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14675 Lee Road  
Chantilly, VA 20151-1715

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**NATIONAL RECONNAISSANCE OFFICE**

14675 Lee Road  
Chantilly, VA 20151-1715

12 June 2015

Re: NRO Case E12-0051 - Mandatory Declassification Review

This is in response to your letter dated 12 June 2012 received in the National Reconnaissance Office (NRO) on 22 June 2012. Pursuant to Executive Order 13526, Section 3.6, requested requesting a mandatory declassification review of the "*Bradburn, David et al. The SIGINT Satellite Story NRO 1 December 1994.*"

One record consisting of four hundred twenty-nine (429) pages is being released to you in part. Information being withheld is currently and properly classified under Executive Order 13526, Section 1.4(c), 1.4(d). To the extent that the classified information in the responsive documents is over 25 years old, we have determined that it qualifies for continued classification under Executive Order 13526, Section 3.3 (b)(1). In addition, the names of NRO or NSA employees and/or information related to NRO or NSA/CSS functions and activities are exempt from public release in accordance with the provisions of Section 6, Public Law 86-35 (50 U.S. Code 3605) (NSA) and Section 3.5(c) of E.O. 13526 (NRO).

You have the right to appeal this determination by addressing your appeal to the NRO Appeal Authority, 14675 Lee Road, Chantilly, VA 20151-1715 within 60 days of the above date. Should you decide to do this, please explain the basis of your appeal.

If you have any questions, please call the Requester Service Center at (703) 227-9326 and reference case number E12-0051.

Sincerely,

A handwritten signature in black ink, appearing to read "Patricia E. Cameresi". The signature is written in a cursive style with a large initial "P" and "C".

Patricia E. Cameresi  
Chief, Information Review and  
Release Group

Attachment:

The SIGINT Satellite Story (429 pages)

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# The SIGINT Satellite Story

by

Major General David D. Bradburn, US Air Force (Retired)

Colonel John O. Copley, US Air Force (Retired)

Raymond B. Potts, National Security Agency (Retired)

EO 13526 3 5(c) [redacted] National Security Agency (Retired)

PL 86-36/50 USC 3605

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December 1994  
Copy 47



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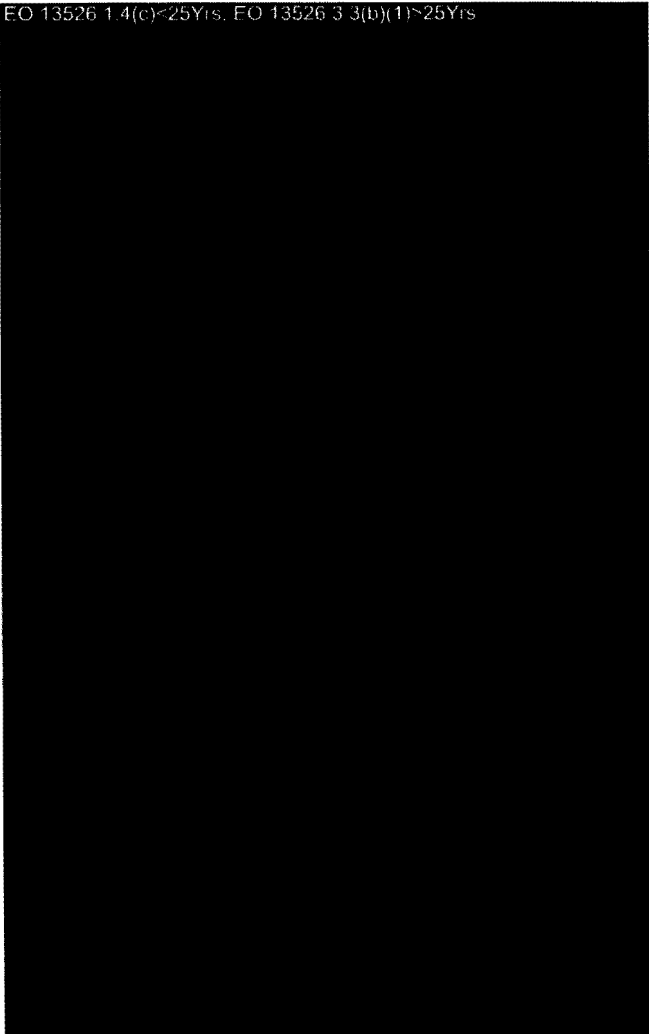
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# Dedications

