS of an interactive capability for handling large information storage and retrieval files such as AEGIS, and;

d. An Agency policy of a centralization of data processing in OCS.

2. The technical outlook for the machine aspects of such capabilities seems good for some time past the mid-seventies. 25X1A [redacted] hazards a "best" guess that by 1975 component costs will have dropped rather dramatically so that very complex large central processors will evolve which will be replete with built in control and reliability (redundancy) features. Such developments are expected to greatly reduce the present impediments to the development of large scale on-line systems, permit mixed mode processing of batch, remote batch and interactive foreground operations, and, despite the large increase in complexity, result in system costs half what they are today. By 1980, this same best guess suggests the advent of really large inexpensive machines--20 to 40 times the performance of today's large processors at 20-40 percent their cost--and, possibly, the advent of such low cost solid state memories that memory constraints and mechanical technology (tape drives, drums, disks, etc.) will disappear.

3. The foregoing leads us to two reactions to the ASPIN recommendations that machine operations and interactive services be highly centralized:

a. While the potential economies of scale and technical feasibility appear probable, they are still several years off;

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b. The Board should certainly keep aware in some detail of the progress of such developments over the coming years.

4. At present there is to our knowledge no general data management system capable of handling both large data files, and a wide variety of mathematical and statistical calculations. Probably there will never be a truly general (do anything - do everything) data management system. The [redacted] consultants to Project ASPIN suggested at least three types of structured files might be justified for separate treatment (biographic, statistical/tabular, and the standard index--coordinate/hierarchic). The consultants regarded as premature any judgments with respect to free text and graphic files. Because of the engineering inefficiency and performance degradation inherent in large, general, flexible software systems, [redacted] suggests that the future development of such systems may depend in no small part on the "cheap" processors referred to above.

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5. We support the recommendation that a small set of reasonably general data management systems be acquired if the IPB can identify a set which would cover a large number of Agency applications. We are not, however, very sanguine about the early advent of a system which will handle large files although we encourage the search for such a system.

6. We also would suggest caution on the part of the IPB in connection with the centralization/decentralization issue, even in the longer term. We believe that the machines will eventually become the least weighty of the elements in the decision. The responsiveness of our computerized reference activities to intelligence production will continue to be one of our principal concerns. If dedicated systems satisfy our needs in this regard, we would see little point in moving toward centralization.

7. In light of the above, we feel that to force centralization in the present environment of inadequate machines, technology and systems programming is almost certain to result in more inefficient, more costly and less responsive processing. Over the next 5-10 years technical progress may make such centralization feasible. Meanwhile,

we should continue with our present reasonable organizational alignment within the Agency and watch technical developments that might have an impact on our future planning.

RECOMMENDATION 13 (Central Reference Operations)

8. While we agree with the general conclusion behind this recommendation--that improved knowledge of the existence of specialized collections of information is desirable--we disagree with the procedures recommended in two instances:

a. The creation and maintenance in CRS of a directory of personal and organizational collections, and,

b. The increased emphasis on establishing CRS as a point of contact for requests from outside the Agency.

9. The compilation of a personnel-area-subject directory of personal and organizational collections of information is an appropriate function of CRS. Direct referral of requestors to individuals throughout the Agency could prove bothersome and have a deleterious effect on their task of producing intelligence. Alternatively, we would support the establishment of a query control officer in each office in the Agency which holds collections of intelligence information, because we realize that queries of such collections are necessary. In conjunction, CRS and the appropriate query control officer could monitor requests and service them in the most expeditious manner.

10. Agency regulations already have established CRS as a point of contact for information requests from within the Agency but, except for biographic support, CRS is required to support other agencies only "to the extent possible." Because of severely reduced resource levels in recent years, we have been curtailing our services to other agencies, particularly in providing them with their own material or with material which they clearly have or should have in their own files.

RECOMMENDATION 21 (ADP Advisor to ExDir)

11. This is apparently recommending a senior technical ADP specialist as an advisor to the Executive Director-Comptroller. We feel that technical problems should be solved at a much lower level and that technical feasibility should be resolved long before the ExDir must make a policy decision on an ADP matter. In any event, the technical group of the Information Processing Board should be able to handle such technical matters as might need to be brought to ExDir attention. Tasks in this recommendation relating to responsibility for establishing standards and ADP planning are covered by Recommendation 24 with which we agree. The recommendation that the ADP advisor be the head of the ADP career service is covered in Recommendation 25 below.

RECOMMENDATION 23 (Charge ADP Costs to Users)

12. The notion that a charge back system somehow creates conditions of more effective utilization is a myth in a government bureaucracy. Such a system might work where personal income and expenditures are involved but the effect of this recommendation is simply a change in bookkeeping procedures. Because a charge-back system will result in an increase in bookkeeping procedures and thus costs, such a system would be not only ineffective, but more expensive.

RECOMMENDATION 25 (ADP Career Service)

13. We disagree only with the ADP Career Service portion of this recommendation. We feel that the establishment of an inter-Directorate career service is only worth-while if the tasks are virtually identical despite component of assignment (e.g., communications). While there are certain basic skills common to all types of ADP processing, much of what ADP analysts do depends on whether their assignments are in a component dealing primarily with computations, signal processing, large file storage and retrieval, etc. Commonality of skills between these types of ADP tasks is probably not great enough to gain whatever advantages might accrue from a common career service and would be disadvantageous to those individuals who would prefer to pursue a career within one of the functional components.

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2 October 1970

ASPIN - GENERAL CONCLUSIONS & RECOMMENDATIONS*

INTRODUCTION

1. In general, automation systems in support of intelligence production in the Agency are functioning well. Many programs are already established as integral and essential components of the research process and others will undoubtedly soon achieve this status. Resources employed in these systems are fairly extensive and compare generally with those utilized in support of intelligence collection or administrative tasks. While not all applications have proved cost effective, the failure rate has been surprisingly low considering the general state of the art in the computer applications field.

INTELLIGENCE PRODUCTION

2. The difficulty of communication between analyst and data processor often causes delays, frustrations, and even inadequate programming in applications development. An active effort to reduce these communications problems is long overdue. We believe that the identification of the problem and recognition of the common goals of the participants is one avenue of attack on the problem. The development of programming skills within production components is obviously another, and demonstrably effective, way of breaking down communication barriers.

We recommend that the Information Processing Board (IPB) create the means for the development of meaningful communications between the systems analyst-programmer and the substantive analyst engaged in the common development of a computer application.

*This summary has been prepared by the DDI Planning Staff from the full text of the ASPIN Report and covers only the general conclusions and recommendations and excludes those relating to specific offices.

3. The research analyst or the analyst engaged in data reduction has been more interested in an on-line, time-sharing system than he has been in the traditional batch processing activities. Many observers believe that analyst interest in the time-sharing phenomenon is transitory. We feel, however, that there are some basic appeals to the analyst in these systems which will provide a sustained, widespread use of this system. There already is a clear demonstration from observation of NPIC as well as OCS Interactive Services that established users of ADP service can and do make wide use of time-sharing. Many analysts want a facility to create, change and rearrange files on-line in an effort to escape what they regard as tedious and unnecessary steps in present file creation and file manipulation techniques. Some have achieved this capability to a limited degree; most of this use is in the offing.

We recommend that the Information Processing Board assure that the present effort to provide a general time-sharing capability in OCS to serve the interest of the Agency as a whole be strengthened to provide not only on-line but also remote batch processing and remote job entry via terminals distributed so as to make them convenient to users throughout the intelligence production components.

4. The development of multiple systems militates against one of the basic requirements of the intelligence analyst -- convenience. The remote user of the time-sharing computer should be able to communicate in a single language from a single terminal to the processor(s) which contain the data he needs. Now, in fact, analysts who have both an interest in any of the large files and in quick computational capability must have two consoles and know two query languages.

We recommend a single, integrated, interactive system to serve intelligence production components at headquarters.

5. The Agency has had its most serious difficulties in trying to implement large ADP applications, a familiar complaint elsewhere as well. Each of the three processing

centers serving the intelligence production components, however, has at least one successful large application in operation, and each of these applications was designed to provide broad support to intelligence analysts; two of these centers are presently supporting large scale on-line activities as well.

6. We believe that the most likely future approach to large applications will be via generalized data management systems. These systems provide a common framework, yet one with great flexibility, which may be used to manipulate a variety of analyst files. Most such systems provide the ability to augment the basic operations by user supplied functions to permit greater specificity of processing. General systems to incorporate such applications may best be acquired from commercial vendors in the interest of economy of maintenance, and simplicity and generality of system operation.

We recommend that the Information Processing Board assure the acquisition, development and use of general data management systems which are sufficiently close to the general design requirements for Agency data processing applications to permit their adaptation and use for a wide range of data processing applications and data processing centers. The acquisition of such systems should be coordinated with the major users of OCS and with each of the components who have their own data processing centers, i.e., NPIC and CRS.

7. We concur in the OCS judgment that it is necessary to provide a satisfactory on-line, time-sharing service for large information storage and retrieval files. The large, on-line, missile and space file (MISTAC) is essentially unavailable at present because of development work undertaken on it in an effort to get faster response. A large ground force file (QUIKTRAK) is being operated experimentally with considerable assurance that part if not all of this system will require an interactive environment in the near future. The AEGIS document index system seems to us an excellent candidate for operation in an interactive environment in the next two to three years.

We recommend that the Information Processing Board, in consultation with the interested parties, assure that the OCS Interactive Services include a general data management system capable of providing quick response capability for large information storage and retrieval activities of the type characterized by the MISTAC, AEGIS, and QUIKTRAK data bases.

8. The need for development of special applications will obviously continue. Analysts will continue to have specific objectives which must be achieved and which will not always fit within the framework of generalized systems.

We recommend that the Information Processing Board assure that the capability for development of unique computer programs be maintained for applications whose objectives are clearly unattainable by incorporation into a general data management system.

9. Several production components have been hiring and developing their own computer programmers. Although few of these individuals have the design and programming skills necessary to plan and execute a major computer application, we favor development of programming talents among production analysts largely to provide better conceptual design for applications. Professional programmer-analysts, assigned to the production components, could best undertake the detailed design and programming of computer applications of any size. They could also be used to assist the production component in planning the development and evolution of computer applications.

We recommend that applications programmers (this would presumably include a major share of the applications divisions' personnel) from OCS be assigned to and, where feasible, colocated with analysts in the production organization for whom they are designing and programming. Their work during their period of assignment should be controlled by the host production organization.

We also recommend that the Agency provide time as well as professional and clerical assistance to a few talented individuals each year to explore, develop,

and test essentially new techniques or new concepts in the use of ADP to support intelligence analysis and production. These applications may be developed under the leadership of either the substantive component, or OCS depending upon the nature of the application and the resources required to do the job.

10. We are impressed with the need to emphasize the early and complete immersion of those individuals who do the data reduction and analysis in the design of new collection systems. We have seen the beginning of recognition of this proposition in the coordination of the RH and HX collection programs with the data processing people. Early access to the proposed format for reporting by collectors makes possible changes in the format to accommodate both data processing systems and analytical techniques which would otherwise be overlooked. Perhaps more important, early coordination makes possible the orderly design and development of the automatic and manual capabilities required to process the output of these systems once they become available.

We recommend that the Agency establish as standard procedure in the development of new collection systems the coordination of the data collection formats with the individuals who must process and analyze the data.

11. COINS has been of almost no use to the production analyst although it represents something of an achievement in concert of community action on a collective data processing experiment. We believe that the procedures used to support and perpetuate COINS will seriously delay rather than hasten the advent of an inter-agency system. The emphasis on the development of automated files and their processing in a large computer network as a gual in itself is a highly questionable procedure. But it is exceeded by the notion that this process should continue until it is successful. Certain of the premises of COINS with respect to the technical achievement of time-sharing systems and of the identity and duplication of intelligence community files appear to have been seriously in error. The COINS effort seems to have

generated a life of its own. It has been an exceedingly expensive effort for the Agency, and it promises to become even more expensive should the Agency have to dedicate an entire computer system to it as additional evidence of good faith.

We recommend that the Agency seek to secure an evaluation of the present COINS experiment at the earliest possible moment in an effort to provide clearer guidance for future Agency planning for participation in Intelligence Community ADP activities.

12. Computer graphics, which we would define as the development of programs to transform stored digital data into meaningful spatial relationships, have been given little attention in OCS. Aside from AUTOMAP which was developed to facilitate cartographic presentation, there has been little use of graphic presentation or display. We note this omission because CIA analytical reports are distinguished by their liberal and effective use of graphic presentation to augment text or data.

We recommend that increased attention be given by OCS, in close cooperation with NPIC and ORD, to the development of a strong computer graphics capability for support of analyst use of the time-sharing system.

INFORMATION HANDLING

13. There are in the Agency a considerable number of specialized information centers. This requires the user to be a specialist or to use the services of a specialist to search and understand the resources of such a center. Moreover, these collections frequently are not known to analysts. We believe that these collections would be more effectively exploited if a central directory of them were maintained.

We recommend that:

(a) the Central Reference Service create a personnel-area-subject directory of other organized collections of information in the Agency. This directory should include both personal and organizational collections

of information and authorization points for control of access to the respective collections.

(b) the Central Reference Service be the point of contact for any general request for intelligence information from outside the Agency or from within where there is no known point where the information is available.

(c) only those data which are generated and accessioned by CRS be provided as a direct response and that all other data be sought from the appropriate center.

It is also recommended that:

(a) the present concept of CRS indexing be continued, and a systematic effort undertaken to encourage indexing input from the substantive analyst.

(b) the Central Reference Service seek as a general objective a standardized document reference number which can be put on the intelligence information document before it is disseminated. This reference number should be capable of being generated and included in the format of any automated dissemination system, and should become a part of that system as quickly as possible.

14. CRS is presently conducting an experiment with a General Electric processor (GESCAN -- earlier called RSM) which will execute high speed search on machine-readable text. There has been a great deal of analyst interest in this processor for searching large bodies of machine readable text. The device is attractive initially because it can be used essentially in an interactive mode. While it is slow in comparison with interactive search of direct access files, it is the only available method for interactive search of unformatted text files.

We recommend that the Agency continue to experiment with a limited number of applications in which documents are stored and searched retrospectively in an electronic full text format.

15. We believe a concerted effort should be made to convert AEGIS into an on-line system. CRS should work closely with OCS to achieve a data base design and a query language which can be used throughout the Agency for the exploitation of large, content oriented files.

We recommend that an extensive interactive (man - machine - data base) capability with the Central Reference Services intelligence document index be developed and tested as quickly as feasible. This is one of the few large data bases in which there is potentially wide interest, frequent use and a requirement for precise, quick responses.

16. CRS is presently introducing a limited system for automatic dissemination of documents received in machine readable form. Preliminary findings indicate that an operational system is practical and may be cost effective. We believe that the system may also help to improve document indexing.

We recommend that the experimental work under way on an automated dissemination system be maintained and each distribution point be urged to cooperate with CRS in providing "dictionary" terms for the system.

We also recommend that planning for undertaking an extension of the automated dissemination system to all State, Defense and Agency positive intelligence information received in machine language be undertaken coincident with the beginning of feasibility testing of the present experimental system.

COMPUTER CENTER OPERATIONS

17. The Office of Computer Services was organized to operate: (1) a general computer processing center for the Agency as a whole and (2) to provide personnel with computer programming and computer applications design experience to assist analytical and operational components in the development of computer assisted solutions to their work.

18. While considerable uncertainty has developed among ADP users as the result of rapid technological change, some seems to be the result of premature announcements of changes in OCS plans. Frequently the user has no opportunity to participate in the decision. He must rework his computer applications to accommodate such changes with no benefit to him.

We recommend that OCS develop a mechanism for communicating plans for major computer system changes to user components and of eliciting their viewpoints.

19. Customers who have operational computer applications tend to be pleased with the service they receive from OCS. Everyone would like his work done more quickly but there are few customers who think the attention their processing requests received is less than satisfactory. The most frequent complaint expressed by customers has been their inability to maintain the job control language and the reference calls in their programs sufficiently current to assure that they would run on any occasion without intervention by the OCS production control or technical programming staff.

20. The present OCS Procedures Manual does not present a complete set of procedures for the programmer in the user organization to assure satisfactory preparation and operational readiness of his program. Either this manual should provide more complete information on the Job Control Language (JCL) needed, or someone should be furnished full time in OCS/Operations who can prepare JCL for anything that may be brought in to run. If the JCL procedures manual were in the Interactive Services System, the procedures would be available continuously.

We recommend that a complete set of procedures be available to assure that a job can be written and run without intervention from OCS programmers.

ADP MANAGEMENT

21. We believe that more effective control of Agency ADP activities is needed. There should be more complete, clear and formal documentation of computer processing proposals and applications. There needs to be both an initial and a continuing systematic review by directorate management, and a centralized review of large projects and projects which impact on more than one directorate.

We recommend that a central technical management review of major ADP projects be created under the present umbrella of Executive Director-Comptroller responsibility for Agency ADP management and that a full-time position of ADP Advisor to the Executive Director-Comptroller be created for an experienced ADP professional whose responsibility it would be to:

(a) advise the Executive Director-Comptroller on all professional/technical matters relating to ADP;

(b) be chairman of the IPB and the director of its permanent staff;

(c) review the various local plans, provide technical input to the IPB and, periodically, develop a statement of long-term ADP objectives for the Agency;

(d) assure that computer application design proposals are given adequate review by a central technical review panel;

(e) prepare Agency-wide ADP technical standards;

(f) serve as chairman of the Agency-wide ADP Career Service Board; and

(g) serve as focal point for internal leadership and for external relations in ADP technical/professional matters.

We also recommend that the Director/OCS be an ex officio participant on the Information Processing Board and that the DD/S&T be represented on the Board

by an individual who reflects the computer user population of the whole Directorate.

22. With the rise of complex computer systems to which the user is offered easy remote access, large hardware, programming and communications expenditures are required to provide the speed and reliability necessary to such systems. Large processors provide economies of scale not achievable with smaller systems.

We recommend that the Agency establish a policy which provides a high degree of centralization in data processing activity in the Office of Computer Services, but which permits the acquisition of small or medium computer processors by other offices where there is a demonstrable economy in using a stand-alone computer system.

23. We believe that data processing facilities will be more effectively utilized if the user were required to bear the costs of ADP services.

We recommend that a means of pricing data processing services performed by computer centers be developed, and that each user component be required to budget for its data processing services in essentially the same way that property funds are handled.

24. We believe that ADP management would be strengthened and made more efficient if some genuine Agency-level effort were undertaken to coordinate and direct those activities which have multi-office, multi-directorate impact.

We recommend that the Information Processing Board provide for:

(a) a more definitive statement of Agency ADP objectives by regular revision and publication of the Agency ADP Plan;

(b) the definition and publication of Agency-wide ADP technical standards beyond the present work on nationwide (USASI) standards; and,

(c) minimum standards for control over data entry, data base documentation and file maintenance for any ADP application serving more than one component (defined as a unit under the first-line supervisor).

25. Finally ADP career development and training should be strengthened.

We recommend:

(a) an Agency ADP Career Service;

(b) ADP training programs with additional emphasis on the role of the user in an on-line and/or real-time computer environment; and,

(c) more widespread development of office level training in the use of ADP in intelligence production and information processing.

RESEARCH AND DEVELOPMENT

26. We believe that ADP research and development activities should be transferred to OCS. OCS not only has the technical expertise necessary, but, more importantly, has a better acquaintance with user requirements arising from its operational responsibility for ADP processing.

We recommend that the DD/S&T review the present division of effort between ORD and OCS in the area of information processing research and development against an alternative allocation of functional and effort which would provide for:

(a) the transfer of the responsibility for computer application design and development effort from ORD to OCS;

(b) the transfer of appropriate computer processing equipment from ORD to OCS;

(c) subsequent ADP equipment or software test and analysis to be conducted by OCS except where the items are a direct adjunct of a special processing center such as NPIC; and,

(d) OCS to issue a current publication to announce new activities, new products, and new developments which its research and development component considers of general interest for Agency components engaged in information processing.

In addition we recommend that the DD/S&T and the Information Processing Board reject the proposal of the R&D Subcommittee of the USIB Information Handling Committee for a community-wide R&D center on the basis that the recent experience with COINS and the IPRD which we believe demonstrate both the difficulty of an integrated community activity and the impracticality of performing research and development divorced from both computer operating centers and ADP users.

Finally we recommend that research and development projects or programs in the area of information processing be submitted to the same scrutiny as required for regular ADP projects.

TRANSMITTAL SLIP	DATE
	23 Nov 1970

TO: DDS/IPC - [redacted] 25X1A

ROOM NO.	BUILDING
710	Magazine

REMARKS:

FROM: DDI/IPC

ROOM NO.	BUILDING	EXTENSION
2F24	Hq	5873

FORM NO. 241 1 FEB 55 REPLACES FORM 36-8 WHICH MAY BE USED.

SECRET

ADTP

Briefing Outline re ASPIN

Organization and Management Recommendations

1. As a general policy the Agency should promote a high degree of centralization in data processing activities. The focus to be on OCS.

2. All major ADP systems proposals be reviewed on the Agency level by a full time ADP professional who will serve as Chairman of the IP Board and principal ADP Adviser to the Executive Director-Comptroller.

3. Create a permanent staff for the IP Board to provide Agency level review of systems proposals in terms of Agency goals and objectives, Agency ADP plans, and Agency technical and procedural standards which are to be developed. Staff to be chaired by the ADP Adviser to the Executive Director-Comptroller.

4. Appoint a DD/S&T representative to the IP Board who will reflect the user population of the Directorate; the D/OCS should be designated an ex officio participant in IP Board proceedings.

5. Create an ADP Career Service.

6. Develop a comprehensive cost-accounting system for data processing services. Components to budget for data processing services and pay for these services by the transfer of funds.

7. Review of existing ADP training programs to foster increasing involvement of substantive, non-ADP professionals.

Computer Applications in Support of Intelligence Production

1. IP Board should look to the private sector for commercially available general data management systems which will handle a wide range of Agency applications in a more economical and timely manner. (Reference to Agency tendency to develop overly elaborate specialized systems which are not compatible or standardized.)

2. IP Board should look for ways to improve communication between the ADP technician and the substantive analyst who are involved in the development of an ADP application.

3. Develop means to ensure that the Agency keep abreast of new ADP techniques and concepts that may be applicable to the production of intelligence.

4. COINS be evaluated soonest to help Agency planning for participation in Community ADP activities.

OCS Activities

1. OCS plans for changes in major computer systems be coordinated with user components before submission to the IP Board for review.

2. OCS personnel (applications programmers) be formally assigned to the production component which is sponsoring the application effort, and their work controlled by the host production office. (Rotation back to OCS would be negotiated upon completion of task.)

3. Increased attention be given to the development of a strong computer graphics capability.

4. OCS to plan for the acquisition of a proprietary general data management system; this effort to be coordinated with the major users of OCS services as well as with NPIC and CRS. (This recommendation also recognizes that certain unique applications may require unique computer systems.)

5. OCS to provide a single on-line service to all the intelligence production components at Headquarters.

Central Reference System

1. CRS to expand its capability to service internal and external requests for intelligence information in CIA. (Community Information Services Center concept. Each agency develop such a center as point of contact for all other agencies.)

2. CRS to continue work on an automated dissemination system initially for COMINT and plan to extend this eventually to State and other non-Agency traffic.

3. CRS Document Index should be developed for on-line, interactive use by substantive analysts.

4. Although the present method of document storage and retrieval is acceptable, the Agency should continue to experiment with improvements for compatibility with the speed of an on-line document index system.

Research and Development in Information Processing

1. Transfer the responsibility for research and development in information processing from ORD to OCS; this developmental responsibility to include problem definition and computer application and design.

2. Transfer standard computer processing equipment from ORD to OCS to support OCS's expanded R/D effort.

3. ORD contracts to be reviewed by the IP Board to determine which should be continued and under whose management.

4. Testing and analysis of developmental ADP equipment and software should be conducted by OCS except where they are in support of a special processing center like NPIC. (NPIC would procure and test their own systems.)

5. R/D projects or programs in the area of information processing should be subjected to the same Agency-level evaluation as other ADP projects.

6. OCS to publish a periodic report on its R/D activities for Agency-wide consumption.

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	COMMENT		FILE		RETURN
	CONCURRENCE	X	INFORMATION		SIGNATURE

Remarks:

For whatever help it may be to you, attached is a summary of selected ASPIN recommendations which was prepared in O/PPB for our own use. We believe the summary to be faithful to the original paper, but we have not verified this with Sweeney.

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FROM: NAME, ADDRESS AND PHONE NO.	DATE
[redacted] 6E-0702, Hq., 6194	11-12-70

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FORM NO. 237 1-67 Use previous editions (40)

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ASPIN

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15 OCT 1970

MEMORANDUM FOR: Chairman, Information Processing Board

SUBJECT : ASPIN

1. Attached is a long memorandum quoting recommendations extracted from the ASPIN Report and my comments about each of them. Neither the comments nor the ASPIN Report have been circulated or coordinated among the Support Offices. A copy of the comments has been made available to the Deputy Director for Support but there has not been time for him to review them.

2. You will note that I have offered a comment about nearly every recommendation in the report. I find this regrettable. You will also note that the comments are not always constructive in the sense that they do not offer alternative proposals or suggest means of accomplishing the objectives of the individual recommendations. This is also regrettable but I see no reasonable alternative. Too many of them require separate additional study and staffing before they can be implemented or acted upon. Too many others are interrelated or interdependent requiring that they be considered in some series of aggregates, but the report leaves the development and considerations of the aggregates entirely up to the individual reader. Very few readers will have the time or the inclination to give the report that much study. This seems to suggest that the first recommendation to be considered is the one which would establish a full-time information processing capability at the level of the Executive Director-Comptroller.

[redacted]

25X1A

Chief, Support Services Staff

DDS/SSS/RHW:hrf (13 October 1970)

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15 OCT 1970

MEMORANDUM FOR: Chairman, Information Processing Board

SUBJECT : ASPIN Report

You have asked the Information Processing Coordinators to comment about the ASPIN Report.

Part II, 18-20

"No. 57. The Agency establish as standard procedure in the development of new collection systems, the coordination of the data collection and data forwarding formats with the individuals who must perform the data reduction and analysis of the data should the collection system become operational."

COMMENT:

Coordination with interested Support Components, particularly where there are space or communications requirements, should not be overlooked in the development of any procedures. This should be accomplished, of course, in the normal course of events but it doesn't always happen. The Technical Facilities Committee is available to facilitate this process and a requirement that it be used should be incorporated in coordination procedures.

New collection systems inevitably produce new products which, no matter what form they take, are records and must be considered as such. Some of the records eventually become archives. Records management considerations should be taken into account from the inception of the projects so that retention plans, disposal schedules, etc. can be developed.

"No. 58. The Information Processing Board assure the acquisition, development and use of one or more general data management systems which are sufficiently close to the general design requirements for Agency data processing applications to permit their adaptation and use for a wide range of data processing applications and data processing centers...."

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COMMENT:

This, and several other recommendations throughout the report, suggest action by the Information Processing Board which the Board is ill-prepared or ill-equipped to take, depending upon what is meant by "assure the acquisition, development, and use". The Board is not equipped to do analyses of the design requirements of data processing application in enough depth to permit a reasonable evaluation of their suitability for general use in all data processing centers. In any case, I don't believe the Board should attempt to set itself up in a way which would permit it to look as closely over the shoulders of the several computer centers in the Agency as would be required to produce the assurance recommended. The Board has no reasonable alternative but to rely upon the technical expertise in the several computer organizations to communicate with each other. Prescription of a policy that cooperation and coordination will be practiced carries no guarantee that it will be done. What the Board can do within its present competence to assure that coordination and cooperation take place must be pretty much limited to some sort of monitoring and presumable that will, as a matter of practicality, come down to the acceptance by the Board of the assurances of the several computer centers that they are in fact coordinating and cooperating with each other. There comes a point when good Agency management means simply reliance upon the management competence of subordinate echelons.

"No. 59. The Information Processing Board assure that the present capability for development of a unique program to process an application is maintained, so that any application whose objective is clearly unobtainable by incorporation into a general data management system may continue to be developed...."

COMMENT:

Again, I don't know what the Board can do to ensure that they have this assurance. The normal demand for service is probably all that is necessary to ensure that this type of capability is maintained. There should, however, be some way to avoid designs of "unique" applications being forced into some particular shape to permit their being serviced by generalized software systems when separate software would be preferable. But, again, this is more a concern of the individual customer in his relationships with the computer center than it is a matter with which Agency level management should be concerned. Perhaps

there should be some expression of Agency policy which the Directorates can implement which will protect the customer from having his application distorted to fit a generalized software system when specialized programs would serve the requirements better.

"No. 60. The Information Processing Board and its Technical Panel be charged with creating the means for the development of meaningful communications between the systems analysts-programmer and the substantive analyst who may be engaged in the common development of a computer application. Have them assure that the requisite training is given to accelerate the reduction of communication barriers which still exist."

COMMENT:

This is a laudible objective but it is difficult to see what contribution the Board can make toward its achievement. The problem is more than a problem of communication; it is a problem of attitude and it may be that only the passage of time will correct it. If there is some identifiable direction which can be taken, it would seem more appropriate that it be taken at the Directorate level or subordinate echelons. The Support Directorate would be happy to have any assistance it can get and will take advantage of any guidance that may be available to help improve communication between substantive people and computer people. We have not yet been successful in identifying what "requisite training" can be given to reduce communication barriers and influence attitudes.

"No. 61. The Agency provide time and professional and clerical assistance to a few talented individuals each year to explore, develop, and test essentially new techniques for new concepts in the use of ADP to support intelligence analysis and production. These applications may be developed under the leadership of either the substantive component, or OCS, depending upon the nature of the application and the resources to do the job."

COMMENT:

This recommendation requires elaboration. There is some implication here of a "think-tank" concept which would make it possible for people to be relieved of their normal duties for a year to experiment. Having the applications developed under the leadership of OCS for the substantive component seems to imply an expectation that the recommen-

dation contained elsewhere in the ASPIN Report to abolish ORD has already been accepted.

Presumably this recommendation means that the Agency should create an atmosphere, or establish a policy, which would permit the kind of activity recommended to occur. The Agency can't provide time. Time has to be made available in terms of the time of individual participants and this can only be done by their parent components. This raises the question of practicality.

