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Central Intelligence Agency

Washington, D.C. 20505

21 November 2017

Reference: EOM-2016-00523

This is a final response to your correspondence of 16 January 2016 requesting an Executive Order 13526 mandatory declassification review of the **History of the Office of Research and Development, Volumes 1 through 6.**

We completed a thorough search of our records and located the document responsive to your request. We have determined that it may be released in sanitized form. We have deleted material that must remain classified on the basis of section 3.3(b)(1) of the Order. Additional information was also withheld because withholding is authorized and warranted under applicable law, as provided for by section 3.5(c) of the Order. Enclosed is a copy of the document showing our deletions and citing our exemptions.

You may appeal this decision by addressing your appeal to the Agency Release Panel within 60 days from the date of this letter, in my care. Should you choose to do this, please explain the basis of your appeal.

Sincerely,

Allison Fong
Information and Privacy Coordinator

Enclosure

ACKNOWLEDGEMENTS

The writing of the history of the Office of Research and Development and the associated monographs were produced through the efforts of many of the members of the Office. We wish to express our appreciation to the 3.5(c)
individuals who have worked to produce this document; however, [redacted] 3.5(c)
[redacted] deserves special mention. Without [redacted] 3.5(c)
efforts and involvement in the coordination, preparation of graphs and charts, typing, and many other tasks that go into an endeavor of this kind, the ORD history would not have attained the level of quality nor would not have been completed in the time allocated.

[redacted] 3.5(c)
Editor
ORD History

FOREWORD

Research and development is a much used phrase in this modern age. The application of new technology can be viewed in every aspect of daily life. However, advancing technology has also made the security of the United States more difficult to maintain. The Intelligence Community must use every available means, including the use of the most sophisticated technological techniques, to collect and analyse information from which intelligence estimates can be made.

The Central Intelligence Agency must provide the leadership and direction for the exploitation of advanced technology for intelligence purposes. A major responsibility of the Office of Research and Development is to assure that CIA is in the forefront of technology.

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OFFICE OF RESEARCH AND DEVELOPMENT

I. Introduction

In the early 1960's it became apparent that a new Directorate would have to be added to the Central Intelligence Agency organization. This new Directorate would bring together those elements necessary to carry out intelligence collection by technical means. Because of the nature of evolving technology, it was no longer feasible to have the responsibility for technical collection systems and scientific intelligence production scattered throughout Agency components. The Director of Central Intelligence needed more direct management of these activities. Therefore, a Deputy Director for Research, Dr. Herbert Scoville, was appointed to organize and bring together the necessary resources to be responsive to the DCI's needs. Colonel Edward B. Giller, USAF, was appointed Assistant Deputy Director for Research. This new Directorate was initially composed of the Office of Special Activities (OSA), Office of Elint (OEL) and the Office of Research and Development (ORD).

II. Mission and Functions

The responsibility of ORD under the DD/R was to conduct in-depth research and development in the scientific and technical fields and to support intelligence collection by advanced technical means. The mission of ORD, as stated in DD/R 584-62 dated 26 September 1962, was as follows:

[redacted] placed the responsibility 3.5(c)
on the Deputy Director (Research) to conduct in-depth research and development in the scientific and technical fields to support intelligence collection by advanced technical means. This was to be exclusive of those research and development activities to support agent operations, NPIC and the Office of Communications. In order to provide a capability to accomplish this mission, ORD has been formed in concept. While a preliminary Table of Organization and budget have been approved, the necessary manpower slots, funds and physical space have not been authorized.

"At present, the mission of ORD is conceived to be that of developing intelligence applications from technological discoveries, the operation of such applications and the conception of ways and methods by which operational analysis may maximize the effectiveness of such collection operations. In order to accomplish this, ORD will have three major divisions which are discussed below."

The three major divisions were Research Division, Systems Division, and Analysis Division. The intent was for the Research Division to perform the basic applied work on projects with the Systems Division mainly responsible for field engineering and applications of the systems. The role of the Analysis Division was to be the processing of data collected by the fielded systems. A secondary responsibility of the Analysis Division was to be the formulation of upgraded requirements levied on the Research and Systems Divisions to complete the cycle.

By mid-1963 the ORD mission and functions were defined as follows:

Mission: To conceive and devise intelligence applications from scientific and technical advances and discoveries and to maintain and operate the capability for the collection and analysis of intelligence by the most advanced technical means. This is exclusive of those specific programs assigned to other Agency components.

Functions:

a. To conduct the necessary basic and applied research and development in scientific and technical fields to support the collection of intelligence and its analysis;

b. To develop techniques, procedures, equipment and/or systems utilizing the most advanced scientific discoveries for the collection of intelligence and its analysis;

c. To systemize equipment and components for operational use and to operate and field the systems derived;

d. To conceive the ways and means whereby such technical collection devices may be utilized;

e. To conduct operational analysis whereby maximum effectiveness of collection operations may be achieved;

f. To conduct liaison and such other activities as may be necessary for the fulfillment of its mission.

ORD's mission and functions have remained nearly the same since mid-1963; however, a quote from the Director of ORD's presentation to the

Bureau of the Budget on 27 October 1967 gives a more concise statement of the mission and functions of ORD:

> "The mission of the Office of Research and Development is to support and enhance the intelligence capability of the Agency by the prosecution of all appropriate basic and applied research and development, and in that connection let me state that the great majority of such R&D is applied; that is, it is problem oriented....."

III. Organization

In the original establishment of ORD, the Office was to be headed by an Assistant Director with three divisions reporting to him. This organizational structure is presented in Figure 1. Figures 2 through 9 show how the organization has evolved from its original inception to the present. The original concept for ORD was part of the concept of the Directorate of Research. The principal participants in the inception of ORD were Dr. Herbert Scoville, at that time head of the Office of Scientific Intelligence (OSI) and Colonel Edward B. Giller, Deputy Chief of Technical Services Division, DD/P.

The Office of Research and Development changed from its original structure (Figure 1) to that shown in Figure 9 to meet increased responsibilities. These responsibilities were part of the evolving technical collection effort with which the Agency was becoming more involved. These additional responsibilities necessitated the growth from a modest, small office to the larger, more diversified organization shown. New

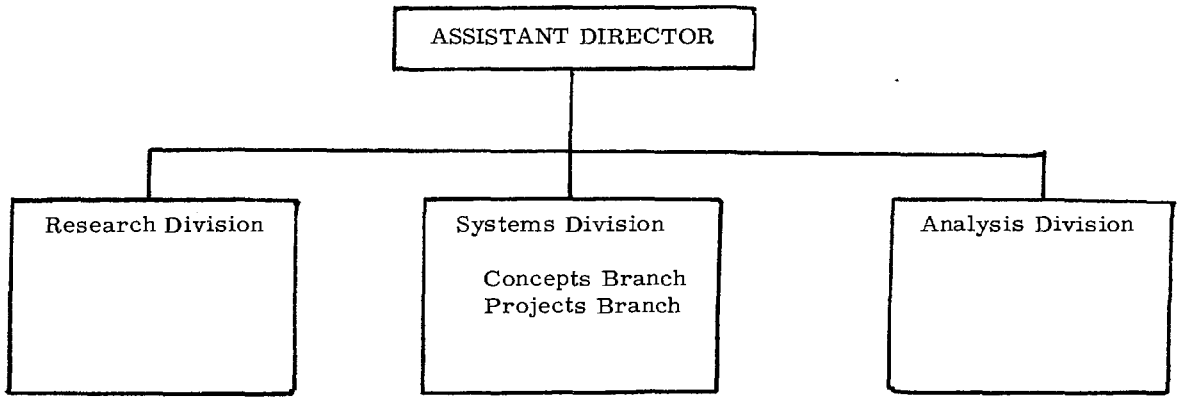

Figure 1. -- Original Concept

(per DD/R 584-62, 26 Sep 62)

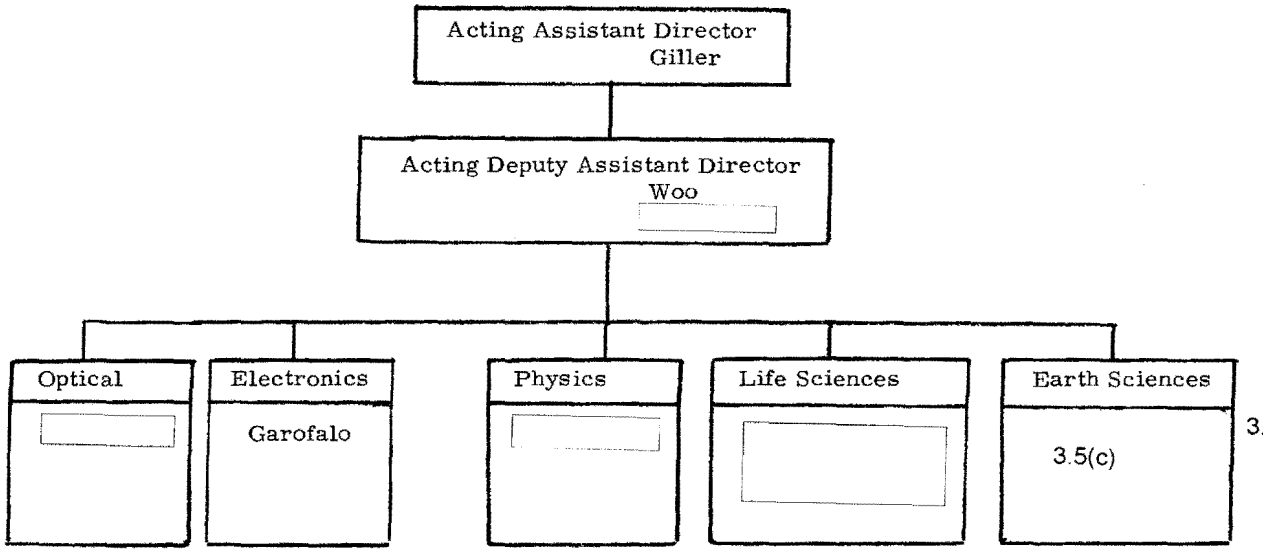

Figure 2. -- 16 January 1963

Mr. Woo designated these areas of interest for ORD.

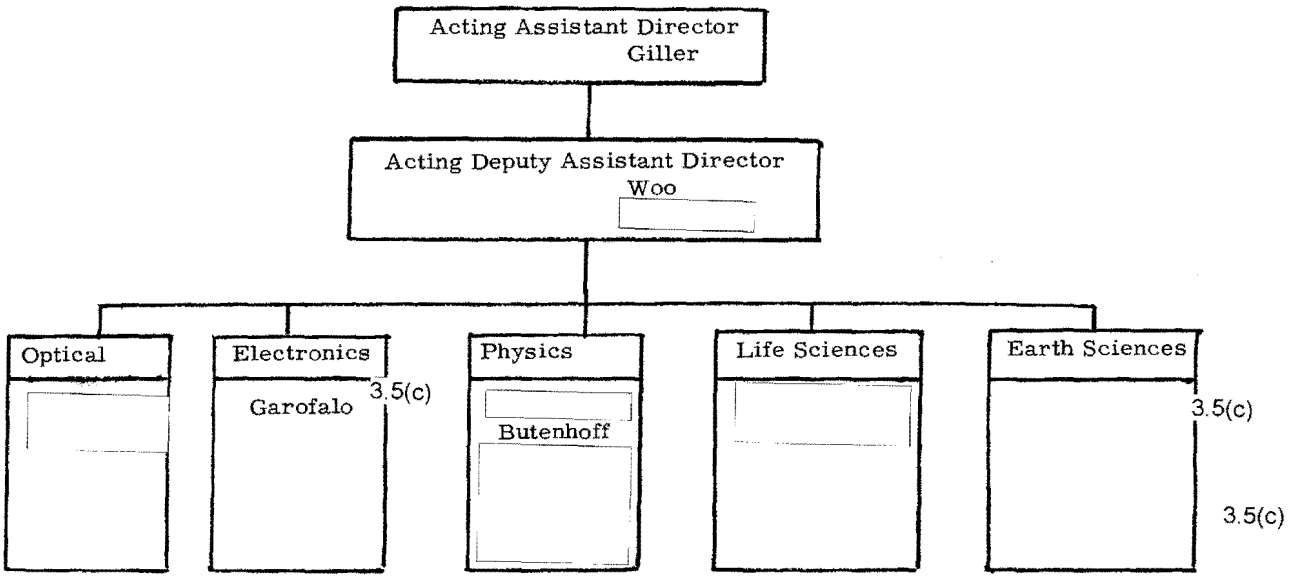

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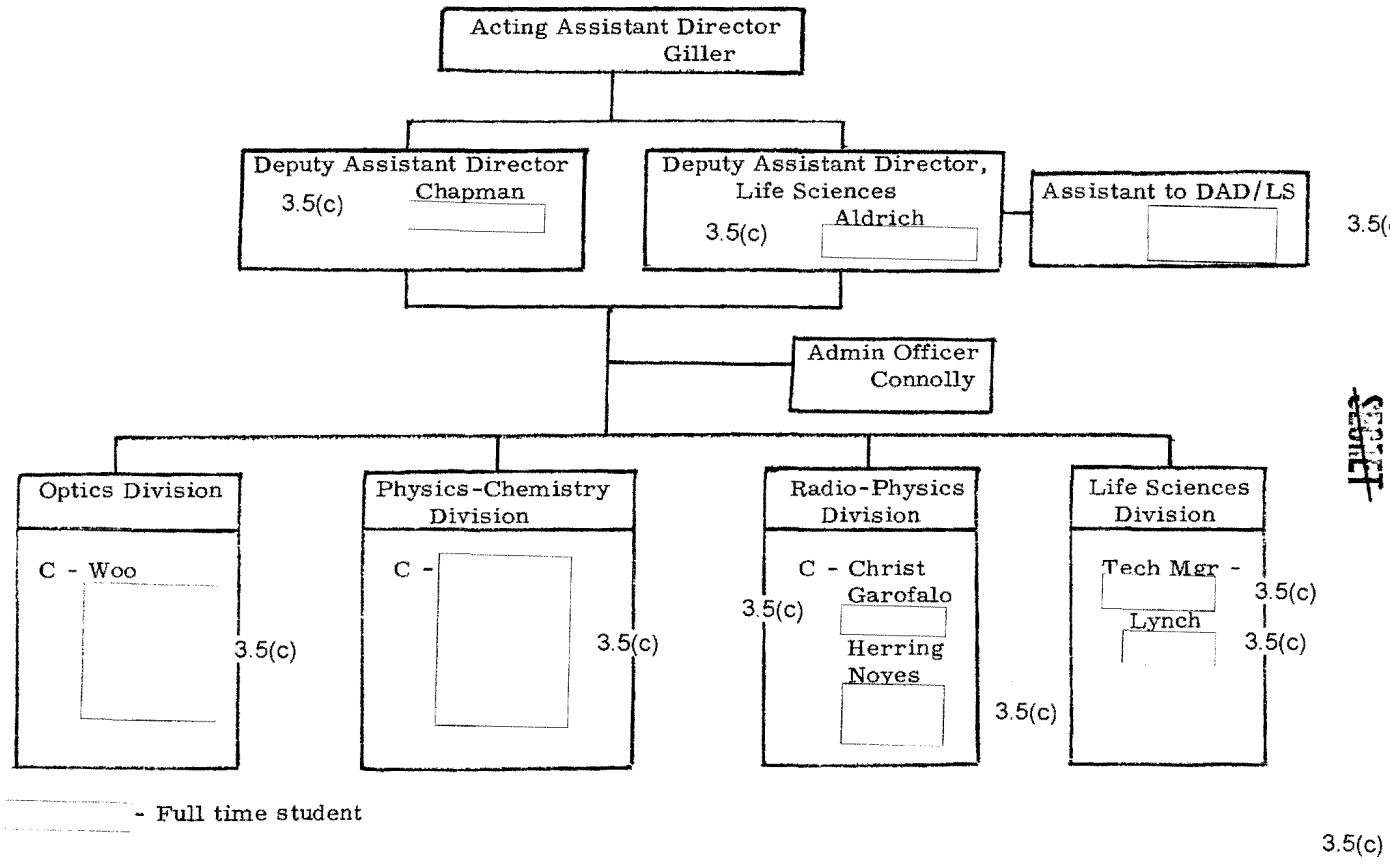
Figure 3. -- June 1963



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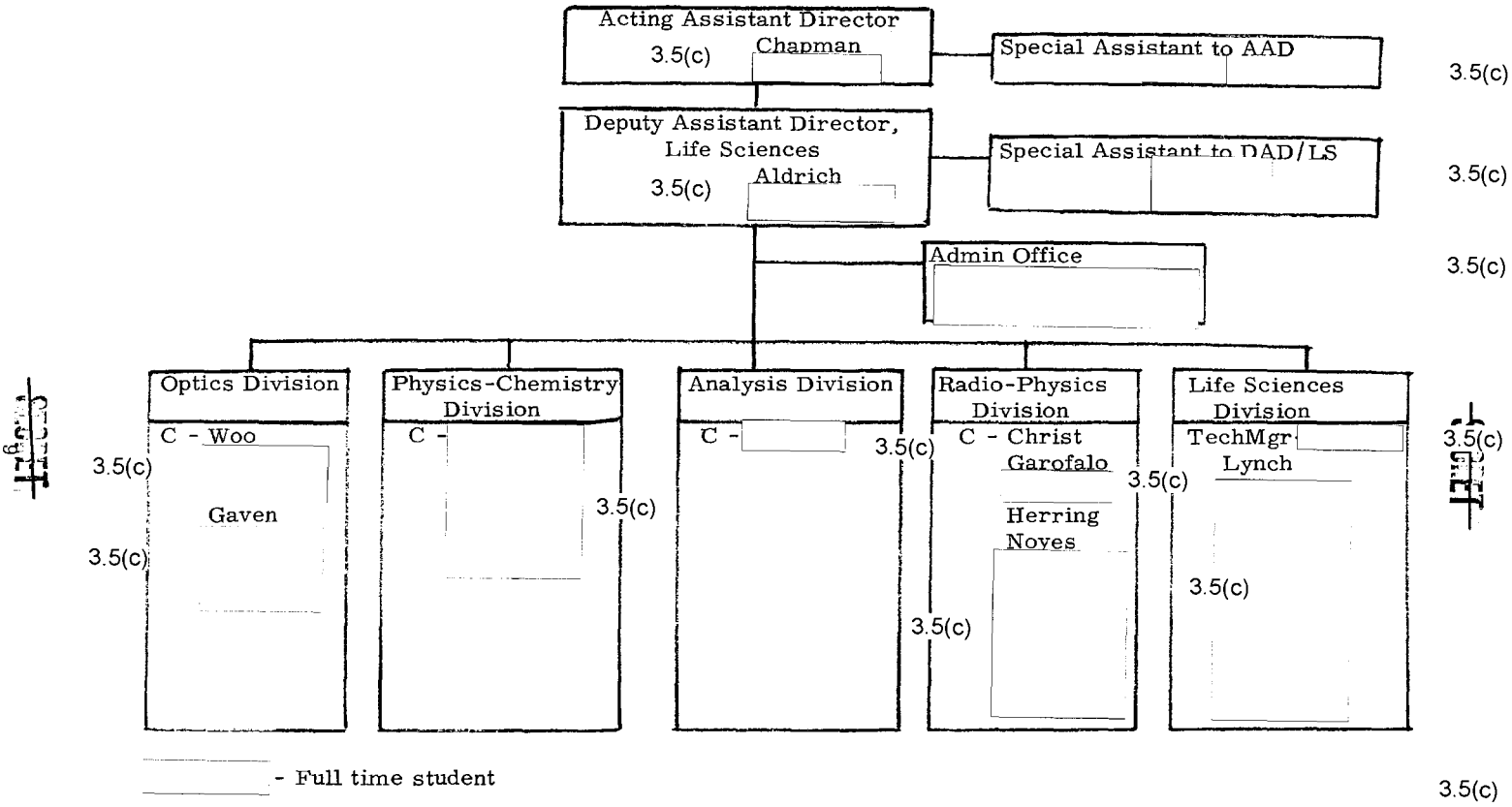