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*To my dear wife, Bertha, whose strength and gentleness and thoughtfulness have been my great joy in life. During the events described in the book she sent me off to work happy and secure, looking forward to each day. And in the writing of this history, she is again doing that. This is for Bertha.*

David D. Bradburn

*To my wife, Theresa, and my daughters, Denise and Diane, who for over 35 years have accepted, without question, the strange hours, mysterious trips, unintelligible telephone calls, and all the other incomprehensible aspects of my behavior that have been an everyday occurrence since I was assigned to the WS-117L Satellite System Office in Inglewood, California, in January 1958. Their support, with only meager knowledge of where I was or what I was doing most of the time, has made an absorbing and challenging program a most enjoyable and rewarding experience.*

John O. Copley

*To my wife, Betty Jean, who worked with me putting in many extra hours during the early days of this program. She and my children, Stephen and Theresa, made many sacrifices and provided much needed support during the mid-1960s and early 1970s when my dedication to this program required long hours and extensive travel. A special thanks to Dr. Louis Tordella, Deputy Director of NSA, without whose trust and support many of the accomplishments and successes would not have been possible.*

Raymond B. Potts

*My contribution to this book, which has been a pleasant cap on my NSA career, is dedicated to my dear wife, Jane, who gave so much love and support to me throughout all our years; this was in addition to the hard work demanded by her own career and our family, Peggy, David, and Cyndy, and all this was done without getting back the satisfaction of knowing much of what my work was about.*

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Dedications

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# Preface

This history was undertaken at the request of Jimmie D. Hill, who maintained a continuing interest and provided moral support and advice as the work went along. The real instigator was Col James C. Fitzpatrick, USAF (Retired), who suggested the idea and showed us how it was done for the preceding volumes on the CORONA, GAMBIT, and HEXAGON imaging systems. Also, Col Frederic C. E. "Fritz" Oder, an old boss on the WS-117L project, who had a major role in the earlier histories, gave his advice at every turn, which really helped in getting started.

Early on, we decided to write a single volume that would cover all the SIGINT satellite projects up to 1975. This was around the time the writers were retiring or moving to new jobs out of the SIGINT satellite business. It was also the time the main SIGINT satellites were all in place, the early versions. So we were writing about an entire set of satellites and we were writing about our own experiences. We decided to organize the book into introductory material, a series of project histories, and some summary material. This plan let us show how each satellite came into being and then show how the whole set worked together. It also allowed for themes about management and results to be summarized at the end after the examples have been given.

Our reader could be an NRO manager, a Congressional staff member, or a family member of a long-time NRO or NSA government SIGINT satellite project participant. We have tried to explain the usually threatening SIGINT business to the non-expert. We owe a big debt to R. Cargill Hall, of the Office of History, United States Air Force, for acting as our professional advisor on methods and as our constant reviewer and editor during the writing process. He gave us his valuable piece, "On Writing History," and other references on clear writing. He also kept on his "non-SIGINT-expert" hat and kept challenging us to write for such people. If we have succeeded, it is Cargill Hall's digs in our ribs that we have to thank for it!