I have no problem with the concept but it will require considerable elaboration and refinement of the definition of what is meant before much of anything can be done about providing a mechanism for its accomplishment. In any case, if it is to be an Agency concept, then it should be truly Agency and not limited to intelligence analysis and production. Talented experimentation and exploration can be applied to most of the things in the ADP world which are of interest to the Support Directorate. I realize that the recommendation may have been stated in this way in keeping with the scope of the ASPIN study but if we are going to deal with the recommendations in an Agency context, then this recommendation is one which should be so considered.

"No. 62. The Information Processing Board assure that the present effort to provide a general time-sharing capability in OCS to serve the interests of the Agency as a whole be strengthened to provide not only on-line but also remote batch processing and remote job entry via terminals distributed so as to make them convenient to users throughout the intelligence production components."

COMMENT:

Again, the scope of the recommendation seems to be intended to conform to the scope of the study. If the Information Processing Board is to interest itself in the manner in which OCS provides service to its customers, then the Board should be interested in the manner in which that service is provided to <u>all</u> OCS customers. The implication of the recommendation is that only OCS will have a general time-sharing capability and, therefore, the Board need only to look over the OCS shoulder and not concern itself with what occurs in the other computer centers of the Agency. In any case, the question of how the Board, with its present resources, can provide itself with the assurance recommended; how it can provide that assurance within the present management-hierarchical-structural relationship between the Board, OCS, and the other computer centers, and whether it should concern itself with these matters will

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have to be examined with some greater care. Even though the arguments used to support a single general time-sharing capability in OCS to serve the interests of the Agency as a whole may seem so persuasive that we evidence an inclination to accept them, we should not act upon that inclination until all ramifications of how, who, and whether have been carefully considered.

"No. 63. The Information Processing Board, in consultation with the interested parties, assure that the OCS interactive services system provides a general data management system capable of providing an on-line, quick response capability for large information storage and retrieval of the type characterized by the MISTAC, AEGIS, QUIKTRAK, data bases. We believe that the present and foreseeable rates of use for these files in an on-line environment are not high enough to warrant economic use of individual processers to support them."

COMMENT:

The comment addressed to No. 62 immediately above also applies here.

I am in no position to comment about the technical practicability of this recommendation but I would not like to see it interpretated or acted upon in any way which would divert or dilute the effort to move ahead with the GIMS system. The search for a data management system that can be all things to all people could very easily mean that we become perpetual searchers while nothing gets done for anybody.

"No. 64. The agency seek to secure an evaluation of the present COINS experiment at the earliest possible moment in an effort to provide clearer guidance for future Agency planning for participation in intelligence community ADP activities."

COMMENT:

I suspect that events will have overtaken this recommendation before it can be acted upon. To comment upon it in this context will make no constructive contribution.

"No. 65. The Information Processing Board define the minimum standards of control over data entry, data base documentation and file management for any ADP application serving more than one component (defined as a unit under the first-line supervisor)."

COMMENT:

I have the same problem with this recommendation that I have with several of the others. I don't feel confident that I really understand what it means; if I do understand it, I don't see how the Board can do it; and I don't see how the Board is going to monitor all ADP applications to ensure that it has been done.

SUMMARY COMMENT:

The sum of the recommendations in this section would seem to impose upon the Information Processing Board a responsibility for the direct-line management of the Office of Computer Services, and presumably the other computer centers, which the Board has neither the time, technical competence, or staff support to fulfill even if a management role for the Board were considered to be desirable. Performance of the functions recommended seem to go beyond the proper role of a Board, certainly they do go beyond the role of the Information Processing Board as it is presently defined. There is even the implication of a rather fundamental change in the ADP management philosophy of the Agency. This is not to imply that a change would necessarily be wrong or bad. It is to say, however, that these recommendations cannot and should not be acted upon individually without a very careful assessment of their total effect and a thoughtfully drawn plan for their aggregate management.

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Part III - Office of Computer Services (OCS) Activities
Pages III. 12-13

"No. 30. We recommend that: OCS develop in consultation with the Information Processing Board a mechanism for communicating plans for major computer systems changes to user components and of eliciting and reviewing user input to these plans before they are ready for submission to the Information Processing Board for review antecedent to approval by the Executive Director-Comptroller."

COMMENT:

We will need to have a careful definition of what is meant by "major computer systems changes" before we can act on this recommendation. Assuming that it means such changes as the installation of GIMS or CP/CMS, then I would agree that coordination and the furnishing of complete information to users is desirable. On the other hand, not all users will have the technical competence to respond intelligently to a request for concurrence with such proposed changes. The same applies to review by the Information Processing Board and approval by the Executive Director-Comptroller. I assume it is this void that the recommendation seeks to fill, but communication requires understanding as well as being told. What the Board or the Executive Director can do in a practical sense to ensure that OCS customers, or the Board itself, understand proposed changes, or how the Board could do it doesn't come readily to mind. OCS has the responsibility for satisfying the requirements of its customers. There has to be some point where we are willing to allow them to do that.

Again, the same standards as apply to OCS should apply to other computer centers.

"No. 31. A complete set of procedures be published and maintained which provide enough information to [redacted]sure that a job can be written (including JCC) and run without intervention from OCS programmers."

COMMENT:

I am not sure I understand the implications of this recommendation nor how it relates to the recommendation immediately following regarding the assignment of OCS personnel to user components. This recommendation would have to be interpreted in the light of actions taken toward the implementation of the other recommendations. In any case, who is going to develop and maintain such a set of procedures? Why, again, is attention focused only on OCS programmers?

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"No. 32. Application programmers (this would presumably include a major share of the Applications Division's personnel) from OCS should be assigned to and, where feasible, located with analysts in the production organization for whom they are designing and programming. Their work during their period of assignment should be controlled by the host production organization except that their rotation back to internal OCS assignment should be negotiated with OCS."

COMMENT:

This recommendation relates directly to Recommendation No. 30, Chapter VI which says that an Agency ADP career service should be created. If the recommendation that an Agency career service be established is adopted presumably the applications programmers currently employed in the CRS, NPIC, and RID computer centers would be a part of it. This would mean that they would be subject to assignment in and out and among the several computer centers as well as user components throughout the Agency. In one case assignments would be negotiated with OCS; in other cases assignments would presumably be negotiated with the computer centers concerned by the Chairman of the Agency-Wide ADP Career Service Board, who would be the Chairman of the Information Processing Board. Assignments from as well as to the computer centers and the user components would have to be negotiated.

While I concur with the concept I believe these recommendations are intended to espouse, it is unfortunate that they cannot be acted upon as stated. I believe the Information Processing Board should pursue the idea of an Agency career service for data processing personnel and the assignment of applications programmers, and perhaps other computer specialists, to the components whose systems require computer programming and systems support. We should create a special study group, or task force, which would devote its full time to the development of a detailed personnel management system concept and a mechanism which would permit its implementation. Alternatively we should assign the task to one person and make it possible for him to have all of the access and assistance he needs to get the job done.

"No. 33. Increased attention should be given by OCS, in close cooperation with NPIC/AID and ORD/AN, to the development of a strong computer graphics capability for support of analyst use of the time-sharing system...."

COMMENT:

This recommendation seems to endorse the solution to problems which have not yet been adequately defined, or are not adequately defined in this report at any rate. What and how extensive is the analyst's requirement for computer graphics support?

I find it curious that so many of the recommendations suggest that the Information Processing Board should give increased attention or seek the assurance that particular actions are taken while in this case the recommendation is addressed to specific organizational components in different directorates. Admittedly, the Information Processing Board as presently structured is in no better position to take action on this recommendation than it is on any of the others but in the interest of consistency, at least, it would seem that the objective sought to be obtained by this recommendation would be more appropriately addressed at the Agency rather than subordinate levels.

While we are at it, the use of computer graphics for the reporting of management information might also be profitably explored.

"No. 34. Present planning for OCS to acquire and test a proprietary general data management system should be encouraged. Plans for this acquisition should be moved forward as rapidly as a careful coordination of the proposal can be concluded.... The objectives in acquiring general data management software ought to be (1) to move toward as wide a coverage of our major processing activities within any given system as is intellectually and operationally acceptable, (2) to establish each system selected as an Agency standard for the type(s) of application identified, and (3) to recognize that there will still exist computer applications which will require unique programs."

COMMENT:

This recommendation apparently is a modification of duplication of II-58.

Action is already under way to accomplish the intent of this recommendation in the consideration being given to the GIMS package. The acquisition of this package with the modifications under consideration is of vital importance to the SIPS Program. I agree that the Agency should take maximum advantage of whatever versatility this package has to offer and that reasonable modifications should be made

to extend its utility to other users in addition to SIPS. The decision of whether or not to acquire the GIMS package should not, however, be conditional upon its adaptability to all of the requirements which may be surfaced for general data management systems. We should avoid encumbrances which might cause these systems to sink of their own weight. We should also avoid shaping our production and information processing systems to fit software packages and thereby distort the purposes the information processing systems themselves are intended to serve. We should acquire software packages to serve the maximum number of requirements; we should not alter the requirements simply for the purpose of acquiring a minimum number of software packages.

"No. 35. A single, integrated, interactive services system to provide on-line service for intelligence production components at Headquarters should be the Agency near-term objective."

COMMENT:

The recommendation clearly is couched in terms reflective of the scope of the ASPIN study. If it is to be interpreted in an Agency context, it is open to the inference that a separate interactive services system will be provided to meet requirements of Support Information Processing Systems and other systems which do not fit within the constraints of the phrase "intelligence production components at Headquarters". The security concerns of sharing interactive services among community and Agency proprietary systems suggest that separate interactive services systems may not be such a bad idea.

Clearly the intent of the recommendation is to consolidate resources and avoid the development of interactive services systems in every computer center of the Agency. I agree with that intent but to accept the language of the recommendation literally would be much too constrained, even as a near-term objective.

I may not understand all of the nuances, but I'm not sure this recommendation is entirely consistent with II-58, and III-34.

Part IV - A Central Reference System
Pages IV. 11-12

"No. 35. We recommend that: the Central Reference Service be established as the point of contact for any general request for intelligence information from outside the Agency or from within where there is no immediate known point where the information needed is available."

NO COMMENT

"No. 36. Only those data which are generated and accessioned by the Reference Center be provided as a direct response by the Center and that all other data are sought first from another center in the Agency which may have resources to respond."

NO COMMENT

"No. 37. Work underway on an automated dissemination system should be maintained and each distribution point to be employed in the initial system test should be directed to cooperate with CRS in providing carefully constructed 'dictionary' terms to try to guide this system. The work should be recognized as experimental at this stage, but it should be widely encouraged for its long-term prospects."

COMMENT: See No. 38 immediately below.

"No. 38. Planning for undertaking an extension of the automated dissemination system from SI input to all State, Defense and Agency positive intelligence information received in machine language should be undertaken coincident with the beginning of feasibility testing."

COMMENT:

Members of the Information Processing Board have heard separate briefings about the automated dissemination system being developed by CRS and the automated communications terminal (ACT) being developed by the Cable Secretary and the Office of Communications. It is possible to come away from these briefings satisfied that they each serve the purposes of their separate systems which makes it legitimate for them to be developed and exist independently. Nevertheless, one has the

nagging suspicion that their independence is more a reflection of organizational structure than it is a functional distinction. Briefings, no matter how complete or competently staged, are not adequate to permit judgements to be made about whether one or the other of these systems could serve both interests, or each should exist in its own environment. Unfortunately the Information Processing Board does not have at its disposal resources necessary to investigate situations of this kind in enough depth with disinterested objectivity to present the Information Processing Board or the Executive Director-Comptroller with the analytical detail necessary to permit judgements to be made. Such a capability is needed if the Board is to perform adequately even the limited role which has presently been carved out for it. Meanwhile, perhaps yet another study group needs to be launched to review the total communications, dissemination, ADP structure to provide a comprehensive picture of the system and develop possible approaches to its improvement.

"No. 39. The present concept of CRS indexing should be continued, and a systematic effort taken to facilitate indexing input from the substantive analyst and to encourage such input to the system."

COMMENT: See below.

"No. 40. The Central Reference Service should seek as a general objective a standarized document reference number which can be put on the intelligence information document before it is disseminated. This reference number should be capable of being generated and included in the format of any automated dissemination system, and should become a part of that system as quickly as possible. It should be made an Agency standard immediately and expanded into a community standard eventually."

COMMENT: See below.

"No. 41. The concept and scope of document indexing by a reference center should be developed by a top management decision. Established at a lower level, it results either in extensive duplication effort or in abandonement of control over the use of intelligence documentation. Document index processing has, however, been customized by each processing organization which supports an individual or organization reference activity."

COMMENT: See below.

"No. 42. The Central Reference Service should create a personnel-area-subject index to other organized collections of information in the Agency. This index should include both personnel and organizational collections of information and authorization points for control of access to the respective collections. This index is an important and complex system which must be carefully defined, coordinated and implemented. CRS should be assigned responsibility for design and development of the system but they must have the full cooperation of all other offices and directorates. Development of such a system would pose an excellent test of the Information Processing Board."

COMMENT: See below.

"No. 43. The present method of document storage and retrieval is acceptable and should be maintained. It provides speed when it is genuinely needed and is far more economical than any system of electronic storage or video storage that we have encountered. We believe that the Agency should continue to experiment with a limited number of applications in which documents are created, stored, and searched retrospectively in an electronic format, because development of an on-line document index will almost certainly require a simultaneous improvement in the speed of delivery of documents."

COMMENT: See below.

"No. 44. An extensive interactive (man-machine-data base) capability with the Central Reference Service intelligence document index should be developed and tested as quickly as feasible. This is one of the few large data bases in which we think there is both wide interest and frequent use. Indeed we are told by analysts that the principle limitation on their use of the system is its slow response time."

COMMENT:

I have no competence which would permit me to comment about recommendations 39 through 44 in the context of the systems to which they are addressed. Documents are records, however, which eventually will become inactive and some significant fraction of them will require storage in the Records Center. Many of them, presumably, will be worthy of permanent retention and should be identified for archival storage and preservation. While indexing and retrieval systems should not necessarily be designed specifically with long-term storage and retrieval from a remote location as constraints upon the systems, the notion of long-term retention and disposal schedules as well as the requirement for manual retrieval from a remote location should be kept

in mind. Systems which permit storage in other than hard copy form are of vital interest to the Records Management Programs of the Agency.

Part V - Research and Development (R&D) in Information Processing
Pages V. 5-6

"No. 14. We recommend that the DDS&T review the division of effort between ORD and OCS in the area of information processing research and development against an alternative allocation of function and effort which would:

a. Provide for the subsequent problem definition and computer application design and development effort to be moved from ORD to OCS.

b. Provide for the transfer of essentially standard computer processing equipment from ORD to OCS and for OCS to provide a level of experimental or developmental computer processing time necessary to support the expanded experimental function outlined above. We would for example urge that processing time might be made available on machines appropriate to the work involved rather than on a single machine which is used only for experimental work.

c. Provide for the transfer of other equipment from the IPRD Laboratory to those surviving or anticipated development programs which may use it most effectively, the rest to be transferred to surplus.

d. Provide for a review of existing ORD contracts through the Information Processing Board and selected prospective users to determine which of those contracts should be continued and under whose leadership they should proceed.

e. Provide that subsequent ADP equipment or software test and analysis be conducted by OCS except where the items are a direct adjunct of a special processing center such as NPIC. The special unit would procure and test the latter product.

f. Provide for OCS to issue a current awareness publication similar to its present Tech Notes to announce new activities, new products, and new developments which its research and development component considers of general interest for Agency components engaged in information processing.

COMMENT: None.

"No. 15. In addition we recommend that the DDS&T and the Information Processing Board reject the proposal of the R&D Subcommittee of the USIB Information Handling Committee which proposes a community-wide R&D Center on the basis of the recent experience with COINS and the IPRD which we believe demonstrated both the difficulty of an integrated community activity and the impracticality of performing research and development on non-existent or badly defined requirements."

COMMENT: Concur.

"No. 16. Finally we recommend that research and development projects or programs in the area of information processing be submitted to the same scrutiny as that proposed for ADP projects in the section below dealing with management."

COMMENT:

Concur subject to the comments offered about the recommendations dealing with management.

Part VI - Organizational and Management Elements of Automatic Data Processing

Page VI. 10-11

"No. 26. We recommend that: the Agency reassert a policy of providing a high degree of centralization in data processing activity in the Office of Computer Services, that this policy be tempered by permitting the acquisition of small or medium computer processers by functional organizations where there is a demonstrable-computational economy in using a stand-alone computer system, and that this policy continue the present emphasis on the functional component (user) responsibility for problem definition and problem solution. In short, we recommend that computer organizations develop the systems necessary to run the computers and run them, and that functional production people prepare the data and the processing steps required for its transformation by computer."

COMMENT:

I see no particular need for a reassertion of this policy from the Support Directorate point of view. We have no particular problem with the intent of the recommendation, on the other hand, as long as the Office of Computer Services is able to retain the capability to satisfy the requirements that we musy levy upon it. If the other recommendations of the ASPIN Report are to be taken seriously, however, something more than a simple reassertion of policy is required. At this point in my review of the ASPIN study I am not able to identify what that "something more" is.

Someone has to find a way of looking at the ASPIN recommendations in the aggregate. Too many of them are inter-related and inter-dependent to permit prudent action to be taken on any of them separately. II.58, II.63, III.34, III.35, and perhaps others should be considered together; II.59, III.31, III.32, V.14, V.16, VI.27, VI.30, perhaps II.64, and possibly others should be considered together; conceivably IV.37 and IV.38 should be included in the latter group as well. I haven't re-examined the recommendations as carefully as I should to assert positively that this suggested grouping of them should hold. This is a part of the difficulty. The ASPIN study requires too much study. Not many of us are going to be able to give it as much study as it requires. I have already spent more time on it than I feel it should have required and I am still uneasy about it because my comments deal with individual recommendations and they might change in the aggregate if I were to take the time to consider the recommendations that way.

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"No. 27. A central technical management review of major ADP projects be created under the present umbrella of Executive Director-Comptroller responsibility for Agency ADP management, that a full-time position of ADP advisor to the Executive Director-Comptroller be created for an experienced ADP professional whose responsibility would be to:

a. Advise the Executive Director-Comptroller on all professional/technical matters relating to ADP;

b. Be Chairman of the IP Board and the Director of its permanent staff;

c. Review the various local plans, provide technical input and, periodically, develop a statement of long-term ADP objectives for the Agency;

d. Assign computer application design proposals to the suitable functional/technical review components;

e. Prepare Agency-wide ADP technical standards;

f. Serve as Chairman of the Agency-wide ADP Career Service Board;

g. Serve as focal point for internal leadership and for external relations in ADP/professional matters."

COMMENT:

It is interesting that the notion of a permanent staff is buried as a subordinate clause in paragraph b. above and that it is considered to be a permanent staff of the Information Processing Board. I realize that this was written before the nonemclature in OPPB changed to eliminate the term "Information Processing Staff" and leave the IP&E Team to perform something of a dual role, but even before that change was made the Information Processing Staff was considered to be an OPPB unit rather than a supporting arm of the Information Processing Board. I have some difficulty conceptually with the idea of the IP&E Team performing a dual role but that concern is not directly germane to discussion of this ASPIN recommendation. What is germane is the opinion that the responsibilities identified for the ADP advisor are more than a full-time job for one man, and probably more than a part-time job for the IP&E Team. It is also my opinion that fulfillment of the responsibilities prescribed calls for a role going far beyond the role of advisor.

The responsibilities suggested for the ADP advisor taken together with the functions recommended throughout the report to be performed by the Information Processing Board clearly suggest the need for an Information Processing Staff at the level of the Executive Director-Comptroller. Moreover, membership on the Board will become a full-time task for each of the Directorates representatives.

Essentially I agree that there needs to be a small staff competence at the Agency level. Its role will have to be carefully drawn in terms of specific functions listed here and the more general functions suggested elsewhere in the report as tasks for the IPB. I wonder whether any of the recommendations can be acted upon until after this one has been dealt with.

"No. 28. Existing Central ADP planning be strengthened to provide:

a. For a more definitive outline of Agency objectives to be achieved in related or overlapping office plans and for regular revision and publication of the Agency ADP Plan;

b. For the definition and publication of Agency-wide ADP technical standards beyond the present work on nationwide (USASI) standards;

c. For a standard format and procedure for the proposal and review of major requests for the acquisition of computer systems or of computer processing applications."

COMMENT:

The idea of ADP planning in its own separate context has always been bothersome to me. ADP exists only to serve operational and management programs and planning for it should be carried out in the context of the programs it serves. We haven't found a way of doing that satisfactorily, but we haven't really tried. The Information Processing and Exploitation (IP&E) Program Category does not serve the purpose. Support information processing is split among the Communications Program Category, the Program Wide Category, and the

IP&E Program Category. It only gets into the latter because the Office of Computer Services is included in that category and OCS provides computer support to the Support Directorate. We don't plan in CIA and we don't program, not really. We budget. We should plan and we should program but we should not delude ourselves into thinking we are doing something that we are not simply because we apply the terminology. We do not have an Agency ADP plan and we have never had one. The only visible objective we have had at the Agency level has been to control the growth of hardware. We need something a great deal better than that but it will take a great deal more time and a great deal more thought than anyone has yet been able to give it. Perhaps what we need as a start is a plan for a plan, but even that won't occur if it is left as a part-time effort of one or several people who have dozens of other things to do. We do need a definitive statement of Agency objectives.

Standard formats for the proposal and review of major requests for computer services may be useful tools but what we really need are some criteria for judging the content of proposals. The memorandum the Executive Director-Comptroller addressed to the Deputy Directors in October 1969 said that decisions to use ADP equipment should be based on a review of proposals in terms of utility, benefits, life expectancy, and relationship to other activities. It identified several bench marks for the review of proposals and it identified responsibilities to be charged to Directorate Information Processing Coordinators and the Information Processing Board. Nothing has been done in an Agency context toward the implementation of the provisions of that memorandum. We don't know to what extent individual directorates may have taken independent action toward its implementation within their own jurisdictions but the kinds of things which come before the Information Processing Board suggest that there may be some inconsistencies or differences in the approaches taken by each of the Directorates. We need some way of assuring that it is neither easier nor more difficult in one directorate than another to get approval of an ADP project and that the same criteria of importance, utility, benefits, etc. are applied in all of the Directorates. When we have these things, then we can develop formats and procedures to ensure their expeditious processing.

"No. 29. A means of pricing data processing services performed by computer centers be developed, and that each user component be required to budget for its data processing services and transfer the funds to pay for these services in essentially the same way that property funds are handled."

COMMENT:

I have commented about proposals for costing data processing services in a separate context and will not belabor the point further here, except to say that I agree we should have some way of knowing what particular computer applications cost for consideration as a factor in considering whether the application should go forward or not. Before we dash madly into an elaborate pricing system we should have clearly in mind what we hope it will achieve. I do not believe that an elaborate system which would require the transfer of funds should be the objective, and while we can certainly learn something from the experience of the PRA (Property Requisitioning Authority) system I doubt very much that we will find it a useful pattern to be followed.

"No. 30. An Agency ADP career service be created."

COMMENT:

See earlier comment, Part III, Recommendation No. 32.

"No. 31. Existing ADP training programs introduce additional emphasis on the changing responsibility or role of the user in an on-line and/or real-time computer environment, and that functional organizations review the need for unit training of personnel in the use of quantitative and/or logical techniques in indigenous analytical problems."

COMMENT: Concur, but first we need some agreement among the Directorates about what the role of the user should be.

"No. 32. The Director/OCS be an ex officio participant on the Information Processing Board and that the DDS&T should be represented on the Board by an individual who reflects the computer user population of the whole Directorate. The presence of the Director/OCS on the Board is imperative, but we believe he should participate in his capacity as director of computer processing rather than as the representative of a directorate with large processing requirements."

COMMENT:

The Information Processing Board has already addressed this recommendation.

25X1A [redacted]
Chief, Support Services Staff

DDS/SSS/RHW:hrf (14 October 1970)

Distribution:
Orig. & 1-Addressee
1-SSS Subject
1-SSS Chrono

SECRET

15 OCT 1970

MEMORANDUM FOR: Chairman, Information Processing Board

SUBJECT : ASPIN Report

You have asked the Information Processing Coordinators to comment about the ASPIN Report.

Part II, 18-20

"No. 57. The Agency establish as standard procedure in the development of new collection systems, the coordination of the data collection and data forwarding formats with the individuals who must perform the data reduction and analysis of the data should the collection system become operational."

COMMENT:

Coordination with interested Support Components, particularly where there are space or communications requirements, should not be overlooked in the development of any procedures. This should be accomplished, of course, in the normal course of events but it doesn't always happen. The Technical Facilities Committee is available to facilitate this process and a requirement that it be used should be incorporated in coordination procedures.

New collection systems inevitably produce new products which, no matter what form they take, are records and must be considered as such. Some of the records eventually become archives. Records management considerations should be taken into account from the inception of the projects so that retention plans, disposal schedules, etc. can be developed.

"No. 58. The Information Processing Board assure the acquisition, development and use of one or more general data management systems which are sufficiently close to the general design requirements for Agency data processing applications to permit their adaptation and use for a wide range of data processing applications and data processing centers...."

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II,57 10.

We recommend that the Agency establish as standard procedure in the development of new collection systems the coordination of the data collection formats with the individuals who must process and analyze the data.

II. 57. While there have been serious lapses in the past in melding analysis with collection, these are disappearing. For example, OEL's Program Review Board considers the analysis problem for each new collection system, and OSP has its own set of management tools toward this end. USIB community forums have also been established where such interfaces can be discussed. OCS feels that from its standpoint, computer users are becoming more generally aware of the need to make their requirements known at the earliest possible date. In any case, this is an OCS problem with its users. No fiat will produce the cooperation that can be gained by good relations with them.

II,58 6.

III,34

We recommend that the Information Processing Board assure the acquisition, development and use of general data management systems which are sufficiently close to the general design requirements for Agency data processing applications to permit their adaptation and use for a wide range of data processing applications and data processing centers. The acquisition of such systems should be coordinated with the major users of OCS and with each of the components who have their own data processing centers, i.e., NPIC and CRS.

COMMENT:

This, and several other recommendations throughout the report, suggest action by the Information Processing Board which the Board is ill-prepared or ill-equipped to take, depending upon what is meant by "assure the acquisition, development, and use". The Board is not equipped to do analyses of the design requirements of data processing application in enough depth to permit a reasonable evaluation of their suitability for general use in all data processing centers. In any case, I don't believe the Board should attempt to set itself up in a way which would permit it to look as closely over the shoulders of the several computer centers in the Agency as would be required to produce the assurance recommended. The Board has no reasonable alternative but to rely upon the technical expertise in the several computer organizations to communicate with each other. Prescription of a policy that cooperation and coordination will be practiced carries no guarantee that it will be done. What the Board can do within its present competence to assure that coordination and cooperation take place must be pretty much limited to some sort of monitoring and presumable that will, as a matter of practicality, come down to the acceptance by the Board of the assurances of the several computer centers that they are in fact coordinating and cooperating with each other. There comes a point when good Agency management means simply reliance upon the management competence of subordinate echelons.

"No. 59. The Information Processing Board assure that the present capability for development of a unique program to process an application is maintained, so that any application whose objective is clearly unobtainable by incorporation into a general data management system may continue to be developed...."

COMMENT:

Again, I don't know what the Board can do to ensure that they have this assurance. The normal demand for service is probably all that is necessary to ensure that this type of capability is maintained. There should, however, be some way to avoid designs of "unique" applications being forced into some particular shape to permit their being serviced by generalized software systems when separate software would be preferable. But, again, this is more a concern of the individual customer in his relationships with the computer center than it is a matter with which Agency level management should be concerned. Perhaps

II. 58. There does not seem to be any magic to the acquisition of general data management systems from commercial vendors as opposed to in-house development which assures that the former is the best route to go. Such developments depend on the requirement that we are trying to meet, what is available in the market place, and our capabilities for building the system. What is important is that the Board insist on the review of commercially available systems when in-house development efforts are proposed. The acquisition of GIMS and AEGIS presumably follow this ASPIN recommendation.

DDS+T

II,59 8. *We recommend that the Information Processing Board assure that the capability for development of unique computer programs be maintained for applications whose objectives are clearly unattainable by incorporation into a general data management system.*

II. 59. The purpose of the recommendation seems to be to counterbalance the previous one. Obviously big systems software is expensive but equally obviously one big system is not likely to solve everyone's problems. Hurrah for motherhood.

DDS+T

there should be some expression of Agency policy which the Directorates can implement which will protect the customer from having his application distorted to fit a generalized software system when specialized programs would serve the requirements better.

"No. 60. The Information Processing Board and its Technical Panel be charged with creating the means for the development of meaningful communications between the systems analysts-programmer and the substantive analyst who may be engaged in the common development of a computer application. Have them assure that the requisite training is given to accelerate the reduction of communication barriers which still exist."

COMMENT:

This is a laudible objective but it is difficult to see what contribution the Board can make toward its achievement. The problem is more than a problem of communication; it is a problem of attitude and it may be that only the passage of time will correct it. If there is some identifiable direction which can be taken, it would seem more appropriate that it be taken at the Directorate level or subordinate echelons. The Support Directorate would be happy to have any assistance it can get and will take advantage of any guidance that may be available to help improve communication between substantive people and computer people. We have not yet been successful in identifying what "requisite training" can be given to reduce communication barriers and influence attitudes.

"No. 61. The Agency provide time and professional and clerical assistance to a few talented individuals each year to explore, develop, and test essentially new techniques for new concepts in the use of ADP to support intelligence analysis and production. These applications may be developed under the leadership of either the substantive component, or OCS, depending upon the nature of the application and the resources to do the job."

COMMENT:

This recommendation requires elaboration. There is some implication here of a "think-tank" concept which would make it possible for people to be relieved of their normal duties for a year to experiment. Having the applications developed under the leadership of OCS for the substantive component seems to imply an expectation that the recommen-

II,60 *We recommend that the Information Processing Board (IPB) create the means for the development of meaningful communications between the systems analyst-programmer and the substantive analyst engaged in the common development of a computer application.*

II. 60. The Information Processing Board can't by itself bring users and processers together. Both Centers and users must work out PDS-T better ways of understanding each other. Centers need to be more user-oriented.

and test essentially new techniques or new concepts in the use of ADP to support intelligence analysis and production. These applications may be developed under the leadership of either the substantive component, or OCS depending upon the nature of the application and the resources required to do the job.