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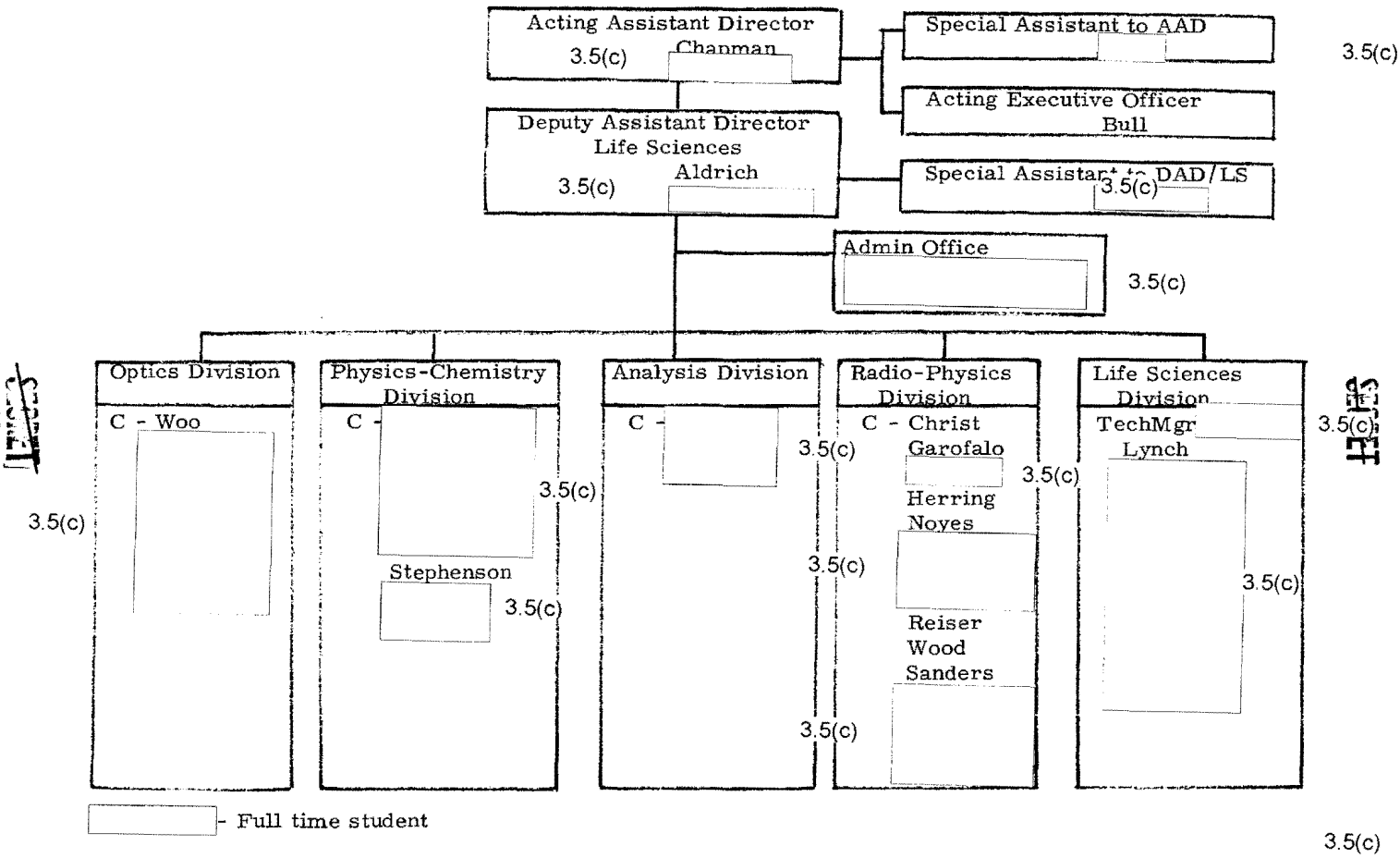

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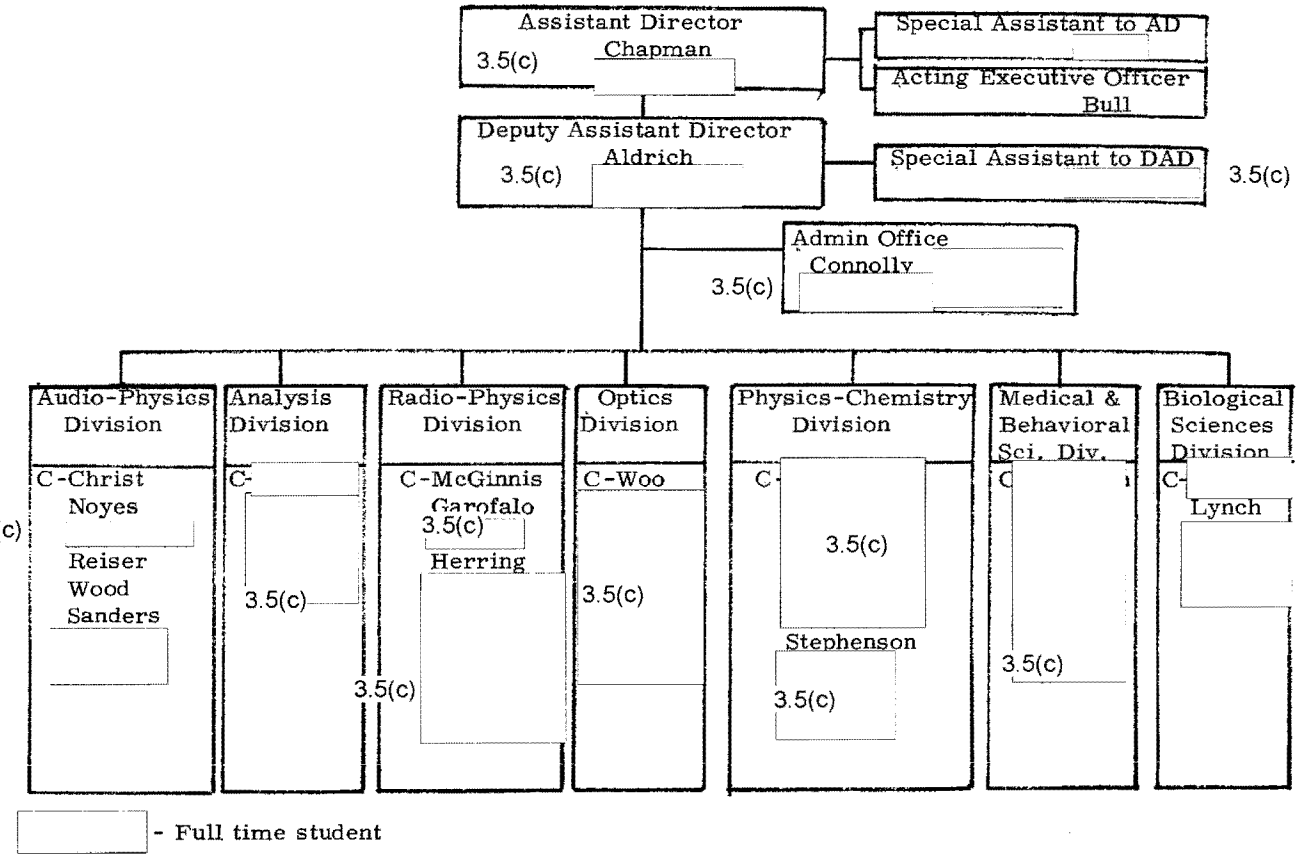

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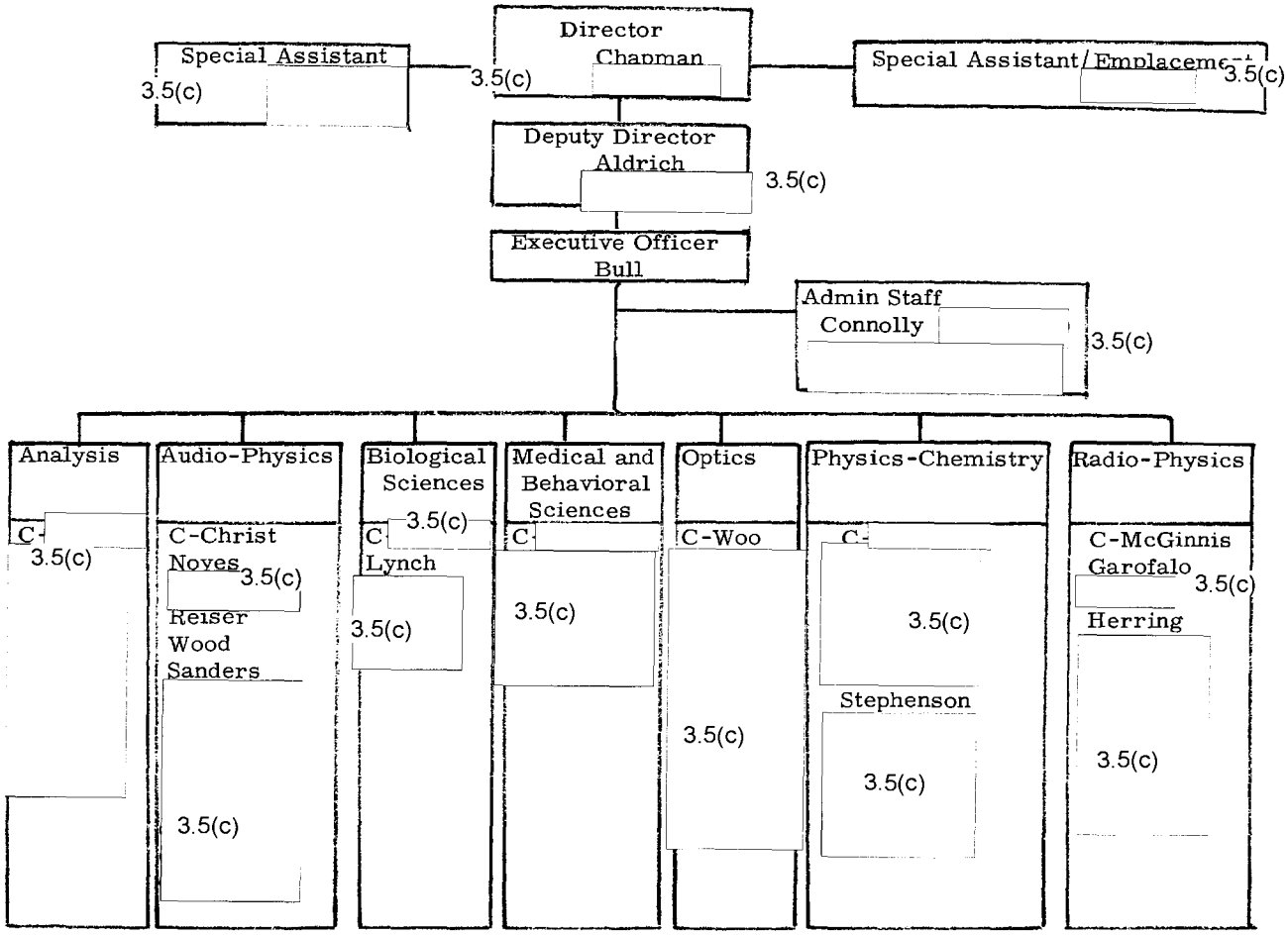

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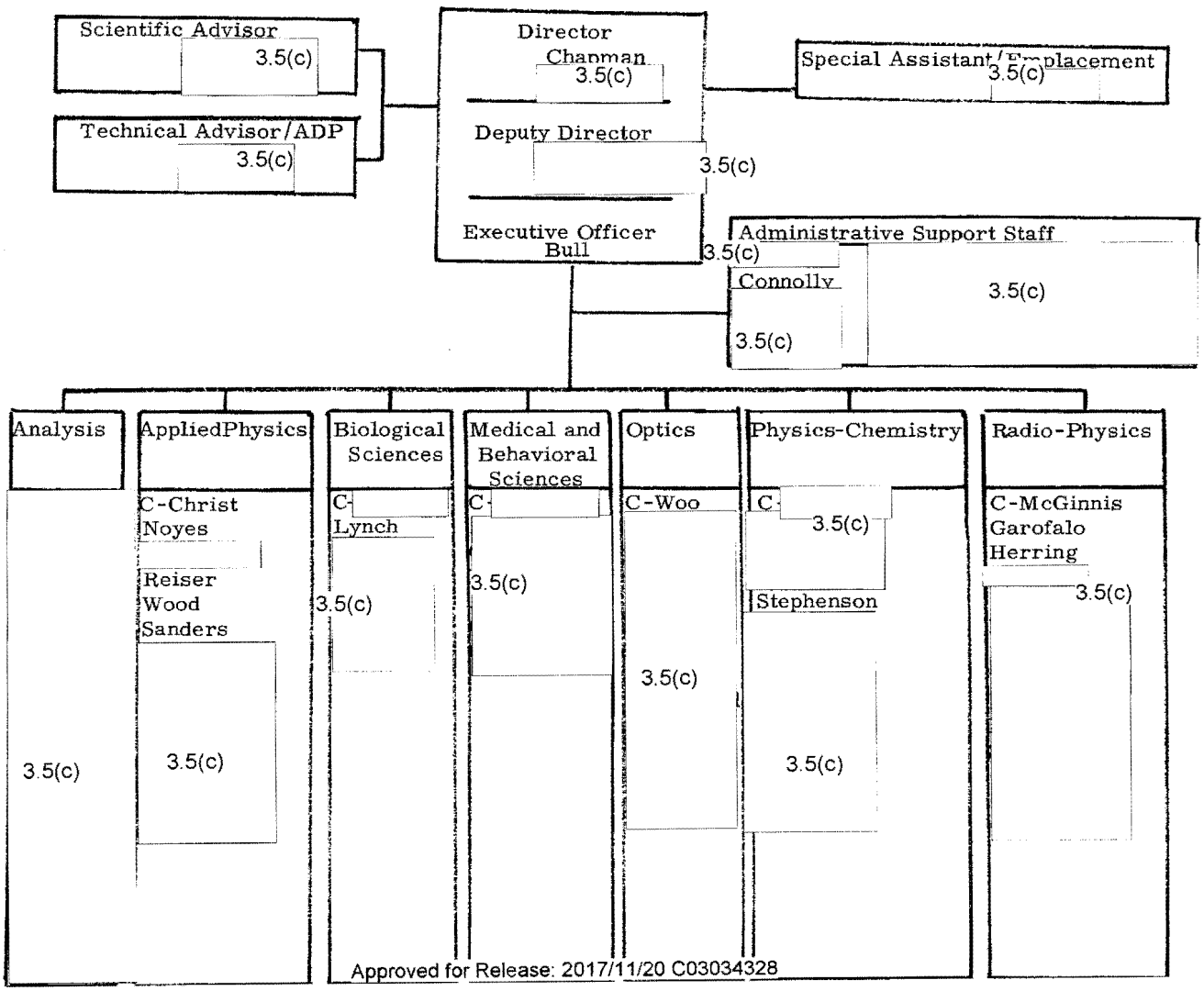

Figure 9. -- September 1967

intelligence collection systems, as well as the pursuit of new technologies, made it mandatory that the Office recruit the most able people available within the U.S. scientific community. The Office of Research and Development was able to attract and hire very competent engineers and scientists. A review of the accomplishments of the Office substantiates this statement.

From the time ORD was originally formed, in early 1963, until October of that year, its administrative functions were handled by the administrative and logistics officers of the DD/S&T Staff. Increasing activities in this area led to the formation, on 3 September 1963, of an Administrative Office. In order to handle the growth in the financial area, especially that associated with outside contracts, a Budget and Fiscal Officer was added in March of 1964, thus transferring this function from the DD/S&T Staff to ORD. Special Assistants to the Director and Deputy Director were later added to carry out specific assignments. These are shown in the above-mentioned organizational charts.

As an appendix at the end of this chapter, Headquarters Notices relating to ORD have been included.

IV. Personnel

When the Office of Research and Development was originally established, it did not have a large on-board personnel pool from which to draw. This is in contrast to OSA and OEL whose staffing was accomplished through reassignment of on-board staff personnel. However, Col. Giller negotiated an agreement with TSD/DD/P by which he could offer positions in ORD to

ten unnamed TSD people. [redacted] 3.5(c)

In early 1963, ORD was composed of Col. Giller as its acting head, the six personnel named above, [redacted] 3.3(b)(1) 3.5(c) These people were responsible for carrying forward certain projects transferred from TSD to ORD as well as initiating new projects in optics, electronics, physics, chemistry, and systems engineering. The second important responsibility of these people was to recruit personnel to staff this new office. Col. Giller was involved in recruiting a Director for ORD; in the interim he was appointed Acting Assistant Director and [redacted] served as Acting Deputy Assistant Director. 3.5(c)

Mr. Robert M. Chapman, the future Director, entered on duty in August, 1963. He came to us from Geophysics Corporation of America where he had been Vice-President and Manager of their Viron Division. His background includes wide experience as a Physicist and as a scientific manager. He was named Deputy Assistant Director of ORD effective 9 September 1963; Acting Assistant Director on 4 May 1964; and became Director of Research and Development 27 July 1965.

[redacted] transferred from the Office of Scientific Intelligence in September, 1963, to become ORD's Deputy Assistant Director for Life Sciences. In OSI he had been Chief of the Life Sciences Division and is a recognized authority on Life Sciences on a National basis. 3.5(c)

[redacted] was named Deputy Director of Research and Development at the time Mr. Chapman was designated as Director. 3.5(c)

[redacted] joined the Office as the Special Assistant to the Assistant Director of Research and Development in March, 1964. He had previously been a Planning Officer on the staff of the Director of Special Activities where he was responsible for reconnaissance program requirements, support and fiscal management. The transfer to ORD was to strengthen the staff in the areas of management coordination and administration during the early days of ORD growth. [redacted] later became the Executive Officer of the Office with general responsibility for managerial support functions, for coordination of administrative planning and for inter- and intra-Agency liaison. 3.5(c) 3.5(c)

[redacted] joined the Office of Research and Development in November of 1964. His previous assignment had been Chief of the General Sciences Division of the Office of Scientific Intelligence. He was reassigned to ORD to provide guidance and assistance to the Director in the formulation, definition and execution of technical programs. This reassignment was largely determined on the basis of his past experience in the analysis and production of intelligence which would provide a suitable background to orient the technical project officers in ORD in performing their research and development activities. [redacted] first served as Special Assistant to the Director of Research and Development and then, early in 1967, became Scientific Advisor to the Director. 3.5(c) 3.5(c)

[redacted] joined the Office of Research and Development in April, 1966. His previous assignment had been as Chief of the Physics and Electronics Branch, General Sciences Division of the Office of Scientific Intelligence. He was reassigned to the Office of Research and Development to provide program management guidance and assistance to the Director of ORD in the emplacement and staybehind equipment programs. This assignment was determined largely on the basis of his past experience in systems engineering research and development as well as the production of intelligence. 3.5(c)

[redacted] joined the Office of Research and Development in the Analysis Division on 10 April 1966. He was later reassigned to be the Technical Advisor to the Deputy Director of Research and Development in August, 1967, to have responsibility for ADP-associated problem areas. In addition, he also has prime responsibility for the planning, programming and budgeting functions of the Office. 3.5(c)

3.5(c) When [redacted] came to ORD, he brought with him [redacted] 3.5(c)
3.5(c) [redacted] as his Special Assistant for liaison and administrative support.
3.5(c) [redacted] acted in this capacity until his transfer in late 1965 to the Office of Planning, Programming and Budgeting.

3.5(c) [redacted] entered on duty as Administrative Officer on 3 September 1963. In March, 1964 [redacted] transferred 3.5(c) from DD/P to become Budget & Fiscal Officer for ORD. [redacted] 3.5(c) was assigned to ORD from the Security Staff of DD/S&T in August, 1967,

as security officer on a part-time basis; later in the year this became a full-time assignment.

When ORD moved from Headquarters to the Ames Center Building in March, 1966, it became necessary to increase the scope of operations of the Registry in order to comply with security regulations concerned with the handling of ORD correspondence. A vaulted area was specially constructed and the Registry was designated a control point for special channel documents. In April, 1966, [redacted] transferred 3.5(c) from DD/S&T to become chief of the ORD Registry.

When the ORD Library was established in 1966, it was manned on a part-time basis by [redacted] of the Main Library. As utilization 3.5(c) of the library facilities increased, [redacted] was added to the 3.5(c) staff as the full-time Librarian.

In January and February, 1964, plans for establishing the ORD Career Service Panel were formulated. The first meeting was held on 9 March 1964 to discuss the organization and responsibilities of the Panel. The voting members of the Panel were [redacted] 3.5(c)

3.5(c) [redacted] The Chairman was [redacted] In 1966 the basic 3.5(c) structure of the Panel was altered in order to solve certain problem areas. The chairmanship was changed, making it an elective position with a six-month tenure, the chairman to be elected by the Panel from its voting members. A later change placed [redacted] DD/ORD, as Chairman of 3.5(c) the Panel and a permanent member.

In addition to their normal duties associated with the Office of Research and Development, members of the staff have been involved in a number of "extracurricular" activities:

Mr. Robert M. Chapman was Chairman of the Photo Working Panel (Drell Committee); he was DD/S&T representative to the CIA R&D Review Board; he was named as the Agency focal point for R&D liaison with DIA; he is a member of the Technical Surveillance Countermeasures Committee of USIB and chairman of its Countermeasures Research and Development Subcommittee; and maintains close R&D liaison with DOD, DDR&E, Office of Science and Technology, and other Government agencies.

3.5(c) [redacted] was Project Officer [redacted] 3.5(c)

[redacted] member of the GEHA Board; member of the National Academy of Sciences Panel on Biology and National Defense; member of the Life Sciences Panel of the Scientific Advisory Board; Chairman of the Medical Services Review Board; member of the Medical Services Clinical Review Board; member of the Medical Services "Panel A"; and Vice President of the Washington Academy of Medicine.

3.5(c) [redacted] is a member of the Suggestion Awards Committee (DD/S&T Representative); coordinator of the [redacted] CIA 3.5(c)

Observer to the EXRAND Committee; guest speaker to the Office of Training IOC courses; and a member of the DD/S&T Requirements Committee.

[redacted] has maintained technical liaison with the 3.5(c)

Office of Science and Technology, DD/R&E, and other Government agencies. He is also a member of the DD/S&T Requirements Committee.

3.5(c) [redacted] was the ORD representative to [redacted] 3.5(c) [redacted] and is the coordinator of activities associated with the President's Foreign Intelligence Advisory Board and a member of the ADP Security Panel.

[redacted] has been effecting coordination in the areas 3.5(c) of signal analysis with Office of Communications, Office of Elint, and FMSAC.

In summary, ORD has grown from its original staff of [redacted] 3.5(c) in January, 1963, to its present level [redacted] as of November, 1967. A 3.5(c) listing of personnel and their assignments is shown on the organization charts, Figures 2 through 9. Figure 10 is a graph chart showing our growth from 1963 through 1967.

V. Budget

In FY 63 the ORD budget was [redacted]. In order to carry out 3.3(b)(1) 3.5(c) ORD's responsibilities, this figure grew to [redacted] in FY 67. However, because of the problems associated with the National budget, 3.3(b)(1) 3.5(c) FY 68 saw a reduction to [redacted]. Figure 11 is a graph chart of showing these figures.

3.3(b)(1) 3.5(c)

The list of major accomplishments at the end of this chapter illustrates the activities and responsibilities that have made the Office of Research and Development a vital partner in the DD/S&T and Agency endeavors.

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MAJOR ACCOMPLISHMENTS

Optics and Infrared

1/2 milliradian infrared scanner [redacted] 3.3(b)(1)
[redacted] now adopted by military and used in Viet Nam.

1/10 milliradian infrared scanner developed and now being prepared for Air Force use in the DMZ.