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The team was organized with the help of EO 13526 3.5(c) of EO 13526 and Judy Colbert, Jane's secretary. We shared the EO 13526 office for the first few weeks of the project and got well started. Then we moved the Los Angeles operation across the hall to offices in The Aerospace Corporation, with the help and support of EO 13526 3.5(c) who was our senior administrator for the nearly five years of the project. EO 13526 3.5(c) and then EO 13526 3.5(c) acted as our primary management authorities in The Aerospace Corporation, giving us help and encouragement when it was most needed. EO 13526 3.5(c) was our secretary in the early days, and EO 13526 3.5(c) came in later as our secretary and team helper. Near the end of the project EO 13526 was our word-processing expert and thus made another major contribution. EO 13526 3.5(c) took over as our secretary for the last two years of the project and, in spite of lots of changes going on in the company and in the industry generally, provided a serene place for us to do our work, kept the project on track, and kept us paid and happy!

Our technical editor EO 13526 3.5(c) came on board for the last year of the project and was a professional from the start, so the other members could concentrate on getting the story together while EO 13526 polished the results.

Our technical artist, EO 13526 3.5(c) was the newest member of the team and a great addition, working with EO 13526 and the team and getting our ideas for the graphic materials online and onto paper.

EO 13526 3.5(c) of NPIC, acted as our scout and contact, helping us to set up the very helpful and good working relationship with our publisher. So did Director Leo Hazlewood EO 13526 3.5(c) who became the primary person responsible for finishing the publishing job. Also at NPIC, editor EO 13526 3.5(c) and senior designer EO 13526 3.5(c) provided invaluable support during the publication process.

At NSA, we would like to thank some people whose invaluable support made this history possible:

VAdm William O. Studeman, USN, Director of the NSA, who provided support from the start of this effort.

VAdm John M. McConnell, USN, Director of the NSA, who continued that support.

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George R. Cotter, NSA Senior Scientist, who provided senior staff support.

David W. Gaddy, NSA Chief of the Center for Cryptologic History, who provided frequent guidance and whose staff provided day-to-day support.

David A. Hatch, NSA Director of the Center for Cryptologic History, who replaced Dave Gaddy and continued the outstanding support.

Henry F. Schorreck, NSA Historian, who provided valuable data.

Thomas R. Johnson, NSA Historian, who provided valuable support.

EO 13526 3.5(c) [REDACTED] NSA Administration, who provided valuable support.

EO 13526 3.5(c) [REDACTED] NSA Administration, who provided much needed support in sending and receiving controlled material.

EO 13526 3.5(c) [REDACTED] NSA Archives, who made a laborious search of the archives to obtain the photographs used in this history.

EO 13526 3.5(c) [REDACTED] NSA, who provided the valuable *RUFFER History* EO 13526 3.3(b)(1)-25Yrs, EO 13526 1.4(c)-25Yrs [REDACTED]

EO 13526 3.5(c) [REDACTED] NSA, who provided valuable assistance in gathering processing data.

EO 13526 3.5(c) [REDACTED] NSA, the expert who provided all the data on the COMINT target development and mapping satellites.

Dr. David vanKeiren, NRL Historian, who found and provided photographs for Chapter 3.

As the book went together, we interviewed many people, each of whom typically gave a morning or an afternoon for the purpose. Those people included the Directors of SAFSP now living: MGen John L. Martin, Jr., Gen Lew Allen, Jr., and BGen William G. King, Jr., all of whom generously also acted as members of our review group ("Red Team") in March 1994. We thank each of our interviewees separately for their time and the chance to renew old friendships: Joe Amato, George Barthel,

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James V. Boone, Julian Caballero, [redacted] EO 13526 3.5(c), EO 13526 3.3(b)(1)>25Yrs, EO  
 Robert E. Conley, George Cotter, [redacted] EO 13526 3.5(c) (who participated by  
 mail), [redacted] EO 13526 3.5(c), EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4 Eugene G. Fubini,  
 [redacted] EO 13526 3.5(c) Robert J. Hermann, Jimmie D. Hill,  
 [redacted] EO 13526 3.5(c) MGen John G.  
 [redacted] EO 13526 3.5(c) MGen John B. Marks, John N. McMahon,  
 [redacted] EO 13526 3.5(c), EO 13526 3.3(b)(1)>25Yrs LtCol John  
 [redacted] EO 13526 3.5(c) M. O'Connell, Col Frederic C. E. Oder, [redacted] EO 13526 3.5(c)  
 [redacted] EO 13526 3.5(c) Navy Capt Frank Sperberg, EO [redacted]  
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 [redacted] EO 13526 3.5(c) Donald Wagner, Albert D. Wheelon, and [redacted] EO 13526 3.5(c), EO 13526 3.3(b)(1)>25Yrs  
 II. Joe Amato, Julian Caballero, Bob Hermann, Jimmie Hill, John  
 McMahon, and Bud Wheelon also came back to help on the Red Team in  
 March 1994.