II,61 *We also recommend that the Agency provide time as well as professional and clerical assistance to a* deleted III 32 *few talented individuals each year to explore, develop,*

II. 61. Agree. Providing special support to talented computer/user PDS-T teams would also help further II. 60.

dation contained elsewhere in the ASPIN Report to abolish ORD has already been accepted.

Presumably this recommendation means that the Agency should create an atmosphere, or establish a policy, which would permit the kind of activity recommended to occur. The Agency can't provide time. Time has to be made available in terms of the time of individual participants and this can only be done by their parent components. This raises the question of practicality.

I have no problem with the concept but it will require considerable elaboration and refinement of the definition of what is meant before much of anything can be done about providing a mechanism for its accomplishment. In any case, if it is to be an Agency concept, then it should be truly Agency and not limited to intelligence analysis and production. Talented experimentation and exploration can be applied to most of the things in the ADP world which are of interest to the Support Directorate. I realize that the recommendation may have been stated in this way in keeping with the scope of the ASPIN study but if we are going to deal with the recommendations in an Agency context, then this recommendation is one which should be so considered.

"No. 62. The Information Processing Board assure that the present effort to provide a general time-sharing capability in OCS to serve the interests of the Agency as a whole be strengthened to provide not only on-line but also remote batch processing and remote job entry via terminals distributed so as to make them convenient to users throughout the intelligence production components."

COMMENT:

Again, the scope of the recommendation seems to be intended to conform to the scope of the study. If the Information Processing Board is to interest itself in the manner in which OCS provides service to its customers, then the Board should be interested in the manner in which that service is provided to all OCS customers. The implication of the recommendation is that only OCS will have a general time-sharing capability and, therefore, the Board need only to look over the OCS shoulder and not concern itself with what occurs in the other computer centers of the Agency. In any case, the question of how the Board, with its present resources, can provide itself with the assurance recommended; how it can provide that assurance within the present management-hierarchical-structural relationship between the Board, OCS, and the other computer centers; and whether it should concern itself with these matters will

II,62
3.

We recommend that the Information Processing Board assure that the present effort to provide a general time-sharing capability in OCS to serve the interest of the Agency as a whole be strengthened to provide not only on-line but also remote batch processing and remote job entry via terminals distributed so as to make them convenient to users throughout the intelligence production components.

DDS&T

II. 62. OCS intends to provide the widest time-sharing capabilities consistent with its budget.

have to be examined with some greater care. Even though the arguments used to support a single general time-sharing capability in OCS to serve the interests of the Agency as a whole may seem so persuasive that we evidence an inclination to accept them, we should not act upon that inclination until all ramifications of how, who, and whether have been carefully considered.

"No. 63. The Information Processing Board, in consultation with the interested parties, assure that the OCS interactive services system provides a general data management system capable of providing an on-line, quick response capability for large information storage and retrieval of the type characterized by the MISTAC, AEGIS, QUIKTRAK, data bases. We believe that the present and foreseeable rates of use for these files in an on-line environment are not high enough to warrant economic use of individual processers to support them."

COMMENT:

The comment addressed to No. 62 immediately above also applies here.

I am in no position to comment about the technical practicability of this recommendation but I would not like to see it interpretated or acted upon in any way which would divert or dilute the effort to move ahead with the CIMS system. The search for a data management system that can be all things to all people could very easily mean that we become perpetual searchers while nothing gets done for anybody.

"No. 64. The agency seek to secure an evaluation of the present COINS experiment at the earliest possible moment in an effort to provide clearer guidance for future Agency planning for participation in intelligence community ADP activities."

COMMENT:

I suspect that events will have overtaken this recommendation before it can be acted upon. To comment upon it in this context will make no constructive contribution.

II,63 *We recommend that the Information Processing Board, in consultation with the interested parties, assure that the OCS Interactive Services include a general data management system capable of providing quick response capability for large information storage and retrieval activities of the type characterized by the MISTAC, AEGIS, and QUIKTRAK data bases.*

DDS&T II. 63. Agree. There should be a long-term goal to provide on-line facilities for MISTAC, AEGIS, and QUIKTRAK. At present, neither the capacity nor the facilities for such a system exist.

II,64 *We recommend that the Agency seek to secure an evaluation of the present COINS experiment at the earliest possible moment in an effort to provide clearer guidance for future Agency planning for participation in Intelligence Community ADP activities.*

DDS&T II. 64. Agree. The Agency should review the COINS experience in detail.

"No. 65. The Information Processing Board define the minimum standards of control over data entry, data base documentation and file management for any ADP application serving more than one component (defined as a unit under the first-line supervisor)."

COMMENT:

I have the same problem with this recommendation that I have with several of the others. I don't feel confident that I really understand what it means; if I do understand it, I don't see how the Board can do it; and I don't see how the Board is going to monitor all ADP applications to ensure that it has been done.

SUMMARY COMMENT:

The sum of the recommendations in this section would seem to impose upon the Information Processing Board a responsibility for the direct-line management of the Office of Computer Services, and presumably the other computer centers, which the Board has neither the time, technical competence, or staff support to fulfill even if a management role for the Board were considered to be desirable. Performance of the functions recommended seem to go beyond the proper role of a Board, certainly they do go beyond the role of the Information Processing Board as it is presently defined. There is even the implication of a rather fundamental change in the ADP management philosophy of the Agency. This is not to imply that a change would necessarily be wrong or bad. It is to say, however, that these recommendations cannot and should not be acted upon individually without a very careful assessment of their total effect and a thoughtfully drawn plan for their aggregate management.

II,65

(c) minimum standards for control over data entry, data base documentation and file maintenance for any ADP application serving more than one component (defined as a unit under the first-line supervisor).

Part III - Office of Computer Services (OCS) Activities
Pages III. 12-13

"No. 30. We recommend that: OCS develop in consultation with the Information Processing Board a mechanism for communicating plans for major computer systems changes to user components and of eliciting and reviewing user input to these plans before they are ready for submission to the Information Processing Board for review antecedent to approval by the Executive Director-Comptroller."

COMMENT:

We will need to have a careful definition of what is meant by "major computer systems changes" before we can act on this recommendation. Assuming that it means such changes as the installation of GIMS or CP/CMS, then I would agree that coordination and the furnishing of complete information to users is desirable. On the other hand, not all users will have the technical competence to respond intelligently to a request for concurrence with such proposed changes. The same applies to review by the Information Processing Board and approval by the Executive Director-Comptroller. I assume it is this void that the recommendation seeks to fill, but communication requires understanding as well as being told. What the Board or the Executive Director can do in a practical sense to ensure that OCS customers, or the Board itself, understand proposed changes, or how the Board could do it doesn't come readily to mind. OCS has the responsibility for satisfying the requirements of its customers. There has to be some point where we are willing to allow them to do that.

Again, the same standards as apply to OCS should apply to other computer centers.

"No. 31. A complete set of procedures be published and maintained which provide enough information to assure that a job can be written (including JCC) and run without intervention from OCS programmers."

COMMENT:

I am not sure I understand the implications of this recommendation nor how it relates to the recommendation immediately following regarding the assignment of OCS personnel to user components. This recommendation would have to be interpreted in the light of actions taken toward the implementation of the other recommendations. In any case, who is going to develop and maintain such a set of procedures? Why, again, is attention focused only on OCS programmers?

III,30 18 *We recommend that OCS develop a mechanism for communicating plans for major computer system changes to user components and of eliciting their viewpoints.*

III. 30. Agree. OCS should keep its user better informed of equipment changes. Also needed is a better means for communicating user requirements for ADP services to OCS in advance of OCS planning activities. As it is now worded, the recommendation implies that OCS should plan first and then ask for user input.

DDS&T

20. III,31 *We recommend that a complete set of procedures be available to assure that a job can be written and run without intervention from OCS programmers.*

III. 31. Agree generally. However, a complete set of programming procedures will not assure that a job can be written and then run without intervention from OCS programmers. OCS has the continuing goal of improving system documentation and procedures so that programmers have a better chance of having their job run without intervention.

DDS&T

"No. 32. Application programmers (this would presumably include a major share of the Applications Division's personnel) from OCS should be assigned to and, where feasible, located with analysts in the production organization for whom they are designing and programming. Their work during their period of assignment should be controlled by the host production organization except that their rotation back to internal OCS assignment should be negotiated with OCS."

COMMENT:

This recommendation relates directly to Recommendation No. 30, Chapter VI which says that an Agency ADP career service should be created. If the recommendation that an Agency career service be established is adopted presumably the applications programmers currently employed in the CRS, NPIC, and RID computer centers would be a part of it. This would mean that they would be subject to assignment in and out and among the several computer centers as well as user components throughout the Agency. In one case assignments would be negotiated with OCS; in other cases assignments would presumably be negotiated with the computer centers concerned by the Chairman of the Agency-Wide ADP Career Service Board, who would be the Chairman of the Information Processing Board. Assignments from as well as to the computer centers and the user components would have to be negotiated.

While I concur with the concept I believe these recommendations are intended to espouse, it is unfortunate that they cannot be acted upon as stated. I believe the Information Processing Board should pursue the idea of an Agency career service for data processing personnel and the assignment of applications programmers, and perhaps other computer specialists, to the components whose systems require computer programming and systems support. We should create a special study group, or task force, which would devote its full time to the development of a detailed personnel management system concept and a mechanism which would permit its implementation. Alternatively we should assign the task to one person and make it possible for him to have all of the access and assistance he needs to get the job done.

"No. 33. Increased attention should be given by OCS, in close cooperation with NPIC/AID and ORD/AN, to the development of a strong computer graphics capability for support of analyst use of the time-sharing system...."

III,32

4. see also II 61

We recommend that applications programmers (this would presumably include a major share of the applications divisions' personnel) from OCS be assigned to and, where feasible, colocated with analysts in the production organization for whom they are designing and programming. Their work during their period of assignment should be controlled by the host production organization.

III. 32. OCS is now detailing systems specialists to help users communicate with OCS programmers and systems analysts. We do not intend this kind of support to include "a major share of the applications divisions' personnel" since this would unduly fractionate scarce OCS resources. Where smaller numbers of people are involved, where adequate professional, mature guidance can be obtained from the production analyst, and where specific projects can be delineated, OCS will follow this recommendation.

DOST

III, 33

12

We recommend that increased attention be given by OCS, in close cooperation with NPIC and ORD, to the development of a strong computer graphics capability for support of analyst use of the time-sharing system.

COMMENT:

This recommendation seems to endorse the solution to problems which have not yet been adequately defined, or are not adequately defined in this report at any rate. What and how extensive is the analyst's requirement for computer graphics support?

I find it curious that so many of the recommendations suggest that the Information Processing Board should give increased attention or seek the assurance that particular actions are taken while in this case the recommendation is addressed to specific organizational components in different directorates. Admittedly, the Information Processing Board as presently structured is in no better position to take action on this recommendation than it is on any of the others but in the interest of consistency, at least, it would seem that the objective sought to be obtained by this recommendation would be more appropriately addressed at the Agency rather than subordinate levels.

While we are at it, the use of computer graphics for the reporting of management information might also be profitably explored.

"No. 34. Present planning for OCS to acquire and test a proprietary general data management system should be encouraged. Plans for this acquisition should be moved forward as rapidly as a careful coordination of the proposal can be concluded.... The objectives in acquiring general data management software ought to be (1) to move toward as wide a coverage of our major processing activities within any given system as is intellectually and operationally acceptable, (2) to establish each system selected as an Agency standard for the type(s) of application identified, and (3) to recognize that there will still exist computer applications which will require unique programs."

COMMENT:

This recommendation apparently is a modification of duplication of II-58.

Action is already under way to accomplish the intent of this recommendation in the consideration being given to the GIMS package. The acquisition of this package with the modifications under consideration is of vital importance to the SIPS Program. I agree that the Agency should take maximum advantage of whatever versatility this package has to offer and that reasonable modifications should be made

DDS&T

III. 33. Agree. We recognize the growing interest in graphics and on-line capabilities of all kinds. A considerable amount of OCS development effort is going into such requirements.

II,58 6.

III,34

We recommend that the Information Processing Board assure the acquisition, development and use of general data management systems which are sufficiently close to the general design requirements for Agency data processing applications to permit their adaptation and use for a wide range of data processing applications and data processing centers. The acquisition of such systems should be coordinated with the major users of OCS and with each of the components who have their own data processing centers, i.e., NPIC and CRS.

DDS&T

III. 34. Agree; the recommendation, in essence, will be accomplished with the procurement of GIMS. OCS, per se, does not see the need for special authority to establish each system it selects as an Agency standard. Most users are reasonable people and will accept any standard system that will meet their needs.

to extend its utility to other users in addition to SIPS. The decision of whether or not to acquire the CIMS package should not, however, be conditional upon its adaptability to all of the requirements which may be surfaced for general data management systems. We should avoid encumbrances which might cause these systems to sink of their own weight. We should also avoid shaping our production and information processing systems to fit software packages and thereby distort the purposes the information processing systems themselves are intended to serve. We should acquire software packages to serve the maximum number of requirements; we should not alter the requirements simply for the purpose of acquiring a minimum number of software packages.

"No. 35. A single, integrated, interactive services system to provide on-line service for intelligence production components at Headquarters should be the Agency near-term objective."

COMMENT:

The recommendation clearly is couched in terms reflective of the scope of the ASPIN study. If it is to be interpreted in an Agency context, it is open to the inference that a separate interactive services system will be provided to meet requirements of Support Information Processing Systems and other systems which do not fit within the constraints of the phrase "intelligence production components at Headquarters". The security concerns of sharing interactive services among community and Agency proprietary systems suggest that separate interactive services systems may not be such a bad idea.

Clearly the intent of the recommendation is to consolidate resources and avoid the development of interactive services systems in every computer center of the Agency. I agree with that intent but to accept the language of the recommendation literally would be much too constrained, even as a near-term objective.

I may not understand all of the nuances, but I'm not sure this recommendation is entirely consistent with II-58, and III-34.

III,35
4

We recommend a single, integrated, interactive system to serve intelligence production components at headquarters.

DDS&T

III. 35. The recommendation is not clear. Is it suggesting that the OCS interactive system be moved to the DDI? Is it suggesting that OCS set up one system exclusively for intelligence production components and others presumably for intelligence collectors (OSP, OEL, OSA) and support components? We don't feel that systems in OCS should be dedicated to a type of user such as "intelligence production components".

Part IV - A Central Reference System
Pages IV. 11-12

"No. 35. We recommend that: the Central Reference Service be established as the point of contact for any general request for intelligence information from outside the Agency or from within where there is no immediate known point where the information needed is available."

NO COMMENT

"No. 36. Only those data which are generated and accessioned by the Reference Center be provided as a direct response by the Center and that all other data are sought first from another center in the Agency which may have resources to respond."

NO COMMENT

"No. 37. Work underway on an automated dissemination system should be maintained and each distribution point to be employed in the initial system test should be directed to cooperate with CRS in providing carefully constructed 'dictionary' terms to try to guide this system. The work should be recognized as experimental at this stage, but it should be widely encouraged for its long-term prospects."

COMMENT: See No. 38 immediately below.

"No. 38. Planning for undertaking an extension of the automated dissemination system from SI input to all State, Defense and Agency positive intelligence information received in machine language should be undertaken coincident with the beginning of feasibility testing."

COMMENT:

Members of the Information Processing Board have heard separate briefings about the automated dissemination system being developed by CRS and the automated communications terminal (ACT) being developed by the Cable Secretary and the Office of Communications. It is possible to come away from these briefings satisfied that they each serve the purposes of their separate systems which makes it legitimate for them to be developed and exist independently. Nevertheless, one has the

IV,35 13. IV 42, 34, 39, 40 *(b) the Central Reference Service be the point of contact for any general request for intelligence information from outside the Agency or from within where there is no known point where the information is available.*

IV,36 13. IV 42, 35, 39, 40 *(c) only those data which are generated and accessioned by CRS be provided as a direct response and that all other data be sought from the appropriate center.*

IV,37 16. *We recommend that the experimental work under way on an automated dissemination system be maintained and each distribution point be urged to cooperate with CRS in providing "dictionary" terms for the system.*

IV,38 16, *We also recommend that planning for undertaking an extension of the automated dissemination system to all State, Defense and Agency positive intelligence information received in machine language be undertaken coincident with the beginning of feasibility testing of the present experimental system.*

DDS&T IV. 37. Agree. Work on automated dissemination should be continued.

nagging suspicion that their independence is more a reflection of organizational structure than it is a functional distinction. Briefings, no matter how complete or competently staged, are not adequate to permit judgements to be made about whether one or the other of these systems could serve both interests, or each should exist in its own environment. Unfortunately the Information Processing Board does not have at its disposal resources necessary to investigate situations of this kind in enough depth with disinterested objectivity to present the Information Processing Board or the Executive Director-Comptroller with the analytical detail necessary to permit judgements to be made. Such a capability is needed if the Board is to perform adequately even the limited role which has presently been carved out for it. Meanwhile, perhaps yet another study group needs to be launched to review the total communications, dissemination, ADP structure to provide a comprehensive picture of the system and develop possible approaches to its improvement.

"No. 39. The present concept of CRS indexing should be continued, and a systematic effort taken to facilitate indexing input from the substantive analyst and to encourage such input to the system."

COMMENT: See below.

"No. 40. The Central Reference Service should seek as a general objective a standarized document reference number which can be put on the intelligence information document before it is disseminated. This reference number should be capable of being generated and included in the format of any automated dissemination system, and should become a part of that system as quickly as possible. It should be made an Agency standard immediately and expanded into a community standard eventually."

COMMENT: See below.

"No. 41. The concept and scope of document indexing by a reference center should be developed by a top management decision. Established at a lower level, it results either in extensive duplication effort or in abandonement of control over the use of intelligence documentation. Document index processing has, however, been customized by each processing organization which supports an individual or organization reference activity."

COMMENT: See below.

It is also recommended that:

IV,39 13. IV 42,35,36,40

(a) the present concept of CRS indexing be continued, and a systematic effort undertaken to encourage indexing input from the substantive analyst.

IV,40 13 IV 42,35,36,39.

(b) the Central Reference Service seek as a general objective a standardized document reference number which can be put on the intelligence information document before it is disseminated. This reference number should be capable of being generated and included in the format of any automated dissemination system, and should become a part of that system as quickly as possible.

IV. 40. Agree. Standardization of document reference numbers is a useful goal. DDS&T

"No. 42. The Central Reference Service should create a personnel-area-subject index to other organized collections of information in the Agency. This index should include both personnel and organizational collections of information and authorization points for control of access to the respective collections. This index is an important and complex system which must be carefully defined, coordinated and implemented. CRS should be assigned responsibility for design and development of the system but they must have the full cooperation of all other offices and directorates. Development of such a system would pose an excellent test of the Information Processing Board."

COMMENT: See below.

"No. 43. The present method of document storage and retrieval is acceptable and should be maintained. It provides speed when it is genuinely needed and is far more economical than any system of electronic storage or video storage that we have encountered. We believe that the Agency should continue to experiment with a limited number of applications in which documents are created, stored, and searched retrospectively in an electronic format, because development of an on-line document index will almost certainly require a simultaneous improvement in the speed of delivery of documents."

COMMENT: See below.

"No. 44. An extensive interactive (man-machine-data base) capability with the Central Reference Service intelligence document index should be developed and tested as quickly as feasible. This is one of the few large data bases in which we think there is both wide interest and frequent use. Indeed we are told by analysts that the principle limitation on their use of the system is its slow response time."

COMMENT:

I have no competence which would permit me to comment about recommendations 39 through 44 in the context of the systems to which they are addressed. Documents are records, however, which eventually will become inactive and some significant fraction of them will require storage in the Records Center. Many of them, presumably, will be worthy of permanent retention and should be identified for archival storage and preservation. While indexing and retrieval systems should not necessarily be designed specifically with long-term storage and retrieval from a remote location as constraints upon the systems, the notion of long-term retention and disposal schedules as well as the requirement for manual retrieval from a remote location should be kept

We recommend that:

IV,42 13. IV 35, 36, 39, 40.

(a) the Central Reference Service create a personnel-area-subject directory of other organized collections of information in the Agency. This directory should include both personal and organizational collections of information and authorization points for control of access to the respective collections.

IV,43 14.

We recommend that the Agency continue to experiment with a limited number of applications in which documents are stored and searched retrospectively in an electronic full text format.

DDS&T

IV. 43. Agree.

IV,44 15.

We recommend that an extensive interactive (man - machine - data base) capability with the Central Reference Services intelligence document index be developed and tested as quickly as feasible. This is one of the few large data bases in which there is potentially wide interest, frequent use and a requirement for precise, quick responses. (AEGIS)

DDS&T

IV. 44. Agree, assuming that cost figures are developed to determine which method is the most economic way of overcoming the potentially slow response time limitation of CRS on-line document index processing.

in mind. Systems which permit storage in other than hard copy form are of vital interest to the Records Management Programs of the Agency.

Part V - Research and Development (R&D) in Information Processing
Pages V. 5-6

"No. 14. We recommend that the DDS&T review the division of effort between ORD and OCS in the area of information processing research and development against an alternative allocation of function and effort which would:

a. Provide for the subsequent problem definition and computer application design and development effort to be moved from ORD to OCS.

b. Provide for the transfer of essentially standard computer processing equipment from ORD to OCS and for OCS to provide a level of experimental or developmental computer processing time necessary to support the expanded experimental function outlined above. We would for example urge that processing time might be made available on machines appropriate to the work involved rather than on a single machine which is used only for experimental work.

c. Provide for the transfer of other equipment from the IPRD Laboratory to those surviving or anticipated development programs which may use it most effectively, the rest to be transferred to surplus.

d. Provide for a review of existing ORD contracts through the Information Processing Board and selected prospective users to determine which of those contracts should be continued and under whose leadership they should proceed.

e. Provide that subsequent ADP equipment or software test and analysis be conducted by OCS except where the items are a direct adjunct of a special processing center such as NPIC. The special unit would procure and test the latter product.

V,14 16. *We recommend that the DD/S&T review the present division of effort between ORD and OCS in the area of information processing research and development against an alternative allocation of functional and effort which would provide for:*

(a) the transfer of the responsibility for

DDS&T V. 14. The subject of IPRD is under management review in the DD/S&T at this time.

processing equipment from ORD to OCS;

(c) subsequent ADP equipment or software test and analysis to be conducted by OCS except where the items are a direct adjunct of a special processing center such as NPIC; and,

(d) OCS to issue a current publication to announce new activities, new products, and new developments which its research and development component considers of general interest for Agency components engaged in information processing.

DDS&T V. 15. This recommendation may represent a popular, intuitive judgment on the value of a community-wide R & D Center, but a more substantial treatment of the R & D Subcommittee's proposal is needed. Such proposals have, however, come to little in other fields in the past.

we believe demonstrate both the difficulty of an integrated community activity and the impracticality of performing research and development divorced from both computer operating centers and ADP users.

V,16 *Finally we recommend that research and development projects or programs in the area of information processing be submitted to the same scrutiny as required for regular ADP projects.*

f. Provide for OCS to issue a current awareness publication similar to its present Tech Notes to announce new activities, new products, and new developments which its research and development component considers of general interest for Agency components engaged in information processing.

COMMENT: None.

"No. 15. In addition we recommend that the DDS&T and the Information Processing Board reject the proposal of the R&D Subcommittee of the USIB Information Handling Committee which proposes a community-wide R&D Center on the basis of the recent experience with COINS and the IPRD which we believe demonstrated both the difficulty of an integrated community activity and the impracticality of performing research and development on non-existent or badly defined requirements."

COMMENT: Concur.

"No. 16. Finally we recommend that research and development projects or programs in the area of information processing be submitted to the same scrutiny as that proposed for ADP projects in the section below dealing with management."

COMMENT:

Concur subject to the comments offered about the recommendations dealing with management.

V. 16. The question, "Why treat ADP R & D differently than other R & D?", needs to be answered. DDS&T

SECRET

Part VI - Organizational and Management Elements of Automatic Data Processing

Page VI. 10-11

"No. 26. We recommend that: the Agency reassert a policy of providing a high degree of centralization in data processing activity in the Office of Computer Services, that this policy be tempered by permitting the acquisition of small or medium computer processers by functional organizations where there is a demonstrable-computational economy in using a stand-alone computer system, and that this policy continue the present emphasis on the functional component (user) responsibility for problem definition and problem solution. In short, we recommend that computer organizations develop the systems necessary to run the computers and run them, and that functional production people prepare the data and the processing steps required for its transformation by computer."

COMMENT:

I see no particular need for a reassertion of this policy from the Support Directorate point of view. We have no particular problem with the intent of the recommendation, on the other hand, as long as the Office of Computer Services is able to retain the capability to satisfy the requirements that we may levy upon it. If the other recommendations of the ASPIN Report are to be taken seriously, however, something more than a simple reassertion of policy is required. At this point in my review of the ASPIN study I am not able to identify what that "something more" is.

Someone has to find a way of looking at the ASPIN recommendations in the aggregate. Too many of them are inter-related and interdependent to permit prudent action to be taken on any of them separately. II.58, II.63, III.34, III.35, and perhaps others should be considered together; II.59, III.31, III.32, V.14, V.16, VI.27, VI.30, perhaps II.64, and possibly others should be considered together; conceivably IV.37 and IV.38 should be included in the latter group as well. I haven't re-examined the recommendations as carefully as I should to assert positively that this suggested grouping of them should hold. This is a part of the difficulty. The ASPIN study requires too much study. Not many of us are going to be able to give it as much study as it requires. I have already spent more time on it than I feel it should have required and I am still uneasy about it because my comments deal with individual recommendations and they might change in the aggregate if I were to take the time to consider the recommendations that way.

SECRET

VI,26

22.

We recommend that the Agency establish a policy which provides a high degree of centralization in data processing activity in the Office of Computer Services, but which permits the acquisition of small or medium computer processors by other offices where there is a demonstrable economy in using a stand-alone computer system.

VI. 26. Agree, greater centralization of data processing activities is desirable especially for standards setting, purchase of equipment, and personnel. How this is done organizationally and functionally is a matter requiring additional management discussion.

DDS&T

"No. 27. A central technical management review of major ADP projects be created under the present umbrella of Executive Director-Comptroller responsibility for Agency ADP management, that a full-time position of ADP advisor to the Executive Director-Comptroller be created for an experienced ADP professional whose responsibility would be to:

a. Advise the Executive Director-Comptroller on all professional/technical matters relating to ADP;

b. Be Chairman of the IP Board and the Director of its permanent staff;

c. Review the various local plans, provide technical input and, periodically, develop a statement of long-term ADP objectives for the Agency;

d. Assign computer application design proposals to the suitable functional/technical review components;

e. Prepare Agency-wide ADP technical standards;

f. Serve as Chairman of the Agency-wide ADP Career Service Board;

g. Serve as focal point for internal leadership and for external relations in ADP/professional matters."

COMMENT:

It is interesting that the notion of a permanent staff is buried as a subordinate clause in paragraph b. above and that it is considered to be a permanent staff of the Information Processing Board. I realize that this was written before the nomenclature in OPPB changed to eliminate the term "Information Processing Staff" and leave the IP&E Team to perform something of a dual role, but even before that change was made the Information Processing Staff was considered to be an OPPB unit rather than a supporting arm of the Information Processing Board. I have some difficulty conceptually with the idea of the IP&E Team performing a dual role but that concern is not directly germane to discussion of this ASPIN recommendation. What is germane is the opinion that the responsibilities identified for the ADP advisor are more than a full-time job for one man, and probably more than a part-time job for the IP&E Team. It is also my opinion that fulfillment of the responsibilities prescribed calls for a role going far beyond the role of advisor.

VI, 27

21.

VI 28, IV 41, VI 32

We recommend that a central technical management review of major ADP projects be created under the present umbrella of Executive Director-Comptroller responsibility for Agency ADP management and that a full-time position of ADP Advisor to the Executive Director-Comptroller be created for an experienced ADP professional whose responsibility it would be to:

(a) advise the Executive Director-Comptroller on all professional/technical matters relating to ADP;

(b) be chairman of the IPB and the director of its permanent staff;

21

VI, 28.3)

VI 27, IV 41, VI 32

(c) review the various local plans, provide technical input to the IPB and, periodically, develop a statement of long-term ADP objectives for the Agency;

(d) assure that computer application design proposals are given adequate review by a central technical review panel;

IV, 41 21

(e) prepare Agency-wide ADP technical standards;

(f) serve as chairman of the Agency-wide ADP Career Service Board; and

(g) serve as focal point for internal leadership and for external relations in ADP technical/professional matters.

VI, 32 21

We also recommend that the Director/OCS be an ex officio participant on the Information Processing Board and that the DD/S&T be represented on the Board by an individual who reflects the computer user population of the whole Directorate.

SECRET

VI. 27. Disagree strongly. The Office of the Executive Director-Comptroller is not the place for "technical management review" which is a proper function of the Directorates. Any technical advisor to the Executive Director-Comptroller should be actively engaged in the ADP business; otherwise he will lose his technical ability in short order. The job suggested is a staff one: how can he expect to manage ADP personnel as a staff officer even if designated as chairman of a career service -- or for that matter how could any computer center or office permit this sort of assumption of line management by staff? The proposal of this recommendation effectively aims at the perversion of management functions and the creation of a permanent empire.

DOS 47

The responsibilities suggested for the ADP advisor taken together with the functions recommended throughout the report to be performed by the Information Processing Board clearly suggest the need for an Information Processing Staff at the level of the Executive Director-Comptroller. Moreover, membership on the Board will become a full-time task for each of the Directorates representatives.

Essentially I agree what there needs to be a small staff competence at the Agency level. Its role will have to be carefully drawn in terms of specific functions listed here and the more general functions suggested elsewhere in the report as tasks for the IPB. I wonder whether any of the recommendations can be acted upon until after this one has been dealt with.

"No. 28. Existing Central ADP planning be strengthened to provide:

a. For a more definitive outline of Agency objectives to be achieved in related or overlapping office plans and for regular revision and publication of the Agency ADP Plan;

b. For the definition and publication of Agency-wide ADP technical standards beyond the present work on nationwide (USASI) standards;

c. For a standard format and procedure for the proposal and review of major requests for the acquisition of computer systems or of computer processing applications."