3.3(b)(1)
3.5(c)
[redacted] now being evaluated in Viet Nam area.

High speed densitometer for rapid readout and image manipulation, tied to 360 computer in IPRD, has been developed.

Scan line remover to facilitate stereo viewing of scanned images has been developed.

1/20 milliradian infrared scanner proven and being completed for Air Force use.

Developed technique for obtaining increased information with stereo infrared scanners.

[redacted] 3.3(b)(1)

Day and night navigational drift sight for high altitude aircraft use.

Biological Sciences

[redacted] 3.3(b)(1)
- system operational.

Demonstrated feasibility of utilizing animals' ears as high-fidelity microphones and developed supportive electronic gear and surgical techniques for long-term body implant.

Demonstrated that birds, cats, and dogs can be trained to perform tasks of operational significance and developed supportive gear for transport and guidance.

Developed ultra-sensitive methods for detection [redacted] 3.3(b)(1)
[redacted]

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Developed technique for remote determination and prediction of crop yields.

Demonstrated feasibility of remote detection of BW/CW activities.

Electromagnetic Research and Development

CHECKROTE over-the-horizon radar designed, developed, and deployed for detecting missile launches from the Chinese Missile Test Range.

EARTHLING over-the-horizon radar developed and operated against the Russian missile test ranges.

IR-AC radiometer for static and dynamic missile test firings developed and tested.

[redacted] 3.3(b)(1)

Developed microwave radiometry techniques now being used by other services for passive navigation and for iceberg detection.

Developed integrated active antennas now being used by Army field units.

High frequency radio systems developed for interrogation of stay-behind systems.

Acoustic missile re-entry and impact locator designed.

Missile trajectory stay-behind system designed and demonstrated.

[redacted] 3.3(b)(1)

Missile tracking system designed and tested [redacted] 3.3(b)(1)

[redacted] 3.3(b)(1)

Designed and now developing world's smallest micropower-micro-miniature radio data relay link having 1/4 cubic inch.

[redacted] 3.3(b)(1)

RF

Authored comprehensive handbook on maximum efficient use of solar energy for ground-based equipment.

Microminiaturization and Micropower

[redacted] 3.3(b)(1)

Developed a class of transistors which are an order of magnitude better than anything commercially available.

[redacted] 3.3(b)(1)

Developed analog circuitry for high performance receiver using power reduced by 3 orders of magnitude.

[redacted] 3.3(b)(1)

3.3(b)(1)

IPRD

Established first secure R&D computer facility to apply new computer technology to attack the indigestion problem using:

On-line real-time display for analyst.

Computer controlled scanner of graphic data.

Time-shared retrieval system.

Ordering and structuring large data files.

High-speed machine recognition of keywords in audio tapes for intelligence search.

Noise-stripping from audio operational tapes to provide better intelligibility and intelligence output.

Method for analysis of business machine emanations for recognition of product of machine.

3.3(b)(1)

Technical Surveillance Countermeasures

Protection (Nullification and Isolation)

Developed demonstration model and application handbook for a [redacted] 3.3(b)(1)

Developed several demonstration models of secure conferencing systems.

Developed demonstration models of two lightweight, easily transportable and erected [redacted] to be delivered to TD/OS/DD/S and OC/DD/S early in 1968. 3.3(b)(1)

[redacted] 3.3(b)(1)

Detection (Link, Device, Objects)

Conducted studies of the RF audio surveillance threat and possible detection philosophies which have become community standards.

Completed evaluation of [redacted] countermeasures systems. 3.3(b)(1)

[redacted] 3.3(b)(1)

Developed techniques and demonstration model of radiometer [redacted] 3.3(b)(1)

Developed and delivered to TD/OS new techniques of telephone system protection.

Demonstrated feasibility of microwave holography techniques to produce usable images [redacted] 3.3(b)(1)

Developed technique and delivered demonstration model of field gradient transmitter detector with significantly lower false alarm rate than existing equipment.

Developed and delivered prototype permanent [redacted] 3.3(b)(1)

ORD organized CM R&D Subcommittee of TSCC.

Special Projects

[redacted] 3.3(b)(1)

Fog dissipation - developed and prepared for deployment in Viet Nam a method for fog dissipation permitting aircraft landing and clandestine operations.

[redacted] 3.3(b)(1)

Battery - mercury battery operational reliability improved from 30% to better than 90%.

[redacted] 3.3(b)(1)

Behavioral and Medical Activities

Established validity and reliability of the polygraph in security screening. Development of improved sensors and analytic techniques for an improved polygraph.

Surveyed selected OTR schools and incorporated greater use of program assisted instruction.

Developed and deployed a sensitive wideband radiometer for measuring microwave radiation hazards.

Developed and deployed a "slide rule" for [redacted] calculation. 3.3(b)(1)

Established feasibility of photochromic displays for imagery enhancement.

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MILESTONES

Jan 1963 ORD came into being and was staffed by eight people with a budget [redacted] 3.3(b)(1) 3.5(c)

Jul 1963 Tests were begun on gamma spectroscopy collection techniques and systems.

Aug 1963 Mr. Robert M. Chapman, D/ORD, joined the Office.

Sept 1963 Dr. Stephen L. Aldrich, DD/ORD, transferred from OSI.

Oct 1963 Kinzel Committee [redacted] activities picked up to high speed. 3.3(b)(1)

Nov 1963 First meeting of the Photo Working Panel (Drell Committee), of which Mr. Chapman was Chairman.

May 1964 Information obtained to enable mercury battery reliability to be improved from 30% of design capacity to better than 90%.

June 1964 Polygraph techniques and system improvement initiated.

Aug 1964 Developed microminiaturized serology technology.

Oct 1964 R&D contract data programmed into computer listings and trial interrogation and retrieval began.

Oct 1964 Developed analytical chemical methods for detecting and identifying [redacted] quantities. 3.3(b)(1)

Nov 1964 Operational prototype 1/2 mrad system tested and deployed [redacted] 3.3(b)(1)

Mar 1965 Advanced audio [redacted] program using [redacted] was begun. 3.3(b)(1) 3.5(c)

Mar 1965 Working model of [redacted] 3.3(b)(1) demonstrated.

June 1965 Regular computer runs to provide ORD contract management data were begun.

Aug 1965 ORD designed [redacted] systems utilized operationally 3.3(b)(1)

~~SECRET~~

Sept 1965 EARTHLING (over-the-horizon) radar research system was closed [redacted] 3.3(b)(1)

Nov 1965 [redacted] were used in operations. 3.3(b)(1)

Dec 1965 Application of computer analyses to polygraph evaluation begun.

Mar 1966 Complete breadboard 1/10 mrad scanner flown successfully, proving feasibility.

Mar 1966 ORD assumed its fourth address in three years when it moved from Headquarters to the Ames Center Building.

May 1966 Produced micropower VHF receiver with two orders of magnitude improvement in efficiency over conventional receivers.

May 1966 Equipment utilizing solar reflection spectra for intelligence collection first used operationally [redacted] 3.3(b)(1)

June 1966 Feasibility study of [redacted] surreptitious intelligence collection missions was completed. 3.3(b)(1)

June 1966 Field demonstrated rechargeable one-mile telemetry system totally implanted in an animal, using animal's ears as stereo-hi-fi microphones.

July 1966 [redacted] 3.3(b)(1) 3.5(c)

July 1966 ORD began FY 67 with a [redacted] budget and a [redacted] personnel allotment. 3.3(b)(1)

Aug 1966 1/20 mrad scanner breadboard flown, proving design feasibility.

Aug 1966 DCI approved the IPRD facility program and initial construction was begun.

Aug 1966 CHECKROTE o-t-h system completed and targeted against the [redacted] 3.3(b)(1)

This Notice Expires 1 August 1963

ORGANIZATION [redacted] 3.5(c)

30 July 1962

DEPUTY DIRECTOR (RESEARCH)

1. The mission of the Deputy Director (Research) is to conduct in depth, research and development in the scientific and technical fields to support intelligence collection by advanced technical means, exclusive of those R&D activities to support agent operations. The Deputy Director (Research) will carry out those operations strictly in the scientific and technical fields which do not involve clandestine agent operations, or those functions of the Office of Communications as contained in [redacted] 3.5(c) except ELINT activities. The Deputy Director (Research) will coordinate such operations carried out overseas with the Deputy Director (Plans) and through the Chief of Station concerned. There is established under the jurisdiction of the Deputy Director (Research) the Office of Research and Development (ORD).

2. The Deputy Director (Research) will have primary responsibility for Agency ELINT activities, including requirements, subject to policy guidance from the Agency SIGINT Officer. Clandestine agent operations and liaison with representatives of the intelligence or security organizations of foreign governments will remain under the direct control of the Deputy Director (Plans). Accordingly, there is established immediately under the jurisdiction of the Deputy Director (Research) the Office of Elint (OEL) to which all such activities will be transferred.

3. The Office of Special Activities (OSA) is hereby established under the Deputy Director (Research). All functions and personnel of the Development Projects Division of the Deputy Director (Plans) are hereby transferred to OSA except those of the Air Support Branch and its supporting staff elements which remain the responsibility of the Deputy Director (Plans).

[redacted] 3.5(c)

Marshall S. Carter
Lieutenant General, USA
Deputy Director

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~~C O N F I D E N T I A L~~

This Notice Expires 1 July 1963

PERSONNEL

7 December 1962

3.5(c)

ANNOUNCEMENT OF ASSIGNMENT TO KEY POSITION

OFFICE OF THE DEPUTY DIRECTOR (RESEARCH)

1. Effective 29 November 1962, Colonel Edward B. Giller, USAF, was designated Acting Assistant Director, Office of Research and Development, DD/R.

2. This designation is in addition to his present position as the Assistant Deputy Director (Research).

FOR THE DIRECTOR OF CENTRAL INTELLIGENCE:

L. K. WHITE
Deputy Director
(Support)

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ORD

~~C-O-N-F-I-D-E-N-T-I-A-L~~

This Notice Expires 1 December 1963

PERSONNEL

3.5(c)

13 September 1963

ANNOUNCEMENT OF ASSIGNMENT TO KEY POSITION

OFFICE OF THE DEPUTY DIRECTOR
FOR SCIENCE AND TECHNOLOGY

Effective 9 September 1963, Robert M. Chapman is appointed Deputy Assistant Director, Office of Research and Development.

FOR THE DIRECTOR OF CENTRAL INTELLIGENCE:

L. K. WHITE
Deputy Director
for Support

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DIRECTORATE OF SCIENCE AND TECHNOLOGY

[redacted] 3.5(c)

5 May 1964

Mr. Robert M. Chapman is appointed Acting Assistant Director for Research and Development, effective 4 May 1964. Effective the same date, he will also serve as the Acting DD/S&T Representative to the Agency Research and Development Board.

[redacted] 3.5(c)

ALBERT D. WHEELON
Deputy Director
for
Science and Technology

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DIRECTORATE OF SCIENCE AND TECHNOLOGY

GENERAL NOTICE [redacted] 3.5(c)

9 November 1964

The following personnel reassignments are effective 16 November 1964:

a. [redacted], Chief, General Sciences Division, Office of Scientific Intelligence, is assigned as Special Assistant to the Acting Assistant Director for Research and Development. 3.5(c)

b. [redacted] is assigned as Chief, General Sciences Division, Office of Scientific Intelligence. 3.5(c)

[redacted] 3.5(c)

ALBERT D. WHEELON
Deputy Director
for
Science and Technology

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(This notice is NOT to be filed in Agency manuals. Please destroy after reading.)

PERSONNEL

3.5(c)

19 March 1965

ANNOUNCEMENT OF ASSIGNMENT TO KEY POSITION

OFFICE OF THE DEPUTY DIRECTOR FOR SCIENCE AND TECHNOLOGY
OFFICE OF RESEARCH AND DEVELOPMENT

Effective 11 March 1965, Robert M. Chapman was appointed Assistant Director for Research and Development.

FOR THE DIRECTOR OF CENTRAL INTELLIGENCE:

L. K. WHITE
Deputy Director
for Support

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This Notice Expires 1 August 1966

ORGANIZATION [redacted] 3.5(c)

16 August 1965

DEPUTY DIRECTOR FOR SCIENCE AND TECHNOLOGY
CHANGE IN TITLE OF OFFICE HEADS AND DEPUTIES

1. Effective 27 July 1965 office heads in the Directorate for Science and Technology and their deputies were designated as follows:

	Office	Abbreviation
a.	Director of Scientific Intelligence	(D/OSI)
	Deputy Director of Scientific Intelligence	(DD/OSI)
b.	Director of Special Activities	(D/OSA)
	Deputy Director of Special Activities	(DD/OSA)
c.	Director of Computer Services	(D/OCS)
	Deputy Director of Computer Services	(DD/OCS)
d.	Director of ELINT	(D/OEL)
	Deputy Director of ELINT	(DD/OEL)
e.	Director of Research and Development	(D/ORD)
	Deputy Director of Research and Development	(DD/ORD)
f.	Director of Foreign Missile and Space Analysis Center	(D/FMSAC)
	Deputy Director of Foreign Missile and Space Analysis Center	(DD/FMSAC)

2. There will be no changes in the titles of the heads of the subordinate components within the directorate; i.e., staffs, divisions, branches, and sections.

FOR THE DIRECTOR OF CENTRAL INTELLIGENCE:

R. L. BANNERMAN
Deputy Director
for Support

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~~SECRET~~

ANALYSIS DIVISION

Chief - [redacted] 3.5(c)

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Approved for Release: 2017/11/20 C03034328

ANALYSIS DIVISION

The Analysis Division is the most recently formed division within the Office of Research and Development. One of the prime considerations in its formation was that the advanced technical collection systems under development in many of the other ORD divisions would ultimately provide a large volume of highly technical raw data which must be processed and significant intelligence (e.g. signals, patterns, changes, etc.) extracted. It was apparent that for reasons of speed, accuracy, and efficiency such data processing would be performed in an automatic or semi-automatic way. Also, the Analysis Division would provide R&D support to a variety of consumers within the Agency in accordance with the general mission of ORD. Hence, the Analysis group was to be, and is, polarized about computers and computer-oriented processes.

The first professional employee of the Analysis Division, and its chief throughout its history, is [redacted] EOD'd with the Agency on 28 June 1964, which can be taken as the formal inception of Analysis Division activities. [redacted] has provided the planning and thrust of the Analysis Division program. 3.5(c) 3.5(c)

By mid-1965 the "data indigestion" problem was becoming increasingly evident to key officials in the intelligence community. This problem can be summarized as follows: the volume of raw intelligence data inputs of various sorts (overt publications, CS reports, reconnaissance and other

types of photography, waveform data, etc.) continues to increase. Intelligence analysis resources available, both manpower and money, are asymptotically approaching limits. Intelligence to be useful must be timely. Hence, automatic and semi-automatic procedures must be developed to aid the intelligence analyst in the performance of his duties. These considerations were emphasized in the recommendations of the PFIAB Communications Panel (memorandum from McGeorge Bundy to Director of Central Intelligence, 15 July 1965 - subject: U.S. Intelligence Community Capabilities for the Handling of Intelligence Information; USIB D-39.7/11). (Attachment #1)

The Division program has been responsive to the aforementioned challenges. Some general comments concerning program rationale are in order before the details of the program are reviewed. The basic goal of the program is to develop procedures and techniques which allow more intensive intelligence analysis, interpretation and production with greater speed and efficiency and with the use of less manpower. The underlying technical basis of the program is the rapidly developing state-of-the-art in computer technology and associated peripheral equipment. Increased computing and processing power, lower computing costs and increasing accessibility of machine capabilities for the intelligence analyst and user are available in the current technology and much more is to come. To achieve operational intelligence systems with the newly available technology requires intensive development effort concerned with machines, procedures

and data characteristics as well as the requirements of the human analyst. Complex and difficult problems exist at the interfaces between these components. The Analysis Division program is focused largely on these interface problems.

Perhaps the most important aspect of the Analysis Division program to date has been the planning and implementation of the Intelligence Processing Research and Development facility (IPRD). The facility (initially called Intelligence Sciences Laboratory) was formally proposed in August, 1965 (Ref: ORD 2227-65, 11 August 1965, subject: ORD Intelligence Sciences Laboratory Facilities for Analysis Division Program, Attachment #2). The facility is designed to provide a focus for

the development of specialized procedures, equipment and techniques for intelligence processing;

the integration of components and procedures into operational subsystems;

testing of subsystems with real intelligence data; and

the generation of experience, know-how and technical specifications essential for planning and implementation of large operational systems.

Planning and design of the facility were completed in July, 1966, and appropriate approvals obtained to proceed with its implementation. Delivery of IPRD equipment commenced in late 1966. On 17 November 1966, [redacted] was appointed Laboratory Director and [redacted] 3.5(c)

[redacted] was appointed Assistant Laboratory Director. Further historical 3.5(c)
details concerning the IPRD are outlined in a separate monograph.

Initially, the Analysis Division program was divided into the technical areas as delineated in ORD 2227-65, Attachment #2. The program was later restructured in accordance with DD/S&T long range plans, and the end of FY 67 saw a further reorganization, with spheres of activity as outlined in Attachment #3. 3.5(c)

FY 65 - The Analysis Division program in FY 65 was relatively 3.5(c)
modest, totaling [redacted] Two externally supported projects [redacted] were 3.5(c)
concerned particularly with problems involved in extracting semantic information from natural language text and making this information amenable to analysts for storage and retrieval of facts. Two projects in pattern recognition were established. [redacted] was concerned with 3.3(b)(1) 3.5(c)
the development of a man-machine system for facial recognition. This effort was an outgrowth of work previously sponsored by TSD/DD/P. [redacted] was concerned with surveying the whole field of pattern 3.3(b)(1) 3.5(c)
recognition with a view toward determining those developments which had particular application to Agency problems. [redacted] was concerned 3.3(b)(1)
with the development of devices for use by an analyst in an on-line mode of operation. In January, 1965 [redacted] became the second 3.5(c)
professional employee of the Analysis Division. [redacted] subsequently initiated and monitored work in speech processing research and development.

FY 66 - The addition of [redacted] persons to the Analysis Division professional staff occurred in FY 66. These included [redacted] who transferred from the Optics Division, ORD; [redacted] who transferred from OCR/DD/I; [redacted] (since resigned), who transferred from NPIC/DD/I; and [redacted] (since resigned), an Agency career trainee. The FY 66 budget increased to [redacted] Speech processing research and development was significantly expanded with the initiation of programs in speech intelligibility enhancement and key-word extraction from continuous speech. The speech processing program is targeted against CS and FBIS requirements. Project action was begun in predictive analysis techniques and on-line processing design and programming. A major portion of Division activity was directed toward the planning and design of the Intelligence Processing R&D Facility. In addition, the following specific accomplishments can be reported:

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Preliminary testing for a man-machine facial-recognition system was begun.

The feasibility of recognizing key words in continuous speech in a speaker-independent fashion was demonstrated.

An extensive analysis was made of a FMSAC data base in order to determine the manner in which it could be in-put to a predictive modeling program (evolutionary programming).

A project involving the ORR/MD data base was initiated. The project goal is to develop data processing tools to aid the ORR analyst in particular and the Agency analyst in general.

Final construction of a ground-based 10 mc recorder-reproducer was initiated. Final construction of a 50 mc airborne recorder, 50 mc ground-based readout was initiated. These programs are funded by the U.S. Air Force.

Two of the most promising approaches to very high density audio recording were identified and R&D contracts initiated.

FY 67 - During FY 67 the following personnel joined the Division professional staff: [redacted] 3.5(c) [redacted] who had previous Agency service at 3.5(c) NPIC, [redacted] 3.5(c) who transferred from OCS/DDS&T. In addition, four OCS personnel, headed by [redacted] were placed on full-time assignment to the IPRD 3.5(c) The budget totaled [redacted] of which approximately one-third was 3.5(c) utilized for IPRD equipment purchases and rentals and the remainder for external contract actions. During this period the bulk of the IPRD equipment was installed and debugged. In-house work was begun on the application of machine-assisted processes to problems of intelligence interest. The following representative accomplishments can also be listed:

Noise-Stripping of Audio Operational Tapes. New machine methods for stripping noise provide better intelligibility and intelligence output. Applied successfully to DD/P samples of [redacted] tapes; further application proceeding in coordination with TSD/DD/P. 3.3(b)(1)

Method for High-Speed Machine Recognition of Keywords in Audio Records. Recognition of keywords in continuous speech records achieved in order to pre-select only passages of intelligence interest. Spin-off for field-operable equipment going forward in TSD/DD/P program in FY 68. Methods will relieve man-hour requirements for processing tapes.

High-Speed Computer-Based Capabilities for the Individual Analyst. New methods to query, analyze, and operate on large intelligence data files at high speed by the individual analyst have been achieved. Implementation of a test operation is being completed

[redacted] 3.3(b)(1)

3.3(b)(1)

which was not possible heretofore. Implementation is going forward in close cooperation with components of Office of Communications.

Attachment #1

USIB D-39.7/11

THE WHITE
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July 15, 1965

MEMORANDUM FOR THE DIRECTOR OF CENTRAL INTELLIGENCE

SUBJECT: U. S. Intelligence Community Capabilities for the Handling of Intelligence Information

Enclosed herewith is a report and recommendations which the President's Foreign Intelligence Advisory Board submitted to the President under date of June 15, 1965.

The President has approved the three recommendations contained in the report.

It is requested that Recommendations 1 and 2 of the report be carried out by the intelligence community under your coordination, and that you submit to this office and to the President's Board by October 1, 1965 a progress report reflecting the actions taken.

With respect to Recommendation No. 3, this office will look to the President's Foreign Intelligence Advisory Board and the Special Assistant to the President for Science and Technology, for periodic reports concerning the activities of the Panel to be established pursuant to that recommendation. To assure proper linkage of the Panel with the broader interests of the Bureau of the Budget in automatic data-processing generally, it is suggested that the Director of the Bureau of the Budget designate a representative of the Bureau to maintain liaison with the Panel.