RAdm Robert K. Geiger joined our Red Team in March 1994 and added a valuable dimension to our Navy story.

Sanford Evans and Bob Gaylord of The Aerospace Corporation brought their insights to the Red Team in March 1994.

We used a number of good histories, which are listed in the references. The ones that were especially useful were:

- *NSA in Space*, April 1975, BYE-19385-75 (TS/B/TK/COMINT). This is an excellent history, giving many details and facts about all the projects for the same time period as our history.
- *RUFFER History*, prepared by NSA, R321 Program Office, 30 September 1990, NSA 86594-90.
- *History of the POPPY Satellite System*, BYE-56105-78, thoughtfully furnished to us by Jim Morgan of Program C.

[redacted] EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs  
 [redacted] EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs thoughtfully furnished by  
 Julian Caballero of Program B.

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The NRO staff pitched in right from the start. Sharilyn Watts and EO 13526 3.5(c) helped us find files for building our chronology. As we got going, EO 13526 3.5(c) SAFSS Policy, was our main source of support in Washington. When we needed to have a meeting or get something done, we just asked EO 13526 3.5(c) and it was done. Helping EO 13526 3.5(c) was EO 13526 3.5(c) who prepared materials for our reviews and briefings. EO 13526 3.5(c) came on the scene during the last year, when we were arranging for reviews by the first four former Directors of the NRO, a big job. He made all that come together and helped to set the stage for some historic meetings.

The writing was done in a matrix. Each writer wrote about what he knew best—for example, all processing by one author, all intelligence results by another. This led to chapters with multiple contributors. We hope this approach helps the book to be objective, even though we are writing as participants and not as historians going back to find out what happened. We started with the idea that NRO management was good. We ended with the idea that the creation of the office of the DNRO was the defining event that led to the results. This came out of the work and was a consensus among those interviewed.

Our approach was to read, collect information, interview widely, write, and ask some senior people—our Red team—to review the book. This was done in March 1994. On this team were the first four Directors of the NRO, Joseph V. Charyk, Brockway McMillan, Alexander H. Flax, and John L. McLucas, whom we had not previously interviewed. These four also came to a first-of-a-kind Round Table meeting on 26 May 1994 at which Louis W. Tordella, the distinguished Deputy Director of NSA from 1958 to 1974, and Julian Caballero, the distinguished Director of CIA's Program B at the time of his retirement in 1993 and a veteran of the EO 13526 3.3(b)(1)>25Yrs from 1965, also took part. This turned out to be the high point of the work for the writing team and was well documented by video and still photography, thanks to the good work of EO 13526 3.5(c) EO 13526 3.5(c) of the NRO Video Productions Center.

This has been a satisfying job, with many rewards in sharing experiences and in planning and carrying out the work. The authors hope this book will be of use and interest to all who can share it.

