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29 December 1982

MEMORANDUM FOR: Deputy Director of Central Intelligence

FROM : [REDACTED] 25X1
 Undersecretary of Defense for Research & Engineering
 (as) Chairman,
 Intelligence Research & Development Council

SUBJECT : Artificial Intelligence Program Recommendations [REDACTED] 25X1

REFERENCE : (a) DDCI Memorandum [REDACTED] 25X1
 (b) IR&DC Report [REDACTED] 25X1

Executive Summary

This memorandum responds to your request for recommendations concerning the application of artificial intelligence (AI) technology in the Intelligence Community (IC). Developed more fully below, the Intelligence Research & Development Council (IR&DC) recommends that:

- (1) Guidance be given to all IC Program Managers to include plans for applying artificial intelligence within their recommended FY-85 programs. A sample of suggested wording for such guidance is provided as attachment-A... [REDACTED] 25X1
- (2) A subcommittee of the IR&DC be established to provide needed information exchange on AI matters within the Community. The scope of this subcommittee would include technical information exchange, interfacing between basic AI research and IC applications, and coordinating IC AI activities. [REDACTED] 25X1
- (3) The IC continue to rely on the long-term financing of basic AI research by the Defense Advanced Research Projects Agency (DARPA) coordinating its requirements through the IR&DC AI subcommittee. [REDACTED] 25X1
- (4) The IC, itself, continue to concentrate on applying AI and prepare a list of applications which would solidify the commitment and alert researchers and vendors to Community needs. An initial set of candidate applications is included as attachment-B. [REDACTED] 25X1
- (5) Community ADP managers be advised that in all likelihood a more diverse set of computing hardware and languages will be required to support AI systems. Plans will need to be developed for maintaining these tools and integrating them into existing computer environments. [REDACTED] 25X1
- (6) Several nascent AI applications laboratories in the Community be expanded, and their timetables advanced, so as to form focal points for AI in the Community. Two such laboratories are those in the

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- Engineering Topographic Laboratories (ETL) and the Office of Research and Development (ORD). 25X1
- (7) An unclassified AI computer facility be established for the Community and networked with the existing AI research centers via the ARPAnet. This facility would provide a cost-savings link between the Intelligence Community and the AI research community. 25X1
- (8) End-users of AI systems begin to allocate resources for technology transfer, recognizing their commitment to provide domain-specific expertise to be built into the systems. 25X1
- (9) The component agencies work together to plan for the internal development of Government personnel in AI. 25X1

As we indicated in our report, we are encouraged by recent breakthroughs in AI and believe that there are many areas in the Community which could benefit from applied AI technology. The recommendations contained in this memorandum are aimed at accelerating current Community efforts in AI to speed up the productive use of this technology throughout the Community. Key among these recommendations are numbers 8 and 9. The projected shortage of trained personnel, added to the normal security issues, necessitates that the IC be able to supply a large proportion of its own AI specialists. Therefore, training is paramount (Rec. 9). The importance of Rec. 8, "End-User Planning", results from the lack of exposure of Community components to the technology and their understandable general reluctance to exchange current resources for future benefits. Although certain of these recommendations may need to wait for FY-85, every effort should be made to take preparatory steps in FY-83/84 and Program Managers should be asked to address this specifically. 25X1

1. DCI Guidance

Given the strong potential for AI applications in the Community, the IR&DC recommends that guidance be given to all IC Program Managers to aggressively pursue the technology and to plan for AI in their FY-85 programs. Each individual Program Manager will, of course, decide where AI technology can best support his or her program. It is therefore recommended that each Program Manager prepare a list of candidate projects for early attention. A sample list is provided in attachment-B. Because of the burgeoning technology and the Community's relative inexperience in applying AI to intelligence problems, we recommend that the DCI resist at this time the temptation to name a single AI focal point or lead office for the Community. We suggest, instead, that the Community rely on developing a program of information exchange concerning applied AI. Such a program can and should be sponsored through the AI subcommittee of the IR&DC. 25X1

2. IR&DC Subcommittee on AI

To coordinate the exchange of information in this field, we recommend that a new subcommittee be established within the IR&DC to exchange technical information, track basic research, evaluate Community requirements from a technical perspective, and review technically the development of Community AI systems. This subcommittee would serve as the

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major coordinating body for AI activities within the Community as well as coordinate AI research efforts on the outside. Specifically, as indicated below, this subcommittee will interface with DARPA (a member of the IR&DC but not of the IC). As another example, a series of specific recommendations have been developed by the EXRAND, including several involving AI technology and these are endorsed by the IR&DC. These are summarized in attachment-C. As a part of its charter the new IR&DC AI subcommittee would monitor the progress of AI activities such as those proposed by EXRAND.

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3. Basic AI Research

While artificial intelligence has been under development for more than 25 years, there remain many fundamental problems to be solved. We recommend that continued encouragement be given to DARPA, NSF, ONR, and other funding agencies to support basic research in artificial intelligence. Historically, these agencies have been providing more than \$10 M per year for AI research during this period. We hope that similar levels of support would be continued in the future. The IR&DC would then serve a coordinating role in expressing the needs of the Community to these funding agencies.