/s/
McGeorge Bundy

Enclosure

cc: The Secretary of State
The Secretary of Defense
The Director, Bureau of the Budget
The Special Assistant to the President for Science and Technology
The Chairman, President's Foreign Intelligence Advisory Board

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Control No. Y- 3934

This document consists of 2 pages

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THE WHITE HOUSE

WASHINGTON

PRESIDENT'S FOREIGN INTELLIGENCE ADVISORY BOARD

June 15, 1965

MEMORANDUM FOR THE PRESIDENT

SUBJECT: U. S. Intelligence Community Capabilities for the Handling of Intelligence Information

This report is based on a study made by the Communications Panel of the President's Foreign Intelligence Advisory Board. The study included consultations with knowledgeable representatives of the departments and agencies making up the U. S. intelligence community, and briefings supplied by the Committee on Documentation of the United States Intelligence Board (USIB) which, under the chairmanship of the Director of Central Intelligence, has been pursuing the current exercise known as SCIPS (Staff for Community Information Processing Study).

Our Panel's study leads us to the following conclusions and resultant recommendations for action in an area of U. S. intelligence activities which we consider to have a most important bearing on the national defense and security.

The principal objective of these recommendations is the prompt initiation by the U. S. intelligence community of positive steps toward the achievement of an improved capability for the efficient storage and retrieval of the intelligence product, through an appropriate combination of machine and human techniques for the management and control of the massive volume of intelligence information involved.

CONCLUSIONS:

1. Information-handling methods occupy a pervasive position in the whole administrative framework of the U. S. intelligence community. Present methods for handling the huge quantity of intelligence information, which is generated from day-to-day by a vast array of collection resources, are a determining factor in the effectiveness of our entire intelligence system to meet national security needs at policy and command levels of the Government.

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2. The systems problems involved are so massive [illegible] many cases expensive, in both money and human [illegible]ces, that [illegible]mary routines have often been ri[illegible]y embodied [illegible] retained. The systems problems of intelligence information access will continue to be of the most difficult type, heightening the importance of great improvements in the depth of understanding and of skills in tackling the wide variety of such problems which confront all levels of Government personnel concerned with access to the national intelligence base.

3. There is a necessary relationship of the United States Intelligence Board SCIPS study to the existing practices of information handling which are variously applied within the respective agencies engaged in the U. S. intelligence effort, particularly in regard to such matters as file format and file control methods. However, the present great demands for effective handling of information within the intelligence community require that additional actions go forward concurrently with those presently approved by the United States Intelligence Board.

4. The additional actions which are required provide the only foreseeable means of extending to the massive operations of the intelligence community the advantages of high-speed machine processing of both numerical and non-numerical information in a way which has already been applied in such specific areas of intelligence as cryptanalysis. Unless strong and immediate actions are undertaken in this area, there is danger that the efficiency of the production and dissemination of intelligence within the intelligence community will decline progressively, and that the already high costs involved will climb so steeply as to jeopardize national support of the broad intelligence effort.

5. Positive action is required now to supplement the longer-range Task Force projects being pursued by the United States Intelligence Board. A large share of the needed technical support will come from automatic data-processing machinery and methods, and from the resources of modern science and technology which are presently available to assist in meeting intelligence community needs for document handling all the way from initial production to final distribution. The need for new intelligence community actions for the handling and routine processing of intelligence information is not regarded as a direct consequence of the rise of the electronic computer. The need for such actions is more deeply the result of the growth of the intelligence community effort and the greater growth of the information which it must handle.

The role of the computer is in offering a new way to assist in the reduction of greatly increasing problems in the intelligence field. The existence of these problems and the need to do things about them would have confronted the intelligence community in any event.

6. All the technical areas which must contribute to the problems of handling intelligence information are advancing very rapidly at present. The intelligence community, with its strong nucleus concerned with the use of computers in cryptanalytic and communications operations, has a real advantage in undertaking early and skillful planning in the information-handling area. (It would, however, be a mistake to assume that this experience can be easily applied to the use of computers in the handling of intelligence information.) The required planning and actions can be not only of great value to the intelligence community, but can be a broad and effective stimulus to improvement in other Federal Government computer operations whose importance is reflected in the President's recent message to the Congress on the use of automatic data-processing equipment.

7. The problems of the intelligence community in connection with information access and retrieval include, but are not restricted to, those common to all who must maintain very large bodies of information in accessible form. This is even true in the handling of information from unclassified sources. The importance of negative information, and of patterns of information, requires that access to intelligence information produce a completeness of response beyond that which is expected from many large files of stored information. Like statistics, intelligence cannot be satisfied with the highly anecdotal, but requires that all available items of information are allowed to contribute their part to the final summary or other intelligence product.

8. As a consequence of intelligence community requirements for high recall, the mechanized and automated means of access to many sorts of intelligence files cannot be required to meet simultaneously, rigid requirements as to relevance. Accordingly for some time to come the mode of gaining access to intelligence information will be through combined machine-human systems that will seek the machine retrieval of stored intelligence information in order that its relevance may be established by human examination. It is this combined machine-human factor which generates systems problems of great difficulty and dimensions.

9. Ways and means must be sought by the intelligence community to enlarge the proficiency of personnel presently engaged in information-handling activities, either through (a) the retraining of personnel so engaged, or (b) the addition of new personnel having experience with systems work, preferably (but not necessarily) in the information sciences and technologies.

10. The scope of the intelligence community's problems in the information-handling field is such that it requires the guidance of a Panel of Technical Experts in the development of methods and facilities for information-handling and access.

11. In the area of experimental approaches to the adaptation of machine processing to the storage and retrieval of intelligence information, an encouraging beginning has been made within the National Security Agency where the Technical Information Processing System (TIPS) study is presently under way. This experiment, although on a limited scale and confined to a selected number of organizational units and information files within the National Security Agency, is producing important lessons for the achievement of a realistic system for the interrogation of a computer by remote users requiring access to a common information base.

RECOMMENDATIONS:

We recommend that the following actions be undertaken immediately within the intelligence community:

Recommendation No. 1: That selected personnel among the departments and agencies making up the U. S. intelligence community be provided specialized training and advanced studies at a university center or centers where systems thinking and systems skills are understood and imparted, and which at the same time possess adequate background in conventional bibliography and other more classical approaches to literature and information management.

/An example of the type of specialized training center we have in mind is the Library School at the University of Chicago, headed by Dean Don W. Swanson. His background in mathematics and physical sciences, and his current emphasis on increased systems thinking in library education, accent the combination of educational capabilities and background which are considered necessary for purposes of meeting the objective of this recommendation.

Arra[illegible]s involving this and perhaps other insti[illegible] might be made so that both senior admini[illegible]ive personnel and more junior operating people [illegible]ld acquire new abilities and attitudes which in the times ahead will be demanded in the discharging of responsibilities for the enormous file and distribution systems of the intelligence community./

Recommendation No. 2: That the Technical Information Processing System (TIPS) project, now under way within the National Security Agency, be expanded to include participation by other member agencies of the intelligence community in an experimental operating system constituting a first step toward interagency (and interbuilding) information handling. Since results should be sought from the experiment as promptly as feasible, the participation of other agencies should be achieved by September of 1965; the capability for extensive handling of the Russian biography problem should be available in the community-wide system by the summer of 1966; and by the summer of 1967 it should be possible to exchange outputs from various mechanized sources in the fashion pioneered by the TIPS project.

/Only through such experimental operational trials can the intelligence community come to grips with the wide variety of program problems involved, including those of security compartmentation, the encryption of communications between the computer/information base and the user locations, and other problems. In order to make such a trial effective, it may be necessary to expand the scope of the information maintained in the TIPS system and, if so, this should be done with caution as to the total amount of material thus added. The intention should be to establish a system that will in fact be used by workers in at least a few agencies as a better way to meet day-to-day tasks; however, the system should be regarded as experimental and there should be no attempt to insure that in its experimental form its operation can be economically justified./

Recommendation No. 3: That there be established a Panel, under the joint sponsorship of the Special Assistant to the President for Science and Technology and the President's Foreign Intelligence Advisory Board, having responsibility for: (a) providing guidance to the intelligence community in the forwarding of methods and facilities for information handling and access;

(b) evaluating in technical terms the true meaning of the enormous and somewhat heterogeneous growth of the intelligence community's information pool.

/This recommended action is an urgent consequence of the USIB's Community Information Processing Study involving actions which, although helpful, are far from meeting the needs accented by the study. It is emphasized that the proposed panel of technical experts would not be tasked with the too obvious assignment of simply applying modern machine methods to the existing, specialized, and rigidly-maintained activities of processing and distributing information within the intelligence community. The panel would have the over-all task of guiding the necessarily large, and presently ignored, planning for the realistic and long-term development of mechanized facilities for the processing of information in the manifold forms in which it is encountered within the intelligence community. Thus, the composition of the panel and its individual skills should permit a concurrent approach to the overwhelming volumes of photographic, electrical and typographical material with which the intelligence system is presently flooded. It is noted that in such parts of the Government as the Bureau of the Budget, and in the Departments of State and Defense, attempts are being made to introduce automatic data-processing and information-handling systems into complex Government operations -- and the panel of technical experts could provide invaluable linkage among these detached efforts which now find some coherence only through the science and technical information people in the Office of Science and Technology and the Federal Council for Science and Technology. Finally, it is evident that the concept of the range of activities of the expert panel includes not only drawing on all the information-handling programs and activities in other parts of the Government, but also being available for over-all counsel in ways which might be especially useful to the Bureau of the Budget in understanding the role of mechanized information handling throughout the Executive Branch of the Government./

For the Board

Clark M. Clifford
Chairman

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Attachment #2

ORD-2227-65

11 August 1965

MEMORANDUM FOR: Director of Research and Development

SUBJECT: ORD Intelligence Sciences Laboratory Facilities for Analysis Division Program

1. We attach a summary of the principal elements of the proposed Analysis Division/ORD program which we have discussed in the last few weeks. We urge the adoption of the general plan of this program and the consideration of increased funding for FY66.

2. A new and important aspect of our program is concerned with the implementation of the analysis portion of an ORD Intelligence Sciences Laboratory to be set up in Headquarters Building. The tasks to be carried out by means of this facility, funding and manpower requirements, and additional background information are summarized in the attached material.

3. We suggest that the Analysis Division program, which has been in process of formulation for the past year, is a pertinent and important element to be included in a possible Agency response to questions raised by the recent PFIAB memorandum and studies of the NPIC operations.

3.5(c)

Chief, Analysis
ORD/DD/S&T

Attachment:
An/ORD Summary Program

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Analysis Division/ORD

General Summary of Program Objectives

I. OPERATIONS AND SYSTEMS RESEARCH

Program Objectives:

To describe and update an integrated model of the overall intelligence process for purposes of management control and R&D planning.

To determine by a continuing study, the impact on the intelligence process of new advances in technology; e.g., mass memories, time-shared computers, multiple terminals, new recording, input, and display methods, new automated recognition methods, etc.

To design new intelligence processes and systems by the application of predictive analysis methods, statistical decision theory, mathematical modeling and operations analysis techniques.

II. RESEARCH AND DEVELOPMENT ON MAN-MACHINE PROCESSES

Program Objectives:

To design, develop and show feasibility of processes and equipment for support of human intelligence processing, interpretation, and production from textual, speech, graphic and waveform input data by application of available time-shared computer technology involving specialized remote terminals and displays.

III. RESEARCH AND DEVELOPMENT ON LANGUAGE AND TEXT PROCESSES

Program Objectives:

To design, develop, and show feasibility of processes and equipment for improved collection, interpretation, and

production operations concerned with textual and language data. The R&D program shall include work on the following:

Textual Input and Transcription Processes
Representation and Indexing Processes
File Organization - Search - and Retrieval Processes
Automated Formatting, Summation, and Reporting
Logical Analysis and Automated Inference
Automated Classification
Machine-Aided Translation
Machine Translation

IV. RESEARCH AND DEVELOPMENT ON SPEECH PROCESSES

Program Objectives:

To design, develop, and show feasibility of processes and equipment for optimization of intelligibility of speech records, and for implementation of an audio pre-processing system with capabilities for automated phoneme, work and speaker recognition.

To design, develop, and show feasibility for operational use of a speech recognizer and phonetic typewriter for the continuous input of speech into data-processing systems.

V. RESEARCH AND DEVELOPMENT ON PATTERN RECOGNITION

Program Objectives:

To design, develop, and show feasibility for operational use of pattern recognition processes and equipment for intelligence interpretation and production operations. The R&D program shall include work on:

Facial Recognition Processes

[redacted] 3.3(b)(1)

VI. RESEARCH AND DEVELOPMENT ON AUTOMATA, SELF-ORGANIZING AND ADAPTIVE PROCESSES

Program Objectives:

To design, develop, and show operational feasibility of processes and equipment which can sense, operate on and use intelligence data in remote and unaccessible locations and which function as automata, self-organizing processors, or processors which adapt to environment or to incoming sensory data.

ORD/DD/S&T

Intelligence Sciences Laboratory - Analysis Program

SPECIFIC TASK AREAS

Laboratory facilities under this program are required for the development, testing, and evaluation of man-machine procedures, equipment, and subsystems in the following areas:

I. Documentary Analysis - Intelligence Production:

Processes which exploit the potential of on-line keyboards, displays, text analyzers, text recognizers, formatting, and editing routines, are to be developed and integrated to provide machine aids for the intelligence analyst.

II. Photo, Radar [redacted] 3.3(b)(1)

Processes using computer-controlled graphic scanners at various levels of resolution, keyboards, input tablets with scriber input and control, mensuration equipment, visual, video, and CRT displays, are to be developed further and integrated into on-line operational subsystems for interpretation of photo, radar, [redacted] 3.3(b)(1)

III. Speech Processing:

Processes using converters, dynamic filtering, CRT displays, spectrum displays, voice control, audio output, pattern recognition processes, pitch tracking analysis, are to be developed and integrated into on-line operational subsystems for enhancing the intelligibility of speech in audio records, for optimizing speech signals in noisy records, for automated recognition methods for words, phonemes and speakers.

IV. Indexing, Search and Retrieval:

Processes using on-line keyboards, CRT displays, automated dictionary files, automated syntactic analyzers and parsers,

recent developments in logical representation, file organization, and search strategy are to be developed and integrated into an on-line indexing, search and retrieval subsystem for documentary intelligence data.

V. Text Processing:

Processes using keyboards, CRT displays, input tablets, and printers are to be developed and integrated into on-line subsystems for editing, formatting, correcting, composing, and report generating from textual input data.

VI. Signal Processing and Correlation:

Processes using converters, signal correlators, comparators, keyboards, CRT displays, transient and delay analyzers, sensor inputs, computer-controlled cameras, recorders, signal and pattern recognizers are to be further developed and integrated into an on-line subsystem for reduction, analysis, and interpretation of waveform and multisensor data.

VII. Pattern Recognition:

Processes using data input devices, keyboards, input tablets, computer-controlled scanners, converters, correlators, visual, video and CRT displays, pre-normalization, property classification and discriminant analysis methods, are to be further developed and integrated into subsystems for automated and human-monitored subsystems for recognition and interpretation of patterns of interest in graphic and waveform intelligence data.

ORD/DD/S&T

Intelligence Sciences Laboratory - Analysis Program

Program Emphasis:

Emphasis is on exploitation of newly available computer technology with remote terminals, program-controlled devices and time-shared processors for intelligence analysis and interpretation.

Emphasis is on design and further development of basic man-machine functions in order to provide essential design and planning data for full systems implementation. Basic functions will be integrated into operational subsystems, tested, and demonstrated in order to show feasibility for application in Agency operations.

Why Action on this Program is Urgently Recommended Now:

1. New developments in man-machine technology can provide better tools to deal with the difficult problem of increased intelligence collection and limited man-power resources.

2. Major changes will be made in intelligence operations because of the inpact of man-machine technology. Steps should be taken to lead in this period to the greatest extent possible.

3. There is danger that large systems applications will be attempted before the basic processes required in these systems have been sufficiently developed. This can be extremely costly and may actually impede desired progress.

4. There should be an adequate base of technical know-how and experience within the Agency in order to provide guidance for management and planning in a very complex and costly change-over period.

5. The intelligence community has specialized requirements which are not being taken care of by developments for the military and for business applications. The Agency should take a lead in initiating appropriate R&D for its specialized needs and it should maintain a position in this area.

6. Recently certain scientific advisory groups, including the Communications Panel for the PFIAB, have urged that more positive action be taken in the man-machine area in the intelligence community. Studies of the NPIC operation urge action in the same direction. The program proposed for the Analysis Division/ORD has been formulated over the past year. The program demonstrates that the Agency has been resourceful and active in this important area; however, expansion and implementation of the program should now be carried forward.

ORD/DD/S&T
Intelligence Sciences Laboratory
Analysis Program

Facilities:

The following types of computer on-line devices and terminals are to be developed, improved, or evaluated in the analysis program:

typewriters, keyboards, control consoles
CRT displays with light pen input and control
computer-controlled cameras, recorders, and video displays
computer voice-controlled units and audio outputs
computer-controlled graphic scanners
input tablets with scriber input and control
printers, plotters
acoustic dynamic filtering equipment
signal correlators, signal comparators
spectrum display equipment
A-D and D-A converters
signal recognizers and transient analyzers
various sensors and transducers
pattern recognition and signature determination equipment
character recognition equipment
manual character reader unit
dynamic and static wall display equipment for graphic and alphanumeric data

Central processor facilities will be provided with capacity to drive terminals and devices under development and with sufficient memory to permit testing and evaluation of experimental pre-operational systems.

Relation to OCS Facilities:

It will be a policy in the planning and implementation of this facility to establish linkages with the OCS facilities where this is feasible and desirable. Available OCS services are to be used particularly for input keying and processing of data and for programming tasks of common interest.

ORD/DD/S&T
Intelligence Sciences Laboratory - Analysis Program

Funding and Manpower Requirement:

	FY66	FY67	FY68	FY69	FY70
An/ORD Supporting R&D Contracts					
Intelligence Sciences Laboratory - Analysis Program *					
An/ORD Technical Staff					

3.3(b)(1)

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62

* Includes processor rentals, procurement, and maintenance including commercially available terminals and computer-controlled devices. Development costs for specialized equipment is covered under supporting R&D contracts.

ORD/DD/S&T
Intelligence Sciences Laboratory
Analysis Program

Action Schedule FY66

August 1965	Install Teleprinter terminal in An/ORD, Headquarters Building, in order to carry out querying, searching, retrieval, analysis and programming experiments with remote time-shared centers	3.3(b)(1)
September 1965	Install terminal in An/ORD to link with systems for evaluation and experimentation concerned with the search and retrieval of highly structured and formatted intelligence data.	3.3(b)(1)
October 1965	Initiate projects with concerned with development of on-line processes for text processing, search and retrieval. Install console linked with time-shared system	3.3(b)(1) 3.3(b)(1)
November 1965	Complete study of specifications for processor and essential terminals and computer-controlled devices for analysis program for the ORD Intelligence Sciences Laboratory.	
Spring 1966	Install processor and on-line terminal equipment in ORD, Intelligence Sciences Laboratory at Headquarters Building.	

Analysis Division/ORD

CONTRACTOR SUMMARY:

(Note: The following key is used in the summary below: 1 - active contract, 2 - contract being negotiated, 3 - proposal received or under discussion, 4 - potential identified.)