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Preface xv

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The first four Directors of the National Reconnaissance Office

(Clockwise from left: Joseph V. Charyk (1961-63); John L. McLucas (1969-73);  
Huckway McMillan (1963-65); Alexander H. Flax (1965-69))

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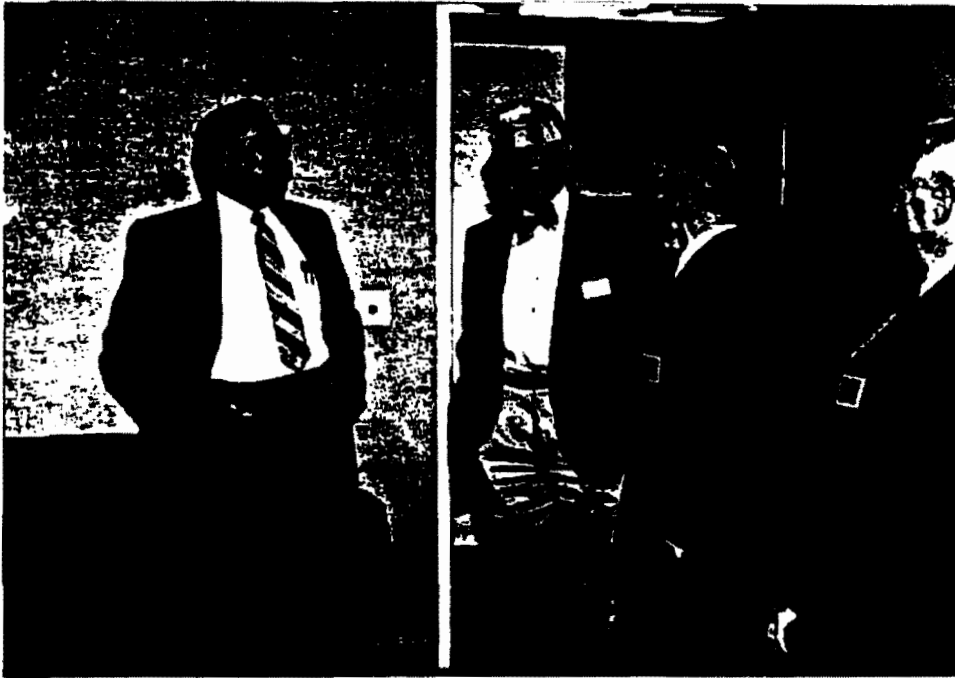
Round Table principals, 26 May 1994

Front row (left to right): R. Cargill Hall, Raymond B. Potts, Joseph V. Charvk,  
Brockway McMillan, Alexander H. Flax, John L. McLucas, Col John O. Copley,  
Back row (left to right): MGen David D. Bradburn, Jimmie D. Hill, Louis W. Tordella,  
Julian Caballero EO 13526 3.5(c)

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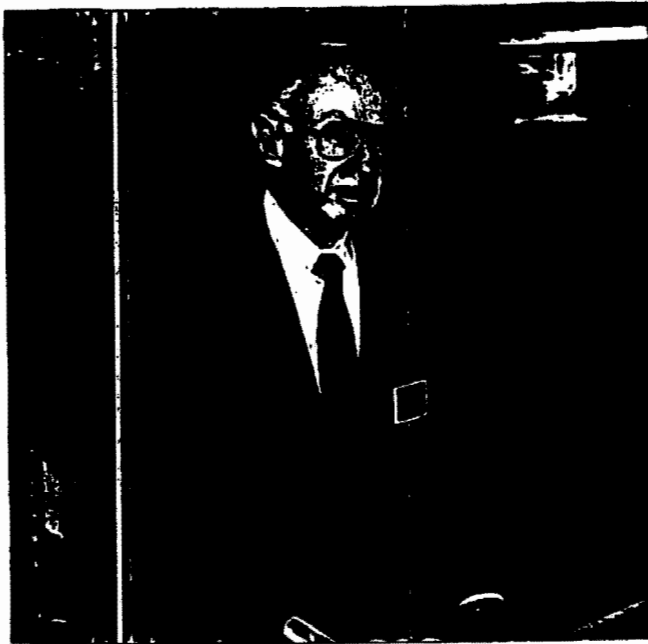