COMMENT:

The idea of ADP planning in its own separate context has always been bothersome to me. ADP exists only to serve operational and management programs and planning for it should be carried out in the context of the programs it serves. We haven't found a way of doing that satisfactorily, but we haven't really tried. The Information Processing and Exploitation (IP&E) Program Category does not serve the purpose. Support information processing is split among the Communications Program Category, the Program Wide Category, and the

VI,28 JH

We recommend that the Information Processing Board provide for:

(a) a more definitive statement of Agency ADP objectives by regular revision and publication of the Agency ADP Plan;

VI,28 JH

(b) the definition and publication of Agency-wide ADP technical standards beyond the present work on nationwide (USASI) standards; and, (see II 6 J)

VI. 28. Agree. The concepts of "proposal and review" needs some "review" in itself. Why should the review of ADP equipment acquisition go beyond that for other R & D activities? DDS&T

IP&E Program Category. It only gets into the latter because the Office of Computer Services is included in that category and OCS provides computer support to the Support Directorate. We don't plan in CIA and we don't program, not really. We budget. We should plan and we should program but we should not delude ourselves into thinking we are doing something that we are not simply because we apply the terminology. We do not have an Agency ADP plan and we have never had one. The only viable objective we have had at the Agency level has been to control the growth of hardware. We need something a great deal better than that but it will take a great deal more time and a great deal more thought than anyone has yet been able to give it. Perhaps what we need as a start is a plan for a plan, but even that won't occur if it is left as a part-time effort of one or several people who have dozens of other things to do. We do need a definitive statement of Agency objectives.

Standard formats for the proposal and review of major requests for computer services may be useful tools but what we really need are some criteria for judging the content of proposals. The memorandum the Executive Director-Comptroller addressed to the Deputy Directors in October 1969 said that decisions to use ADP equipment should be based on a review of proposals in terms of utility, benefits, life expectancy, and relationship to other activities. It identified several bench marks for the review of proposals and it identified responsibilities to be charged to Directorate Information Processing Coordinators and the Information Processing Board. Nothing has been done in an Agency context toward the implementation of the provisions of that memorandum. We don't know to what extent individual directorates may have taken independent action toward its implementation within their own jurisdictions but the kinds of things which come before the Information Processing Board suggest that there may be some inconsistencies or differences in the approaches taken by each of the Directorates. We need some way of assuring that it is neither easier nor more difficult in one directorate than another to get approval of an ADP project and that the same criteria of importance, utility, benefits, etc. are applied in all of the Directorates. When we have these things, then we can develop formats and procedures to ensure their expeditious processing.

SECRET

"No. 29. A means of pricing data processing services performed by computer centers be developed, and that each user component be required to budget for its data processing services and transfer the funds to pay for these services in essentially the same way that property funds are handled."

COMMENT:

I have commented about proposals for costing data processing services in a separate context and will not belabor the point further here, except to say that I agree we should have some way of knowing what particular computer applications cost for consideration as a factor in considering whether the application should go forward or not. Before we dash madly into an elaborate pricing system we should have clearly in mind what we hope it will achieve. I do not believe that an elaborate system which would require the transfer of funds should be the objective, and while we can certainly learn something from the experience of the PRA (Property Requisitioning Authority) system I doubt very much that we will find it a useful pattern to be followed.

"No. 30. An Agency ADP career service be created."

COMMENT:

See earlier comment, Part III, Recommendation No. 32.

"No. 31. Existing ADP training programs introduce additional emphasis on the changing responsibility or role of the user in an on-line and/or real-time computer environment, and that functional organizations review the need for unit training of personnel in the use of quantitative and/or logical techniques in indigenous analytical problems."

COMMENT: Concur, but first we need some agreement among the Directorates about what the role of the user should be.

"No. 32. The Director/OCS be an ex officio participant on the Information Processing Board and that the DDS&T should be represented on the Board by an individual who reflects the computer user population of the whole Directorate. The presence of the Director/OCS on the Board is imperative, but we believe he should participate in his capacity as director of computer processing rather than as the representative of a directorate with large processing requirements."

SECRET

VI,29
13.

We recommend that a means of pricing data processing services performed by computer centers be developed, and that each user component be required to budget for its data processing services in essentially the same way that property funds are handled.

VI. 29. Disagree. The effect of this recommendation could be to diffuse the resources being programmed for ADP services so that they appear as a lot of line items for various user components. This would make for less top management control and focus on ADP expenditures. This seems to be the opposite effect from that which is desired. We should properly cost data processing services and make sure they are reviewed regularly by the user before moving to the step of having all users budget for ADP services. If this fails, the budgeting will probably be the simplest way to force priorities on managers.

DDS&T

VI. 30. The career service matter is a low priority issue. In any case it would tend to be incestuous or cannibalistic as its members feed on themselves without outside influence from other professions.

DDS&T

25. Finally ADP career development and training should be strengthened.

We recommend:

VI,30
25.

(a) an Agency ADP Career Service;

VI,31
25.

(b) ADP training programs with additional emphasis on the role of the user in an on-line and/or real-time computer environment; and,

VI,31
25.

(c) more widespread development of office level training in the use of ADP in intelligence production and information processing.

VI. 31. Agree. The users' understanding of system analysis and the on-line environment needs strengthening.

DDS&T

VI. 32. This recommendation has already been discussed by the Chairman of the IP Board with the Director of OCS. The Director of OCS should also be Technical Advisor to the Board.

DDS&T

COMMENT:

The Information Processing Board has already addressed this recommendation.

25X1A [redacted]
Chief, Support Services Staff

DDS/SSS/RHW:hrf (14 October 1970)

Distribution:
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1-SSS Subject
1-SSS Chrono

ASPEN DECISION MATRIX

RECOMMENDATIONS		CONCURRENCE	NONCONCURRENCE	INCONCLUSIVE	COMMENTS
2. (II, 51)	Improve Programmer - User Communications.	DD/I*, DD/P* DD/S, DD/S&T		~~DD/S, DD/S&T~~	DD/S and DD/S&T question means of achievement.
3. (II, 52)	Strengthen OCS Time-Sharing.	DD/P*, DD/I*, ~~DD/S&T~~		DD/S	
4. (III, 33)	Single Interactive System (OCS).	DD/P*	DD/I, DD/S,	DD/S&T	DD/S&T opposed to limiting such systems to a single function (e.g., intel. prod.).
5./6. (II, 58 - III, 34)	Acquire general data management packages.	DD/P*, DD/I*, DD/S&T		DD/S	DD/S concurs in principle on III, 34, does not concur on II, 58 (IPB as decision making forum on general data management systems).
7. (II, 62)	Acquire general data management package for large files (AEGIS, etc.).	DD/P* - DD/S&T		DD/S, DD/I	
8. (II, 53)	Special programs for unique needs.	DD/P*, DD/I, DD/S DD/S&T			DD/S questions role of IPB in such decisions.
9. (III, 32)	Assign OCS Programmers to User components.	DD/P*, DD/S, DD/I*	DD/S&T		
(II, 61)	Formal effort at ADP innovation.	DD/P*, DD/S, DD/I*, DD/S&T			
10. (II, 57)	Collectors to coordinate with processors and users.	DD/P*, DD/I*, DD/S, DD/S&T			DD/S&T and DD/S agree in principle but see no requirement to formalize coordination.
11. (II, 64)	Evaluate COINS ASAP	DD/P*, DD/I*, DD/S&T, DD/S			

*No comment--Concurrence assumed.

	RECOMMENDATIONS		CONCURRENCE	NONCONCURRENCE	INCONCLUSIVE	COMMENTS
12.	(III, 33)	Develop computer graphics.	DD/P*, DD/I*, DD/S&T		DD/S	
13.	(IV, 42)	CRS to serve as directory to all CIA files.	DD/P*, DD/I		DD/S, DD/S&T	DD/S and DD/S&T did not comment except for IV, 42 where DD/S&T concurred.
	(IV, 35)	CRS point of contact for external requests.	DD/P*, DD/I		DD/S, DD/S&T	
	(IV, 36)	CRS to service only from own files.	DD/P*, DD/I*		DD/S, DD/S&T	
	(IV, 39)	Continue shallow indexing in CRS; User indexing encouraged.	DD/P*, DD/I*		DD/S, DD/S&T	
	(IV, 40)	Standard document number system	DD/P*, DD/S&T, DD/I*		DD/S	
14.	(IV, 43)	Continue RSM experiment.	DD/P*, DD/S&T, DD/I*		DD/S	DD/S did not comment on IV, 43.
15.	(IV, 44)	Put AEGIS on line.	DD/P*, DD/I*, DD/S&T		DD/S	
16.	(IV, 37)	Support automatic dissemination.	DD/P*, DD/I*, DD/S&T		DD/S	
	(IV, 38)	Expand automatic dissemination.	DD/P*, DD/I*		DD/S, DD/S&T	
17./18.	(III, 30)	OCS coordinate changes with user.	DD/P*, DD/I*, DD/S&T		DD/S	
19./20.	(III, 31)	Improve OCS Procedures Manual.	DD/P*, DD/I, DD/S&T		DD/S	

*No comment--Concurrence assumed.

	RECOMMENDATION	CONCURRENCE	NONCONCURRENCE	INCONCLUSIVE	COMMENTS
21. (VI, 27)	ADP Advisor to ExDir-Compt.	DD/P, DD/S	DD/S&T, DD/I		
(VI, 32)	OCS Ex officio on IPB.	DD/P*, DD/S, DD/S&T DD/I*			
22. (VI, 26)	Centralize most computer in OCS.	DD/S, DD/S&T	DD/P, DD/I		
23. (VI, 29)	User budgeting for ADP.		DD/I, DD/S&T, DD/P, DD/S		DD/I supports status quo and will match future technical developments.
24. (VI, 28)	Develop ADP objectives and plan.	DD/I*, DD/S&T, DD/P*		DD/S	DD/S sees need for ADP objectives but cannot see relevance of an overall ADP plan divorced from the functions served.
(II, 65)	Technical and data standards.	DD/P*, DD/I*		DD/S, DD/S&T	DD/S&T did not comment re II, 65.
25. (VI, 30)	Career Service.	DD/S	DD/I, DD/S&T, DD/P		
(VI, 31)	Develop Training.	DD/S, DD/S&T, DD/I*, DD/P*			
26. (V, 14)	Transfer IPRD functions-assets to OCS.	DD/I*, DD/P*		DD/S, DD/S&T	
(V, 15)	Reject Community R&D Center.	DD/S, DD/I*, DD/P*		DD/S&T	
(V, 16)	Same management control for R&D as other projects.	DD/S, DD/I*, DD/P*		DD/S&T	

*No comment-Concurrence assumed.

9 October 1970

ASPIN - OFFICE CONCLUSIONS & RECOMMENDATIONS

1. FOREIGN MISSILE & SPACE ANALYSIS CENTER (FMSAC)

The comprehensive ADP needs of FMSAC for its intelligence production require daily consultation and support from the Office of Computer Services (OCS). The most burdensome aspect of ADP involves the continuous redevelopment of FMSAC intelligence production computer programs for operation under the changing OCS data processing environment.

We recommend that:

(a) coordination between OCS and FMSAC be expanded when changes in OCS digital computer equipment, systems, and/or operating procedures are to be implemented.

(b) OCS efforts be extended to obtain and/or evaluate a general purpose data management system for Agency use and to support FMSAC's Information System requirements.

(c) experimentation with use of ADP for intelligence production be continued (e.g., generate the FMSAC quarterly reports of analyses on foreign missile and space events from the new comprehensive Information System).

(d) capabilities be expanded to improve data processing of current information receipts, to economically process peak loadings of information, and to process a growing volume of foreign missile and space information.

2. OFFICE OF ELINT (OEL)

We believe that the development of advanced ELINT processing systems is essential. Better coordination of OEL and its contractors with OCS systems analysis efforts seems to be needed to support both the OEL processing and

the OEL collection activities. The techniques involved have many attributes in common and can, in many instances, be solved by common techniques.

We recommend that:

(a) a technical review panel be established in OEL to review past, existing and proposed analysis programs and projects to determine their relative effectiveness, relationship to each other and to other work being done on signal analysis and that the panel include representatives from the other organizations involved in signal processing, and, possibly, an outside contractor.

(b) personnel be provided to Analysis Division/OEL to permit it to undertake internally the conceptual and detailed design of the processing interface to OEL collection systems presently performed under contract.

3. OFFICE OF SCIENTIFIC INTELLIGENCE (OSI)

OSI's cautious approach to ADP seems proper. In solving calculations that would be impossible because of their complexity or number of interactions, OSI has been successful and these efforts seem to be evolving satisfactorily. The recent addition of remote terminals in an on-line system will particularly facilitate program development and test as well as interactive running of computational programs. In general OSI's computer usage is growing steadily as more personnel become familiar with it, and more equipment becomes available.

The area that seems to hold promise for the greatest improvement is in data indexing, storage, and retrieval, (ISR), but there appears to be no single high-priority OSI intelligence problem that would justify an ISR research effort by itself.

We recommend that:

(a) OSI support strongly, with money and manpower if needed, promising research and development efforts in the following areas:

SECRET

(1) Automated dissemination of information along the lines being pursued in CRS;

(2) Converting incoming hard copy and personal research files to machine readable form; and,

(3) Retaining and exploiting information in machine readable form.

(b) OSI train its own personnel in ADP so that they may better adapt this technology to the analytical and operational problems of the office. This training should cover both interactive services and batch processing.

4. CENTRAL REFERENCE SERVICE (CRS)

Computers are making significant contributions to the information handling aspects of CRS' mission and their contributions can be expected to improve further. A centralized document storage and retrieval system is essential to the Agency and also provides valuable service to other agencies in the intelligence community. The automated subject retrieval system (AEGIS) has improved overall response to users, and further improvements are possible. A survey of potential users, however, revealed many with little or no knowledge of the capabilities and usefulness of CRS machine systems. Automation also promises to improve the quality of CRS' dissemination services.

We recommend that:

(a) efforts be continued to extend the on-line remote query capability within CRS to improve the quality and timeliness of responses;

(b) more user participation be encouraged in determining AEGIS data base coverage and indexing policy;

(c) the availability of AEGIS and other CRS services be publicized more widely and effectively;

(d) CRS analysts be made more intimately aware of users' needs through training and tours of duty in user offices;

(e) the possibilities of expanding the use of computers to support CRS' biographic, installations and photographic functions be investigated, in particular, the possibility of extending the ability to build and maintain special files on-line; and,

(f) the development of the automatic dissemination system be continued.

STATSPE

[redacted]

STATSPEC

[redacted]

6. OFFICE OF BASIC & GEOGRAPHIC INTELLIGENCE (OBGI)

OBGI is engaged in an active ADP program which, at present, is largely oriented toward the cartographic responsibilities of the Office. ADP support for geographic research and NIS production is essentially experimental.

We recommend that:

(a) development of the AUTOMAP system continue. The pace of development should be guided by the availability of resources and by the capacity of the cartographers to absorb extensions of the system into their day-to-day operations.

(b) Experimentation with techniques of statistical and numerical analysis be encouraged. Newer collection activities are yielding more numerically manipulatable information related to OBGI's interests, and the number of potential production computer applications is increasing.

7. OFFICE OF CURRENT INTELLIGENCE (OCI)

The manual files maintained in OCI are adequate for most of the Office's requirements. Except for a few situation-oriented retrieval problems there is little felt need for ADP support for information storage and retrieval. The need for ADP computational capability is small--currently limited to Bayesian probability calculations. Although text processing routines promise ultimately great power to manipulate information, they are currently too primitive and take too much computer and analyst time to be cost effective.

No recommendations.

8. OFFICE OF ECONOMIC INTELLIGENCE (OER)

Most of OER's ADP applications originated to relieve analysts of the burdens of extensive manual calculation and to permit the use of sophisticated mathematical-economic models in analysis of intelligence problems. Most applications of this type have been demonstrably cost effective. The relatively few file management applications in OER's inventory of ADP applications suggests that there is substantial room for growth in this area. Indeed, several analysts specifically mentioned that the "record keeping" behind their ADP applications might be automated. Small file management applications can build from the lessons of the successful CHILEC and COMPIN projects: carefully selected subsets of existing systems were redesigned for the specific applications.

We recommend that:

(a) OER continue to develop and improve its scientific calculation capabilities by providing more powerful scientific subroutine packages, by training OER analysts in the use of these packages and basic programming techniques, by providing on-line access, and by developing staff professionals to assist in the initiation and maintenance of ADP applications.

(b) OER move toward developing banks of raw, unevaluated intelligence data maintained at the branch level and repositories of finished, evaluated intelligence data maintained at the Office level. These sources would provide data for inter-country studies and for current intelligence support.

9. OFFICE OF STRATEGIC RESEARCH (OSR)

OSR has numerous and varied ADP applications which are demonstrably cost effective. Indeed, some of the most important analyses accomplished by the Office would be prohibitively expensive if done manually making machine-assistance essential to the Office's mission. The most ambitious ADP application currently under development is QUIKTRAK. While the basic QUIKTRAK concept is sound, programming design and subroutine structures may be less

easily modified than is desirable and input costs may turn out to be significantly higher than anticipated originally.

QUIKTRAK files have been too limited thus far to test the system on live problems. Moreover, there is no plan for a controlled test or evaluation to measure the effectiveness of the application and to determine detailed requirements for expansion and/or modification.

We recommend that a controlled test be conducted to measure the effectiveness of QUIKTRAK and to determine the detailed requirements for expansion and/or modification.

10. NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER (NPIC)

NPIC currently has its full share of problems in the ADP field. It is expected, however, that when the Integrated Information System (IIS) becomes operational (scheduled during second quarter of FY 1971) most, if not all, of these problems will be alleviated and/or solved. This is not to say that NPIC should then set back and be satisfied with its ADP posture. Rather, as soon as possible, after declaring the IIS operational, NPIC should devote a continuous effort to expand, improve, and update the system.

We recommend that:

(a) Both FORTRAN and COBOL programming capabilities be provided at upwards of 100 terminal devices to NPIC professionals throughout the Center. Such capabilities will permit the computers to help solve specific problems encountered by these personnel in their particular areas of professional expertise.

(b) Efforts to develop a capability to search [illegible] of documents be continued.

(c) ADP support to the research, development, and engineering work of NPIC be expanded. In the past, little such support was possible because of the priority need to develop and implement the IIS.

(d) Emphasis be continued on the need to improve the job priority structure, to optimize the utilization of random-access mass storage, and to seek a better method for using the two central processors and associated core.

II. INFORMATION REQUIREMENTS STAFF (IRS)

IRS has undertaken a substantial effort to provide for frequent and general evaluation of intelligence information collection systems. Only an automated system is likely to contain the scope and flexibility necessary to exploit these data extensively on a cost-effective basis.

We recommend that the data being obtained in an attempt to evaluate intelligence collection activities be recorded in machine readable form and a program be developed for its analysis.

25X1A

TRANSMITTAL SLIP | DATE

TO: Mr. [redacted]

ROOM NO. 710 | BUILDING Magazine

REMARKS:

FYI - per IP Boar discussion today.

25X1A

FROM: [redacted]

ROOM NO. 6E 0702 | BUILDING Hq | EXTENSION 4456

FORM NO. 241 REPLACES FORM 36-8 WHICH MAY BE USED. (47)

1 FEB 55

file ASPIN

IV. IMPACT ON THE SUPPORT DIRECTORATE

GENERAL

Part VI of the ASPIN Report should be read in its entirety by senior Support Directorate officials as its impact could be far-reaching if adopted by management. This section contains implications for virtually all offices within the Directorate.

25X1A

The [redacted] report on Organizational and Management Aspects of ADP in the Agency should also be reviewed.

ASPIN has recommended strongly that the research conducted by ORD/An in the field of Automatic Data Processing be brought under the cognizance of OCS; that all outstanding contracts being sponsored or monitored by ORD/An be reviewed by the IPB; that the hardware resources of ORD/An be transferred to other ADP components or be declared surplus; that ADP development projects be given the same scrutiny and review that has been established for major equipment and software acquisitions. This recommendation will have some impact on the Office of Logistics if adopted.

The ASPIN Report recommends that Applications Programmers be assigned to tours of duty with customer components much in the same way that Security Officers, Logistics [illegible]s and Communicators are assigned to customer elements. If accepted, this recommendation could prove a considerable boon to DD/S offices as these programmers would serve in the offices concerned and would report to the office heads rather than to OCS. Under this scheme the Applications Programmers would tend to become thoroughly familiar with the problems of the offices to which assigned and be able to present solutions to problems more cogently and comprehensively by virtue of being "involved" to a greater degree. Being responsive to the "customer" will, we feel, make the programming effort more viable over the long haul in addition to effecting better day-to-day solutions to intelligence problems.

Implicit in the ASPIN Report (at least to this writer) is the need to create another study group to review the entire information handling process within the agency, i.e., the receipt, control and distribution of all documentary material regardless of the means by which it is received. At this late date there does not appear to be any appreciable standardization in the field of information handling; each directorate and each office within the directorates has developed its own proprietary means of receiving, sorting, and distributing information. The DD/P has its RID, DD/S&T tasks FMSAC for some basic distribution of electrical materials, DD/I relies on CRS, OC has its RMB, OS has its own telecommunications network, OSA has a comprehensive telecommunications capability, etc. It would seem salutary to conduct a review of the total communications-dissemination-ADP

structure extant to provide management with a comprehensive picture of the system, possible approaches to its improvement and the elimination of duplication where indicated.

A great amount of material received by the Agency in "machine language" is reproduced as a document and subsequently reprocessed into "machine language" for storage, retrieval and manipulation in computer based files. It would appear that the time is upon us to study the somewhat amorphous relationships that exist between our electrical communications services, the several dissemination services and the automatic data processing activities of the agency. Such a study is particularly apt at this time in view of the work being done by CRS in the realm of automated dissemination and the joint efforts of OC, the Cable Secretariat and the Intelligence Watch with regard to the ACT Program.

SECURITY

By virtue of having sensitive operational files, administrative files, payroll records, name check files, TKH data, etc., resident in a computer based system which is connected to remote points via communications lines, a serious set of security considerations are raised. The resolution of the problems engendered by this situation becomes complex and involves a number of technical disciplines ranging from physical security precautions, through and including issuance of clearances, EMSEC, and the design of algorithms to prevent release of information to unauthorized persons. Security officers must become broadly aware of and personally involved in the data processing milieu. This is being done at present by training, by assignment of security personnel to the Office of Computer Services and by review of computer security problems within the community. Security and privacy in computer operations is an esoteric field and it would appear that the Office of Security will have to identify and develop personnel resources to cope with this continuing problem. I foresee the assignment of both OS personnel to OCS and OCS Applications Programmers or Systems Analysts to OS in order to arrive at meaningful solutions to the several problem areas extant.

LOGISTICS

STATSPEC The automation of certain [redacted] functions will have an impact on the Printing Services Division of the Office of Logistics. The study on the Office of Basic and Geographic Intelligence will also be of interest to the Printing Services Division as will

25X1A the [redacted] Report on Text Stream Processing.

FINANCE - BUDGET

OER experience in the use of the proprietary program package CROSSTABS should be of interest to Support Directorate personnel engaged in SIPS, financial accounting, payroll and budgeting.

COMMUNICATIONS

In addition to the comments made under the GENERAL heading, the following are of interest to the Office of Communications:

The implementation of the Integrated Information System at NPIC could result in a substantial technical engineering and installation workload for OC as the need for remote terminal devices connected to the system is felt.

25X1A The [redacted] report on Monitoring, File Processing and Computational Support to Missile and Space Related Systems will be of interest.

The study on the Office of ELINT should be reviewed by the Special Programs Division of the Office of Communications. Much of the work being conducted by the Office of ELINT in the realm of signal analysis and machine-aided collection systems is of direct interest to OC-SPD and a dialogue between these two elements should prove mutually beneficial.

SENDER WILL CHECK CLASSIFICATION TOP AND BOTTOM

UNCLASSIFIED | CONFIDENTIAL | SECRET

OFFICIAL ROUTING SLIP

TO	NAME AND ADDRESS	DATE	INITIALS
1	[redacted]	10/9/70	W
2	710 Magazine Bldg		
3			
4			
5			
6			

	ACTION		DIRECT REPLY		PREPARE REPLY
	APPROVAL		DISPATCH		RECOMMENDATION
	COMMENT		FILE		RETURN
	CONCURRENCE		INFORMATION		SIGNATURE

Remarks:

Bob,

h/w the bit I wrote on ASPIN impact on Support Directorate.

j

FOLD HERE TO RETURN TO SENDER

FROM: NAME, ADDRESS AND PHONE NO.	DATE
[redacted] -- SCD	

UNCLASSIFIED | CONFIDENTIAL | SECRET

FORM NO. 237 1-67 Use previous editions (40)

10 JUL 1970

MEMORANDUM FOR: Director, Project ASPIN

SUBJECT : ASPIN Draft Dated 7 July 1970

1. The Security Records and Communications Division is in general agreement with the content of the subject draft as it applies to the problems we have experienced. We, however, would like to take issue with the statement made on page 12 that the degradation of TSMON service bothered no one and therefore "perhaps measures the need for the service."

2. During the past year, the Office of Security has continually voiced its disapproval with the quality of interactive service received from OCS. We have registered our complaints through IPC channels and at almost every Computer Users Group Meeting. It is partially as a result of our complaints that OCS decided to move the SANCA file to the 360/65 at the cost of $90,000 per month, which perhaps better measures either the need for the service or the amount of complaining done by TSMON users or both.

3. The fact that Security was able to "retreat" to its manual files during periods when the system was useless prevented a potentially disasterous situation. Fortunately, the Office of Security anticipated the possible breakdown of remote terminal services and maintained its "hand-files" and it will continue to maintain this file until a reliable back-up computer system is provided.

[redacted] 25X1A

Chief, Security Records and
Communications Division

25X1A
cc: Mr. [redacted]

CONFIDENTIAL

Fele
ASPIN

MEMORANDUM FOR: Chief, ASPIN Staff

SUBJECT : Comments About Working ~~Graphs~~ DRAFTS for the ASPIN Report

Leo:

1. The papers you have circulated for comment deserve a more careful review and a more thoughtful response than it is possible to give in the time you have allowed. It may be useful to offer some preliminary observations with a more detailed response to follow.

2. I assume the papers you circulated 7 July are only part of the product you expect to produce and that you will have another chapter which will help the reader to relate the total product to the concept and terms of reference circulated with your memorandum of 28 May 1969. Some assessment and explanation of how you feel you have satisfied the objectives, where you think you may have fallen short, and how you were led beyond the original scope of the project would be helpful in evaluating the achievement and the product.

3. Support information processing systems are not intelligence production systems. We recognize, of course, that many of the support systems have characteristics similar to intelligence production systems. The GIM package to which you allude without using the acronym was, in fact, sought out, identified, and brought into the Agency at the initiative of the SIPS Task Force. Nevertheless, generalizations about the need for compatability, exchange of files and data, etc., do not apply to support systems in relation to intelligence production systems. Support systems should be excludad from this paper by definition which would apply to the whole report or general statements throughout the paper should be appropriately qualified.

CONFIDENTIAL

4. A few specific points for now:

a. To say that the Office of Security was not bothered by the difficulties of the interactive services system is an error in fact. Their patience should not be misinterpreted.

b. The proposal to include the Office of Communications in a Directorate of Information Processing would require a great deal of justification and rationalization; its inclusion in the proposal is not as self-explanatory as is implied by the casual mention.

c. Formats may be useful tools for submitting proposals but what we need are some criteria against which the content of the proposals can be evaluated.

d. Personnel management and career service concepts are mentioned and discussed at several points throughout the papers and I believe I have detected some inconsistencies among them but a more careful review will be required to identify them.

5. Unfortunately I have not been able to give your draft my undivided attention. I hope that these observations may be useful and I will follow them with more complete comments as soon as I can.

[redacted] 25X1A
Chief, Support Services Staff

DDS/SSS/RHW:rf (9 July 1970)

Distribution:
Orig. & 1-Addressee
1-SSS Subject
1-SSS Chrono

Delivered by hand 13 July 1970 - unsigned - Points were discussed and Jeanne agreed to accommodate most & thinks we will get another shot at this before it takes final form - [illegible] 24 July

DDC - Projects

MEMORANDUM

25X1A To: [redacted]

Case: 72277 Date: March 12, 1970 Page:

Subject: Computer Hardware and Software Trends

25X1A

One of the major areas in which [redacted] is expected to assist you involves projecting the costs, in both hardware and software, of various system alternatives. We recognize, with you, that this is a risky business, mainly because of the possibility of technological breakthrough. But the computer industry is mature now, and the number of such breakthroughs, at least in the time frame of interest to you, will likely not be large. In any case, it is preferable that the presumptions, no matter how shaky, on which system costing will be done should be explicit, and that any disagreements among us about the future of the technology should be surfaced.

25X1A The enclosed memorandum, which for the most part is a cutting and pasting of non-proprietry [redacted] projections, contains a good deal of reference detail which will be needed when we actually begin to cost out systems but which may be excessive for present purposes; it might be useful, as we have already discussed, if [redacted] met for a few hours with your staff to highlight the more important of the trends and their implications as he sees them. 25X1A

In any case, the memorandum is submitted with the humility required when making technological projections, and should be received only as the starting point for discussion. I would appreciate it very much if, in addition to comments from your staff, we could find out how well these projections square with what the various computer offices within your organization are projecting for internal planning purposes.

25X1A

From [redacted] Bldg./Room..... Ext.....

25X1A [redacted]

ADL 115-269

COMPUTER

HARDWARE AND SOFTWARE TRENDS

IN THE 1970'S

March 12, 1970

I. CENTRAL PROCESSORS & MAIN MEMORIES

[redacted]

A. INTRODUCTION

Future progress in central processor and memory technology promises to be no less impressive than the dramatic improvements occurring since 1955. Today's main frame equipment is typically 100-200 times more powerful than equipment first delivered in 1955. Prices for machines with power equal to that of their predecessors have been reduced by a factor of ten.

By 1980, the most powerful computers for general use will outperform today's large machines by factors of twenty to forty. Prices for medium to large multiprocessors will then be one-fifth to two-fifths of their current prices.