Operations and Systems Research:

3.3(b)(1)

R&D on Man-Machine Processes:

3.3(b)(1)

R&D on Language and Text Processes:

3.3(b)(1)

R&D on Speech Processes:

3.3(b)(1)

R&D on Pattern Recognition:

3.3(b)(1)

R&D on Automata, Self-Organizing Processes:

3.3(b)(1)

Attachment #3

ANALYSIS DIVISION/ORD

Program Area A

ORGANIZING, SEARCH AND MODELLING PROCESSES

1. Computer On-Line Processes for Analysis

   Design of Integrated On-Line Processes
   Textual Analysis - Text Editing
   System design and security requirements
   Low-cost terminals, CRT's

2. Storage & Retrieval Processes for Text and Formatted Data

   File input and update methods
   Indexing and Representation Methods
   File Organization - Data Structuring
   File querying, Retrieval and Search Methods
   Associative Processing Methods
   On-Line analysis of large formatted data bases

3. Mathematical Modelling - Prediction Analysis

   Predictive Modelling Methods
   Early Warning Indicators
   Econometric Models
   Statistical and Mathematical Modelling Methods

4. Systems Design & Simulation

   Intelligence Process Model
   Systems simulation - support for AQUILINE
   [redacted] processing systems 3.3(b)(1)

5. Machine-Aided Translation

6. Computer-Aided Instruction

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ANALYSIS DIVISION/ORD

Program Area B

GRAPHIC AND DISPLAY PROCESSES

1. On-Line Processing System for Graphic Data

   Integrated on-line processing module for graphic data analyst
   Program-controlled scanning methods
   High speed graphic processing methods
   Graphic languages and representation of graphic structures

2. Pattern Recognition Methods for Graphic Data Processing

   Target detection-change detection methods
   Recognition methods for personal identification from graphic data, facial recognition, handwriting recognition
   Recognition processes for stereo graphic input data
   Automata theory and application

3. Display and Transmission of Graphic Data

   Cost, bandwidth, speed, and resolution factors for graphic data transmission
   Experimental graphic transmission subsystem
   High resolution graphic output for digital computer systems
   Video technology for graphic processing; digital-video interface
   Display multiplexing technology
   Computer-controlled 3-dimensional display

4. Advanced Methods for Data Storage and Retrieval

   Multiple-image storage
   High-density recording methods
   Wide-band thermoplastic recording
   Novel photosensitive materials

Program Area C

SPEECH, ANALOG, AND WAVEFORM PROCESSES

1. Speech Processing

   Noise removal from audio tapes
   Recognition of speech
   Speaker recognition
   Keyword extraction
   Speeded-speech playback techniques
   Speech intelligibility enhancement

2. Automated Pattern Recognition and Adaptive Control

   Design and development of new methods for feature generation classification, recognition decision logic
   Application and testing of learning and adaptive control methods
   Evaluation and testing of methods, systems, and equipment for pattern recognition
   Signature determination methods
   On-line recognition methods for waveform signals

3. Security Systems - Processing and Control

   Evaluation and specification of equipment methods and systems in support of O/Security requirements
   Intrusion alarm systems
   Security badge system

4. Recording Methods and Equipment

   Evaluation and testing of methods and equipment
   Liaison with developments and standardization in the community

5. Analysis and Interpretation Methods for Analog and Waveform Data: Audio, Acoustic, Seismic, EEG, Polygraph, etc.

   Development of on-line analysis processes
   Transformational analysis methods
   Non-parametric processing
   Design and development of methods and equipment for analysis
   Experimental processing for data and requirements of in-house operations: O/COMMO, OEL, FMSAC, ORD, DD/P Components

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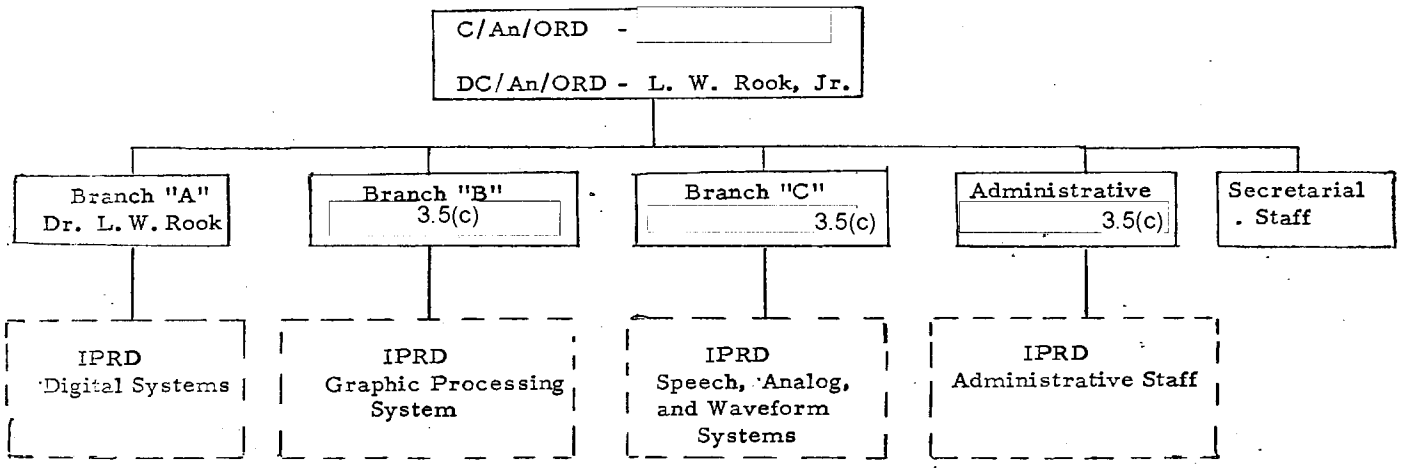
ANALYSIS DIVISION

ORD/DD/S&T



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APPLIED PHYSICS DIVISION

Chief [redacted]

3.5(c)

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APPLIED PHYSICS DIVISION

I. Background

Programs in the Applied Physics (formerly Audio-Physics) Division goal areas were initiated in FY 64 in primary response to the findings of the CIA-DIA Scientific Guidance Panel established by NSAM-170 dated October, 1962. [redacted] who had extensive experience in the audio surveillance (AS) and audio surveillance countermeasures (ASCM) needs of the Agency from both operational and R&D perspective, initiated the first year's efforts for a broad investigation of parameters associated with AS and ASCM technology. The initial efforts were begun in December, 1963, while [redacted] was Chief of the Radio Physics Division. 3.5(c) 3.5(c)

Applied Physics' mission is to form new concepts for technical intelligence collection and countermeasures systems, identify R&D efforts required to make or prove the new concepts feasible, and pursue such R&D efforts necessary to achieve the desired capability and/or implementation of the resulting advanced systems. The Division pursues intensive R&D efforts in AS, ASCM [redacted] 3.3(b)(1) Systems, and Microtechnology.

The audio surveillance efforts emphasize micropower microelectronics collection and non-detectable long-range systems. The Division was specifically given the advanced R&D mission [redacted] 3.3(b)(1)

[redacted]

The objectives of the countermeasures R&D programs are to support Technical Division, Office of Security, and to improve the security technology available to the Intelligence Community

3.3(b)(1)

II. Organization

The Audio Physics Division was established to continue the ORD Audio Surveillance and Countermeasures programs which were launched

in December, 1963. [redacted] laid the 3.5(c)
foundation for the Audio Physics Division as a branch of the Radio-Physics Division. The total money available for these initial efforts was FY 64
3.3(b)(1) 3.5(c) year-end funds of [redacted]. During FY 64 and early FY 65, approximately 20 ASCM and 20 AS contracts, at a cost of [redacted] 3.3(b)(1) 3.5(c) [redacted], were administered by [redacted] in coordination with appropriate 3.5(c) elements of other members of the Intelligence Community. When Mr. Donald Reiser joined the group in July, 1964, he assumed responsibility 3.3(b)(1) for all [redacted] programs. During FY 65, AP personnel increased to [redacted] 3.5(c) including [redacted] the division secretary. 3.5(c)

By February of 1965 the potential of the Audio Physics group had developed to the point where it assumed the status of a division. [redacted] 3.5(c) as chief of the new division, set up its organization by

- the establishment of an Audio Surveillance Branch under Mr. Donald Reiser with the help of [redacted] 3.5(c) [redacted]

- the establishment of an Audio Surveillance Countermeasures Branch under [redacted] 3.5(c) [redacted]

- beginning the spadework on [redacted] 3.3(b)(1)
3.3(b)(1) Branch and [redacted] Branch. The [redacted] 3.3(b)(1) [redacted] Branch was established under the direction of [redacted] 3.5(c) [redacted] after his EOD in January, 1966.

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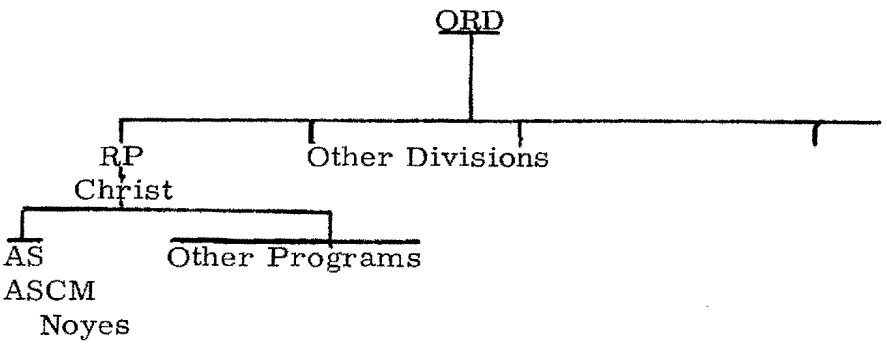
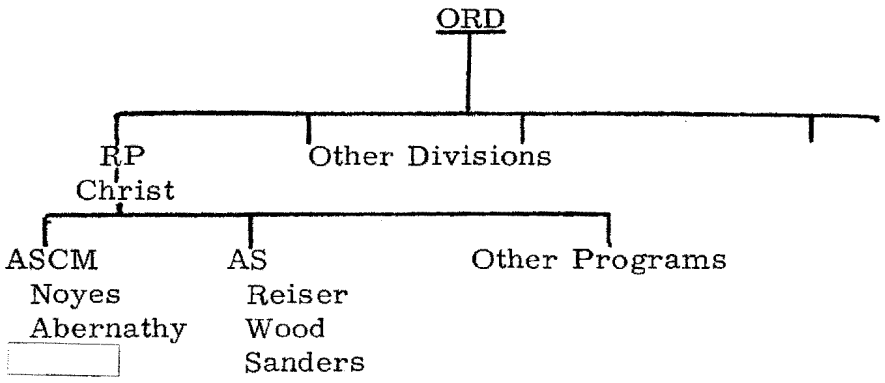
Organizational Evolution

FY 1964



FY 1965



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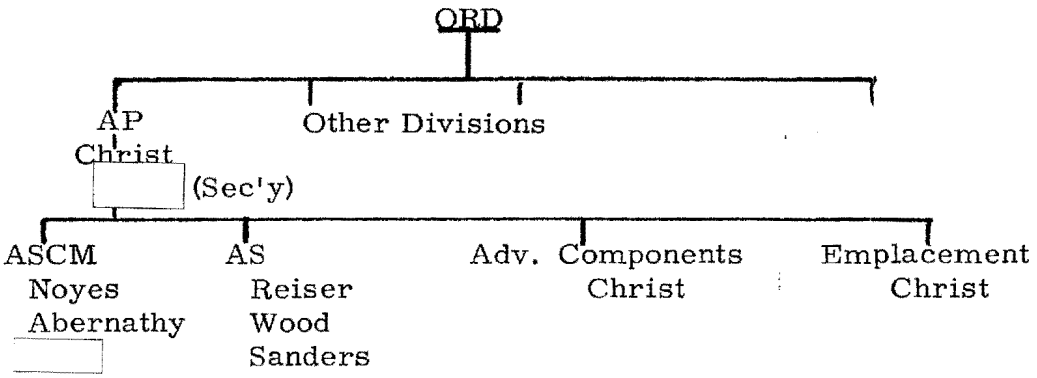
February 1965



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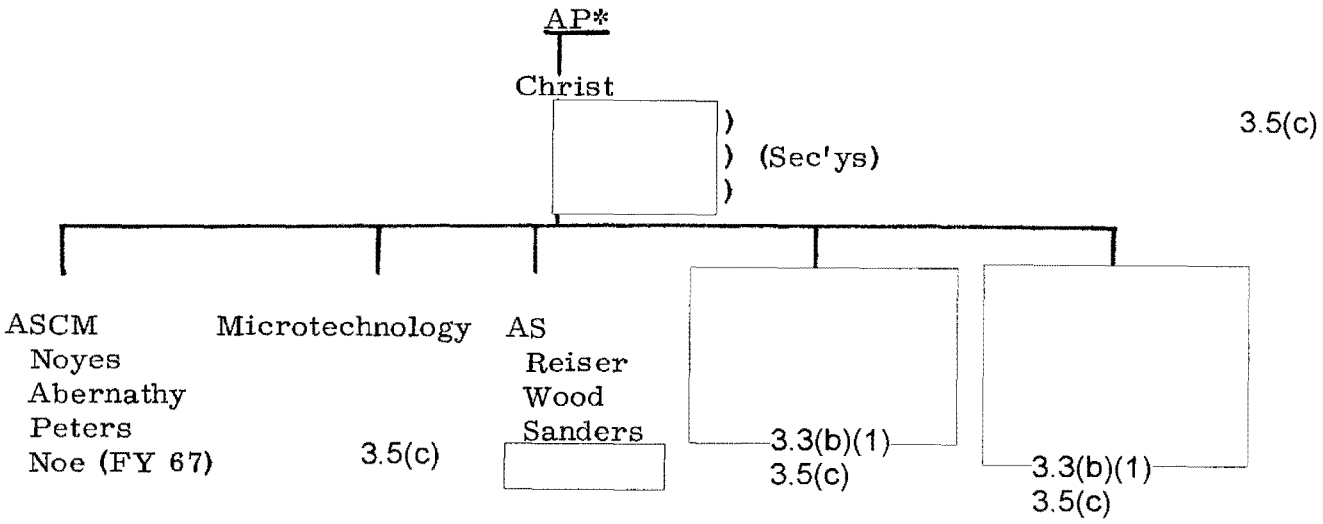
FY 1966/1967



* Changed from Audio-Physics to Applied Physics - late 1966

The AQUILINE program was initiated in 1966 with [redacted] as 3.5(c)
project officer. In May, 1966, [redacted] EOD'd and assumed 3.5(c)
responsibility for the program. He, together with [redacted] 3.5(c)
(EOD 27 June 1966) formed the [redacted] Branch, which 3.3(b)(1)
carries the primary responsibility for development of the AQUILINE program. The program was advanced from feasibility studies to practical R&D budget projects, many of which were initiated during the year.

During the latter part of 1966, the Audio Physics Division was renamed Applied Physics to more accurately reflect the broad technological programs now being pursued.

III. Philosophy

The Applied Physics Division has placed heavy emphasis on thorough review of fundamental principles and state-of-the-art technology which could be integrated into an overall system approach for the solution of AS and ASCM problems. The fundamental studies resulted in a better understanding of principles which could be further researched to produce results in the same areas plagued by a series of failures in the past. Examples of high pay-off achieved through using this approach are:

The laser probe systems which were developed and turned 3.3(b)(1)
over to [redacted]

[redacted] 3.3(b)(1)

The development of an effective practical [redacted] 3.3(b)(1)

technique in a modes[redacted] study, after many past efforts having 3.3(b)(1) 3.5(c)

the same objectives had been unsuccessful.

Proved the practicability of developing an advanced bird-like intelligence collection system using state-of-the-art technology.

The first overall system approach was the [redacted] concept of 3.3(b)(1) 3.5(c)

making [redacted] in the field for analysis at

a headquarters central processing center. The [redacted] concept was found 3.3(b)(1) 3.5(c)

to yield too low a cost-effectiveness in its full application using today's state-of-the-art. However, the work in this area pointed out the advantages of using a centralized support and guidance facility to improve current CM operational techniques.

AP's overall system approach to AS and [redacted] proved 3.3(b)(1)

to be very fruitful. For example, [redacted] Alpha and Beta concepts 3.3(b)(1) 3.5(c)

provided a new capability [redacted] 3.3(b)(1)

[redacted] The AQUILINE* concept has developed into a program for

the development of a prototype system having the capability to [redacted]

3.3(b)(1)

[redacted]

* separate monographs

3.3(b)(1)

IV. Major Accomplishments

A. Audio Surveillance

[redacted]

Micropower-Microelectronics: During 1966, long-term programs were begun in this field. These programs are directed toward

increasing the effectiveness of electronic equipment in audio surveillance by reducing the dependence upon large power sources. Extremely low power electronic circuitry is being pursued on two major fronts. Basic technology advancements have made possible the following achievements during FY 67:

3.3(b)(1)

Microminiature Long Life Battery Sources: Work has been initiated in R&D programs for ultraminiature power sources which would be compatible in size to the microelectronic circuits being

3.3(b)(1)

[redacted] as the modulating 3.3(b)(1)
element. The technical report on the laboratory investigation was distributed to the Office of Communications Special Programs Staff and to components of the DD/P.

The development of a [redacted] 3.3(b)(1)
[redacted]. Information on this device was given to OC/SPS for their consideration and evaluation.

The feasibility of [redacted] 3.3(b)(1)
[redacted] was demonstrated to representatives of the Office of Security, the Office of Communications, and the DD/P.

Various [redacted] equipments were tested 3.3(b)(1)
to determine their [redacted] 3.3(b)(1)
techniques. These tests included [redacted] 3.3(b)(1)
[redacted] and the data has been furnished to OC/SPS and OSI.

A parametric modulator equipped with a lead zirconate high frequency acoustic sensor was developed and turned over to OC/SPS for evaluation. Further development of this system is under way.

C. Technical Surveillance Countermeasures

General Protection Techniques: The feasibility [redacted] 3.3(b)(1)
[redacted] was investigated and successfully demonstrated. A handbook describing the general [redacted] approach was prepared. [redacted] 3.3(b)(1)

3.3(b)(1)

Several improved conferencing systems were developed and demonstrated to the TSCC in October, to a COS seminar, and to representatives of other Government agencies. A catalog describing present systems is being prepared for dissemination by the SSU/DD/P to DD/P field units to assist in procurement decisions.

Typical building materials, including commercial window glass, were evaluated for use as countermeasures. The 3.3(b)(1) results of this study will be furnished to the DD/P and OS/DD/S for application.

The effect of various 3.3(b)(1) and the relative effectiveness of sounds were evaluated in April, 1967, and used to provide guidance to field personnel by TD/OS.

3.3(b)(1) Detection: A significantly improved system was produced and demonstrated to and OS/DD/S. Th 3.3(b)(1)

3.3(b)(1) the best system produced to date in the Intelligence Community, but much remains to be desired.

The ability to produce a microwave hologram was demonstrated. Attempts will be made to apply this technique for real time non-destructive inspection of opaque bodies for surveillance devices.

An evaluation was completed of relative merits of on-site vs

countermeasures systems, from which the 3.3(b)(1)
following results were obtained.

Relative advantage of on-site processing systems was demonstrated.

The use of computer techniques for handling signal data was demonstrated and simulated in a computer-aided intelligence game that demonstrated machine aided information organization techniques.

3.3(b)(1)
was demonstrated in March, 1967, and is undergoing continued technical evaluation.

A scheme was demonstrated in November 3.3(b)(1)
1967, that utilized analog to digital signal processing techniques for greatly improved sensitivity over previous techniques and provided the capability of automatic real time processing.

An operating prototype of the detector was 3.3(b)(1)
produced and delivered to the Department of Defense in response to the emergency requirement of This system 3.3(b)(1)
performed well under field conditions in Viet Nam during September. An improved version is to be delivered in January, 1968.

A state-of-the-art, amplifier was 3.3(b)(1)
provided to TD/OS/DD/S in September, 1967, and has been adopted for production.

Several improved prototypes of the efficient [redacted] 3.3(b)(1)

[redacted] transmitter (SWS) were delivered in February, 1967, 3.3(b)(1)

to OC/DD/S and OS/DD/S for use in their programs.

An improved [redacted] detection system 3.3(b)(1)

[redacted] was produced and demonstrated. This system is modulation independent and exhibits reduced false alarm rate over other similar systems. [redacted] 3.3(b)(1)

[redacted]

D. [redacted] Countermeasures 3.3(b)(1)

[redacted] 3.3(b)(1)

[redacted] was demonstrated to the various Agency security components, including OC/SPS, OC/Security, OS/TD, [redacted] 3.3(b)(1)

[redacted] 3.3(b)(1)

[redacted] Distribution of these results has been made to OC/SPS, OS/Security, OS/TD, and the TSCC where appropriate.

[redacted] 3.3(b)(1)

[redacted] 3.3(b)(1)

[redacted] OC/SPS representatives have witnessed a demonstration of the first laboratory model and are following its current development.

E. Advanced Emplacement

Conceptual studies have established the feasibility of developing advanced emplacement systems. The initial studies were concerned with the overall vehicle for emplacement and a general look at the subsystems which would be used in any particular emplacement system. Subsequent studies and developmental efforts have been directed toward the subsystems. Some of the outputs of these studies and developmental efforts are:

Establishment of payload weights and configurations.

Flight tests of initial versions of some vehicle systems were accomplished. In addition, wind tunnel tests were completed on the initial vehicle configurations.

Completed studies on applicable navigation systems to provide unlimited range navigation capability.

Developed slow scan TV camera for use in midcourse and terminal guidance and surveillance.

[redacted] 3.3(b)(1)

[redacted] 3.3(b)(1)

Completed a series of detailed mission analysis studies attesting to the efficiency of advanced emplacement systems in the collection of technical intelligence critical to the security of the U.S. government.

[redacted] 3.3(b)(1)

Completed the design of a four-cycle internal combustion engine which would provide medium operational range capability of 2400 nautical miles.

[redacted] 3.3(b)(1)

V. Problems

Applied Physics has had very few problems in planning and implementing its programs. One exception is the unusually high degree of coordination required to clear some of the audio surveillance programs with TSD/DD/P and educate potential operational groups concerning the value of the emerging techniques.

Much extra effort has been required to keep up with the ever-changing and flexible budgets we have had to work with--particularly in FY 67.

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BIOLOGICAL SCIENCES DIVISION

Chief - [redacted]

3.5(c)

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BIOLOGICAL SCIENCES DIVISION

In 1963, during the early formative phases of the Office of Research and Development, Office efforts were roughly divided into Life Sciences and Physical Sciences. At that time no divisional organization existed. This situation was extant, insofar as Life Sciences were concerned, until June, 1965.

Life Sciences efforts were dichotomous -- first, to carry out required research and development efforts, and second, to carry on a continuing program of educating various Agency components in the ways in which Life Sciences could be used to exploit the vast potentials of the "living world" as a complement to Physical Sciences in the technical aspects of intelligence collection. The Life Sciences mission as promulgated at that time was stated, "to undertake R&D in the Life Sciences which will assist the Agency in the collection, collation, analysis and dissemination of intelligence; to undertake promising research in support of other offices of the Agency where adequate research capabilities were nonexistent, with particular emphasis on efforts which might be applicable to the problems of several Agency components, e.g., measurement of physiological and psychological stress".

The initial Life Sciences organization consisted of a Technical Manager reporting directly to the Assistant Director and Deputy Assistant Director of ORD. The position of Technical Manager was occupied by

[redacted] from the inception of ORD until June, 1965. During this period, the Life Sciences area grew to a working group of [redacted] technical officers and support personnel. 3.5(c) 3.5(c)

Initially the research and development was directed toward such areas as laser effects on living systems, brain mechanisms, phycochemicals, animal studies and the like. This R&D program evolved and developed into more directed efforts related to stress measurement, human behavior, animal studies related to emplacement, physiological chemistry and bio-engineering of a variety of types. Finally, specific applications began to evolve, such as development of sensor and data display techniques for stress measurement; exploitation for intelligence of specific animal sensory, motor, and cognitive functions; animal training for operational tasks; interpersonal and environmental manipulations; polygraph studies; and a number of diversified studies of living system physiology and biochemistry.

During this period a number of accomplishment milestones were achieved, as detailed in Appendix A. Major milestones are related directly to missions and requirements; minor milestones were achieved in support of other Agency/Federal components.