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4. IC Applications of AI

There are many areas where AI technology could be applied to intelligence problems. Several initial efforts are already underway to investigate the application of expert systems, natural language processing, image understanding, and logic programming technologies and methods. A preliminary list of potential Community applications appears in attachment-B. This initial list presumably will be expanded and continually refined by the IR&DC AI subcommittee. As usual, identifying suitable applications and expressing Intelligence Community requirements to the research community will be a challenging task requiring a deep understanding of both AI technology and IC needs.

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5. AI Computing Environment

Systems involving artificial intelligence generally have special requirements which necessitate a computer environment that is somewhat different from the classical data processing centers of the Community. Consequently, the development of AI applications in the Community will necessitate the member agencies' acquiring a diversity of computer equipment (e.g., machines specifically designed to run the LISP programming language). The various Program Managers should begin planning now to allocate resources for these facilities. Admittedly a diversity of computing equipment (and vendors) will be a hardship on ADP managers. However, such equipment is essential at least for in-house research and development efforts. Of course, every effort should be made as systems are developed to ensure that operational systems will be as compatible as possible with individual agency ADP masterplans and traditional mainframe equipment.

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6. Classified In-House AI Laboratories

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Current efforts to establish classified, in-house AI laboratories such as those in CIA-ORD, and ETL should be encouraged and expanded with additional funds. The special research-user relationships needed to develop applied AI support to operations argues for several distributed facilities as opposed to a centralized approach. Quality Government laboratory facilities will not only provide the computing resources necessary to conduct AI research and development but will also provide a mechanism for training Government personnel and attracting competent researchers from the universities and private industry. While recognizing the special security and privacy needs of each of the agencies, consideration should nonetheless be given to the electronic networking of selected Community AI research facilities to further the exchange of knowledge and information in the field. Recent advances in network security and compartmented dissemination substantially reduce the risks associated with such interconnections.

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7. Unclassified AI Laboratory

In addition to in-house facilities for developing classified AI applications, the Community could also benefit from an unclassified facility which is connected electronically to other unclassified AI research centers outside the Community. Such a connection most likely would be via the existing ARPAnet which already connects most of the AI research centers in the U.S. The IC unclassified AI facility could be operated under contract following models established by DARPA such as the Information Sciences Institute at the University of Southern California. This facility could be used to cut down on Government commercial software development costs by providing Government-furnished computer time to contractors in an environment similar to the classified environment into which the operational system must eventually be placed.

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8. End-User Commitment

The basic paradigm of an AI system is to develop a functionally capable system in the laboratory and then to load it with specific knowledge about the intended application. This knowledge is generally obtained from the customers for whom the system is being built. We recommend that guidance be given to the various components to plan for a substantial consumer commitment to identify experts and to make them available to provide the required domain-specific knowledge. Further, these internal customers for AI technology will also need to plan adequate resources for operating and maintaining such systems once they are developed. Active user involvement in the technology transfer process should be ensured from the beginning.

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9. AI Training

Perhaps the most important consideration for a long-term commitment to artificial intelligence will be the establishment of an adequately trained Government work force. Sufficient understanding of the tools and techniques of AI will be required of Government personnel to identify suitable applications, to monitor contracts, to select hardware and software, and to apply commercially developed products to the Community's needs. Because of strong competition for the relatively few skilled AI

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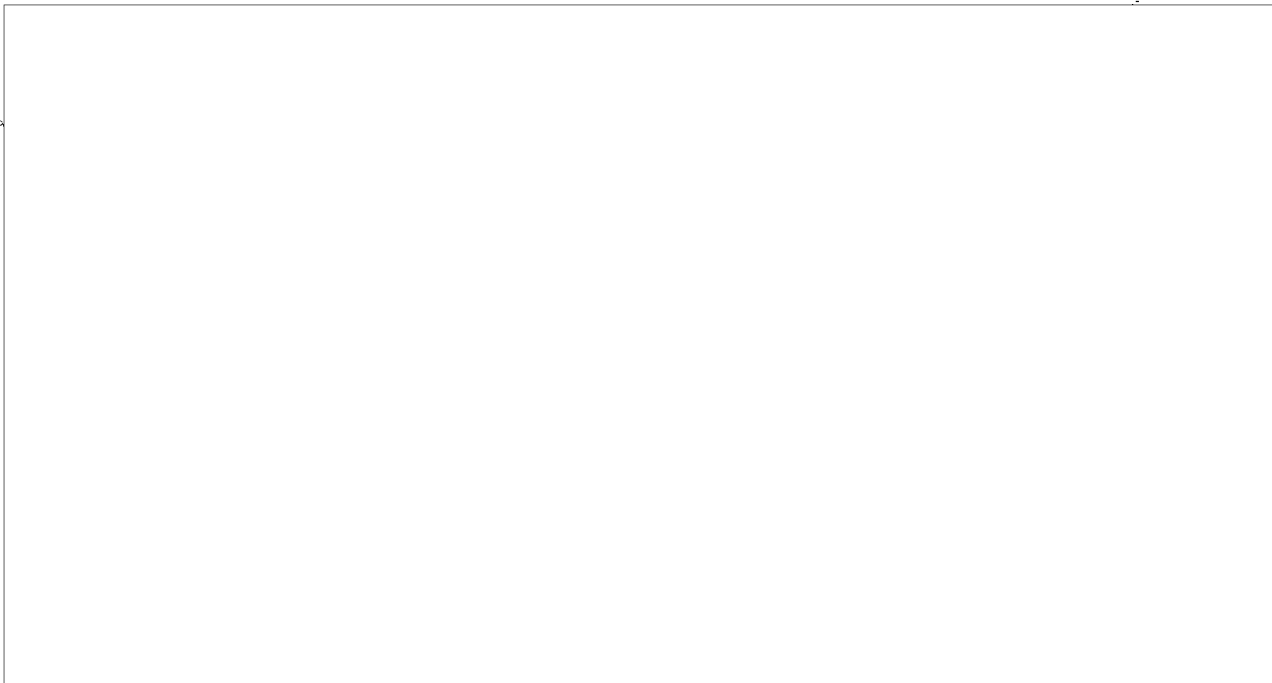
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systems people available, the Community will have to establish training programs to develop its own internal expertise. Options available for acquiring this expertise include:

- 9.1 Establishing close relationships with the major AI research centers through summer institutes, post-doctoral fellowships, hosting professors on sabbatical, and extended on-site apprenticeships with the centers. 25X1
- 9.2 Encouraging and assisting employees to seek formal courses or graduate school training in AI and knowledge engineering. 25X1
- 9.3 Conducting an AI seminar or lecture series for members of the Community. 25X1
- 9.4 Sponsoring periodic AI symposia similar to the one recently hosted by CIA-ORD and CIA-OSWR at CIA Headquarters. 25X1
- 9.5 Developing a series of internal training courses for AI system developers and end-users. 25X1
- 9.6 Providing internships at Community AI laboratories for academic or industrial AI researchers. 25X1

Early consideration should be given to recruitment and training in FY-83 and 84 to form a cadre of knowledgeable personnel around which to build a viable program of applications beginning in FY-85. 25X1

10. The Scale of Community Efforts



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11. The Need for Artificial Intelligence

To reiterate, the Intelligence Community is faced with a continuing

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set of technical problems involving the collection, processing, and reporting of intelligence. Advances in collection technology promise to continue to provide more data than we can process with common data processing technology. Valuable human expertise is lost every year as knowledgeable analysts retire or otherwise move on from their positions. Confusion mounts over just what it is that a particular quantitative technique really models or how to set the parameters to make it work. Information systems continue to be developed which are inflexible to changes in requirements and costly to modify. In short, much is being spent on developing automated systems, but the practical utility of such systems is not all it could be.

In conclusion, we believe that artificial intelligence is the only technology today with the promise of yielding the kinds of information systems needed to process the projected volumes of data and present it in a way that is meaningful to and efficient of our human analysts. The time is now to begin to build the kinds of systems which will be required by the mid- to late-Eighties, systems which employ the techniques of artificial intelligence.

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attachments as stated.

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ATTACHMENT-A

SAMPLE DCI GUIDANCE

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As in previous years, I wish to emphasize the importance of developing innovative technical and operational solutions to the intelligence problems that face us. Creative planning and application of appropriate technology should allow us to achieve the significant progress of which we are capable.

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One can scarcely be unaware of breathtaking advances in computers which touch every corner of our lives. We must redouble our efforts to take fullest advantage of this technology. I am particularly persuaded that the most advanced area of computer science, known (to my dismay) as "Artificial Intelligence", has much to offer the Community. To this end, I have reaffirmed and strengthened last year's DCI GOAL 12: "To Enhance Manpower Talent and Productivity (U)". It has been modified to recognize explicitly the potential contribution of advanced computer science.

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GOAL 12: To Enhance Manpower Talent and Productivity

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Intelligence analysis and production remain a manpower intensive effort and we continue to suffer from a critical shortage of scarce skills. Methods must be found to ensure intelligence access to the necessary skills and to leverage through computer technologies our resident talents. The shortage of linguists and regional analysts will be particularly critical, but engineers and technical specialists will also be in short supply. Ways must be found both to increase the skilled manpower available and to improve the productivity of available personnel.

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The capability of the Intelligence Community to recruit, retain, and ensure the productivity of necessary manpower remains limited. Colleges and universities continue to produce insufficient graduates with the skills required by the Community, nor is the shortage likely to be remedied through the decade. And, while public perceptions are slowly changing, the problem is still compounded by: an impression among undergraduates that past personnel cuts and hiring freezes reflect the long-term trend; a residual negative public attitude toward intelligence; and, competition from the private sector for the same skills. Consequently, it remains difficult to find qualified personnel, even when manpower positions are available.

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You should endeavor to initiate programs that will improve the Community's ability to recruit and retain the manpower necessary. Further, you should endeavor to initiate programs, based upon the most promising computer science advances, to multiply the productivity of available manpower.

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