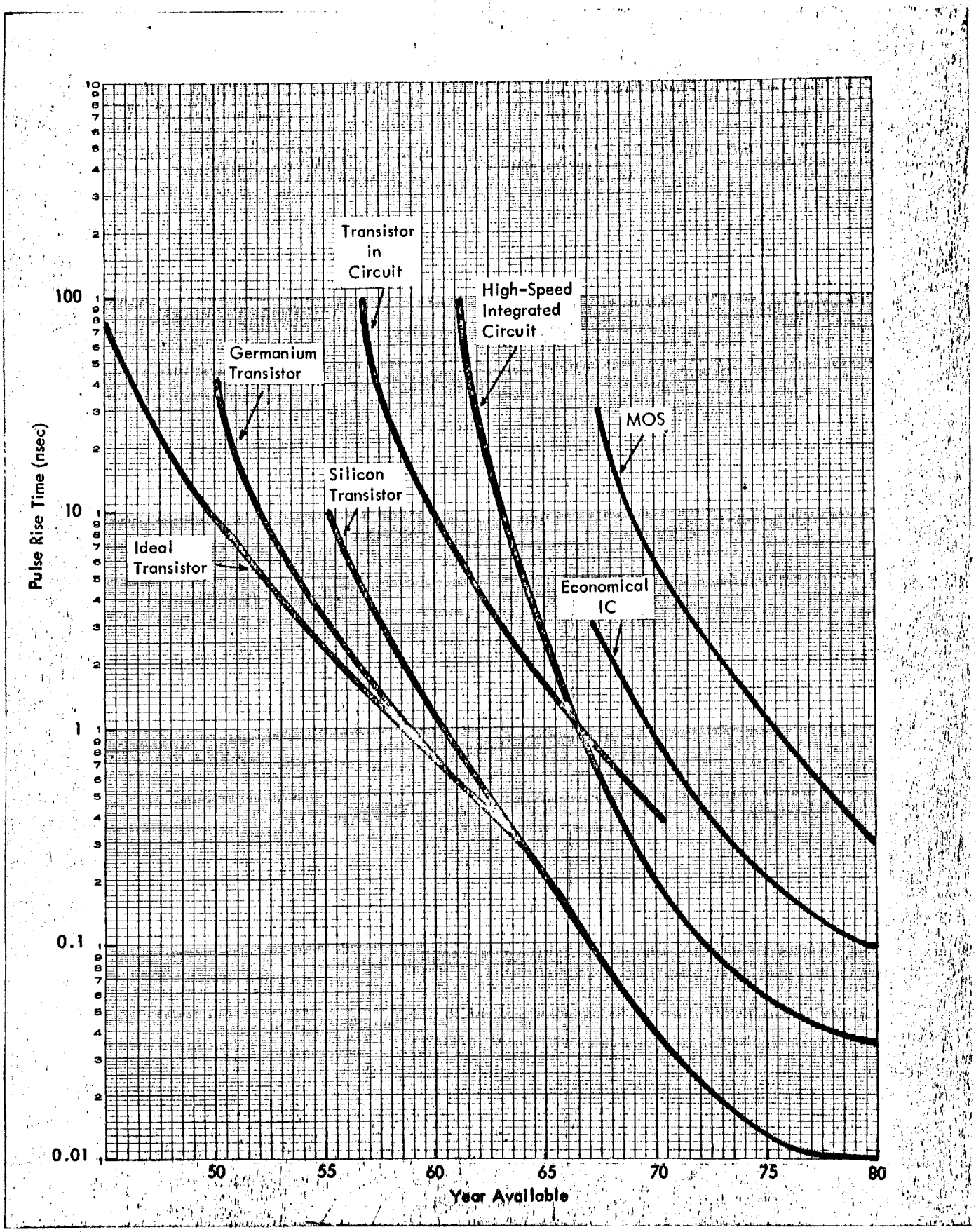
This rate of progress is clearly indicated by trends in several diverse, relatively new technologies: integrated circuits, Medium-Scale Integration (MSI), Large-Scale Integration (LSI), plated-wire memories, and thin-film memories. While perhaps not all of these technologies will succeed, it would be unreasonable to assume all will fail. At the same time, the physics of these new technologies preclude any abnormal breakthrough in computer performance and cost, beyond that already indicated. While some invention which would have an impact similar to that of the transistor or vacuum tube cannot be ruled out for the 1970's, its development should not be relied upon for system and financial planning. A reasonable basis for planning is to assume no significant departure from the trends and appreciable progress indicated by existing techniques.

B. PERFORMANCE TRENDS OF LOGIC CIRCUITS

We consider first the cost-performance of electronic logic circuits, since this underlies the capability of any computer system. Figure I - 1 summarizes both the history and the long-range forecast of our engineers in this area, showing curves relating the pulse rise time in nanoseconds for typical circuits to the year of availability. Germanium and silicon transistors are shown, both separately and in circuits, and compared with "ideal" transistors. It is apparent that the performance of the real devices (taken separately and not in circuits) has already approached that of the ideal transistor, and that it is still improving. Comparable curves are shown for MOS (metal oxide semiconductor) integrated circuits and for both economical and high speed versions of conventional integrated circuits. Evidently discrete components will continue indefinitely to offer higher performance than integrated components. It follows that the highest performance computers may continue to use

Figure I - 1

CIRCUIT PULSE RISE TIMES



discrete components as they do now. Also, the curves for all the devices are approximately parallel; therefore, between now and 1975 about a fivefold increase in circuit speed can be expected, regardless of which type of device is considered.

Circuit speed is of little meaning without consideration of cost, so Figure I - 2 shows a corresponding relationship of cost to time for the types of integrated circuits most likely to be used in large computers. It is clear that a dramatic improvement is likely in low cost MOS circuits between now and 1975; they could drop to 10% of their present cost. Higher performance integrated circuits are also likely to decrease in cost as manufacturing technology improves and as the number of effective circuits per chip increases, but the higher speed devices are unlikely to decrease in cost more than about 50%.

It appears, then, that a tenfold or twentyfold improvement in the combined cost-performance of circuits can be expected within the next five years. The result will be that designers will feel free to "hard-wire" a wider variety of functions for large machines, since the cost of adding functions will be so low.

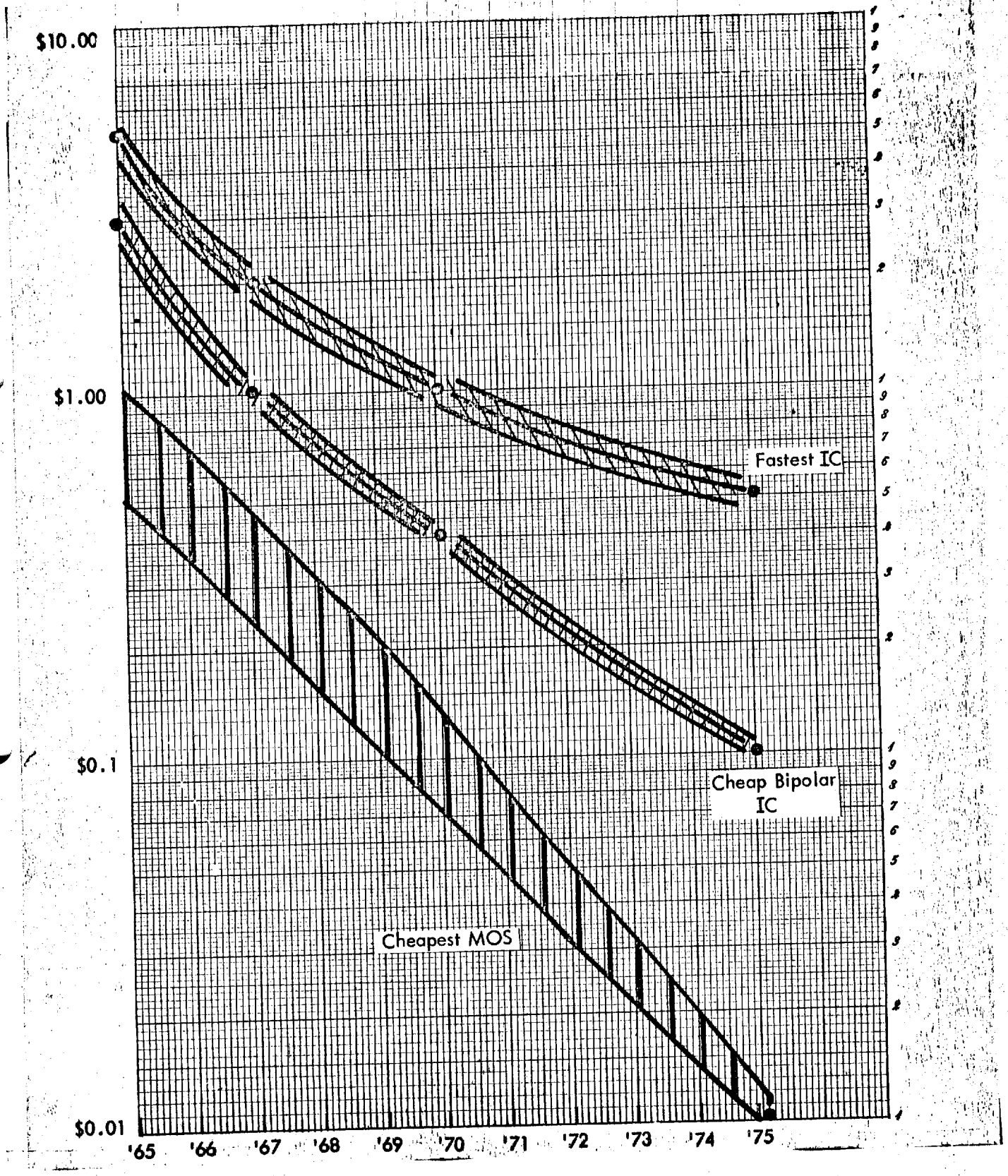
C. TRENDS IN MAIN MEMORIES

The faster computers are already constrained more by memory performance than by circuit performance, so let us consider next the improvements in memories that can be expected. Figure I - 3 summarizes what we forecast in this area. Cycle time is shown against year of availability and, for each class of memory, a family of curves appears for several levels of cost per bit. Core memories have still further improvement potential, but theoretical performance limitations will probably be approached by 1975. Thin-film memory, which had been considered on a large scale by Burroughs, is now losing ground to its major competitor the plated wire which has a cycle time similar to the one of thin-film memories and is now commercially available. It is semiconductor memories (large scale arrays of integrated circuits) that offer the really exciting potential. We are willing to predict that they will overtake all other types on a price basis as well as on a performance basis within three or four years, but this is admittedly conjectural.

There are many problems involved in integrating new memories into existing computer lines, so in 1975 and even beyond we will probably see the manufacturers intermixing different kinds of memories in their computers. This is not critical

Figure 1

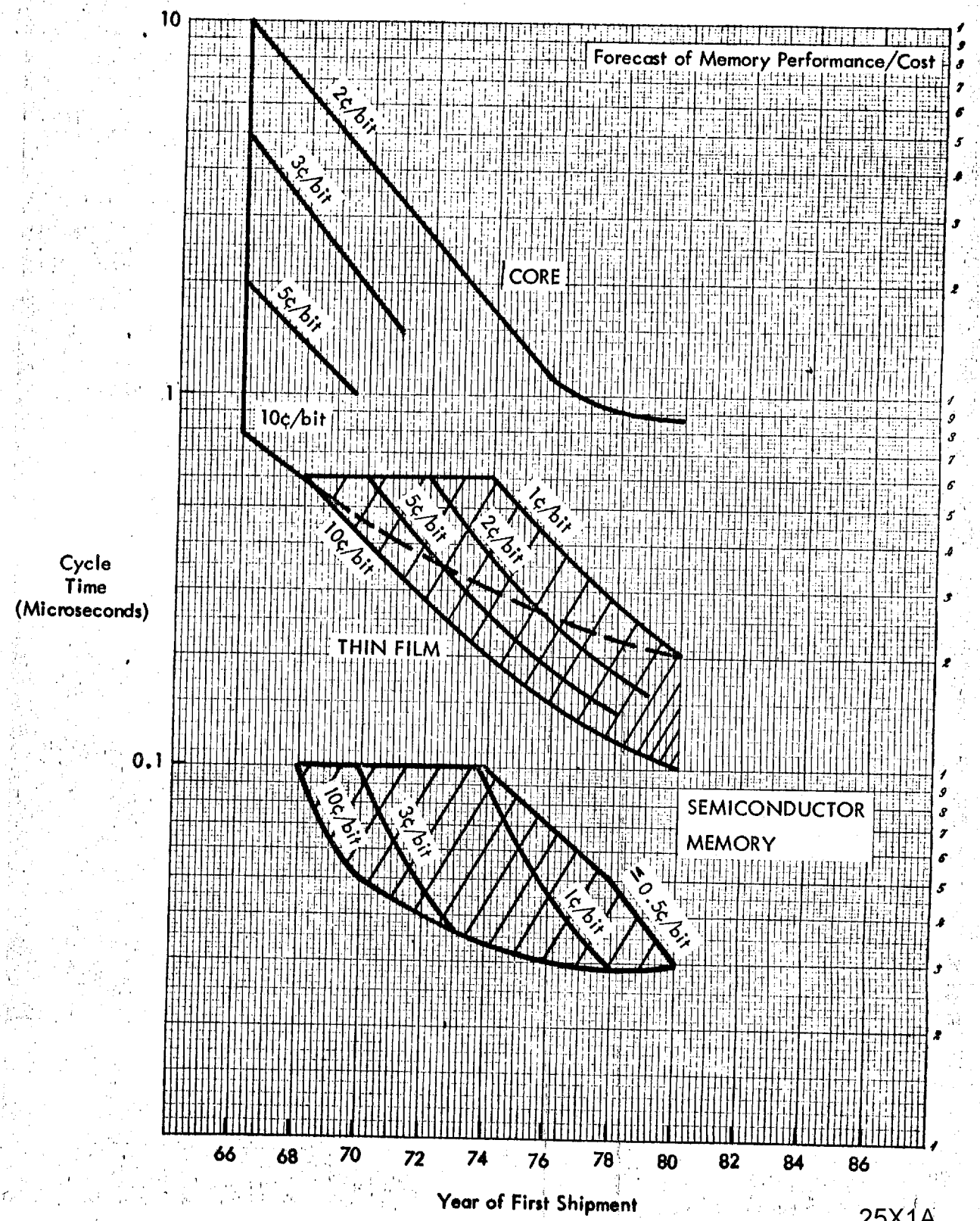
LOGIC CIRCUIT COST PER BIT VS TIME



25X1A

Figure I - 3

FORECAST OF MEMORY PERFORMANCE/COST



to the user; the important thing is that he continues to gain cost-performance in the memory area as well as in the circuit area. Apparently, by 1975 an improvement of memory cost-performance of tenfold is likely to be attained, regardless of which of the three classes of memory is involved. Also, apparently computer memories will continue to improve until (at last) they are no longer a constraint on what the user wishes to do. In time, perhaps even mass storage of files will be done using solid-state rather than mechanical technology. However, the necessary very low cost solid-state memories are not likely to be available for perhaps as long as 10 years. The same considerations apply to radical technologies as the "magnetic bubble" circuits recently announced by Bell Telephone Laboratories. There is great inertia in this industry now, and many have learned to their sorrow that many years intervene between laboratory demonstration of a device and large scale employment of it.

D. THE PROBABLE CONFIGURATION OF FUTURE LARGE SYSTEMS

Our concept of the large system of 1975 is diagrammed schematically in Figure I - 4. The central elements only are shown; the peripheral equipment (discussed elsewhere in this report), including the mass storage system, is to be accessed through the input/output processors.

We believe the system will incorporate two or more central processing units operating in a multiprocessing mode. These will be capable either of operating the system or of performing any of the processing tasks. Each will be complete and self-contained, but they will be assisted by specialized elements designed to facilitate overall system control. These elements are a task control section, which consists of registers, firmware, macros performed by very-high-speed operating system storage and logic, and a paging machanism to permit optimum employment of high speed and main memory on an adaptive basis.

The functions performed by the task control and paging mechanisms are equivalent to software functions in that a stored program will be available from the manufacturer to function in an identical manner. With their aid far faster operation is possible, however. Should a processor fail, the second processor can run the system. Should only the task control or paging mechanism fail, either one of the CPU's can take over the operating system function at lower efficiency using a software version of the operating system. This kind of arrangement will make it unnecessary for the

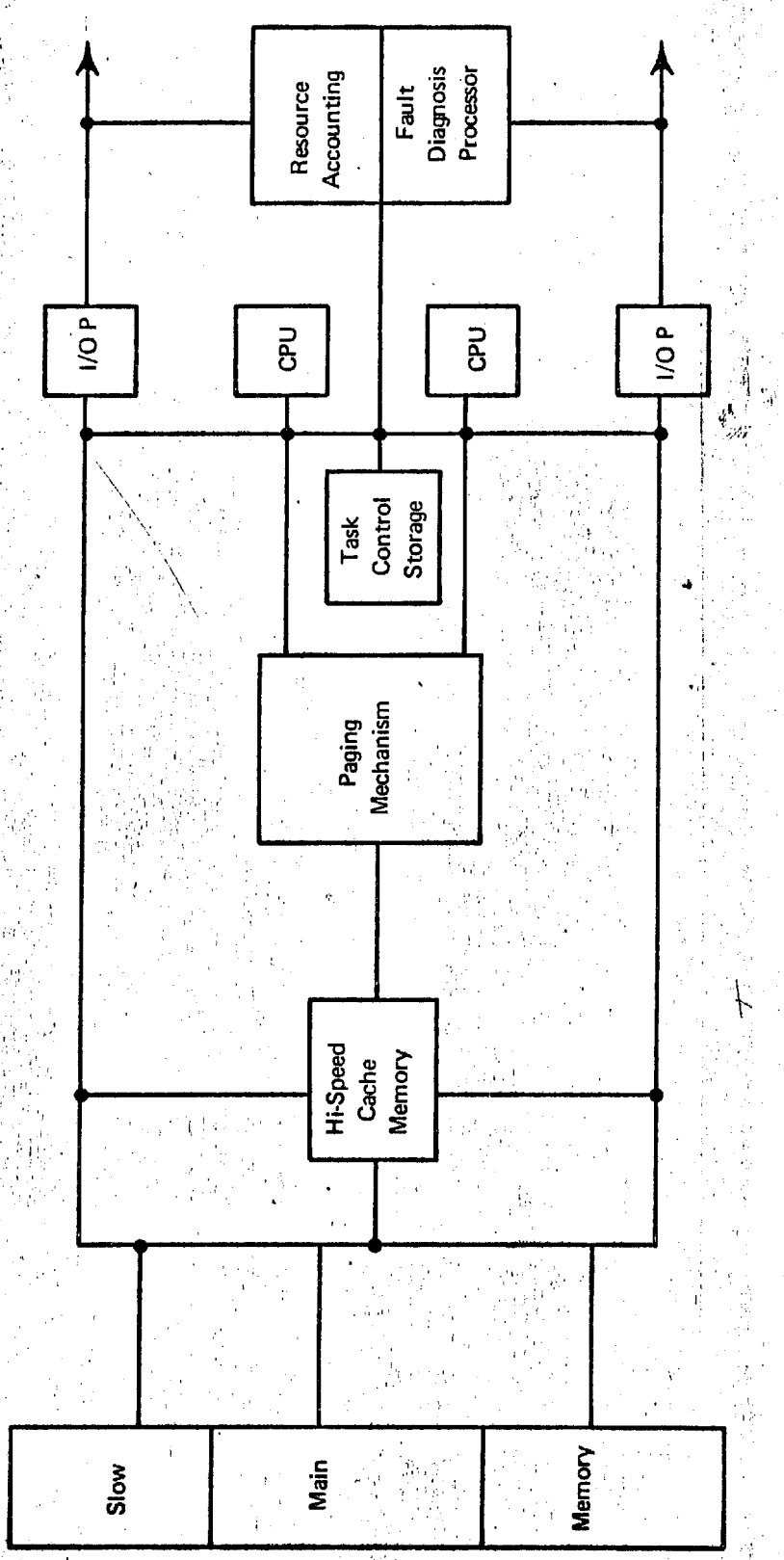


Figure I - 4

LARGE SYSTEM OF 1975

user to acquire duplicate control elements for his system; at the same time, it will permit less efficient, but still complete mode of operation, should one element fail.

Another likely characteristic of future central system organization will be the autonomous, asynchronous operation of central elements. Primarily for the sake of speed, prior designs have imposed rigid, synchronous control and data transmission among the central processor, memory and I/O channels. In other words, control and data signals were clocked and were assumed to be validly established at certain points in system time. Future organizations will probably abandon this fundamental design technique in favor of a "hand shaking" mode of control and data signals transmission. The overhead associated with this and the handling of possible default conditions will, by and large, be invisible to the user program, as well as to the operating system.

The objectives of this mode of operation will be modularity and reliability. Modularity will facilitate horizontal growth, i.e., additional central system elements can be quickly utilized as they become available or are installed. For example, it will be simple for the hardware to take cognizance of the number of input/output channels installed and to search automatically for an available one. By the same token, if an I/O channel is faulty and must be removed from operation, the search hardware would ignore it, and system operation would be unaffected. We expect that the interface logic for each element will operate on the assumption that there may be a multiplicity of other system elements, including duplications of itself. Although these design techniques are admittedly expensive, they will permit a greater degree of horizontal growth and will begin to eliminate the distinction between uniprocessor and multiprocessor system configurations.

The system's memory management will be more flexible than those of present systems. The performance of today's fast-response systems - which have multi-faceted usage of centralized, integrated data bases - has shown that a high premium is to be placed on effective management of main-memory facilities. The goal is efficient dynamic reallocation of program and data segments and, to a lesser extent, the multiple usage of a single program segment, written in "pure procedure" (or re-entrant) code. In contemporary time-sharing systems these operations have been accomplished by paging and segmentation hardware. While this technique may well be extended and improved, it is not necessarily the only approach available, as the Burroughs 6500/7500 has shown. But the conception, development, and refinement of new

approaches in this area characteristically take a long time. In lieu of them, we expect that paging hardware, and, to a lesser extent, segmentation (or two-dimensional addressing) hardware will become increasingly available in the form of options.

Designers will probably employ memory hierarchy techniques to provide a better power match with central processors. This is not a new concept. Some older machines had a relatively higher speed memory: e.g., core or delay lines supporting a drum which was addressed as if it were main memory and not a peripheral device. Recent examples of systems using the memory hierarchy concept include the IBM 360/195 and the CDC 7600. These two systems have both fast and slow main memories, although their use is quite different. The IBM 360/195's high-speed, "cache" memory includes both instruction and data portions of a program, and it is used in a paged manner. The CDC 7600's high-speed memory will apparently contain only program instruction streams, leaving operand data in the slower main memory.

The management and operation of these memory hierarchies will have to be made invisible to system programming. Although these memory hierarchy techniques will be generally more cost effective for problem mixes that contain a high compute-to-I/O activity ratio, their prime benefit in fast-response systems will be holding frequently used common routines and portions of the operating system. Their operation will involve a whole set of familiar problems: e.g., loading/unloading scheduling criteria, roll-in and roll-out processing of the high-speed memory, and maintaining the equality of what is logically a single set of data simultaneously in both the high-speed and low-speed memory. The control and coordination of these hierarchical memory elements will be neither simple nor inexpensive, particularly when they are employed in fast-response, paged, multiprocessor systems. Despite these difficulties, they will probably be employed to achieve the desired matching of central processor and memory performance. When the speed and costs of the memories in the hierarchy begin to converge, perhaps by 1980, the hierarchical organization will probably be abandoned simply because of its higher coordination costs.

√ Future organizations are likely to include expanded I/O capabilities in input/output processors which are operationally separated from the central processors. These I/O processors will eliminate the need to generate I/O programs (at execution time) to perform an I/O macro. Whether the sequence of instructions needed to perform an I/O macro is

softwired in the I/O processor, contained in a special memory in the I/O processor, or contained in an operating system portion of main memory is relatively unimportant. What is important is that more central processor time will be available for dependent program usage.

The extent of the processing that should be relegated to the I/O processors for data-based, fast-response systems is not a clear cut issue. At a minimum, they should be given the responsibility for physical I/O execution. For complicated information-retrieval applications, it may be useful to expand their scope of responsibility to include certain portions of the indices-searching and conflict-resolution functions. The argument for restricting their functions and capabilities beyond is twofold:

1) For purely economic reasons, the I/O processors should probably not become general purpose machines, since the central processors can more economically perform the complicated, computational aspects of data management tasks.

2) Performance might become "I/O processor-bound" if their workload is excessive, thus raising the familiar interference phenomena in today's multiprogramming systems.

Regardless of where this demarcation line of functional capability is finally drawn, considerable data pertaining to I/O tasks will have to be accessed and updated by the I/O processors. For example, these data will include: (1) links between logical file names and physical file names, (2) links between file names and devices, and (3) "queued" and "in-process" I/O orders. As these data must be shared (or made available) to other system functions, such as the processor(s), they will probably reside in a reserved high-speed storage.

For the job switching and associated roll-in/roll-out functions, we expect hardware improvements to overlap and effectively hide the program switching time. The considerable amount of data normally associated with running a program segment (or task) will be centralized, largely in the reserved, high-speed storage. Privileged monitor instructions will automatically scan these storages, making appropriate alternations in the rapid (de)activation of program tasks. The result will be not only faster job switching but smaller memory requirements for the operating system modules responsible for shared resources management.

As the hardware and organization of central elements become more complex, particularly because of the inclusion of the aforementioned advanced facilities, and as greater reliance is placed on the system's availability in on-line usage, automatic fault diagnosis equipment will be necessary. Future central elements will have, as an option, non-manual, automatic reconfiguration of system elements that will eliminate the faulty processor or memory module from the operational system resources pool and assign it to the fault diagnosis system. In present commercially available equipment (IBM 360/65 II and Burroughs 6500/7500), systems must be reconfigured manually, an operation that typically requires 15-60 seconds.

The diagnosis equipment for faults in central elements will consist of a specialized processor which has access to many key control and data signals in the processors and memory units. The diagnostic processor will be capable of performing numerous tests that recursively dissect the machine's logical organization in order to localize the fault. Typically, these test routines and logic design specifications will be held on a tape or disk. A test would consist of a series of specialized instructions and operand data, which would be sent to the suspected faulty unit. Its behavior during this execution would be observed, and the resultant data compared to a predetermined or calculated answer. Of course, operating personnel will have to be kept well informed of the degraded system status and diagnostic progress and should be able to alter and aid the process according to their own observations or priorities.

Another necessary function related to fault diagnosis is resource accounting. Present computer systems have, as yet, been unable to provide sufficiently detailed information about what the system was doing when an error occurred. Furthermore, the operating system accounting facilities often do not provide enough insight to identify the factors limiting performance. Although these two types of resource accounting have quite diverse purposes, much of the necessary hardware (and software) for each will probably be the same. For system diagnosis purposes, the needed information must be related closely to task control and execution: it is necessary to know which portion of a task was executed just prior to the error, so that it and all related status tables are not left suspended or pending. When a fault occurs, the task hardware/software should resolve (or restart) those affected operations which are pending on the basis of data contained in the accounting facilities.

Using the resource accounting facilities to identify system bottlenecks, while a highly desirable goal, can potentially require complicated hardware. Interference effects in multiprogramming systems have often produced appreciable variances in program performance - causing switches in the "processor bound" and "I/O bound" labels. Detecting habitual sources of interference and conflict is potentially costly, because the root causes can sometimes be very hard to find. Yet, we foresee the need for equipment which analyzes the statistical nature of operations and makes its deductions plainly visible to operating personnel and available to the operating system for cataloging. Maintaining these statistics on programs andfiles would be a valuable aid for job scheduling, as well as system planning.

The open-endness of the accounting problem and the appreciable expense of the hardware relative to its rather intangible payoff means, we believe, that limited progress will be made prior to 1975. After that, the declining cost of electronics may permit manufacturers to make significant progress in this area.

We think the fault diagnosis and resource accounting is likely to be performed by a separate processor. We envision this as a small, complete computer system with a minor amount of file storage for systems status "snapshots", a library of diagnostic routines, and a set of criteria for judging functional adequacy and optimum performance. This machine, though versatile, will be required to operate only upon occasion and at low speed; consequently, a low-cost "minicomputer" can conveniently be used. A separate processor is not only likely to do a better job because it is not itself a perturbing element in the system, it is also likely to involve less expense than adding to the central elements' overhead.

There will probably be other types of large computer systems in 1975. For example, Control Data and others are now investing much effort in "pipeline" or very rapid serial processors for scientific users with large array-type problems. As we have said, however, we think these will be rather specialized systems for smaller markets.

E. FUTURE COSTS AND CAPABILITIES

Obviously such systems will still be expensive. Not only do they incorporate multiple processing units, but also the specialized system control units needed for system efficiency. Over-all, there are likely to be several times the number of circuit elements in such systems than there are

in comparable systems today. However, reductions in component costs will be so great that we think they will overbalance the increase in system complexity and produce a net decrease. Our best guess is that such a system, with relatively large file storage, would have a purchase price somewhere in the range of $1.5 to $2.5 million; systems with comparable throughput today cost $2.5 to $5 million.

It can be seen that the capabilities of this system will be considerably different from those of today. When it is used for batch processing, considerations of I/O device performance and channel capacity will still predominate, and the system will probably not have much more throughput capability than those of comparable cost today. On the other hand, used for mixed-mode processing of batch, remote batch, and interactive foreground operations, the system will be tremendously improved. It will adaptively and efficiently intermix these modes, even though all may involve file reference. It will incorporate "graceful degradation" in the event of failure of any central component. It will perform self-diagnosis, informing the operator of the difficulty, and be capable of reconfiguring itself to handle the total workload at reduced efficiency regardless of which component failed. It will generate its own performance and billing statistics. (Does this also mean that it will be capable of simulating the effect on its operations of adding or deleting a specific component-of "self-simulation"?) It will respond to simpler programs, inquiries, and directions by using implicit brute-force methods for processing and by performing housekeeping functions automatically without operator intervention or even knowledge.

In summary, such a system is not really very different from those today. It is an evolutionary outgrowth of devices and techniques now in use or beginning to be in use. Most manufacturers will probably still call such systems members of their existing families. On the other hand, by sacrificing part of the cost-performance improvement implicit in the new components in order to gain higher efficiency and generality, it will have become far easier to use. As a result, the present problems impeding the development of large scale on-line systems should be greatly reduced.

F. TRADE-OFFS BETWEEN LARGE AND SMALL SYSTEMS

As the large computer systems evolve in this manner, the minicomputers will evolve as discussed in Section IV. As that section points out, minicomputers will find increasing application to data processing and communications functions. This section summarizes the roles we think each will play.