In June, 1965, the Life Sciences program was reorganized as a result of a more clearly defined set of missions and requirements and to facilitate support in terms of management and coordination. Also, it was apparent that the Technical Manager was no longer able to maintain an adequate and

efficient overview of the total Life Sciences program because of its size, diversity and complexity. Accordingly, the position of Technical Manager was abolished and two line organization divisions were established. Schism of personnel and program followed essentially disciplinary lines. These two divisions were titled Biological Sciences Division, under the direction of [redacted] and Medical and Behavioral Sciences Division, under the direction of [redacted] (a career Medical Staff employee). 3.5(c) 3.5(c)

The Biological Sciences Division was assigned responsibility for programs in animal studies, biotechnology, [redacted] and advanced concept feasibility studies. Significant efforts have evolved in [redacted] animal emplacement systems design, development and fabrication; estimation of crop yields and vigor through photography; macromolecule studies. Further details are given in the monographs entitled Operational Use of Biological Systems, Remote Crop Yield Determination, and [redacted] 3.3(b)(1) 3.3(b)(1) 3.3(b)(1)

As a consequence of the breadth of the programs falling under the generic heading of Biological Science, the limited number of biological scientists within the Agency, and the interface of these projects with related work in other Government agencies, there has been considerable inter-agency interaction. An outline of these coordinated activities is presented in Table I.

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3.3(b)(1)

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Approved for Release: 2017/11/20 C03034328

The Biological Sciences Division at the present time has [redacted] personnel, with an anticipated growth to [redacted] by FY 1970. Its current budget is twice the initial total budget of Life Sciences, for an integrated growth rate of approximately 25% per year. It is anticipated that by FY 1970, another 50% increase increment will be realized. Table II indicates the fiscal growth of the Division. 3.5(c) 3.5(c)

TABLE II

Fiscal Growth

FY	[redacted]
63	
64	
65	
66	
67	
68	

3.5(c)

The personnel roster of the Division now includes the following:

[redacted]

3.5(c)

Accomplishments listed in Appendix B are grouped by study areas and are in addition to the previously listed milestones.

APPENDIX A

MILESTONES

MAJOR

[redacted] 3.3(b)(1)

Demonstrated feasibility of utilizing animals' ears as high-fidelity microphones. Supportive electronic gear and refinement of surgical techniques are under way.

Demonstrated that low-level continuous laser radiation does not produce detectable damage to photosynthesis in plants.

[redacted] 3.3(b)(1)

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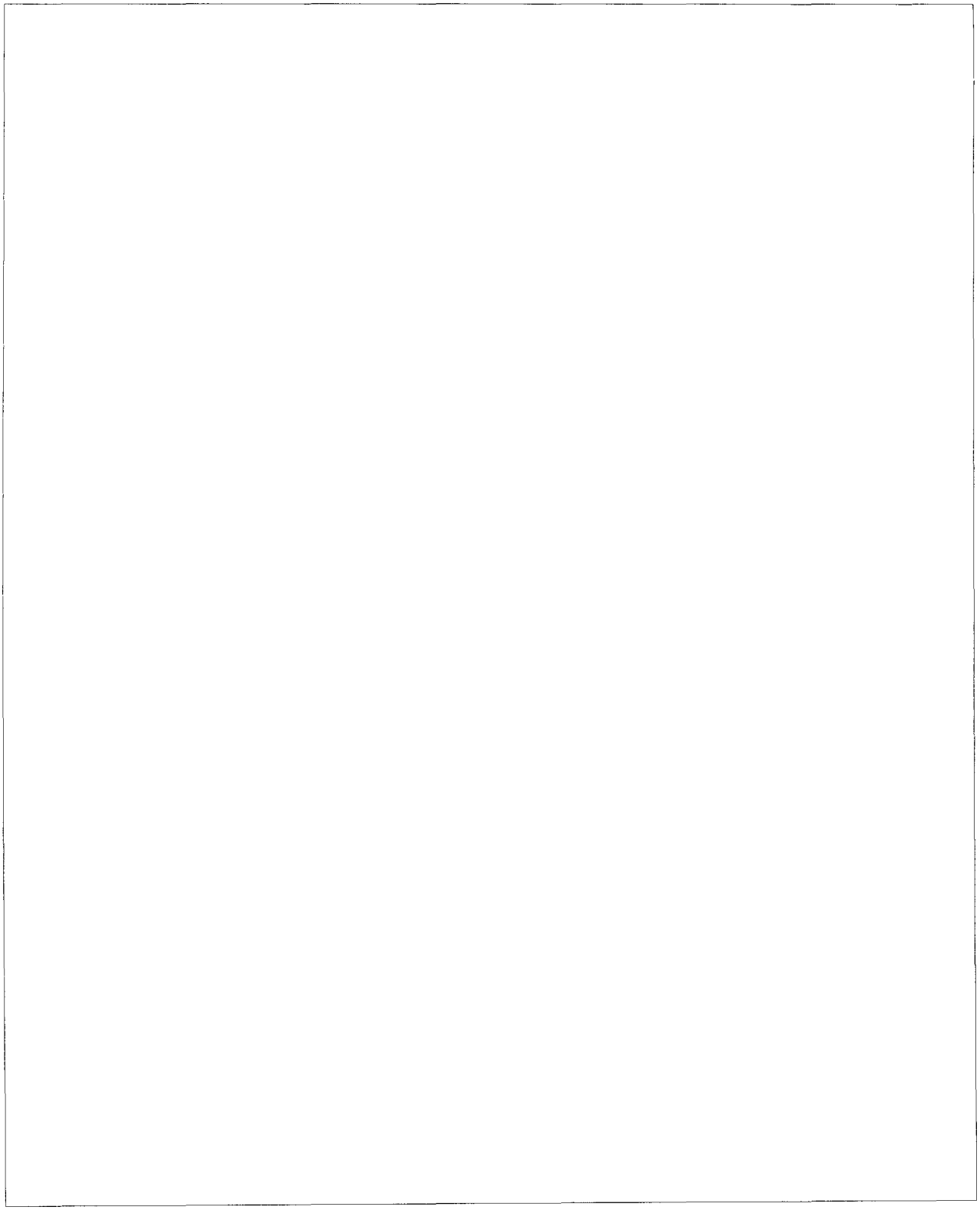

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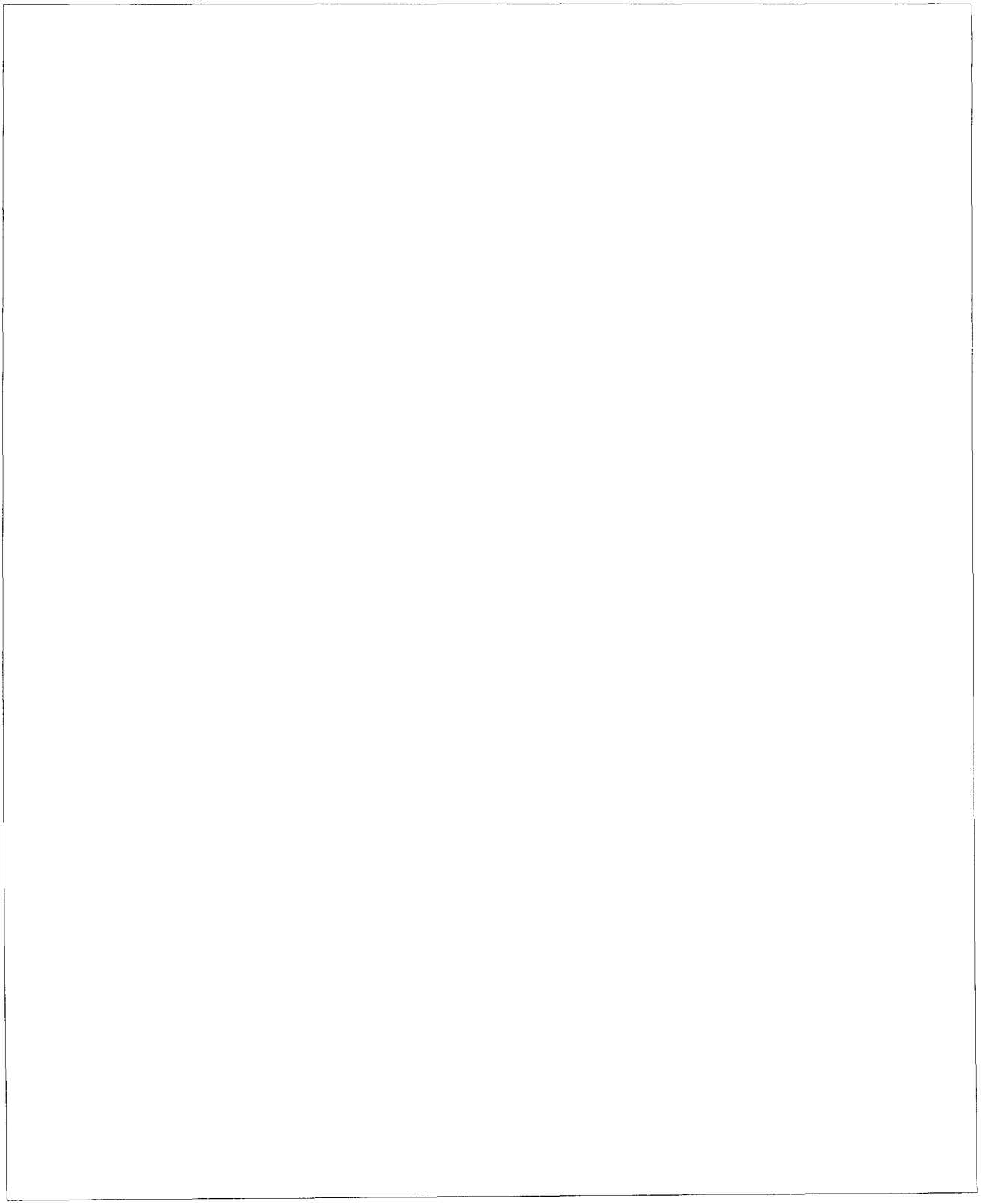
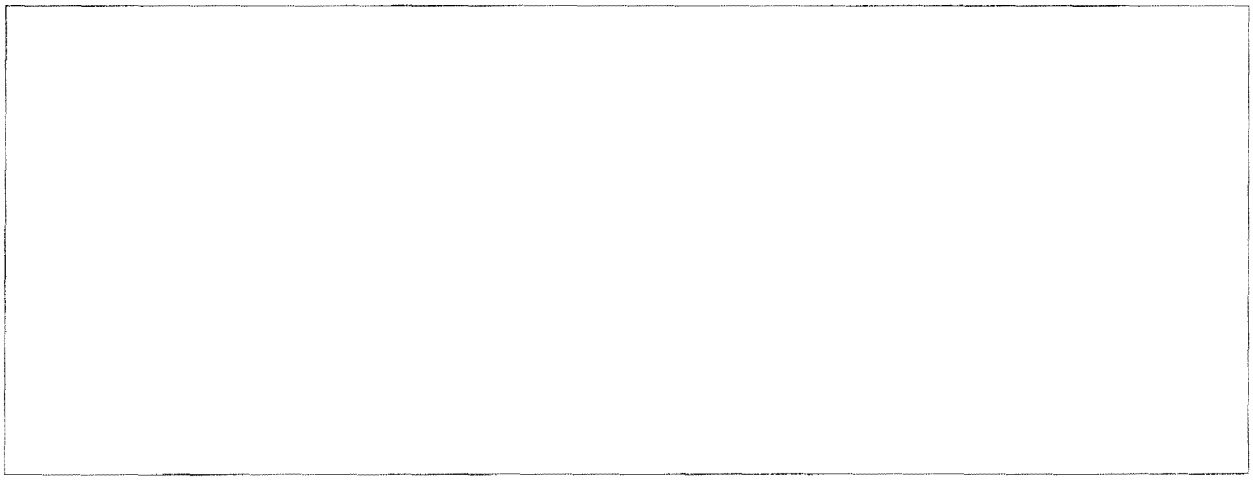
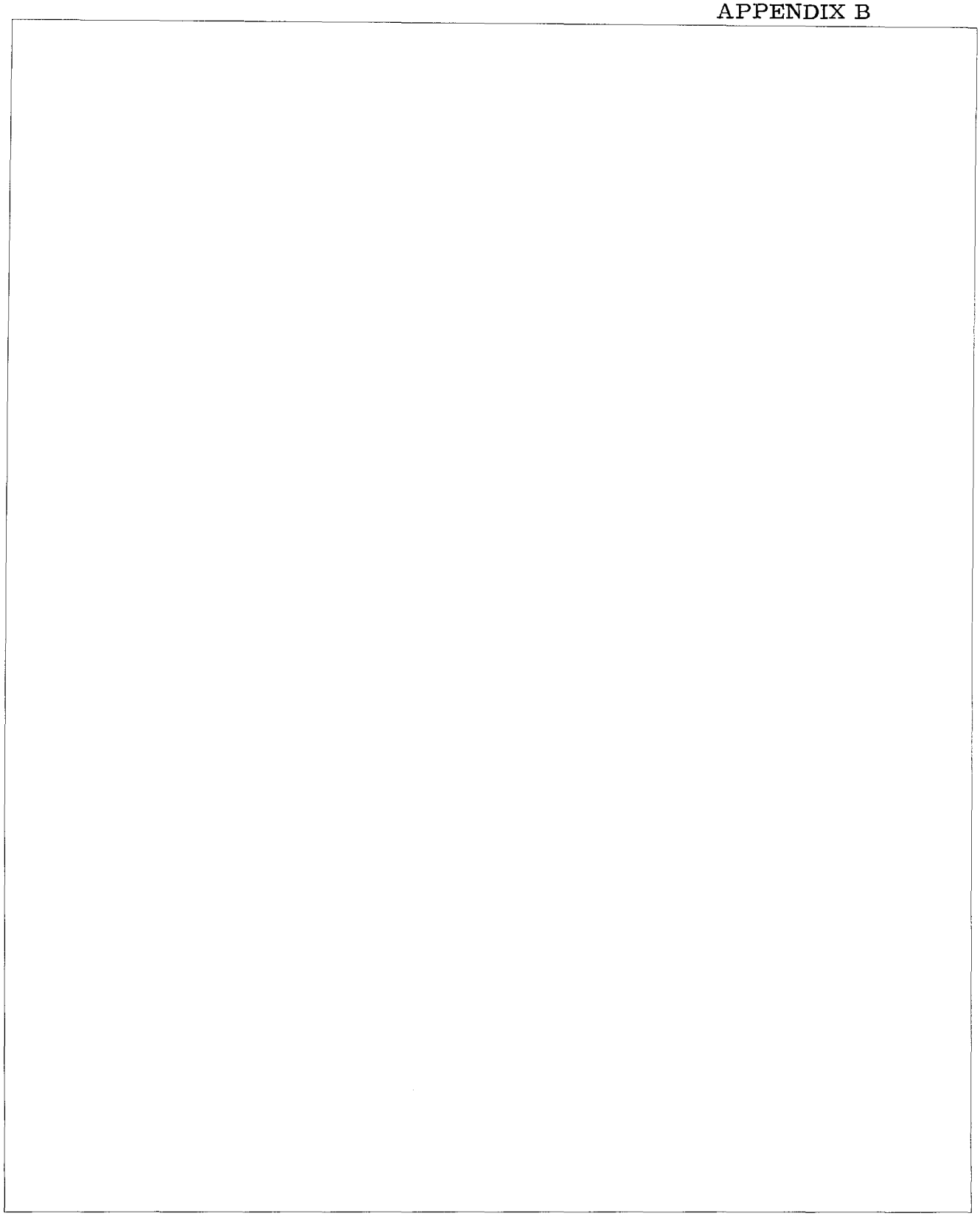
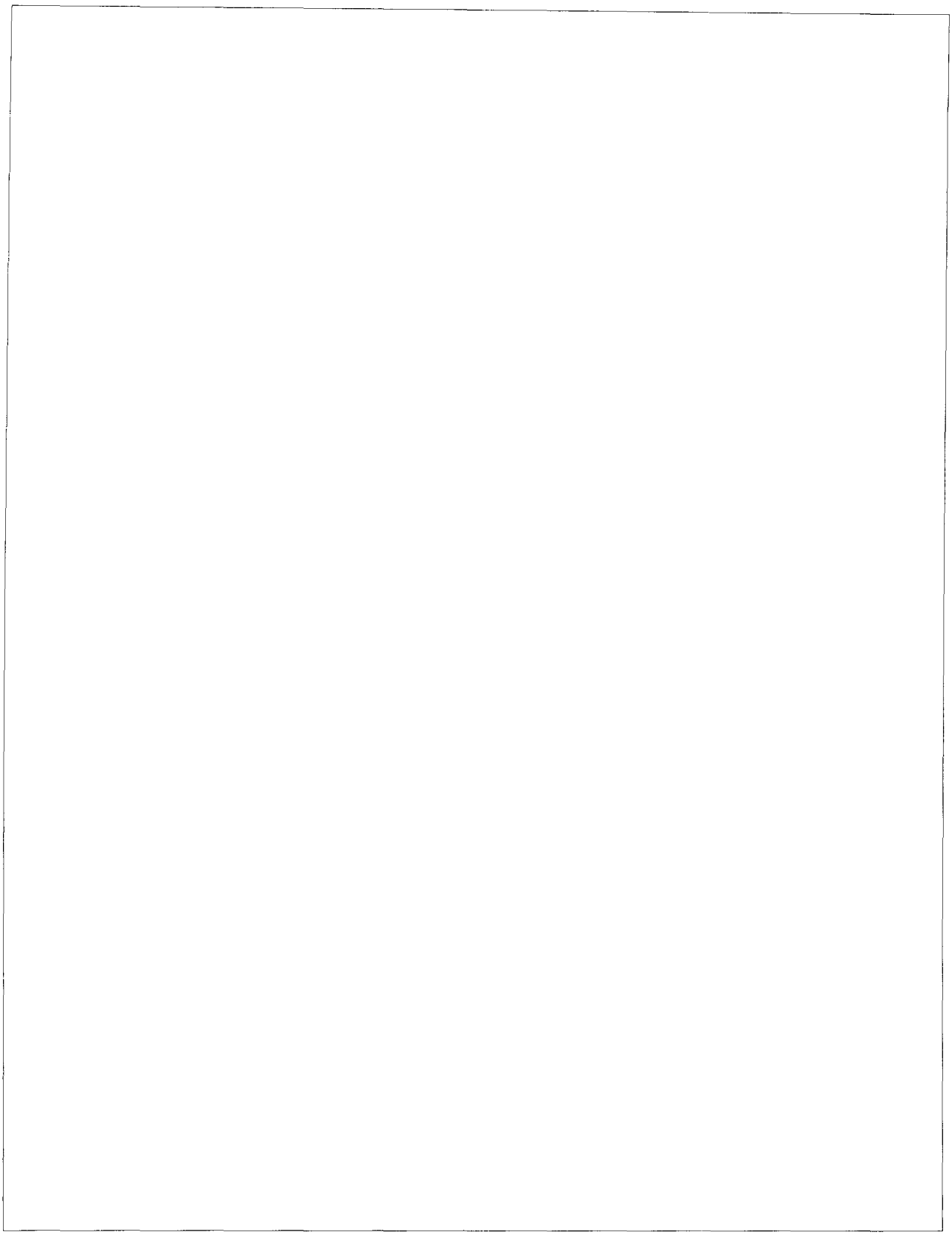
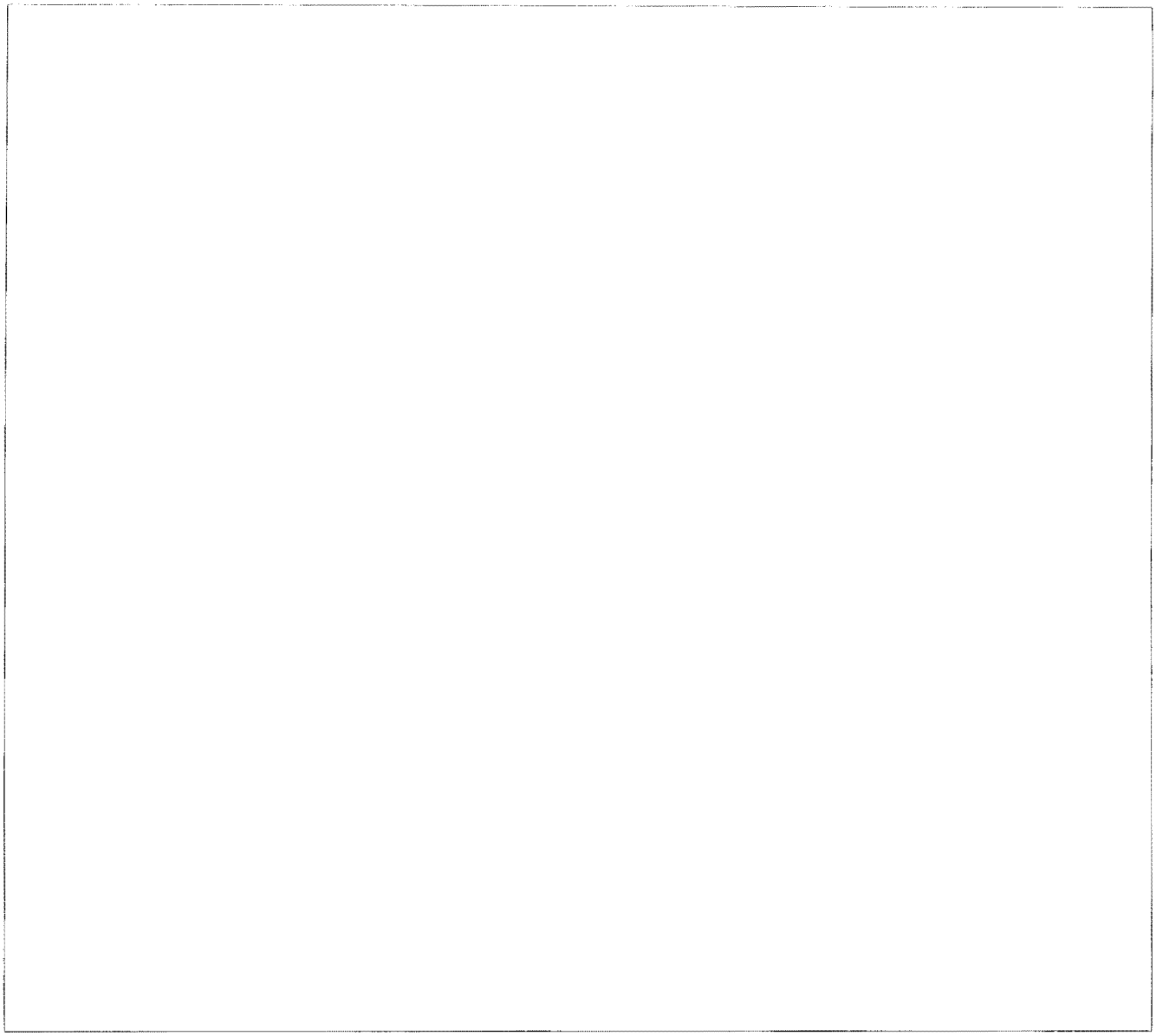




APPENDIX B







Overhead Crop Photography

Film/filter combination for the detection of low vigor (disease, mineral deficiency, mineral toxity, physical damage, etc.) in rice, wheat, and sugar cane has been established.

Low vigor signatures can be detected on multispectral photography taken at 20,000 feet and on simulated multispectral photography up to 300,000 feet (approximate orbital altitudes).

Data reduction techniques have been proposed and implemented.

Preliminary PI keys for accurate yield estimations have been formulated. Yield estimates from these keys have permitted estimates with little or no ground truths to [redacted] of the actual yield data. 3.3(b)(1)

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Medical and Behavioral Sciences Division

[redacted]

3.5(c)

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Medical and Behavioral Sciences Division

The Medical and Behavioral Sciences Division of the Office of Research and Development was established in June, 1965. The creation of this Division, and the simultaneous establishment of the Biological Sciences Division, was brought about as a result of the growing complexity and rapidly expanding diversity of their parent organization, Life Sciences, ORD. The Life Sciences group existed from 1963 until June, 1965. During this time, this group initiated a wide variety of priority research tasks which were representative of Life Science disciplines ranging from human psychology and decision theory to biological sub-systems, such as microimmunology and particle physics. Because of this exaggerated diversity, it was believed that a division of Life Science activities into separate but closely coordinated working groups responsible for behavioral activities and for biological activities would be more efficient and productive. Accordingly, the Medical and Behavioral Sciences Division was established and tasked with the primary responsibility of carrying out research and development operations in support of intelligence requirements in the behavioral activities area. Behavioral Activities was therefore established as an Agency Research and Development Sub-element. Under this Sub-element, three Agency R&D projects were established: Stress Measurement and Interpretation, Behavior Control, and Human Factors.

The initial Medical and Behavioral Sciences Division consisted of a Division Chief, four technical officers, and one secretary. Professional

disciplines represented were one Medical Doctor, one Ph.D. Physiologist, two Ph.D. Psychologists, and one Pharmacologist. During the period June, 1966, to 1 January 1968, the Pharmacologist resigned, a Ph.D. Physiologist with a background in pharmacology joined the Division staff, and one secretary was added, bringing the Division complement to seven.

Research projects initiated by the Life Sciences Group and continued by the Medical and Behavioral Sciences Division were polygraph program, stress measurement support, baseline stress measurements, vulnerabilities of special behavioral groups, hypnotic susceptibility and biological effects [redacted] With the exception of the polygraph 3.3(b)(1) and baseline stress measurement studies, these initial projects were subsequently redirected or discontinued. Stress measurement support and 3.3(b)(1) biological effects [redacted] were discontinued, the latter responsibility going to the Department of Defense.

The vulnerabilities of special behavioral groups effort was redirected to a study of undercover agent characteristics, con men, and provocation, elicitation, interrogation techniques while the hypnotic susceptibility work was redirected to a study of sleep suggestibility. Meanwhile, the stress measurement project was expanded to include indirect or remote physiological monitoring, and the polygraph program was enlarged from three to six research contracts. This latter effort was coordinated and directed by a team within MBSD that performed most of the data analysis and that prepared and published reports of polygraph program developments.

The Behavior Control project was expanded to include a drug acquisition and screening program, exploratory and developmental work on techniques for improved direct and indirect assessment of individuals and small groups, work on covert provocation and elicitation techniques, and new efforts in the area of ethnocultural factors concerned with communication barriers within and between selected cultural groups, national issues and tribal issues among nomads and other minority groups.

The Human Factors project has developed during the period since June, 1965, to include a coordinated multi-task effort to improve photo-interpreter performance in target detection, to improve audiotranscriber performance, to improve performance of the Agency training system, to analyse and define the role of transfer functions of the human in the intelligence process, and to develop means of optimizing his performance with particular emphasis to date on the intelligence analyst and the decision making process, and to identify and exploit factors influencing learning, memory, and fatigue. 3.3(b)(1) 3.5(c)

Starting in June, 1965, with a budget of [redacted] and a program of eight projects, today the Medical and Behavioral Sciences Division has established twenty-five procurement contracts and three personal services contracts amounting to [redacted] 3.3(b)(1) 3.5(c)

In spite of the small size of the Medical and Behavioral Sciences Division, during this developmental phase its officer personnel were successfully monitoring two projects for other ORD Divisions, serving as

consultants on three Department of Defense committees, and as consultants to various Agency components or activities. MBSD personnel, both as a group and as individuals, were actively involved in a collaborative effort with other Agency components to identify Agency problems and related requirements. With the Office of Security and Office of Training, these relationships centered about the polygraph program and the training systems study, both of which were carried forward with the assistance of outside contractors. With the Office of Current Intelligence, MBSD initiated research to identify problems associated with the role of the intelligence analyst. MBSD initiated work with [redacted] and A&E Staff, Office of Medical Services, to better define problems associated with assessment of individuals and groups. 3.3(b)(1)

As a result of these efforts, problems of access and of cooperation between offices based on habits and established practices have been largely overcome. The principal example of progress in this area was the polygraph program jointly undertaken by the Interrogation Research Division, Office of Security, and MBSD/ORD. This example-setting effort, along with the training system survey, has gone a long way toward establishing precedence for future cooperative efforts between MBSD and other Agency components. It is expected that the current method employed by MBSD of establishing procedures for the identification of Agency problems will be the first step toward a definition of the various human roles in the intelligence analysis process.

Immediate plans of the Medical and Behavioral Sciences Division include a moderate growth in personnel and funds to complete the work now under way and to support new work needed in the Stress Measurement, Behavior Control, and Human Factors areas. It is also planned to increase the in-house effort with respect to the on-going analysis of Agency problems. At the same time it is planned to systematize and adapt special analytical techniques, Bayesian, contextual, and others, to the Agency's peculiar problems and to implement their use as appropriate.

Long range plans call for careful analytical studies and preparations for the probable needs of the Agency in the years to come. If predictors, for example, indicate that human group behavior is to become increasingly more emotional and violent for the foreseeable future, requirements concerning the struggle for men's minds could change radically. To survive and succeed in a rapidly changing world, it may be that the Agency will have to have some means of instant self-analysis of any one or more of its various components and a means of quickly instituting changes as needed.

At this point in time, a number of accomplishments may be cited as milestones toward the achievement of established goals:

Polygraph program results have yielded findings with respect to polygraph utility, reliability, and validity.

Automatic measurement of polygraph signals was accomplished. The method could be used to assist the examiner.

An improved Galvanic Skin Response (GSR) design was developed and demonstrated.

An improved respiratory sensor was developed. The improved design has yet to be demonstrated as superior in operation.

An improved blood pulse sensor is under development.

A pulse wave velocity sensor is under development.

The Electroencephalogram (EEG) was shown to be a sensitive indicator of stress.

The Electrooculogram (EOG) was shown to be a sensitive indicator of "yes" and "no" answers and hence potentially an indicator of deception.

Three new stress indicators, parotid fluid flow, electromyographic potentials, and muscle microvibration, were investigated and discarded as potential polygraph parameters.

Significant new developments in indirect physiological monitoring were identified and redirected for Agency application.

Sleep suggestibility as distinct from hypnotic suggestibility was demonstrated as a phenomenon.

Some characteristics of individuals more successful in resisting polygraph interrogation were identified.

Methods that con men use to identify susceptible targets were studied and classified.

Two first operation health hazard radiometers were developed and deployed to the field.

A dosemetry slide-rule for safe operation [redacted] 3.3(b)(1)
was developed and disseminated to users.

Preliminary design specifications were developed for a system to determine critical parameters in photointerpreter detection of targets.

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OPTICS DIVISION

Chief - [redacted]

3.5(c)

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OPTICS DIVISION

A. Introduction

Activity in the Optics area was initiated prior to the formalization of the Office of Research and Development. This occurred due to the request of General (then Colonel) Edward B. Giller, Assistant Deputy Director (Research), that [redacted] of TSD/DD/P investigate the state of technology of infrared scanning systems and prepare recommendations for research and development in this field. This work was initiated in October, 1962, approximately three months before [redacted] the second scientific member of ORD, reported for duty with ORD/DD/R; the first member, [redacted] preceded him by several days. The more formalized shape of an organization did not begin to form until Mr. Robert M. Chapman and [redacted] reported aboard as the Assistant Director and Deputy Assistant Director, respectively. At this point, [redacted] was designated Chief of the Optics Division, with two staff members, [redacted]

3.5(c)
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3.5(c)

From the initial concept, the mission of ORD was to provide research and development capability in technical and scientific fields, and to intelligence requirements in general. In the optics area it was specifically directed to optical collection devices and ancillary activities, and to direct support to the Office of Special Activities in research and development of advanced overhead collection systems. For the most part, Optics Division has adhered to its original mission.

B. Major Accomplishments

The report by [redacted] relative to the state of infrared scanning 3.5(c)
systems and his recommendations for research and development in this area resulted in a major contribution to the Intelligence Community. A new state-of-the-art was established, resulting in the practical utilization of infrared scanning systems for the overhead collection of strategic and tactical information at night. The first high resolution infrared scanner was produced by the Optics Division in thirteen months with a tenfold increase in resolution over then existing infrared scanners. This accomplishment was deemed to be five years away by knowledgeable scientists. Five months later it collected the first substantive intelligence data toward a National Intelligence Objective requirement. For this feat, [redacted] 3.5(c)
[redacted] each received the Intelligence Medal of Merit and, more 3.5(c)
mundane, cash awards totaling [redacted] Unfortunately, this infrared 3.5(c)
scanner with a 1/2 milliradian resolution was lost several weeks later on another operational mission.

However, even before the first operational mission with the 1/2 milliradian scanner was undertaken, the design for an unheard of 1/10 milliradian resolution scanner was under way, with a radical change in the scanning mode to permit obtaining stereo-infrared imagery through the one system. The design was sufficiently good that a 1/20 milliradian resolution system was initiated at the same time. Thus, with the initiation of the infrared program in June, 1963, a series of high resolution scanners

was produced, with the 1/2 mrad delivered in July, 1964, the 1/10 mrad breadboard in March, 1966, the 1/20 mrad breadboard in August, 1966, and a 1/10 mrad operational prototype scheduled for February, 1967. As of June, 1966, an in-house design study for a 1/50 mrad resolution system for satellite use was under way. Through this bold and aggressive program, Optics Division has established the Central Intelligence Agency in the forefront of infrared technology in the Nation, and has made and is continuing to make, significant contributions to the infrared capability of the U.S. military services. Further details of these amazing achievements may be found in "Studies in Intelligence", Vol II, No. 3, Summer 1967.

Continuing in the field of overhead reconnaissance was the concept of high altitude aircraft equipped with a long focal length lens looking upward to intercept and photograph earth satellites, the system to yield target resolutions of 9-14 inches. The system was such that down-looking photography could also be taken, giving two to three inch target resolutions in the resulting photography. This system, totally conceived and designed by Optics Division, created a tremendous impact on the scientific and reconnaissance world. Unfortunately, Optics Division was not given the funds and responsibility for its development. However, the concept and much of the system design are utilized by the Air Force, which has the responsibility for [redacted] in situ. It can be said that the Optics 3.3(b)(1)
Division concept and design, known as [redacted] made a significant 3.3(b)(1)
contribution toward the Air Force responsibility [redacted] 3.3(b)(1)

This brainchild of [redacted] is more fully described in the monograph entitled [redacted] 3.5(c) 3.3(b)(1)

In 1965, Optics Division work was directed toward tactical intelligence by the Director of Central Intelligence, the Honorable William F. Raborn, who requested a foliage penetration study and recommendations as to how this might be accomplished. The word was received by [redacted] 3.5(c) the night of 10 July, and on Sunday, 11 July, [redacted] met 3.5(c) to discuss this problem. From this meeting came the [redacted] concept 3.3(b)(1) which later became known as [redacted] in CIA and [redacted] in 3.3(b)(1) the Department of Defense. On 16 July, ORD submitted the "Report to the Director: Techniques for Foliage Penetration in Reconnaissance and Technical Recommendations for Agency Programs". 3.3(b)(1) 3.5(c)

DD/S&T and staff met with Dr. Harold Brown (then Assistant Secretary of Defense for Research and Engineering) to brief and coordinate Agency and DoD programs and to prepare a coordinated report to Bureau of the Budget. At this meeting it was agreed that [redacted] was to be an Agency 3.3(b)(1) 3.5(c) effort, with ORD coordination to be effected through DD/R&E and ARPA. A series of briefings and coordination meetings was held with Navy Liaison, CNO, Bureau of Weapons, Joint Chiefs of Staff, Vietnam Task Force, and elements of BoB. On 7 September 1965, BoB provided the first funding for Project [redacted] 3.3(b)(1) 3.5(c) 3.3(b)(1)

The name [redacted] is an acronym derived from [redacted] and is essentially the original concep 3.3(b)(1) 3.5(c) 3.3(b)(1)

[redacted] concept was later 3.3(b)(1)
removed from the system. While this program was directed toward operations in Southeast Asia, the systems and technology are applicable in other areas of dense foliar coverage, e.g., portions of Latin America, Africa, and the Caribbean Islands. The concept was designed around Agency proprietary equipment developed in Optics Division in the infrared and active magnetics sensor disciplines. The concept found such favor in the military services that both the Navy and Air Force allocated large multi-millions toward building similar systems. The Navy, for instance, has eleven systems under contract, eleven systems under negotiation, and plans for twenty additional upgraded systems.

In 1966 a change in policy occurred with the new DCI. CIA financial support was withdrawn, and [redacted] 3.3(b)(1) 3.5(c)
was almost abandoned, but was rescued by the Assistant Secretary of Defense for Research and Engineering, Dr. John Foster, who directed DoD support, in his words, "for this worthwhile development". Under his sponsorship [redacted] was to obtain the necessary data 3.3(b)(1) 3.5(c)
relative to sensors, navigation, and tactics to guide the development of like follow-on military systems. As of this writing, [redacted] is being 3.3(b)(1) 3.5(c)
tested in the Southeast Asian environment. The various sensors and coordinated components utilized in the [redacted] multisensor system are 3.3(b)(1) 3.5(c)
described in the monograph entitled [redacted] 3.3(b)(1) 3.5(c)

It seems as if Optics Division, because of its unusual conceptual approaches toward problems, has a permanent position as the center of controversy. In the development of the Airborne Active Magnetic Sensor ("Abacus"), test flights were flown against submerged objects with sufficient signal return to indicate that it may be able to detect submerged submarines. Previous analysis of active magnetics by magnetic experts rules this technique out as a non-feasible approach. However, arrangements were made through the auspices of the Chief of Naval Operations to run tests against the conventional submarine Redfin off the coast of Norfolk on 8 November 1966. The tests were scheduled during darkness in order to test a thory of [redacted] relative to the use of infrared equipment against submarine wake detection. The results of the tests showed clear signals of the submarine by the Abacus device and recorded wakes created by the submarine at depths to 300 ft. These results have caused a furor, since numerous studies indicated that detection of submarines by active magnetics and infrared at such depths was not possible. It is almost a year, at this writing, since these results were obtained and no further tests have been conducted. However, controversial discussions are still under way, especially with the Abacus system, where top scientists of the Nation are stating that "it's no damn good and can't work". At this point in time we are trying to develop a mathematical model and obtain additional data to convince the scientists that Abacus does not violate the laws of physics.

3.5(c)

Unfortunately, ASW has been deemed not part of the Agency's

responsibility, and we were directed not to investigate further. It is "unfortunate" because our ballistic missile submarines are presumed to be undetectable and serve as our first line of defense; therefore, any system which offers a possibility of detection should be investigated to determine its capabilities and limitations so that suitable countermeasures can be devised. The picture of the IR wake is contained in "Studies in Intelligence", Vol II, No. 3, Summer 1967.

There are other achievements, and some failures, in the Optics Division program. Failures for the most part resulted from trying to achieve goals where it was not possible to push the state of technology within the time limitations set to achieve the goal. However, successes far outnumber the failures, and the Optics Division enjoys a good reputation for being conceptual and getting things done.

C. Philosophy

For the most part Optics Division has been engaged in applied research and development, even though it has established the state-of-the-art in infrared and magnetic detection. With the establishment of the Optical Sciences Laboratory in Optics Division, the trend is toward in-house analysis of optical phenomena prior to external contracting for optical manipulations.

One of the questions posed to Optics Division is "How do you accomplish your developments so rapidly?" The technique is to do total contracting for all phases, the philosophy being that at some point in a

phase prior to phase completion there is sufficient data to render a decision to go ahead. If the decision is made at that time to proceed with the next phase, six months to a year can be saved, depending on the complexity of the system under development. Also, the philosophy is to design for an operational prototype, which means that the first model is designed to be used operationally, if necessary. There is a large risk factor involved, but if the project engineer is sufficiently knowledgeable and is close to the development, the risk is not as great as it appears to be. The first 1/2 mrad IR scanner produced was used operationally.

D. Problems

The major problem facing Optics Division is the top level decision that large reconnaissance systems will not be undertaken. This reverses, somewhat, the original mission of the Optics Division, and at present Optics is restructuring its roles and mission. Funding is a problem, and the tendency is to fund those R&D projects which have the least amount of risk. While this is understandable in the light of tight money, it does stifle bold approaches toward solution of problems. Certainly fewer state-of-the-art systems will be developed if this tendency continues.

In the final analysis, however, there are not as many restrictions placed on the technical people when compared to those of the military. Although there are frustrations, the work is most challenging, diversified, and most enjoyable.

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PHYSICS-CHEMISTRY DIVISION

Chief - [redacted]

3.3(b)(1)
3.5(c)

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3.3(b)(1)
3.5(c)

PHYSICS-CHEMISTRY DIVISION

What was later to become Physics-Chemistry Division, ORD, had its beginnings early in the Winter of 1963. [redacted] 3.5(c)

[redacted]

The first form to the Division came about in the summer of 1963, when part of the growing ORD staff was remotely located within the 3.5(c) Headquarters building. At that time [redacted] was assigned supervisory responsibilities for the area which housed [redacted] 3.5(c) [redacted] in addition 3.5(c) to those named above. [redacted] was the group secretary. 3.5(c)

Division Chief and the Divisional role in ORD grew from several pressures: supervisory function, technical program, budgeting, and recruiting. A homogeneous, interdisciplinary capability was generated. 3.5(c) [redacted] transferred to the embryonic division from GSD/OSI; he brought a unique concept with him [redacted] 3.3(b)(1)

[redacted]

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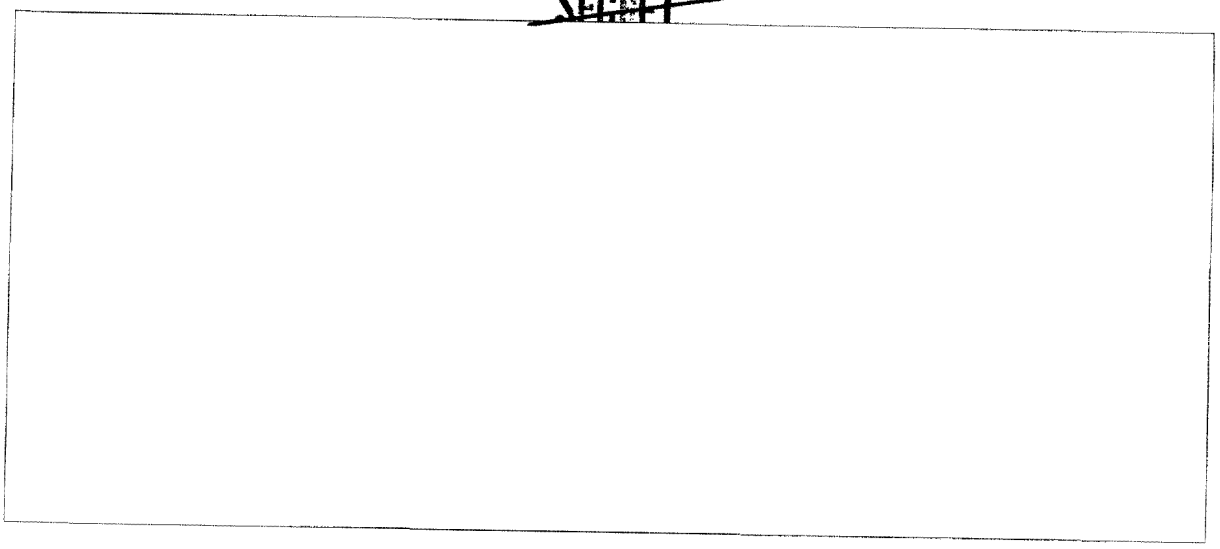
By the early Winter of 1964, Physics-Chemistry Division was a functioning organization. Professional staff changes since that time have been:

[redacted] Physical Organic Chemist, from TSD and AEC (Sandia) in July, 1964. 3.5(c)