1. Terminal and Peripheral Controllers

The more advanced batch terminals and complex input-output devices (graphic printers, optical readers) already incorporate stored program minicomputers. The market has shown its willingness to pay present prices for the flexibility gained; with decreased minicomputer prices we think their use will become universal. They will perform a degree of autonomous processing; however, as noted below they will also serve as satellites to large computers.

2. Communication Controllers

Minicomputers are already finding widespread use as data concentrators to minimize communication costs. Their use will probably spread to cover communications system interface controllers for large computers. In this application the minicomputers will probably require dedicated disk files and other peripherals required for their roles.

3. System Schedulers and Monitors

As noted above, we believe minicomputers will become part of large complexes as performance monitors and diagnostic tools. It is also possible that they may take over the scheduling function, assigning the resources of the processing system to meet the demands. The scheduling problem is complex, though; it may continue to require the large computer's capabilities.

4. File Processing and Computers

The minicomputer satellites will be used for such work as they can handle; this will include simple processing of local files. However, the processing of a large integrated file is usually complex. We, therefore, believe that in most cases file processing will remain the assignment of the large, central system. The same conclusion applies to mathematical computing. The minicomputers can, of course, be used for simple work but larger jobs will still be assigned to the central system, both for economy and convenience.

This discussion has concentrated on extremes, the large central system and the minicomputers. The manufacturers will also offer compromises, of course, as they do today: medium-price systems with part of the capability of large ones plus a limited ability to deal with remote terminals and satellites. We do not foresee any universal move toward a single size of computer or a single system plan.

II. MASS STORAGE

A. Introduction

The characteristics and cost of memory are of fundamental importance in determining the performance of a digital computer. In general, central processor operating rates are memory bound, and system thruput depends upon secondary memory. For a typical large-scale computer system, 50% of the cost can reside in memory.

During the decade beginning in the early 1950's, computing rates for a typical high-performance central processor increased by approximately two orders of magnitude. To a considerable extent this improvement resulted from advances in the electronics and logical organization of arithmetic elements; of equal importance, however, were improvements in performance and costs for central processor memories. Memory device development during this period emphasized improvement of raw central processor or computing power at reduced costs; secondary storage development during this period focussed upon realizing reliability and moderate cost for file storage.

With the renewed emphasis upon on-line systems in the mid 1960's, program size, message handling, program time-sharing and system response requirements have resulted in a re-evaluation of total memory system requirements for computers designed for these applications. High performance central memory, random access mass storage and appropriate software operating systems have proven to be focal points in the evolution of fast-response information processing and handling systems.

The announcement of IBM's 360 computer series in 1964 was one of the first attempts to include a broadly integrated set of mass storage equipments in a computer system product line.

The mass-store complement for this product line was designed to cover a broad range of random-access capabilities ranging from an eight microsend cycle time, two-million byte core module to a half-second access, 400-million-byte Data Cellmodule. Subsequently, other major manufacturers announced broadly based computer "families" with similarly integrated storage systems: Honeywell 200 series, General Electric 600 series, Burroughs 500 series, etc.

Time-sharing research has led to another significant development which deals with the conceptual organization of integrated memory systems. Pioneering work by the developers of the Ferranti "Atlas" computer in the early 1960's resulted in the concept of addressing by memory "paging." This addressing technique, which is based upon a memory logically divided into "pages", permits a mass random-access secondary store to be considered as a logical extension of the main central processor store

Extended addressing of this type is most useful if a fast-access secondary store such as mass core or drum is available. At present, drum storage is used for most large-scale time sharing systems with mass core being planned for a few of the largest systems. These relatively fast-access mass storage devices are in turn backed up with larger-capacity, slower-access disk or moving-head drum systems for general random-access storage.

Subsequent to the IBM 360 series announcement, other mass storage devices evolved. The greatest emphasis has been on disk file devices which has resulted in the following operational disk-file classes: (1) moving-head, fixed disk; (2) moving-head, removable disk pack; and (3) head-per-track, fixed disk files. IBM, Control Data, Bryant Computer Products market moving-head, fixed-disk files ranging in size from 100 million to over 400 million bytes.

Large-capacity random-access tape strip systems, which were originally developed by NCR, now include the NCR CRAM series, IBM Data Cell and RCA RACE. These systems have a large storate capacity implemented by cartridge-mounted tape strips; the strips are mechanically accessed and subsequently transported to a drum-processing station.

At various times, the use of tape loops for mass storage has also been attempted. The sole presently operational device of this type is the Potter RAM. This is a cartridge-loaded device of approximately 6-million byte capacity.

B. Secondary and Tertiary Memory

Memory organization in a given computer system is usually influenced by the class of application. For each class a different emphasis is placed on the salient factors: access time, transfer rate, capacity, and cost. Some typical secondary memory classes are considered below.

1. Extended Primary Storage

Problems such as weather forecasting, nuclear physics calculations, modeling of ocean tides of seismic disturbances, economic simulation models, and war gaming require high-performance central processors and large primary core-storage. However, even central-memory capacity in the range of 65,000-128,000 words may not be sufficient for these applications; therefore, secondary storage may be used to extend primary storage.

Historically, high-performance drums have been used in scientific applications, to yield rapid access and rapid transfer from secondary to primary storage. Fixed-disk, head-per-track systems now are -- and all-electronic stores within the next five years will be -- competitive with drums for these applications (Table 2-1).

Fixed-head disks can be expected to supplant drums, particularly in medium to small information processing systems that are implemented with extended primary storage and are cost-sensitive. For the smaller-scale systems, disk storage would serve multiple functions, including storage for problem segmentation and program and data files, as required. (For the larger-scale, time-shared systems, fixed-head disk systems will serve as the secondary program store, as will be discussed later.)

Where the costs of extending memory capacity are not the overriding consideration, mass core (or its equivalent in plated wire) has the advantage of providing higher performance than do fixed-head discs. Mass-core stores cost one-third to one-fourth as much as central cores, but about three to five times as much as drums. Cost trends indicate that all-electronic mass stores will be cost-competitive with drums within five years. All-electronic stores should gain initial acceptance in extended primary-storage applications for large-scale scientific or military systems.

2. Large, Random-Inquiry Low Activity Files

Applications here are characterized by relatively infrequent random access to sets of very large files, such as savings bond files, insurance files, banking-corporate trust files, county land record files, or military personnel files.

Files of this class may vary in size as much as 50/1, typically from one million records to about 50 million records. In both cases, random inquiry, low activity, and relatively long response times ranging from hours to days are characteristic. Other storage techniques will probably not be a threat to magnetic tape in these applications for the next three to five years. Improvements in tape performance, primarily by means of increased density, can be anticipated. The IBM Hypertape represents the present upper limit of performance for operational tape drives (Table2-2). This unit has a linear packing density of 3022 bits/inch, compared to about 1600 bits/inch for other high-performance systems. Current research in this area indicates that packing densities higher than about double that of the Hypertape is likely to be available before 1975. If historical trends are followed, cost reductions to about one-half the level of current prices for the high-performance drives are likely by 1975; although in the case of tape drives, the maturity of the devices may inhibit this trend.

Table II - 2

SECONDARY STORES FOR LOW-ACTIVITY, SLOW-ACCESS FILES

	Present High-density Tape	1975 High-density Tape
Capacity (thousands of bytes/tape drive)	40	50-100
Max. Access Time (min)	4	4
Transfer Rate (bytes/sec)	340,000	500,000-1,000,000
Cost for Tape Drive ($)	67,500	45,000-55,000
Reliability	1 uncorrectable error/10 passes on the same tape	1 uncorrectable error/10 passes on the same tape

3. Information Retrieval

Retrieval applications for high-rate-of-activity information often include a relatively fast-access indexing system combined with larger, slower-access files; examples of applications are library abstracts, billing records, or inventory records. Such systems are typically used when the total files are to be randomly accessed on a daily or an even more frequent basis (e.g., for inquiries or postings), but also are to be sequentially accessed on a less frequent basis (e.g., for monthly billing).

The information retrieval category is broad and includes all classes of techniques. In general, however, file records are rather short (500-1000 characters), and access time is more important than transfer rate. Since volume is large, cost per character tends to outweigh other criteria in selecting a device. Reliability requirements are severe, but errors recoverable by rerunning are tolerable.

Most contemporary information retrieval systems use separate random-and sequential-access files when both modes of access are required. However, there is a definite trend to combine data presently distributed in many files into a single data base. In some applications, concentrating information into omnibus files may do little to reduce costs for equipment and operating personnel or to improve response time. However, carefully designed centralized systems do have great potential for some applications. A hierarchy of mass storage memories--fast-access stores for program storage and for data base indexing, moderate-access for rapid response to inquiries, and slow-access for very large files-- generally would be required for a typical large-scale application of this type.

Disk devices are applicable to information retrieval systems at all levels. In addition, magnetic card systems may be applicable. The IBM Data Cell, RCA Mass Magnetic Card System, and NCR CRAM systems are aimed directly at this market, as they have relatively fast random-access rates compared to magnetic tape and adequate sequential-access rates for batch work. For many applications, however, the magnetic card first-word access is too slow, approximately 300-500 milliseconds compared to 100-150 milliseconds for a moving-head disk, and 20 milliseconds for a drum or fixed-head disk. For applications where the file record is small (50-400 characters) and the transaction computation time is also small, the file accessing time is too long compared to the computation interval. To make matters worse, the effective transfer rate of the data for sequential processing is only 20-50% that of normal tape speed. Some users feel that the Data Cell class of device is too slow both for random access and for batch processing. These devices have an excellent cost-per-unit-of-storage ratio, but mediocre performance. Moreover, from an equipment viewpoint, the present magnetic card accessing mechan-

isms are complex. The resultant preventive maintenance requirements and magnetic card wear are not compatible with generally accepted levels for computer equipment. Improvements in transport mechanism design may eventually result in adequate levels of maintainability and reliability.

The disk files used in this application will be similar to those previously described. Magnetic card files for this use are characterized in Table 2-3.

4. Communication Systems

In communications systems, remote stores serve such functions as communications message concentration or data and control storage for remote displays. Capacities usually are relatively small, ranging from hundreds to tens of thousands of bytes. This class also encompasses the processing of communications network messages and line-control computers, which include large-capacity secondary stores for message handling.

Communications buffering, accumulation of data from remote point-of entry terminals, remote display terminal control, and remote file retrieval systems are rapidly growing storage applications. Since in these applications storage devices are used at remote stations, reliability and ease of maintenance are important.

The use of communications control computers for temporary storage and subsequent forwarding of messages is now significant in military systems and is becoming a very important growth area for public and private communications utilities. Moving-head drum and disk systems of moderate to large size serve as the storage media for message handling, as well as for programs, in large-scale applications, while a small-to moderate-capacity store implemented by a drum or mass-core memory may be required for high-reliability applications.

In these applications, competition for mass core stores is expected to come from plated wire and planar thin films, when they realize their cost improvement potential. Serial-access stores are frequently more compatible with the data format from the communications lines than parallel-access stores and potentially could yield more reliable, less costly equipment by virtue of the reduced component usage inherent in serial-by-bit data handling. For plated wire and thin film storage devices, techniques for serial-by-bit accessing can be implemented more easily than is possible with core-matrix-oriented design.

Because of the wide range of requirements, it is not feasible to list all applicable devices. Local storage could range from paper tape to core memories.

Table II - 3

MAGNETIC CARD STORES FOR ON-LINE INQUIRY FILES

	Present	1972
Capacity (millions of bytes)	100-400	100-1000
Access Time (millisec)	400-550	100-200
Transfer Rate (bytes/sec)	55,000-70,000	100,000-200,000
Cost (¢/byte)	0.033 (low compared to tape)	0.02
Reliability	Poor compared to a tape drive	Comparable to a tape drive

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5. Real-Time, On-Line Systems

Real-time implies a response linked to immediate needs; usually the response is made while the user is waiting at a console or a printing station. Earlier applications are exemplified by the SAGE air-defense system. Applications now include fixed-program airline reservation systems and the highly publicized, multi-program, time-sharing systems for engineering and scientific use.

Real-time, on-line information processing systems cover a very broad range of applications. This section deals primarily with systems which are multiprogrammed, and therefore, require memory swapping between primary and secondary stores.

Prior to the introduction of central-memory addressing by paging methods, primary memory extension by means of rapid transfers between a high-performance secondary store (such as a drum) and primary storage was awkward to achieve.

Systems based upon paging automatically cope with the relocation of available central storage to provide the required number of logically contiguous storage registers for programs being shuttled from secondary to primary storage. By means of suitable hardware and software logic, relocation is implemented more rapidly than was possible in the previous systems.

The requirements for this use are fast random access to information in the secondary store and relatively high transfer rates between primary and secondary storage. The capacity required of the secondary store will vary according to the application. Access times and transfer times for the drum and mass core storage devices currently suitable for this application are shown in Table II - 4. Fixed-head disks are also used; they may have average access times of 20 milliseconds, transfer rates of approximately 375,000 bytes/second, and costs of 0.25-0.65¢/byte.

For large-scale, time-sharing applications, secondary-store transfer rates of 500,000 words/second or greater are not unusual. Most present fixed-head disk systems do not meet this requirement-primarily because they are bit-serial-oriented for information transfer, not because of limitations with regard to packing density or disk rotation rate. Modification of data format and conversion to character-serial or word-serial information transfer from the disk would yield transfer rates of the correct order of magnitude. For mass core, adequate transfer rates with microsecond access can be realized by suitable overlapping of storage accesses.

Table II - 4

SECONDARY STORES FOR EXTENDED PROGRAM STORAGE

	Very-Fast-Access System		Fast-Access System	
	Present Mass Core	1972 Plated Wire	Present Head-Per-Track Drum	1972 Head-Per-Track Disk
Capacity (millions of bytes)	1-8	1-16	1-4	1-16
Access Time (millisec)	0.004 (first access)	0.001-0.002	8-17	4-8
Transfer Rate (thousands of bytes/sec)				
No Overlap	500	2,000	1,000-2,000	1,000-2,000
Overlapped*	1,000	4,000-10,000		
Cost (¢/byte)				
Overlapped*	20-28	4-8	4-8	1-2
Reliability	Comparable to central core	Comparable to central core	Less than central core; better than disk	Less than central core; same as drum

* An exception to these typical values for very-fast-access systems is the CDC 6000-7000 computer series; for the CDC 6600 the transfer rate 7 million bytes/sec overlapped.

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C. Future Developments

For the period through 1975, alterable mass memory will use magnetic storage exclusively. Generally, secondary storage equipment will be of the same classes as presently available: i.e., mass core, drum, disk and tape strip. For archival storage, film storage may become a factor during this period.

Mass core systems are expected to have strong competition from plated wire systems before 1975 and through 1980.

Drum systems will initially have strong competition from fixed-head disks, and toward the end of this period low-cost all-electronic stores will become competitive. The outlook for drum systems seems bleak.

Disk systems will have a strong growth during this period. Increased packing densities (about 4 to 8 times present densities) at about the same cost (or less) as present disk systems can be anticipated as well as marked improvements in the mechanics of the existing devices.

A representative range for future packing densities is 4000-8000 bpi. This can be contrasted to present densities of 1000 bpi (IBM 2311), 2000 bpi (IBM 2314) and 2500 bpi (Burroughs head per track disk). Further capacity improvements will result from larger track densities, gradually approaching 200 tracks per inch from the present values of 50-125 tracks per inch.

On the other hand, substantial improvements in effective transfer rate will result from "multiple channel access" to large disk systems. We expect a rapidly increasing utilization of those "multiple access ports" in the first half of the 1970's until, eventually, there can be (optionally) an access channel to each drive.

Tape-strip systems which utilize pneumatic or vacuum strip handlers are a likely development for this period. In addition, other accessing techniques for stores with the price/performance characteristics of magnetic tape-strip systems are likely to be introduced. All of these methods will attempt to eliminate the present weakness of mechanical strip accessing which leads to excessive tape-strip wear. The future for this class of device is for relatively low-performance, low-cost, direct-access requirements. If the improvements noted above are realized, tape-strip systems can be expected to impact strongly on magnetic tape systems.

Magnetic tape drives will continue to be the major secondary storage device used for file storage for batch-processing systems. At present, packing densities of 3022 bits per inch and tape speeds of 200 inches per second are the upper limit on the more significant tape parameters. Typical values are 800-1600 bpi and 75-150 inches per second. Tape-packing densities in the 3000 to 4000 bpi range will be feasible during the period under consideration. However, in order to realize reasonable packing efficiency, tape formats will have to be changed to yield longer block lengths. Tape speeds are not likely to exceed 200 ips. In general, tape-drive performance improvements during this period will not represent breakthroughs.

Beyond 1975, newer techniques yielding magneto-optic stores and/or holographic stores may become factors for direct-access mass storage. Introduction of these stores will represent performance/cost breakthroughs which will strongly impact total system designs. Optical and electron beam memories which are being actively developed, will be available by 1975 and cost competitive beyond 10^{9} bits. Bell Telephone Laboratories bubble memory should also be available by 1975.

III. SOFTWARE

A. LANGUAGES

1. Introduction

Since one of the basic problems in the use of computer systems is the communications gap between man and machine, we may expect that one of the greatest concentrations of development effort in the computer industry will continue to be the development of improved languages. It is now clear that there is no ultimate solution to this problem, no "ideal" programming language that will do away with problems of programming. Developing a processing algorithm is still an intellectual exercise for the human, which none of his own languages (mathematical notation, logical notation, or spoken language) can describe; it follows that no one machine language can. Developments throughout the forecast period and beyond will be evolutionary, then; not only because of the intellectual difficulties of improving significantly on current programming languages, but more importantly because of the enormous inertia of the training and habits of the tens of thousands of programmers now using these languages. Unlike hardware, or even operating systems, which can be improved or changed with their effects somewhat "masked" from the user, programming languages directly affect the user and a great deal of resistance to change is to be expected.

In theory, it is difficult to forecast the evolution of computer languages since the physical constraints applicable to hardware do not apply and the possibility exists that an intellectual breakthrough will revolutionize programming. Practical experience to date, however, indicates that this is not very likely; the development of programming languages has been a slow and steady evolution with language designers' ideas tested by users, suggestions fed back, and the languages slowly growing in richness, convenience and depth. At the same time, successive generations of compilers and other language processing tools improve in efficiency and generality; a process of "boot strapping" takes place in which the languages improve both in utility and (more rapidly) in applicability to efficient machine processing. If we assume that this evolutionary process will continue, it becomes possible for us to project developments for a period of at least five years; beyond that the possibilities of new methods for man-machine communication become too diffuse.

In considering computer languages it is essential to remember the problems of education and comprehension by the computer user. A small fraction of computer users are intelligent professionals, to whom the limitations of languages are lack of elegance and the absence of advanced capabilities. To the great majority (surely over 90%) the limitation is in comprehending and exploiting what is already available. We conclude that this user inertia and limitation of intellectual capability are constraints on the evolution of languages, then; it may be that this inertia has already frozen the basic processing vocabularies of the procedure-oriented languages. One of the great pressures on language development will be toward simplicity; the relative popularity of simplified languages such as BASIC, RPG, and COBOL has not escaped the designers. An important development effort is toward the elimination of programming languages, as such, altogether; with machine code generated directly from formalized application specifications such as decision tables prepared by analysts. The precision required by any type of machine code generator, however, suggests that some intermediary form of problem description will be necessary for many years and the programming language problem will never disappear from the scene.

Another pressure is toward integration of software capabilities hitherto developed separately and able to work together only imperfectly. Such integration of functions requires generalization which so far has usually led to painful losses of efficiency because of the increased time and memory space required to maintain lists, queues, translation tables and the like.

If computer hardware was not expected to greatly increase its power and cost-effectiveness during the forecast period, then much of the pressure in software development would have to be toward increasing the efficiency of software packages and language processors. Fortunately, however, the computers will become much more cost-effective making it possible to relieve much of this burden from the software developers. We may infer that "brute force" methods of implementing generalized software will continue to be used and will become increasingly acceptable as the cost per unit of processing declines.

2. File Management Languages

A primary objective of data management systems is to make files available directly and remotely to managers who are not computer trained. This implies strong pressure toward the integration of programmer-oriented and user-oriented data management languages; since there is no theoretical impossibility in performing this integration, we expect that it will be accomplished within a few years. An equally strong pressure results for the provision of simple, terminal-oriented languages for the manager, so that he may successfully access the data and instruct the computer from his terminal without the intervention of a trained person. This objective will probably never be fully met, but because the user's own data names are to be used, we believe that widely usable partial solutions can be found. We think "menu programming" will come into widespread use for the inquiry function of file management systems.

In menu programming the user is not permitted to generate his own processing statements to the computer using terms he provides, but instead generates them by selection from a "menu" or tree structure of terms displayed for him by the computer (cf. Project AESOP). This selection of alternatives from a menu can be made using a light pen or finger pressure on a cathode ray tube face, or by a combination of named terms on the screen and function buttons on the keyboard of the terminal. Either way, a processing demand results, which is by definition acceptable to the computer, and the user need know nothing about programming. Menu programming languages are feasible, and many users with infrequent and varying inquiries find them acceptable and sensible. We forecast that they will be in widespread use for file inquiry within five years. Full time terminal operators will probably continue to require short-cut means of specifying their actions such as function buttons or direct statements with appropriate parameters.

Other developments likely to take place include the ability to build "macro" commands that represent a series of more primitive terminal and/or data management commands that that particular operator would frequently use; the ability to define synonyms more natural to that user; the ability to prepare and call from storage simple processing algorithms on the data;

and, of course, more sophisticated password, lockout, audit trail, and other file security measures. Apart from these, we expect languages used in file management systems to change little. The problems are not nearly so much in language as in the operating system and file handling.

3. Procedure - Oriented Languages

In this area the constraints discussed in the introduction are strongest. The widespread knowledge of FORTRAN and FORTRAN-related computational languages, and of COBOL for English language processes, almost automatically constrain future versions of procedure-oriented languages to similarity with them. The greatest needs of the users to-day are for greater integration of procedure-oriented languages with related operating software, in particular data management and communication management systems. We anticipate that integrated software environments will be widely available within three years. The form they may take is more likely to be determined by the CODASYL standards agreements than by any individual manufacturer or user preference. We believe no manufacturer is now interested in being different in this area; they are aware that user inertia is too great and that the industry standards in procedure-oriented languages are too developed.

Comparable standards have not yet emerged for data management or for communications management, but here the needs of the users are localized and involve clearer criteria than in the procedure-oriented area. The CODASYL decisions will be close to the interests of users and manufacturers alike, implemented with little change, and subject to further evolutionary improvement. Most required improvements will occur in operating systems and file processing. However, we may also expect (because designs are already emerging) that language compilation will be significantly improved by the incorporation in advanced machines of read-only macros. These, almost certainly part of user changeable "firmware", will be available at compilation time and should make it possible to attain compilation speeds faster than any previously available. In addition, other hardware functions will reduce the magnitude of the compiling functions themselves, replacing them with loading and/or execution-time

operations e.g., absolute address assignment, overlay control, editing functions, and subroutine linkage.

With hardware functions available to assist in compilation the nature of the compiler program changes. Time-consuming, repetitive functions are no longer performed by machine instructions, so the complexity of the compiler program decreases; much more important, its efficiency requirements decrease too. Compilers have customarily been written in assembly language for maximum efficiency. The same is true of other programs requiring high efficiency. Machines get faster, though, and existing compilers improve in efficiency. As they do, the trade-off between programming convenience and efficiency moves toward the former. Compilers are no different from other programs in this respect. Compilers that will be little used are being prepared in higher-level languages.

4. Problem-oriented Languages

In a variety of disciplines (particularly engineering) problem-oriented languages can be successfully developed to serve the specialist far better than the generalized procedure-oriented languages do. The leading examples are civil engineering and numerical control of machine tools as implemented in COGO and APT, respectively; both areas are now well advanced toward completely satisfactory and generalized problem-oriented solutions. Structural design will probably be next; it is more difficult to handle, but is already well advanced (e.g. STRESS). Electrical circuit analysis and optical system design are two other areas in which POL developments are rapidly taking place. Other areas will surely follow. Geological survey data reduction, ship design, and aerodynamics computational processes are likely candidates within the next five years.

A capability recently introduced in a primitive form by IBM (in its PLAN processor) is that the language designers may be able to develop "problem oriented language generators", in which the user is provided with a framework for converting his own processing vocabulary into processing verbs automatically.

5. Simulation and Graphic Languages

Of all the language areas simulation and graphic languages are the most primitive. The simulation languages that have been developed are very limited; they have whetted users' appetites for improved languages rather than provide solutions to problems. As industrial data bases are developed, the desire to process simulations based on them in support of management research grows; manufacturers are aware that simulation languages such as GPSS and SIMSCRIPT are an important part of their product lines. We may expect to see a steady evolution of simulation languages through this period and beyond.

It is difficult to foresee the ultimate form that simulation languages may take, because it is clear that the requirements for man-machine communication of the results of simulations (particularly simulations in progress) are not satisfactorily met by any known language. Some form of graphic communication is almost certainly required. The first form of it will surely be simple plotting of curves corresponding to the various cases simulated. Because users ordinarily wish to try a great many cases incorporating minor variations in assumptions of relationships and data, the mechanical plotter is not appropriate. Probably simulation languages will incorporate cathode ray tube displays with graphic capabilities within a few years. Curves are not completely satisfactory, however, because many simulations of physical processes (e.g. petroleum refineries, or aerodynamic vehicles) can be only imperfectly represented by simple curves. It seems to us possible that an entirely new form of man-machine communication language may evolve, incorporating multi-dimensional data structures with flexible display options to provide a "window" to the state of the entire process being simulated. Clues to the form of this abstract display may be found in the integrated navigational systems being developed for advanced aircraft and spacecraft. This is highly conjectural, and it is uncertain that anything beyond interesting research possibilities will have appeared within five years.

6. System Reliability

One of the users' primary complaints about all programming languages to-day is imperfection in debugging and error-freedom. The user is being heard, and language designers are turning their attention to this problem.

In the immediate term (the next two or three years) we expect to see better diagnostics provided in the languages of the procedures. All interaction between the programmer and the machine should be in a single abstract language, not requiring a shift to the level of machine language during the debugging process. This is difficult, but much progress has been made and we can expect the evolution to be completed soon. Another near-term improvement (already announced from DOS/360) is an abnormal termination facility, which allows the user to obtain control in his program before an abnormal job termination occurs. The user must, of course, specify what constitutes an abnormal job termination; this is an open-ended requirement that will never be fully generalized. However, we may assume that its absolute necessity will lead to a continued evolution over the next few years, perhaps to a specialized subset of procedure-oriented language designed for convenient provision to the compiler of thresholds and definitions of "out of bounds conditions" for a particular program being developed. Such capabilities may also affect file structures. One can imagine a redundant feed-back built into a file so that some relationship directed by a process condition can be identified as unacceptable. Beyond these developments, the primary trend we see in the short term is toward the perfection of what is already available, the elimination of existing bugs from the more advanced compilers, and steady improvement in their efficiencies.

In the longer term (beyond three years) there are some interesting new possibilities for improving system reliability. The very serious problem of accidental file destruction must be faced more squarely than it has been by the language designers. It may be avoided by "simulated file actions" taking place prior to actual posting. In such a scheme, only trailer records associated with basic file records may be actually manipulated at the time the user is

on-line, and only after completion and verification of the process (often requiring later audit in a batch mode) will the system post the changes recorded in the trailer records to the basic file. Such a "simulated file management system" enables the business to run as if the file were changed regularly during the day, but preserves the original copy until the audit of the transaction has been made. This procedure (also known as"post posting") will be difficult to implement because it will be expensive both in processor time and file storage space. However, there may be no alternative consistent with on-line file management and security. The problem of file security is also related to the development of passwords and other user identification facilities. Most of these are concerned with the design of the terminal (e.g. badge readers, special keys, personal identification), but some of them may also be related to the file lock-out structure. A structure of password acceptability may be superimposed on the detailed structure of the file, permitting selective access to individual records. This again will be slow to evolve because neither the user nor the language designer can anticipate the functions needed.

B. OPERATING SYSTEMS

1. Introduction

As computer hardware increased in complexity and computer applications expanded in scope and diversity, effective management of the computer complex eventually required a comprehensive set of programs that streamlined and co-ordinated the work to be done with the available system resources. This set of programs is now called an operating system. While the management of jobs and resources is their principal purpose, they also include language translators, I/O facilities, utility routines. Thus, an operating system has two major purposes: first, it is a real-time programming system, controlling a complex production operation, and second, it provides service facilities that perform routine, detailed tasks, and permits users to interact with the system via higher-level languages.

Operating systems have had their primary impact in systems programming and computer operations. For systems programming and design, operating systems include generalized programs for performing routine though intricate tasks, and a greater degree of device and configuration independence and variability. These have simplified and reduced the effort needed for initial application programming and design, program maintenance, and reprogramming. For the computer operations category, the two largest components have been data preparation and computer operators. Data preparation has been largely unaffected, but operating systems have had a significant impact on computer operator costs - - eliminating or simplifying many of their tasks.

In summary, the prime objectives of an operating system are:

- Faster turnaround time
- Improved total throughput
- Increased programmer productivity
- Design and operational flexibility
- Standardization of fundamental operations.

In performing these objectives, third-generation operating systems typically perform most or all of the following functions:

- Job scheduling
- Job initiation, loading, termination
- Continuous job processing
- Resource allocation
- Job accounting
- Data and program library control
- I/O control and monitoring

- Symbiont or spooling operations
- Protection and security
- Error handling
- Operator communications.

Our predictions of future operating system technology can essentially be classified into three groups: (1) overall architecture, (2) the control programs in job, task, and data management and (3) system procedures and operations.

2. Overall Operating System Architecture

In second-generation equipment, most operating systems possessed a singular, specific orientation, suitable for a particular type of processing, such as batch or fast-response. Practically all standard operating systems were batch-oriented; fast-response systems usually were developed specifically for a particular installation. Perhaps the most significant improvement in operating systems for third-generation equipment was the attempted "general purpose" nature within various machine levels - - "general purpose" in the sense that a single operating system could accommodate, or be specialized for, a range of applications, from batch to fast-response. This meant, for example, tuning the system to favor either "turnaround" or "throughput", to the extent that these are conflicting goals. Equally important were the increased user (programmer) services available with third-generation systems, such as facilitated program/data storage and linkage, and more execution-time flexibility. All the operating systems components needed to manage and run the "production line" currently exist; further, we see future processing requirements as being essentially of this "production line" nature. Thus, we expect that future operating systems will be performing basically the same operations they are to-day.

How, then, will future operating systems be different? The major changes we foresee result from two problems in present systems:

Although present operating systems have provided basically all of the necessary functions, their overhead, in both storage and time, presents numerous opportunities for improvements. Design changes will occur in both hardware and software, with greater emphasis given to the hardware requirements of operating system functions than in the past. Many of the predicted changes for "central element" equipment resulted from current operating system deficiencies or inefficiencies. Many operating system functions will simply be transplanted into hardware. For others, there will be hardware aids, greatly improving system efficiency, e.g. environment sensing hardware, permitting rapid adaptation to system changes.

The impact of hardware features on operating system design is that they will permit a greater degree of flexibility and standardization. The emphasis on forcing every possible nanosecond out of control programs will decline as overhead decreases to negligible values.

The second - - and more powerful - - influence arises from difficulties in the "user services" and "system procedures" aspects of operating systems. Pertinent topics in this area include (a) system macros, (b) job control language, and (c) system generation. These features typically involve several tradeoffs:

Standardization and compatibility vs. specialization.

Operational, programming simplicity vs. flexibility.

The problem with "user services" or "system procedures" is the inflexible nature of the tradeoffs they offer. One of two conditions usually exists: either a system is simple and

straightforward but rigid and inflexible, or it is flexible but difficult to learn, operate, and maintain. The lack of a mechanism for moving gradually from one to the other is, in our opinion, a serious defect in contemporary system architecture.

In summary, the directives (or "frame of reference") for future operating systems are:

- They will perform basically the same functions in managing the work flow.
- There will be an expanded use of hardware for operating system functions, permitting greater efficiency and operational flexibility.
- From the user's (programmer's, analyst's, operations manager's, and operator's) viewpoint, system usage and maintenance will be accomplished under varying degrees of system control and specialization.

At first glance, these improvements might appear too simplistic, considering the contemplated advanced uses of computers,such as computer utilities or advanced management information systems. To be sure, there will be considerably advanced uses made of computers and complex information networks, but we feel that these programming systems are outside the province of operating system software.

With the background established by these general directives, we foresee two predominant architectural improvements in future designs:

a) Upward compatible operating systems within a family.

Designers of future operating systems will carefully scrutinize possible sources of incompatibility within a product line. This will impose certain design requirements across all systems developed. For example, in the smallest operating systems, the conventions employed will have to be cognizant of more sophisticated processing modes, such as multiprogramming. In a small,

monoprogramming system, a program issuing a "machine halt" instruction might make perfectly good sense; run in a larger system, the same job would likely be aborted. Alternatively, constraints will be imposed on the more sophisticated operating systems - - e.g. supervisors must be capable of understanding simpler supervisor calls issued by a program generated in a smaller system.

b) Hierarchical and modular construction and usage within each operating system.

By modular structures, we refer to a system whose functions have been neatly packaged and separated into modules, such that they can be used and eliminated dynamically by the central control program.

By hierarchical structures, we refer to systems that have a varying number of levels of sophistication and complexity - - depending upon the application and/or user experience.

The consequences of both modular and hierarchical organizations can be classified as either (1) design considerations or (2) their operational and economic impact.

Design Considerations

The manner in which modules interact with each other must be general purpose and flexible. Of concern is not only their expanded utility but the possibility of forcing standards or conventions which, later on, will be sources of incompatibility. Without careful planning, subtle repercussions in programmer and operational procedures (due to a peculiar implementation of an operating system function) can render upward transition incompatible.

Intercommunications among modules, particularly with general purpose interfaces, will undoubtedly cause storage and time overhead. As a design consideration, there must be a compromise between the overhead and generality.

4. Data Management

The trend toward on-line data bases, with multiple usage in real time, rapid batch, and batch applications will require an extensive, but consistent, range of data management capabilities. Put another way - - two applications may require vastly different data management facilities, but both will use a central, integrated data base. Often the term"data management" is misinterpreted, simply because it spans such a wide class of applications. As a minimum, it refers to the expansion and execution of I/O macros and, at the other extreme, refers to large scale systems that process global, English-like questions of a large data bases. The demarcation line between "operating systems-data management" and "data-management systems" has never been precisely drawn. Further, we anticipate that these distinctions will become even less clear as a result of the future system facility of superimposing data management modules of increasing sophistication onto a previously existing hierarchy. As said before, the modular and hierarchical organizational modes will naturally get wider usage throughout the range of data management operations.

A further motivation for this modular approach arises from the users' requirements not to have their file organizations confined to sequential, random, or indexed sequential. Integrating the files within an organization typically takes a long time, requiring several successive phases of increasing consolidation. Naturally, it is desirable to effect these transitions without program alterations. For this type of generality and flexibility, a linkage mechanism must be provided so that source programs are unaffected by logical and physical reorganizations of the data base. The techniques for accomplishing this linkage are numerous, but on a theoretical basis, the linkage consists of a set of information describing the logical and physical attributes of a data base, as well as the more traditional parameters of data set cataloguing, indicating physical location, and generation of dates. Thus this information linkage can take a form not unlike that of the data division of a COBOL program; it can be maintained centrally or reside with its particular file, or both.

Without question, these systems will not be accomplished simply, nor are these approaches universally acceptable. In certain cases they would be clearly inappropriate. Yet for a large percentage of user applications they appear feasible and attractive. The importantconclusion is that these basic data management functions should be constructed with these ultimate uses in mind.

Aside from the growth and integration difficulties, other general problems will include the security and integrity of data bases which undergo shared processing and their reconstruction upon file destruction, due either to user program errors, operating system errors, or hardware errors. For the security/integrity problem we anticipate the implementation of "lock-out" hardware which prevents attempted, simultaneous updating of information. For file reconstruction, it will be necessary to restore not only the files, but also their indices and data file descriptions. Future operating systems should provide this capability, even for a localized portion of the data base. For example, if an indexed sequential file requires several discpak modules and one of them fails, it should be necessary to reconstruct only the file and indices for the malfunctioning portion.

Some specific features which will likely emerge in basic operating systems data management modules are: (1) I/O Macro Executions, (2) Real-time file processing, and (3) File usage statistics.

5. System Generation

System generation refers to a process that builds a specific operating system, particularly suited for a given equipment configuration, application workload, and prevailing, statistical nature of its processing. The system generation process starts with a system nucleus and grows by selecting various operating system features. In the past, much user discontent and discomfort has been experienced.

In future operating systems designs, we anticipate less flexibility in the system generation process, which hopefully will minimize these discontents. This will require a much stricter adherence to standard conventions by successive versions of the system.

A further attribute of future system generation processes will be their considerably simpler, more general input information. Typically, input specifications will, at least, optionally, be expressed in English-like statements, and the allocation of various operating system functions to the hierarchy of system devices will be accomplished in a greatly simplified manner, such as narrative or tabular specifications. Of course, many of the statements now required by system generation will disappear altogether, such as specifying the equipment configuration: these parameters can be supplied by the equipment itself.

Another requirement of future system generations will be an elaborate specification of default conditions. The objective of such planning should naturally be to allow a user program to attempt to perform those operations desired by its creator, even though his program and operations specifications are incomplete or incorrect. The decision to abort a job will therefore become increasingly complex.

6. System Security and Error Handling

System designers and operators of multi-operation, real time systems must be concerned with the potential consequences of hardware and software malfunctions. Unraveling system errors in a monoprogramming-batch processing environment was often difficult; but the cumulative effects from errors were usually quite limited. With on-line systems, cumulative effects can potentially become quite extensive. Since these system errors often arise from the confluence of weird, non-duplicatable events, it can be impossible to determine precisely what malfunctioned and, worse yet, the extent of the damage. Progress in this general area, both hardware and software, will be limited at best, particularly for the next decade - - because of the practically infinite number of states that potentially exist in a large scale system. Determining the province of valid states and transgressions from them is also infinitely complex. However, gradual, evolutionary improvements can be reasonably expected throughout the next decade.

Operational and Economic Impacts

There will be a greater degree of both horizontal and vertical growth within a particular operating system - - horizontal in the sense of easier accommodation of increased system resources; vertical, in the sense of increased operating system capability. Thus, operating systems will be adaptive, changing to accommodate system component availability and user requests.

This facilitated growth means less frequent system generations. Operating systems, however, will continue to be specialized via the system generation process, but there will likely be fewer alternatives - - with a greater degree of standardization and reduced flexibility. This, resulting from the fact that the operational or economic payoff to users will not be sufficient for them to worry about "fine-tuning" the system.

The increased scope of an individual operating system means fewer, distinctly different versions will be produced.

All thse mean reduced personnel costs - - in system planning, programming, and operations.

3. Job Management

The job management portion of operating systems refers to that set of programs which schedule, activate, and terminate the processing of any particular job and its sub-job steps. It is the first and last portion of the operating system that interacts with a user program. Future job management control programs will functionally be equivalent to those in operation to-day. However, there will be improvements in their implementation, ease of use, and expanded use of operational data.

Particular job management functions likely to undergo significant improvement include: job scheduling, job accounting operations, automatic job initiation, task management and job control language.

IV. MINICOMPUTERS

A. INTRODUCTION

Before commencing discussion of minicomputers, it is worth defining our terms. For our purposes, this area is defined as that for systems utilizing processors in the $25,000 and below range. As a result of advances in integrated circuits, core memory, and packaging technologies, machines of this class extend over a broad range from programmable controllers, at $3,000 to $10,000, to more general-purpose computers at $10,000 to $25,000. Typically, these processors have fast processing rates (1 to 8 sec memory cycle times), relatively short word lengths ($\leq$ 18 bits), and versatile input-output structures (up to and including Direct Memory Access channels).

Historically, the minicomputer industry was not recognized until about 1965-66. The market at this time was not only limited to specific application areas, i.e., laboratory and industrial, but was also dominated by two major manufacturers, Digital Equipment Corporation and Computer Control Division of Honeywell. Not until 1968 did other manufacturers and new applications give rise to more production and activity in the industry.

During the period of 1965-1968 growth rates between 35 to 50% a year were typical. In 1968, approximately 3,000 miniprocessors valued at $65 million were shipped and installed. This year and 1969 were significant growth years with new manufacturers, CPU's, and application markets. During 1969, approximately 6,000 processors were installed with a value of about $95-100 million for central processors only; total systems value including peripherals was in the range of $200-250 million.

B. APPLICATIONS

An important feature of the minicomputer market is that the computer systems are generally dedicated by application. The market presently consists of the following major application areas:

a. Laboratory Applications

Products for laboratory applications include vendor-supplied integrated laboratory systems consisting of instrumentation, display computer, and software as a package and individual system building blocks. The integrated systems are frequently referred to as turnkey systems. Such systems packages may be tailored for automatic control and data acquisition for a specific set of instrumentation or be more general purpose to permit on-line manual use of the

system while experiments are in process.

b. Industrial Applications

Industrial applications can be divided into factory management, discrete manufacturing and continuous process control. Table IV-1 represents some of the major functions that a minicomputer may perform within the industrial application environment.

c. Data Communications

Data communications systems are composed of terminals, message concentrators, message switching systems and preprocessors for large computers. Each of these elements may utilize a minicomputer ranging from the lower end of the price range for terminals to the upper end for concentrators and preprocessors. Table IV-2 is a partial list of the functions/applications which may be required in this application environment.

d. Business Applications

Business systems applications can be divided into general, commercial, and special purpose requirements. Although at present the latter is predominant, the general commercial market has a very large potential. As a result of IBM's entry into this market with the System/3, it is expected that very rapid growth will occur beginning in 1970.

The cost/performance characteristics of contemporary minicomputer systems have made dedicated information and/or control systems feasible for the various applications noted. Variation in performance, cost and reliability requirements coupled with the proliferation of available machine types give a prospective user of these equipments considerable latitude in matching a minicomputer to his application.

C. TECHNOLOGY TRENDS

Since 1957, the cost/performance ratio of machines in this performance range have improved by two orders of magnitude as a result of advances in integrated circuit, core memory and packaging technologies. The trend toward even more cost effective minicomputer processor hardware will continue into the foreseeable future.

Table IV - 1

TYPICAL INDUSTRIAL MINICOMPUTER FUNCTIONS

Management Control

- Data collection
- Data processing and report generation
- File updating
- Display

Manufacturing

- Sensor monitor, control and processing
- Discrete and continuous machine control
- N/C paper tape generation
- Piece counting
- Piece routing
- Machine cycle timing

Table IV - 2

DATA COMMUNICATIONS FUNCTIONS

Terminal Controllers

- Local processing – business or scientific
- Control of local peripherals
- Local data collection
- Code and speed conversion
- Insert/delete communications control characters
- Insert error control information
- Data compression
- Message formatting and editing

Data Concentrators

- Assembling of characters/messages
- Multiplex from low-speed to high-speed lines
- Message buffering for efficient line utilization
- Polling and addressing of terminals
- Line monitoring and control
- Format messages and insert control characters
- Code and speed conversion
- Data compression
- Echo check control
- Error detection/correction
- Terminal usage accounting

Store-and-Forward Message Switching and Preprocessing Equipment

- Assembly of characters/messages
- Multiplex from low-speed to high-speed lines
- Message buffering
- Polling and addressing of concentrators and terminals
- Line monitoring and control
- Code and speed conversion
- Recognition of control characters
- Echo check control
- Error detection/correction
- Automatic dialing/answering
- Message header analysis
- Sequence numbering of messages
- Time and date stamping of messages
- Message routing
- Accumulation of network statistics
- Message logging and retrieval

25X1A

1. System Architecture

Figure IV-1 represents some of the general overall minicomputer characteristics found among more than fifty machines marketed today. Also, this figure represents the logical organization, i.e., memory, processor/control unit, and input/output. Some of these characteristics are optional from the basic unit sale price and are so indicated. The dotted line within the memory and processor/control unit modules indicate some features (ROM, general registers, and firmware) of minicomputers today that, we feel, are trends for the standard basic machine of 1972-74.

Projecting what the minicomputers will look like in 1972-74 requires some assumptions about technological innovation. Essentially, a more modularized organization seems forthcoming. Figure IV-2 shows four basic organization modules rather than the previous three. This trend is evident due to manufacturers trying to meet diversified application markets for both OEM and end-user sales.

Due to faster memory speeds, the elimination of some hardwired registers and accumulators in the processor unit may be made. These registers may then become merely selected main core memory locations. What is most evident for the future is a CPU that offers as standard many features that are now optional. Therefore, we feel, the cost of a basic CPU will, in many cases, remain somewhat the same, but more features will be available. Obviously, some suppliers will offer stripped-down versions of central processors that will be exceedingly low-cost for very limited functions. These will probably occupy only a few LSI chips and cost under $5,000.

2. Circuits and Main Memory

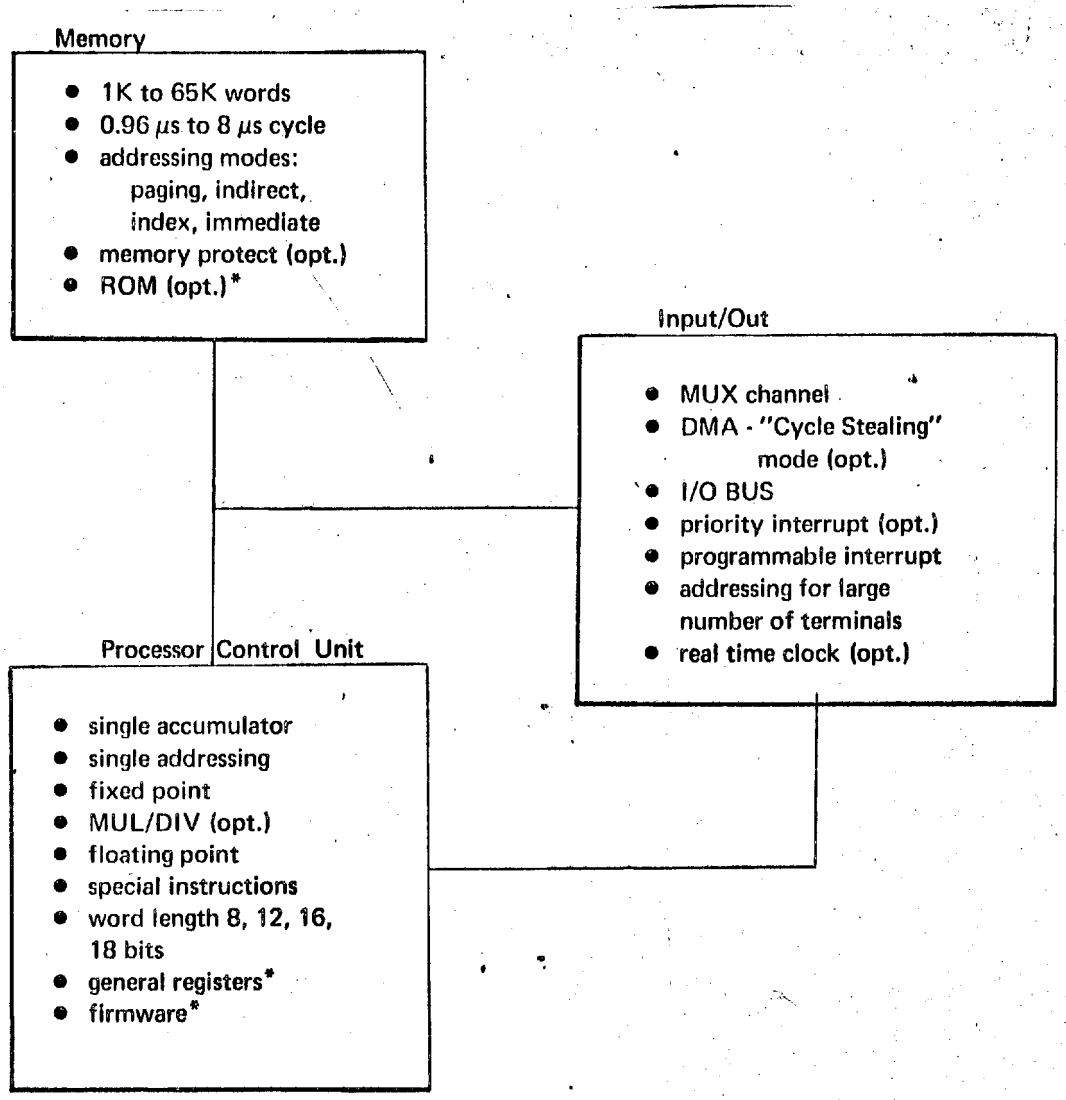
In the same way as we have already discussed for the larger systems, much of the projected advancement in minicomputer cost/performance characteristics is based on the use of newer forms of digital circuitry such as MOS, bipolar, or SOS integrated circuits, and in semiconductor memories.

3. Production and Cost Trends

The principal trend in minicomputer construction is the use of fewer and larger circuit boards to reduce the number of interconnections in the back plane. These large, functionally complex boards are feasible only if

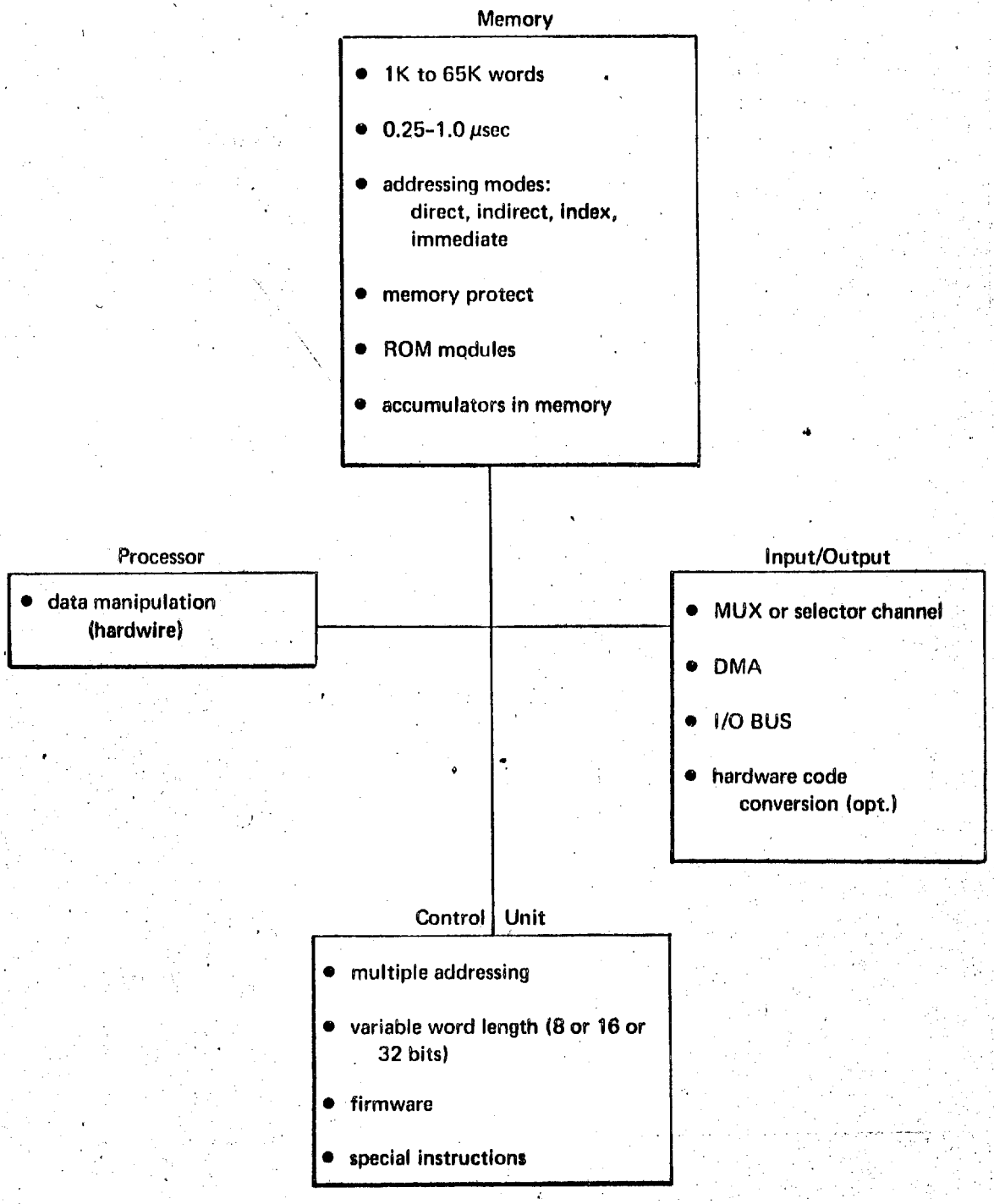
Figure IV - 1

THE 1969 MINICOMPUTER



* These options will most likely be standard items in 1972-74 minicomputers.

THE 1974 MINICOMPUTER



sophisticated diagnostic testing routines are used to exercise the board before it is assembled into a system. In some cases, the tester is a completed minicomputer where all boards except the one under test have been exhaustively tested by hand. A diagnostic program can then be loaded and run to exercise the board and report on faults.

The technical trends described above generally provide lower production costs, but require higher development and capital equipment investment. Price trends in systems will be similar to price trends in devices; that is, the performance available at any price will increase faster than the price of constant performance will fall. An increasing portion of the cost of production of the lowest cost minicomputers is in hardware (case, panel, connectors, switches, power supply, etc.) that will not decline substantially in price with time.

V. SELECTED TERMINALS & PERIPHERALS

A. OPTICAL CHARACTER RECOGNITION AND SCANNING DEVICES

1. Introduction

Scanning devices fall into several categories: magnetic readers, mark sense equipment, bar code readers, and full optical character recognition devices. The first three groups require some kind of special preparation of the document. Either magnetic ink is used, a particular position must be darkened with a pencil, or small bar codes must be imprinted on the front or the back of the document before it is scanned. However, for full optical character recognition, there is no requirement above a special font or clean copy.

As the capabilities in generality of scanning devices increase, prices become greater. MICR readers have speeds of 1,000 to 1,500 documents per minute with rentals in the range of $1,100 to $2,300 per month corresponding to purchase prices of from $50,000 to $100,000. Mark sense devices which depend upon the position of the character for decoding sell for $100,000. For optical character recognition machines, of which there are an estimated 600 installed today, the price range is $75,000 to $100,000 with rentals ranging between $3,000 and $20,000 per month. This can be further broken down according to the characteristics of the OCR machine. Those reading a single stylized font sell for between $100,000 and $350,000 while those having the more general capability to read a number of fonts run $400,000 and over.

2. Technological Forecast

Optical readers have been developed to sense pre-printed (or perforated) marks, pre-printed characters, typewritten or impressed characters, and hand printed characters. Another class of optical readers deals with graphic and photographic material. These are generally experimental and/or classified; they will not be considered further here.

All mark and character readers operate on the principle that the shapes being sensed have previously known characteristics, so that a given shape can be uniquely recognized by comparison against a list of stored criteria. When the documents being read are forms of known design, a computer program can inform the document reader what kinds of characters are possible (or required) in the various parts of the form, thereby assisting the process.

The limitation of the devices are inherent in this technique. They generally work well when the characters being read all have the proper characteristics (e.g., the shapes do not vary, the marks are solid and have sharp edges, the contrast with the background paper is high). The devices work poorly when the shapes vary and when the impressions are light, fuzzy or broken. This means that simple marks (pencil strokes or bars) usually give no trouble. Documents specially prepared with the reader in mind are also acceptable, because special attention can be given to the machines doing the printing and special training can be given to the people. On the other hand, random printed material (newspapers, books) generally cannot be handled satisfactorily, and longhand script cannot be attempted.

These statements have been true for a number of years, and will probably continue to be. The layman always reads in context; without conscious effort he can often "reconstruct" a faulty character image. No way is known to make a machine read with consciousness of context; for the foreseeable future they will always operate on a single character shape basis. We therefore conclude that the tolerance of optical readers for low quality material is unlikely to improve.

The paper feeding mechanisms for optical readers have also posed problems because the readers are required to handle discrete documents of varying sizes and thicknesses at high speed. The mechanical technology of paper feeding has been steadily improving, unlike that of character recognition. It is likely that by 1975 the feeding mechanism will no longer be a constraint.

3. Devices Available

Based on these considerations, we forecast that the following situation will prevail in the 1975 period.

Reliable optical readers at reasonable cost will be available that can read the following classes of documents with no more than 5% rejected as unreadable:

- Pencil marked documents (mark sensing)
- Documents imprinted from embossed plates
- Documents printed by computer output devices
- Typewritten documents, where the typewriters are specially prepared and serviced
- Documents containing hand printed digits and possibly alphabetic characters, where the personnel preparing the documents have been specially trained

On the other hand, there seems to be little possibility that optical readers of 1975 will reliably handle:

- Books
- Newspapers and magazines
- Uncontrolled typewritten material

B. COMPUTER OUTPUT TO MICROFILM DEVICES

1. Introduction

The major motivation for the use of computer output to microfilm devices has been to increase the speed of computer output and reduce the subsequent retrieval time and storage space required for that output. The most frequent applications to date for microfilm are for large data bases which do not change frequently, for example, a parts catalog. However, microfilm is now moving into areas where dissemination and retrieval is a problem. For example, it has been used in a job bank in which new microfilm reports are issued every day. In this particular example, it has been estimated that the computer output to microfilm is some 20 times faster than using a line printer. The output costs about one-fifth as much as printing and weighs one-fiftieth of the printed output. Overall data storage space is reduced by about 96%.

The widespread use of microfilm as computer output has been inhibited by the marked difference between film and paper. Potential users in the data processing industry are not accustomed to film; hard copy on paper is the accepted output form for computer installations. Microfilm must be viewed through a special device, and indexing for easy retrieval has been a problem.

Another major disadvantage to microfilm equipment for computer output has been the large fixed investment required both for the output device, the developer, and the subsequent viewers for retrieval. The output devices generally cost on the order of $100,000 and substantial price reductions do not appear likely. In addition, $50,000 in film costs over the life of the device and $100,000 for other peripherals are typical.

One of the major advantages of microfilm is a lower operating cost than for an impact or non-impact printer. For example, the cost for 100 feet of 16mm. film is about $3.00. Another 35¢ in chemicals will be required for developing.

This 100 feet can store between 2 and 8,000 pages of material depending upon the reduction. This means a cost of about $.0017 to $.0005 per page stored. On the other hand, a single copy on stock paper runs about $.0040 per page.

One great advantage of microfilm output is that most of the devices allow for an overlay which can be used as a substitute for pre-printed forms. Since these forms are extremely expensive, particularly when proper alignment is demanded, the ability to use an overlay on the microfilm will result in even further cost savings over printing. It should also be noted that attempts are being made to develop readers that scan microfilm output making it directly readable input. This can be used for editing or selective input and if information is to be read later, such a device could eliminate the need for producing a tape simultaneously with the original microfilm output.

There are two basic types of COM devices - alphanumeric and graphic. Alphanumeric COM devices are primarily used to substitute for impact printers. Whereas an impact printer can produce up to 2,400 characters per second, COM devices can write characters at rates up to 90,000 characters per second. Since a large percentage of the information generated is for reference only, there are extensive savings in the cost of film compared to paper. Binding expenses as well as storage and shipping costs are also minimized. Graphics COM devices are used in making bar charts, graphs, drawings, typesetting, company logos, and half-tone pictures.

2. Future Trends

It seems certain that in the future, less flexible COM devices will be marketed at a much lower price than devices currently available. Almost all devices will be provided with versatile, prepackaged software. Currently, graphics capabilities often limit the maximum alphanumeric print speed. In the future, machines which offer both graphics and alphanumeric will have to do so at a high enough speed to be competitive with the alphanumeric only devices. Future COM's are expected to have the capacity to store large numbers of forms, drawings, photographs and similar information on film, then merge them with computer generated data on a programmed basis. More emphasis is being placed on providing better indexing facilities. One possibility is the use of automatic ordering and indexing to allow a large microfilm data base to survive several updatings by establishing pointers to new information.

Emphasis during the next decade will be on marketing microfilm as a complete system including both the original data capture, development, and ultimate display and retrieval after exposure of the film. Several systems are now in operation where large microfilm mass memories are being used on-line with computers. The computer supplies the logic and address for attribute search and retrieval and directly commands the automated film file to display a given image at any one of a number of remote terminals. These units have been used for applications such as bank signature verification, insurance records and police files.