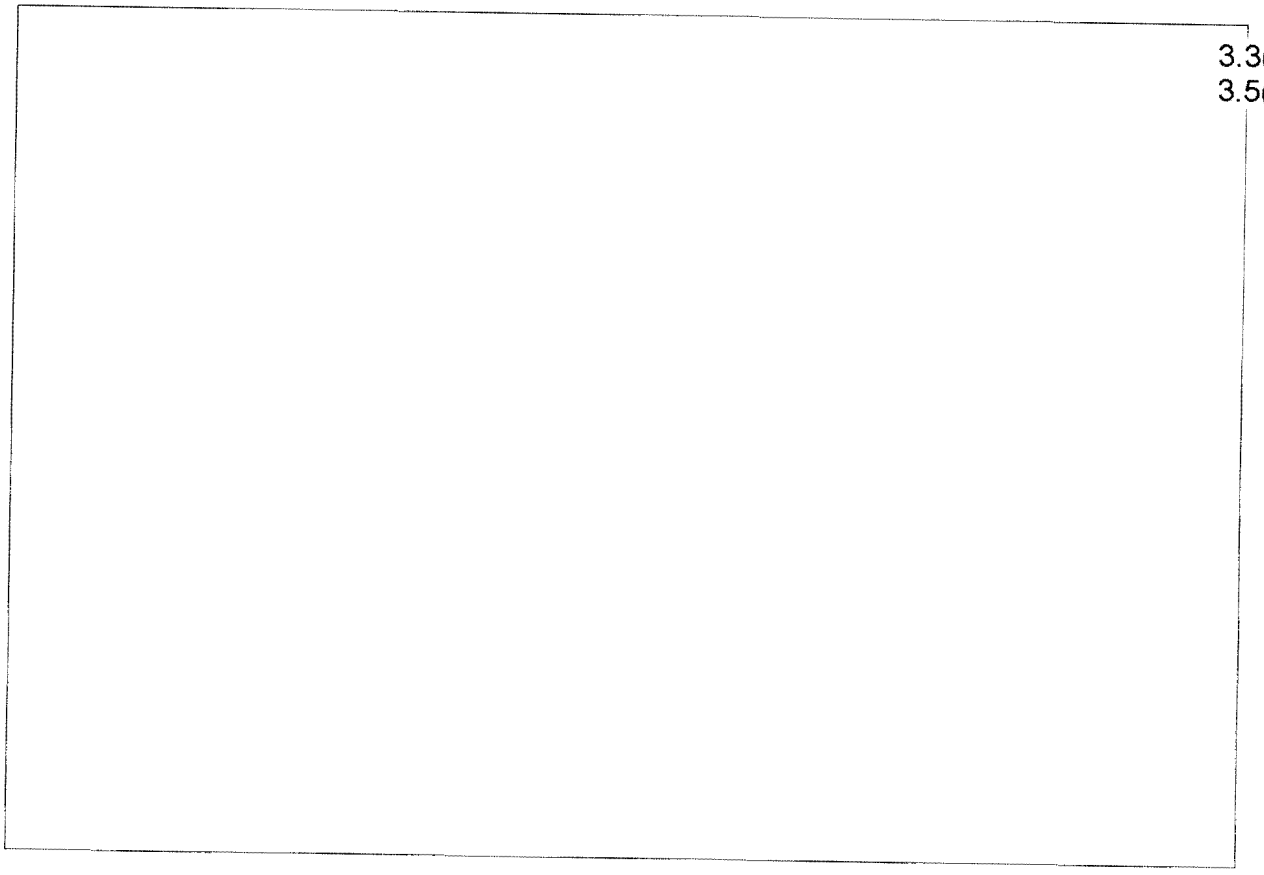
[redacted] 3.5(c)



3.3(b)(1)
3.5(c)

In March, 1967, the Chief of the Division established a Branch structure to better formulate programming and supervision of on-going activities. [redacted] was given the added responsibilities of heading a Systems 3.5(c)

3.5(c) Branch; [redacted] heads the Materials Branch, and [redacted] the 3.5(c)
Research Branch.



3.3(b)(1)
3.5(c)

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[redacted] 3.3(b)(1) 3.5(c)

[redacted] 3.3(b)(1) 3.5(c)

[redacted] and [redacted]

[redacted] 3.3(b)(1) 3.5(c)

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3.3(b)(1)
3.5(c)

The staff of eleven professionals work in some six program areas.

These are identified and briefly characterized in the following summary:

3.3(b)(1)

using active and passive systems ranging across the electromagnetic spectrum. [redacted] 3.5(c)

[redacted] lead this work.

[redacted] 3.3(b)(1) 3.5(c)

Geophysical Techniques: The technical program consists of two significantly different elements. The one, [redacted] encompasses weather control efforts (see [redacted] and application to fields of populace control, crop control, and weaponry. There is a collection side as well. Here we are attempting to identify signatures to detect evolution of threatening capabilities and also to extend photointerpreter read-out of meteorological and other photography. [redacted] is the prime mover of this program. 3.3(b)(1) 3.3(b)(1) 3.5(c) 3.5(c)

Power: Secondary, or auxiliary, power is largely battery-work. Emphasis is on (1) low-power systems compatible with printed and micro-electronics, (2) secondary systems for audio, (3) solar cells and fuel cells for "black box" systems, and (4) propulsive power engines for ORD emplacement systems. [redacted] guide these support projects. 3.5(c)

Materials Technology: [redacted] 3.5(c)

3.5(c) [ ] manages a number of projects. [ ] 3.3(b)(1)
[ ] methods dominate. Special support on materials with unique properties, such as [ ] is 3.3(b)(1)
provided. [ ] is active in the broad field of camouflage 3.5(c)
where the interaction of energy and matter set the technology; requirements cover audio, infrared, visible, and radar camouflage for a variety [ ] 3.3(b)(1)

[ ] and Analysis: This program supports highly sophisticated 3.3(b)(1)
approaches; [ ] 3.3(b)(1)
for example, for instrumental analyses. Work is also done on FORMAT and specially collected items to get at the technology of threat nations by exploiting in depth both chemical and physical analytical methods. Dr. [ ] manages this effort. 3.5(c)

Summarizing, Physics-Chemistry Division is a highly interdisciplinary division. Systems approaches requiring an engineering rather than scientific outlook motivate the staff against requirements which find a greater focus in nuclear capabilities, including delivery systems, than any other field. The total effort may be scaled by the annual budget, which approximates [ ] 3.3(b)(1) 3.5(c)

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Attachment A

[redacted] 3.3(b)(1)

by

[redacted] 3.5(c)

This project was generated through the efforts of [redacted] 3.5(c) who sold the concept to the DD/P and NED/OSI. No formal requirement was ever written, although there is in the Priority National Intelligence Objectives (PNIO) ample evidence for the need to collect intelligence [redacted] The first contract was let in December, 3.3(b)(1) 1964 [redacted] for the materials development. A total 3.3(b)(1) 3.3(b)(1) of [redacted] was spent wit[redacted]n a two-year period. From this work 3.3(b)(1) 3.5(c) several classified patent applications have resulted. A significant achievement of this phase of the work was the incorporation [redacted] [redacted] 3.3(b)(1)

The second phase of the work was the analysis of the material after [redacted] This work required 3.3(b)(1) 3.3(b)(1) 3.5(c) [redacted] over a three-year period and was done [redacted] 3.3(b)(1) [redacted] Additional no-cost analyses have been provided by other AEC laboratories. Significant analytical accomplishments have been the development of very fine chemical separation techniques and an ultra-low level counting capability.

Currently, the [redacted]work has been completed and they are providing 3.3(b)(1) only work order preparation of operational material. U.S. field testing is nearing completion, with additional special testing being done upon

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appropriate request. [redacted]

[redacted] 3.3(b)(1)

The system is being actively considered for use [redacted] 3.3(b)(1)

[redacted] 3.3(b)(1)

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Attachment B

[redacted] 3.3(b)(1)

by

[redacted] 3.5(c)

The requirement for this project originated with the Vietnamese Affairs Staff in December, 1966. It was in the form of a request to [redacted] 3.3(b)(1)

[redacted] 3.5(c)

was Project Officer. The final selection was a [redacted] 3.3(b)(1)

[redacted] which, when spread on the surface [redacted] was 3.3(b)(1) sufficient [redacted] Field tests were run at 3.3(b)(1) [redacted] was produced. 3.3(b)(1)

An air drop system was developed with SOD/Air Branch using 25-pound paper bags filled with the chemicals which were dropped from C-130 aircraft on pallets [redacted] per 3.3(b)(1) pallet. Drop height was 200 ft. and air speed was 150 knots. Upon completion of these tests, an operational test was run [redacted] 3.3(b)(1)

3.5(c) The test was supervised by [redacted] of P-C/ORD, an [redacted] 3.5(c) [redacted] Results were inconclusive because of the lack of follow-up 3.5(c)

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[redacted] 3.3(b)(1)

During the course of these tests, the DCI requested that we turn the technique over to the military. This was done at a series of high-level briefings at the Pentagon conducted by [redacted] and Major [redacted]. As a result of this, the Air Force conducted a large-scale test in Viet Nam with, again, inconclusive results. Since the technique was designed [redacted], there is some possibility the target requirements overrode the requirement for proper [redacted] conditions. This would cause poor results. (Dr. William G. McMillan, Scientific Advisor to Gen. William Westmoreland, personally commented upon the unsatisfactory nature of the Air Force evaluation.) There was evidence of the use of bamboo mats and logs in the drop zone after the military drop, but the effect on traffic movement could not be assessed. The military stopped operational testing.

3.5(c) 3.5(c) 3.3(b)(1) 3.3(b)(1)

ARPA took over the research and development management of the military aspects of this program and had work done [redacted]. The basis of the work remains sound, but what is needed is a method to improve mixing of the chemicals with the soil to give more effective mud making. Since there were some chemicals left over, we hope to have them retested this spring in the research and development area in Southeast Asia, using an improved mixing technique.

3.3(b)(1)

~~SECRET~~

Attachment C

[redacted] 3.3(b)(1)

by

[redacted] 3.5(c)

In January, 1967, [redacted] met with representatives 3.5(c)

3.3(b)(1)f [redacted] Division and TSD to discuss [redacted] The 3.3(b)(1)

result of this meeting was a contract with [redacted] 3.3(b)(1)

Incorporated, on 20 February 1967, to study methods of suppressing the

[redacted] 3.3(b)(1)

The results of this program are currently being evaluated by DD/P.

~~SECRET~~

Attachment D

FOG DISPERSAL

by

[redacted] 3.5(c)

In September, 1967, [redacted] discussed with Mr. 3.5(c) George Carver, Special Assistant to the DCI for Vietnamese Affairs, the possibility of being able to disperse warm fogs in Laos. Mr. Carver enthusiastically approved of this idea, and on 10 October 1967, a contract was given to [redacted] to determine 3.3(b)(1) feasibility of the concept and conduct limited field testing. [redacted] 3.3(b)(1) impressively demonstrated that warm fog could be dispersed, and on 15 January 1968 they were asked to provide equipment and materials for Agency testing [redacted]. 3.3(b)(1)

The DCI was briefed on the program by [redacted] 3.5(c)

[redacted] 3.5(c)

VAS, on 2 February 1968 with regard to dispersal of fog in combat areas in Viet Nam. He concurred and promptly sent a memorandum to the Joint Chiefs of Staff offering Agency assistance. General Earle G. Wheeler, Chairman of the JCS, accepted and on 13 February 1968 [redacted] 3.5(c) departed for Da Nang, Viet Nam, to assist the military with the operational deployment of this technique at besieged Khe Sanh.

Success was achieved at Khe Sanh when weather conditions existed for which the system was designed. The Department of Defense was

sufficiently impressed with the field demonstrations that it is now developing the technique into a standard military field system. Additional Agency evaluation and testing is continuing as of this writing.

Attachment E

MERCURY BATTERIES IN AUDIO APPLICATIONS

by

[redacted] 3.5(c)

In the summer of 1963 [redacted] explored Agency require- 3.5(c)
ments for battery power to establish the need and nature of any research and development to be initiated by DD/R in a support role to using components. One requirement existed in the inadequate performance of the Mallory mercury primary battery in wide use [redacted]. 3.3(b)(1)

The mercury cell was invented in 1942 by Samuel Ruben and was promoted by his organization, Ruben Laboratories, Yonkers, New York. The [redacted] 3.3(b)(1)
captured almost the total market. The basic cell is very stable electrochemically. Further, its electrical performance, efficiency and energy density fitted it uniquely to many applications for which the old faithful LeClauche dry cell was unacceptable.

The manufactured products were designed and formulated to supply an area of need which either reflected a relatively high, steady-state current as in the hearing aids of the day and in certain radio applications or were applied to instrument uses under pulse loads. In each case cells were sized in terms of capacity so that near 100% material efficiencies were obtained in these uses. The TSD experience with audio applications showed initial failures when but 25-30% of the reactive chemicals had been electrochemically utilized. A significant problem existed for the operational

situation demanded [redacted] power-wise, in line with this 3.3(b)(1)
efficiency. Accordingly, [redacted] use of three to four times 3.3(b)(1)
the number of batteries which should have been the case.

3.5(c) With [redacted] CB/TSD/DD/P, [redacted] reviewed the 3.5(c)
peculiarities of the audio application. The electrical loading was totally different in two basics, namely, a very long period of service (many months to years) and a condition requiring a steady state microampere background current upon which was superimposed pulses at tens of milliamperes.

Here now was a clear situation wherein the Agency's peculiar demand on a highly successful commercial product produced totally unacceptable performance. 3.3(b)(1)

In November, 1963, a [redacted] contract was written with the [redacted] for work to be conducted [redacted] 3.3(b)(1) [redacted] The scope of the effort was:

Problem: Mercury cells of the military type (BA1030/U) are used in a pulse application in which a minimum voltage must be maintained. Performance testing characteristically shows failures when only 25-30% of the reactive materials have been electrochemically utilized. Representative environmental conditions and duty cycle are:

(1) Conditions are basically human ambient with no extremes of any kind being involved.

(2) Duty cycle involves a 25 microampere background current with 50 millisecond pulses being required every 2.5 seconds. Pulse heights are 10, 40, or 60 milliamperes. The two higher pulses are required no more frequently than hourly. A minimum of 1.0 v/cell must be maintained.

Failure is defined as the inability to maintain the one-volt minimum under the instantaneous pulse requirements.

Objective: The objective of this research is to generate and report firm guidance for technological action leading to a substantially improved conversion efficiency, or materials utilization, in cells under the described use.

Task: The conduct of theoretical and experimental research on mercury cells (BA0130/U) for the purpose of identifying failure modes in the electrochemical materials, structure, or system (under the described conditions of use) is required. The identified failure modes are then to be interpreted technologically. (Cells tested to failure under an approximation of the duty cycle will be available as raw material.)

Fate was kind. In a few months [redacted] had eliminated chemical problems of electrode polarization and shelf instability of material substances. Either of these possibilities would have been most difficult to overcome. The course of failure was found to be mechanical; it appeared in two forms. In some cases the lead from the anodes to the negative

3.5(c)

terminal was inadequately protected; it corroded through and produced a failure through an open circuit. The more subtle, and dominant failure mode was the internal shorting of cells. Upon cell discharge free metallic mercury appears at each electrode. Under design uses, this free mercury is immobilized by the electrode, matrix characteristics and is restrained by the use of physical barriers between the electrodes, i.e., the well-known role of the battery separator. The Agency condition of use simply provided time for minute mercury droplets to grow and combine; the increased masses of mercury then penetrated the separator barrier at lap joints, causing a short circuit.

The balance of the technical program was simple and direct. Knowing the cause of failure, several positive actions were immediately evident. A variety of design and material changes were incorporated into test cells. Electrochemical efficiency rose to better than 90%, and, with this demonstration our work was done. TSD wrote an engineering and test program with [redacted] proved out the improvement on a statistical basis, and then revised operational procedures. [redacted] then reflected a confident design criteria for the mercury cells of 90% utilization of available capacity rather than the uncertain 30% level in use prior to this project.

3.3(b)(1)

3.3(b)(1)

SECRET

RADIO PHYSICS DIVISION

Chief - [redacted] 3.5(c)

RADIO PHYSICS DIVISION

The Radio Physics Division was initiated in February of 1963, when [redacted] transferred from TSD/DD/P. In December, 1963, [redacted] assumed responsibility as Chief of the Division and at the same time started organizing the mission for the Audio Physics Division. [redacted] entered on duty in February, 1965, to become Chief of the Radio Physics Division, and Audio-Physics was set up as a separate entity. 3.5(c) 3.5(c) 3.5(c)

This division was organized to conduct applied research and development in the EM antenna and propagation field, in over-the-horizon radars, advanced sensors, EM surveillance systems, stay-behind systems using advanced microminiaturization techniques which can gather intelligence in a remote fashion, and secure retrieval of data from stay-behind devices. The charter was later expanded to include stand-off emplacement vehicles for emplacing these remote sensing devices, non-linear joint detection studies and applied research.

The operating budget for the Fiscal Years 1963 - 1968, in the above areas of discipline, was as follows:

FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
[redacted]					

3.3(b)(1)
3.5(c)

Following is a chronology of major milestones -- projects in the areas mentioned above which are particularly worthy of mention. This by no means covers all tasks accomplished and under way.

In the over-the-horizon radar field, Radio Physics has developed, fielded, and operated a major radar installation [redacted] (CHECKROTE). 3.3(b)(1) More than 500 tons of sophisticated radar equipment was designed, procured, integrated, shipped half way around the world, assembled, and put on the air in less than fifteen months. This development was the outgrowth of the prior work on the EARTHLING OTH radar evolved and operated [redacted] Since its initial operation, in the Fall of 3.3(b)(1) 1966, CHECKROTE has detected the launching of 33 Chinese missiles -- many times the number detected by any other intelligence source. This unique system, CHECKROTE, and its predecessor EARTHLING, are described in more detail in separate monographs.

The OTH radars were shown to have a capability for tracking cooperative aircraft reliably out to a [redacted] 3.3(b)(1) [redacted] program. 3.3(b)(1) 3.5(c)

The CHECKROTE radar may be considered to be a very high powered, high frequency transmitter (3.2 megawatts) with a very sensitive receiver connected to a 600- by 150-foot directional antenna. As such, it could be used to communicate with emplacement vehicles such as AQUILINE and with unmanned stay-behind intelligence collection devices emplaced in denied areas of the world. A transponder breadboard was designed and tested in 1966 [redacted] 3.3(b)(1) [redacted]. Another transponder was developed and used with the CHECKROTE [redacted]. Other transponders providing 3.3(b)(1) 3.5(c)

greater security in smaller packages are currently under development [redacted] 3.3(b)(1)

Stay-behind intelligence collection systems for detecting and tracking missiles and the research and development of the subsystems necessary for these stay-behind devices have been conducted. A small, general purpose computer was developed and tested -- smaller than 3"x4"x7" and weighing less than 4-1/2 pounds. This computer has been integrated with [redacted] and tested as part of the early [redacted] system as an [redacted] 3.3(b)(1) 3.3(b)(1) 3.5(c) The QUADRANT program is more fully described in the monograph. A smaller computer, three-quarters of a pound in weight, with 25 times the storage capacity and a lower power drain, is being developed. 3.3(b)(1)

Starting in 1964, techniques for packaging stay-behind devices so that they can withstand emplacement from both high and low altitude emplacement vehicles were studied and tested. Earth-penetrating vehicles of the [redacted] 3.3(b)(1) include non-penetrating vehicles with crushable noses, drogue chutes or balloons or air vanes for slowing them down, motor-driven and gravity erection systems for leveling the emplaced package, [redacted] 3.3(b)(1)

Communications subsystems for transmitting commands to the stay-behind devices and for retrieving data collected by the stay-behind systems have been developed. These include high frequency radio receivers and transmitters for over-the-horizon communication; UHF/VHF transmitters and receivers for communication line-of-sight through air-borne relays or through satellites have been constructed. Antennas, sensors, and power supply subsystems have been developed.

These subsystems have been assembled into working systems, such as the OXIDANT, [redacted] systems. The OXIDANT program, more fully described in the monograph, was started in January of 1964 to gather definitive intelligence on enemy missile performance, to digest pertinent information using a logic computer, to store the information, and to transmit data in a secure fashion upon demand. 3.3(b)(1) 3.5(c)

The [redacted] system was started in January, 1965, to provide a passive sensing system to accurately [redacted] during the early launch phase by means [redacted]. This system was successfully demonstrated in the field in October, 1965. This breadboard system demonstrated its capability to detect, process, and store [redacted] 3.3(b)(1) 3.5(c) 3.3(b)(1) 3.3(b)(1) 3.3(b)(1)

flight. Activities since that time have been devoted to increasing the range, designing and developing [redacted] systems, and performing operational system program definition studies. 3.3(b)(1)

A number of propagation programs have been conducted since the inception of the Division. VLF propagation studies were conducted with the National Bureau of Standards and the Naval Ordnance Test Station, China Lake, California. High frequency propagation studies have been a continuing output from the EARTHLING and CHECKROTE programs. This work has contributed much to the understanding of high frequency propagation, ray tracing, ray focusing, ionospheric tilt, and ground backscatter phenomena. A study of an anomalous VHF propagation phenomenon is presently under way [redacted] VHF propagation 3.3(b)(1)

[redacted] 3.3(b)(1)

fore thought unattainable.

A new technique [redacted] has been under investigation 3.3(b)(1)

since January, 1966. This method involves [redacted] 3.3(b)(1)

[redacted] The system in 3.3(b)(1)

its breadboard form has detected [redacted] 3.3(b)(1)

Development work now in progress should extend this range to several thousand feet and thereby provide a reliable means for detecting the

[redacted] 3.3(b)(1)

In the stand-off emplacement areas, started in 1966, the work includes studies directed at establishing the feasibility of and program definition for [redacted]

3.3(b)(1)

[redacted]

and acoustic signatures. Studies have demonstrated the feasibility of these approaches.