Longer range research points to the possibility of using lasers giving potentially higher resolution. Research is also being done in holography which promises potential error free storage and parallel search capabilities, and in erasable films which may be capable of recycling images and digital information for reliable read and write storage. If this research is successful, it means that the analog microfilm store will merge in the future with the digital optical store being suggested for mass memories.

C. ALPHANUMERIC VISUAL DISPLAYS

1. Introduction

These terminals, better known as CRT's (cathode tubes - the means by which digital information is converted to visible form), provide a volatile display, generally of about 1,000 characters, on a TV-like screen. The terminal normally includes a typewriter-style keyboard and some special keys for cursor control (a movable symbol indicating a particular character position on the screen), editing commands, message transmission control, etc. Frequently, clusters of CRT consoles are cable-connected to a single controller, but many stand-alone versions with their own buffer memories and control logic are also available. CRT's have no direct hard-copy capability. Many types of hard-copy devices may be used with CRT systems to allow selective output, but most approaches to this problem are unsatisfactory because of low speed or high cost.

2. Advantages

Alphanumeric visual displays, a relatively new form of conversational terminal, are rapidly increasing in popularity. The majority of the newer terminal-oriented systems seem to be using CRT's for the following reasons:

- Very high-speed information display - in fact, almost instantaneous display of a full screen -

is possible. Speed is most frequently limited only by the capacity of a voice-grade communications line (about 2,400 bits/second or 300 characters/second), and can be higher if a higher capacity communications line is used.

- The speed capability makes full text output feasible, in lieu of the cryptic abbreviations frequently needed on teletypewriters, which are much slower. Full text output permits a more natural dialogue between the user and the computer, enabling less well-trained or lower-grade personnel to use the system.

- A more flexible decision-making process is possible through the use of such techniques as "menu selection", where the user selects an option from a displayed list and thereby initiates another set of options, and so on down the decision tree. The high speed also facilitates the question/answer process by making accurate construction of a transaction a more conversational process.

- Information generated by the computer can be displayed together with data entered by the operator, with only the newly entered portion transmitted back to the computer. This capability, sometimes called "split-screen", is useful for pure data entry situations because field labels and prestored information can be used to guide the operator.

- The use of paper is discouraged since most CRT-oriented systems feature central mass storage of a data base which can be accessed at any time for the desired information.

- Noiselessness, appearance, elimination of supplies (notably paper) requirement, and reliability make CRT's more suitable to an office environment than teletypewriters.

3. CRT's with Hard Copy

While character serial printers were the earliest and still are the most popular forms of dispersed computer output, an approach which is growing in popularity is the CRT.

The impetus behind this trend is the desire to reduce paper flow in an organization and provide instantaneous access to up-to-date information stored in a central data base.

Interestingly, although one of the major advantages claimed has been the reduction of paper with its ancillary burdens of storage costs, supply costs, lack of currency, proliferation of redundancy, etc., both users and vendors are becoming increasingly aware of the need for hard copy with CRT's. Hopefully, hard copy output would not be needed for all transactions via the CRT, else it would probably not be a suitable application for a CRT in the first place. In many applications, however, after some preliminary dialog between the user or the computer, or for some particularly important responses from the computer, it is desirable to have a printed record of the result.

The impetus for the development of non-impact printers has come from this need for hard copy with remote CRT terminals. Many of these printers are serial devices which print one character at a time at speeds ranging from 120 to 250 characters per second. However, non-impact techniques have led to the development of at least two high speed printers with speeds of 4,800 to 6,000 lines per minute.

Although still in its infancy, the field of hard-copy devices for CRT's promises to be thriving one due to the popularity of CRT's themselves coupled with the growing awareness of the need for paper at some point in the system.

4. Development Trends

Lower Cost. The expected trend to lower-cost devices, as indicated previously, will result in substantially higher unit sales. The lower prices will result from the use of standard television technology, MOS/LSI circuitry, and solid state keyboards, as well as from competitive price cutting.

Better Software Support. Except for Sanders and Bunker-Ramo, the independent terminal vendors have not attempted to solve the greatest user problem with CRT terminals - inadequate software. The mainframe computer manufacturers also have been somewhat delinquent in this respect. To reach the less sophisticated users - who will constitute the vast bulk of terminal purchasers - simpler, more reliable, more applications-oriented, and better documented software must be made available.

Hard-copy Output. The most talked about industry effort is the search for a satisfactory CRT hard-copy capability. Office copy mechanisms might provide the ideal solution, but, for the near term, auxiliary conventional printing mechanisms attached to the control logic may be required. Inexpensive non-impact printing techniques, such as thermal or electrostatic methods, may be a reasonable compromise. The potential market for a hard-copy device costing no more than the CRT console itself might range from 15% to 25% of the total CRT market.

TV Converter Systems. More and more of the newer systems are in essence digital logic to convert digital information to a TV-scan format for display on a regular TV tube. For many terminal applications the resulting character quality will be quite adequate, although some demand will remain for high-quality character displays requiring more expensive devices.

Graphics Capability. Primitive line-drawing capability for display of business form overlays, simple graphs, pie charts, trend lines, etc. is needed and feasible, particularly with TV-oriented systems.

Greater Character Capacity. Some applications, including text editing, computer operators' consoles, and complex process monitoring, require more than the 1,000-character display traditionally available. The limits of human comprehension do not, however, make such a capability necessary in general, and for most business situations current capacity is adequate.

Local Storage Media. Using magnetic cartridge, cassette, or disk devices for such purposes as local storage programs, text to be edited, and menus or other fixed data to be displayed is both feasible and desirable; this approach could reduce communications costs and simplify central mass storage requirements.

Flat Screen Displays. Display techniques still in the laboratory development stage (e.g., those involving liquid crystals and plasma cells) suggest the possibility of an aesthetically more pleasing and potentially less expensive display form. Such displays, while providing basically the same functions as present systems, may also include image storage characteristics. Flat screen capability does not seem as necessary for the projected expansion of the market as do most of the preceding developments.

Color. Color display is now available (e.g., RCA's, Viatron's, Data Disc's systems). It provides some "human factors" improvement in information display, but since other techniques are available to distinguish data fields this development also does not seem a highly critical requirements.

5. Cost Trends

We anticipate that the price of serial impact terminals (like the present teletypes) will remain constant (in the $2,000 to $3,000 range), and perhaps even increase slightly as modifications to reduce their noise level and improve their appearance are developed.

The price of CRT conversational terminals by the middle of the decade should be on the order of $2,000 to $5,000 for devices with equivalent capabilities which are marketed for $5,000 to $8,000 today. The upper price range ($4,000 to $5,000) will encompass higher quality devices with better character generation techniques and higher capacity.

Non-impact printing devices to provide hard copy with CRT's are still in their infancy, and it is difficult to project their future prices. But for output speeds almost equivalent to CRT's (c. 250 characters a second), they can be expected to have costs of approximately the same magnitude.

ASPIN

10 FEB 1970

MEMORANDUM FOR THE RECORD

SUBJECT: ASPIN - Status Report

25X1A 1. [redacted] briefed the Information Processing Board on 28 January 1970 on the progress and status of the ASPIN project. He described their findings but indicated that their conclusions and recommendations have not yet been formulated.

2. Existing and proposed systems in the intelligence production Offices have been examined and they find that they are, with the Office of Computer Services, engaged in a significant range of computer activities. Many of the applications are very narrowly focused and not always well defined making it difficult if not impossible for systems to communicate in machine language. Applications have been developed by individuals who have identified their own problems and worked directly with the Office of Computer Services to find solutions.

3. In general ASPIN has found the management of information handling to be poor. People don't try to learn what others know about problems, solutions or what is being done in other organizational elements even within the same component. [redacted] says this applies to the Computer Centers as well as user offices and he attributes it to a fear that something might be learned which would require some action to be taken. He says that people don't always know what they are trying to do or how much it costs. Some Offices over-use computers and he cites FMSAC as an example; others are far behind and he cites FBIS as an example. 25X1A

25X1A 4. [redacted] says they have found that most users are using the computing capability of computers to do quantitative numeric computation as opposed to data processing or information retrieval. They have found nothing seriously in need of attention that isn't getting attention. People are generally not finding themselves so hard pressed to do their jobs that they are seeking solutions to problems. He finds that there is no system available or in process which is intended to meet the needs of the intelligence analyst. Nevertheless he believes that there are areas that we ought to be exploring but aren't. In general the applications which have been developed and are being run on computers simply do the things which have always been done but usually do them somewhat better. He describes the approach most often taken as "the solution in search of a problem." He is convinced that management attitudes require change more than methods of operation.

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5. In ORD the application has been the element used as the vehicle for generating research and development activity. He implies that we are not using our R&D capability as imaginatively and productively as we should be. He suggests, for example, that R&D should be directed toward finding solutions to well defined problems where the results will have general applicability rather than devoted to solving the problems of a particular application.

6. ASPIN is considering, and may have started action, to have a contractor look at what has been done in the ASPIN project and cost out the alternatives. It wasn't clear to me from his remarks what the status of this notion might be.

15/

[redacted]

25X1A

Chief, Support Services Staff

SSS/DDS/RHW:mjk (10 Feb 70)
Distribution
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20-214

30 January 1970

MEMORANDUM FOR: The Honorable Henry A. Kissinger
Assistant to the President
for National Security Affairs

SUBJECT: Intelligence Information Handling

1. As one consequence of the 8 January meeting on information handling, which I attended, I have had prepared and am forwarding herewith for your information a brief summary of information handling activities underway within CIA.

2. My impression is that CIA and the intelligence community have made satisfactory progress in the information handling field, particularly in light of budgetary limitations, and that plans for the future are compatible with the technological opportunities described at the 8 January meeting.

3. In addition to the attached summary, you already have been provided the most recent annual report of information handling on the part of USIB members (USIB-D-71.6/3, 21 August 1969). More detailed data is available, of course, should you desire it.

/s/ Richard Helms

Richard Helms
Director

Attachment

NIPE [redacted] (Rewritten O/DCI) 25X1A

Distribution:
#1 - addressee w/att
#2 - DCI w/att
#3 - DDCI w/att
#4 - Exec Dir w/att
#5 - O/PPB (John Clarke) w/att

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AUTOMATIC DATA PROCESSING (ADP) ACTIVITIES WITHIN CIA

ADP and information handling activities in CIA have been making steady progress and receiving a solid share of money, manpower, and organizational resources.

Some 45 computer hardware systems are now operated by CIA. Twelve of these are large, worth more than one million each; 13 are medium-sized and 20 are small (priced less than $200,000 each). The dollar value of ADP equipment in the Agency is about $40 million.

About five percent of the Agency's total number of positions is allocated to ADP functions. Automated components occupy 111,000 square feet of floor space in CIA buildings in the Washington area. This is about five percent of the Agency's total space in this area.

We use computers for a variety of purposes, including:

a. Document storage and retrieval systems and automated substantive data files as aids in the production of finished intelligence;

b. Maintenance of biographic data and other information relating to foreign intelligence operatives and activities as an aid to U.S. counterintelligence efforts;

c. Scientific activities, such as precise measurement of objects in imagery collected through overhead reconnaissance, control of electronic intercept operations abroad, automatic plotting of maps in any scale and in various projections, and trajectory and orbital analysis;

d. Communications message-switching and dissemination;

e. Management and administrative systems to provide records on payroll, budget, personnel, and other such activities; and

f. Support for research and development in information processing fields which may provide future payoff to Agency and community activities.

Organizationally, the Agency operates a centralized component (Office of Computer Services) to serve a wide range of needs of all Directorates. In addition, there are several specialized ADP components serving the special needs of individual offices. Agency-wide coordination and management review of these activities are the responsibility of the Executive Director-Comptroller. A newly-established Information Processing Board is the instrument used to accomplish coordination and recommend policy.

Included among some of the more recent achievements are the following:

a. As a planning aid for the benefit of operating offices and Directorates and in order to facilitate exchanges between ADP technicians, a Technical Group has been established to meet systematically and exchange experiences and wrestle with technical problems in information processing. In addition, a Technical Facilities Committee has been established to insure planning at an early stage for the positioning of upcoming ADP equipment and facilities in the appropriate space and at the proper time. Project ASPIN (Automated Systems for the Production of Intelligence) is coming down the home stretch and is expected to be completed by July. The objective of this study is to identify and stimulate the development of realistic and advanced ADP systems to provide information to the intelligence producer in more complete, flexible and rapid form. The findings are expected to lead to new systems which could become elements in a Community-wide information system.

b. Various ADP training courses are available and training in general has been intensified. In FY 1969, 1,070 Agency students participated in a total of over 150 different courses. Most CIA in-house ADP training is technical in

nature and deals with programming, operating systems and systems design. The longest course is a 15-week, full-time course for programmer trainees. The shortest is a three-day orientation course for users and managers.

c. There is a steady growth in the number of remote terminals which link the users (in most cases analysts) with computers to permit quick response. There are 125 remote terminal devices in use today. We expect the number to reach beyond 200 before the end of this calendar year.

[redacted] 25X1C

e. In November 1969, a GE-manufactured rapid search machine (RSM) was installed in the Agency. The RSM is operated directly by the using analyst who poses his own questions to the machine which searches automated data files at very high speed and prints out data in response to the query. The capabilities of this machine are now being tested by over 100 different analysts. If it pans out, we will have a very fast operating system which may bring significant savings because of the relatively low-cost of the RSM.

f. CIA has provided 18 of the 45 automated systems currently listed in the Inventory of Community Information Handling Systems. This, of course, is but a small fraction of the total number of specific applications of ADP (some 400) in being or under development in the Agency, but these are the ones having special interest to the Community. CIA can provide for Community use any of the other Agency systems listed in USIB's File and Program Catalogue which might be considered appropriate and useful for the Community. CIA is, for example, currently preparing its index to Community finished intelligence production so that it can be directly accessed by machine by all Community members.

Marcia - Pls Type -

SENDER WILL CHECK CLASSIFICATION TOP AND BOTTOM

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CENTRAL INTELLIGENCE AGENCY

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TO	NAME AND ADDRESS	INITIALS	DATE
1	Mr. Coffey		
2	Mr. Bannerman		
3			
4			
5			
6			

	ACTION		DIRECT REPLY		PREPARE REPLY
	APPROVAL		DISPATCH		RECOMMENDATION
	COMMENT		FILE		RETURN
	CONCURRENCE		INFORMATION		SIGNATURE

Remarks:

~~This paper was not coordinated.~~ ~~The attached is self-explanatory~~ I believe the attached papers will be of interest to you. They are self-explanatory. They were not coordinated with ODP/EPR. I received them 13 Feb 1970

Ron

FOLD HERE TO RETURN TO SENDER

FROM: NAME, ADDRESS AND PHONE NO.	DATE
Ron sent to Shaw	

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FORM NO. 237 Replaces Form 30-4 which may be used.

1 APR 55

U. S. GOVERNMENT PRINTING OFFICE : 1955—O-342531

20 September 1969

Mr. Bannerman:

Project ASPIN Terms of Reference are attached, with some of the main points highlighted.

DDS&T and DDI clearly do not want PPB to run the information processing business. I agree -- I don't think we do either. Each Deputy should run his own, but there should be some cross-the-board guidelines-standards or criteria to which they can all adhere.

Duckett's paper says most important need is to create a greater sense of responsibility in live management.

ASPIN terms of reference focus on utility, systems, integration, compatibility, productivity, effectiveness. I haven't been able to find out yet what DD/P said, but DDI and DDS&T papers are implicity consistent with yours.

I suggest you distribute at the meeting copies of the draft memorandum you offered for Col. White's consideration. Paragraph 3 may give some trouble, particularly the words "planning" and "control" in the fourth and fifth lines of paragraph 3. Otherwise I think they would have some difficulty in finding reasons to turn it down.

RHW

Projects-ASPIN

DDI 1528-69

28 May 1969

MEMORANDUM FOR: Deputy Director for Intelligence

SUBJECT : Expansion of the ASPIN Concept and Terms of Reference

This memorandum is for your information and approval. It is an effort to assure mutual understanding of the objectives and the approach of Project ASPIN, and to secure your approval of the attached expansion of the ASPIN terms of reference to facilitate guidance of ASPIN personnel and initial planning of tasks for the Project.

[redacted] 25X1A

Chief, ASPIN Staff

Attachment:
as stated

APPROVAL

25X1A [redacted]

Acting Deputy Director for Intelligence

3 June 69
Date

GROUP 1
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An Expansion of the ASPIN Concept and Terms of Reference

Objective

1. The basic objective of ASPIN is to develop a broad conceptual design, or plan, for automatic data processing (ADP) support to intelligence production. This design should indicate

(1) the types of ADP applications which may be profitably undertaken.
(2) the relationships among these applications which ought to be preserved in their design, (modification) and 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.

Methodology

2. The method of approach to the problem initially is to identify the organizations within the Agency engaged in intelligence production. This would be followed by a systematic analysis of the intelligence product and the process and data involved in its production. Particular attention would be given to analysis of the role of existing ADP applications and their utility to intelligence production as well as the liabilities incurred in operating these applications. The effort to identify potential ADP applications in intelligence production must in part be a de novo approach to the production process, but it must also draw upon the experience of existing applications -- both their successes and failures -- for potential extension or avoidance in the design of a generalized ADP system to support intelligence production.

3. ASPIN should describe the general structure of ADP support needed for intelligence production rather than develop detailed computer applications for particular activities or organizations. The general structure must be built from an understanding of the types of application required and the relationship of these applications in an

framework to address a particular problem must be built from an understanding of process and the collection and manipulation of fragmentary data from scattered sources. In these circumstances, the most that an analyst may hope for in assistance for automation is to retrieve some of the potentially relevant data elements and perform any complex calculations required to seek to relate the data. The notion that an automated information system will provide instant answers in an analytical environment should be eschewed.

7. The preceeding discussion suggests change, re-arrangement of existing processing activities. The Project has no commitment to change for its own sake any more than it believes change should be avoided to protect the status quo. We shall be content to have dealt with existing processing arrangements and assure Agency management that such arrangements provide an optimum attack on the problem of providing support for intelligence production if our observations warrant such a conclusion. Equally, we shall feel free to suggest both changes in processing arrangements and in the product itself if the technology we are addressing and the production process suggest that such changes are politically, economically and technically viable.

8. Fundamentally, the function of ASPIN is to design for the orderly incorporation or integration of automated systems to provide optimum assistance of the intelligence analyst who is the focal point of intelligence production. These systems should increase analyst productivity, reduce rather than increase his non-analytical activity, provide ease of access to the assistance functions it provides, and increase rather than constrain analyst flexibility in the performance of his duties. ASPIN should also present to management a clearer set of procedures and decision points to guide approval and development of specialized computer applications as well as recommendations for organizational arrangements to optimize the development and operation of analyst support systems.

Relationship to Intelligence Community ADP Activity

9. The relationship of ASPIN to the IHC community of activities on information processing seeks to be direct even as it appears to be remote. Information systems have too often been created for analytical components by data

information processing milieu. It will seek to define the need and rationale for integration of information processing applications and the level at which such interrelationship might be achieved if it is required. Integration may, for example, take the form of providing greater commonality of data formats to facilitate comparison of data series. Conversely, one might propose the use of a wide range of specialized programming languages, each optimized for a particular data processing activity.

4. ASPIN seeks to analyze and evaluate the application of ADP to intelligence production more from the point of view of utility and productivity than technical feasibility. The project objective is to provide an effective intelligence product at the lowest possible cost. This may be achieved by substituting automatic processes for human processes where the former will provide an acceptable product at lower cost. It seems equally important to us to look at the prospect of using ADP to support the creation of intelligence products which are otherwise unavailable in terms of existing processing techniques where the product may be worth the additional processing expenditures which may have to be incurred.

5. ASPIN must devote attention to the rationalization of manual data processing systems as well. The implicit assumption that any manual processing is per se inefficient is not acceptable. Many information processing activities involve a heterogeneous information flow much of which is of uncertain relevance. Distribution of this information is complex, selection of it for retention and potential analytical use is an order of magnitude more complex. Still more complex is the function of drawing relevant information from such a collection of information. Some of these functions are being analyzed in an effort to provide automated assistance to this process. Many of these functions can never be automated. The critical need for ASPIN is to recognize and identify these functions appropriately.

6. The initial persuasion of Project ASPIN is that the intelligence production process is an intellectual, analytical process. This process requires analysis of a complex set of relationships or interactions in which there is seldom an equality between a particular data element (piece of information) and an event. Often the analytical

processing people who were more interested in promoting their private information concepts, in being "modern," and in watching little lights blink on and off than in the final product. When these systems have failed to operate, or have operated and have been wanting for users, the analyst has always been at fault for being narrow-minded. Sustained observation of this condition leads us to believe that the fault may rather lie in the design of these systems which tends to overlook the analyst function it seeks to serve or to oversimplify it.

10. We believe that general systems, -- and community information processing systems must be general systems -- must clearly understand and be responsive to the analyst production function. Further, we believe that only analysis of that function, and particularly observation and analysis of the ADP applications which are generated by analysts or which are considered highly useful to analysts, will produce system parameters which have a sufficiently high probability of increasing analyst productivity to warrant the large expenditures such systems require. We are inclined to conduct this investigation within CIA rather than on a community-wide basis because interagency access to analysts is too highly constrained (middle management filters) and because we have found no other organization with any demonstrated interest in pursuing this approach.

IPC - Projects (ASPIN)

SECRET

19 June 1969

MEMORANDUM FOR: IP Coordinators and Chief, IPStaff O/PPB

SUBJECT : Files for an Improved Community Information Handling System

1. Attached is a draft letter on the matter of files for a Community Information Handling System. I prepared this note pursuant to our agreement at the last IPC meeting. Fundamentally, I have sought to develop a general Agency approach to the subject for the IHC meeting in July. No formal Agency response is required before October in terms of present IHC schedules.

2. Nevertheless, I believe that, if the Agency could agree on some statement of the nature of the attachment, it would be useful to send it to the IHC. Such a statement would provide some focus for the July discussion and subsequent drafts from other IHC members. It would remove some of the stigma which the Chairman puts on the Committee to wit that the members are not inclined to be "constructive" in their recommendations. Those of you who have observed the "progress" of the IHC on this matter probably recognize that anything which will give this matter some focus or point of departure ought to be helpful.

3. I would propose since [redacted] is now on board 25X1A that this draft might be considered at an early IPC meeting so that he could have the benefit (?) of our reactions for subsequent IHC deliberations.

[redacted] 25X1A

Director, Project ASPIN

Attachment:
as stated

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GROUP 1
Excluded from automatic downgrading and declassification

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25X1A

DRAFT [redacted] 18 June '69

MEMORANDUM FOR: Chairman IHC

SUBJECT : Files for an Improved Community Information Handling System

REFERENCE : IHC-D-113,4/17, 12 May 1969

1. Most of the files which the Agency would like to see in a "Community System" are in part available now. The following files (or elements thereof) are regularly acquired and used by Agency analysts or production support components.

1) DIA Radar Order of Battle

2) DIA Target Data Inventory

3) NSA Harvest File

4) NSA Unit File

5) NSA Soviet Airfield File

6) SAC Consolidated Air Defense Order of Battle

7) USAREUR Order of Battle

None of these files as presently constituted meets our full requirement for data on the file subject. The principal omission from these files is a "history" element. Each contains the current status of organizations, facilities or equipment, but none maintains a history file. The latter is often of more interest to our analysts than the available file. Thus we tend to seek copies of these files, to maintain current status and to build a history file of our own.

2. In general we would prefer consolidated files such as the SAC CADOB file rather than disparate lists which treat isolated phenomena, usually with no crosswalks to associated phenomena. The preceding comment should not be construed as condemnatory, inasmuch as I'm sure many analysts want a clean, unambiguous file which satisfied their own activity requirement and which is sufficiently isolated from other work that no one can intervene in their activity, and thus complicate it.

3. As a result of being eclectic in our file building activity, we have discovered and developed some characteristics that we'd insist were available in any system the Agency would find more than minimally useful. There are often several sets of data, for example, on any given installation, some of the data treating different aspects of the installation, some using different definitions of the installation and its parts and thus producing different data and different perspectives, and some that are rather directly duplicative yet contain contradictory data. In general it has been our policy to maintain a wide range of these data where we have reasonable confidence in the source of or relevance of the data. Analysis of such data-ranges permits greater accuracy and relevance in reporting which more than compensates for its apparent lack of absolute certainty.

4. The subject matter of the files which can be effectively employed is infinite. We would be inclined to prefer general country data sets and certain functional data sets in somewhat

greater detail, particularly those dealing with biographic, foreign policy, scientific, economic and military activity. There is a critical need for a capability to generate sub-sets from these files which can be augmented by the user and maintained and manipulated by the user during a period in which he is engaged in a particular assignment. These subsets might, subsequent to varying periods of use, be moved to off-line (more remote) storage or destroyed if they were no longer useful or needed.

5. The subject matter of files which the Agency would be prepared to offer for this sort of system is essentially that which is available today from the Central Reference Service, in the COINS Project, and in the listings made available to the USIB File and Program Catalog System. Access to many of these files would be limited to individuals who are qualified to exploit them appropriately. Such limitation would be based on intellectual qualification as well as security clearance levels. The damage that can be done by incorrect or irrelevant inference from many general, and most private, files is considerably greater than inadvertent access to data at security levels above the level for which an indoctrinated individual in the intelligence community has been cleared.

6. We believe that any effort to be definitive about the subject matter of files required from or to be furnished to a community system will be self-defeating as well as exceedingly

expensive and wasteful. Any research or analytical effort worthy of the name finds its data base constantly shifting as a function of the present state of knowledge, the state of collection and processing technology, and the demand for information and intelligence products by licensed consumers.

7. Critical to the utility of community exchange of files whether in an on-line or off-line environment is the development of certain standards of reference which ought to be as common as possible over the entire community. Although every participant recognizes the desirability of standards and the widespread absence of standards both within and between Departments and Agencies, few participants recognize the underlying reasons for this condition. Different production and research activities have different problems which each attacks in the way best calculated to produce the required solutions with the minimal expenditure of effort and a maximal identification of the solution with the individual producer or production organization. As a result, an individual or organization tends to employ no more identification of data elements than is necessary to do the job and to assure that the job is identified with the producer. This means however that there is often wide divergence both in the content of data employed and in the means of identification of data from individual to individual and organization to organization. These differences are sometimes troublesome in bilateral exchanges of data even among "cognoscenti" but a user rather quickly overcomes these problems and with minor irritation can handle bilateral exchanges

with other interested parties. Thus, although standards of reference might facilitate information exchange, they tend to be avoided in most areas because they add to the work required to carry on required services, research, and production. Standards also tend to mask the identity of a producing organization.

8. The development of reference standards can only begin where there is understanding of the above basis for lack of standards. Developing standards by decree is both capricious and wasteful, but so also is the creation of "private" reference to distinguish output of a particular organization or individual. Data standards will be developed slowly (1) in response to recognized need, (2) with careful assessment of the gains from easier exchange against the losses in responsiveness and precision, and (3) with sufficient flexibility to permit both access to needed historical data and freedom to adapt to changes in future information requirements.

Distribution:
1 Each IPC
1 - OPPB, [redacted] 25X1A

SECRET

BJ RHW

[redacted] 25X1A

IPC meeting. Nothing was said which allowed me to understand whether [redacted] were 25X1A
for or "agin" [redacted]. At first I thought they were agin but 25X1A
it later sounded as though they were with him. After having read [redacted] letter I couldn't see how they were 25X1A
able to be either.

25X1A It seems that NSPIN is going to run head on into COINS and "other" community systems, unspecified. [redacted] do not see eye to eye but I gather that nobody on the IHC sees eye to eye with anybody.

EOI is the big thing now. I got a laugh out of this. [redacted] went on at great 25X1A
length about EOI in mysterious and guarded ways. I was about to ask what EOI stood for when [redacted] 25X1A
25X1A [redacted] leaned over to [redacted] and asked my question. 25X1A
[redacted] didn't know the answer. That characterized this part of the meeting for me - much talk no answers.

25X1A

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OFFICIAL ROUTING SLIP

TO	[redacted]	DATE	INITIALS
1		4/24	M
2			
3			
4			
5			
6			

	ACTION		DIRECT REPLY		PREPARE REPLY
	APPROVAL		DISPATCH		RECOMMENDATION
	COMMENT		FILE		RETURN
	CONCURRENCE		INFORMATION		SIGNATURE

Remarks:

1,2 Any comment?

What impact on Comms?

Other programs?

Any time you go to remote access real-time systems Comms will get involved just as they have with COINS. The problems are essentially the same – requiring effective access codes, secure lines, scramblers, etc. Probably some effect on OCS, but not a serious problem as they have looked at it for some time.

FOLD HERE TO RETURN TO SENDER

FROM: NAME, ORG. AND PHONE NO.	DATE
[redacted]	4/26

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(40)

FORM NO. 237 Use previous editions

25X1A

IPC - Projects
ASPIN

DD/S 691961

28 APR 1969

MEMORANDUM FOR THE RECORD

SUBJECT: Project ASPIN

1. After reviewing the papers which Mr. [redacted] sent at our request concerning ASPIN, I telephoned him to make the following points: 25X1A

a. The DD/I papers indicate 1 July 1969 as the activation date. We had understood that Logistics Services Division had been given a 5 May deadline on the ASPIN group space.

25X1A

b. While Mr. [redacted] is the Support Directorate Information Processing Coordinator, it is not correct to say that he is coordinating for us on the ASPIN project. In fact, we continue really to be ignorant and we need some briefing or other information as to what ASPIN is to accomplish and what the Support role is expected to be.

2. Mr. [redacted] confirmed 1 July as the expected group activation date. 25X1A He said that DD/I had not intended to indicate a 5 May readiness deadline for the ASPIN group space. It had been intended to indicate that decisions were needed early on in order to ensure the 1 July readiness date.

3. On the substantive side, Mr. [redacted] offered to discuss with Mr. 25X1A Proctor and Mr. [redacted] and suggest that a substantive briefing be set up for 25X1A us.

(signed) John W. Coffey

John W. Coffey
Assistant Deputy Director
for Support

ADD/S:JWC/ms
Distribution:
Orig - DD/S Subject, w/Background (DD/S 69-1923)
1 - Chief, Support Services Staff ✓
1 - Director of Logistics
1 - DD/S Chrono