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The SIGINT Satellite Story

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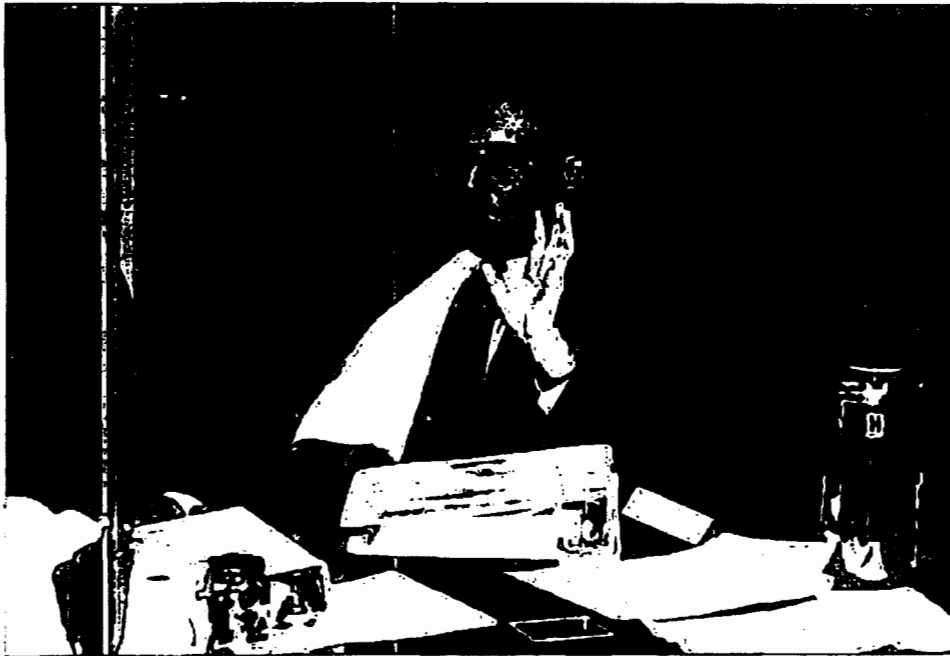


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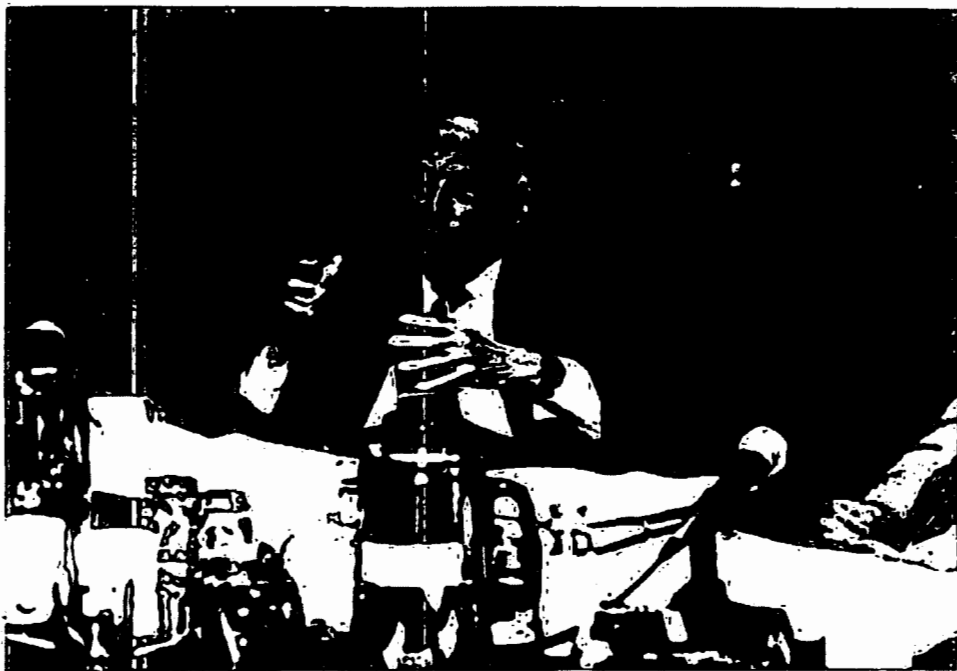


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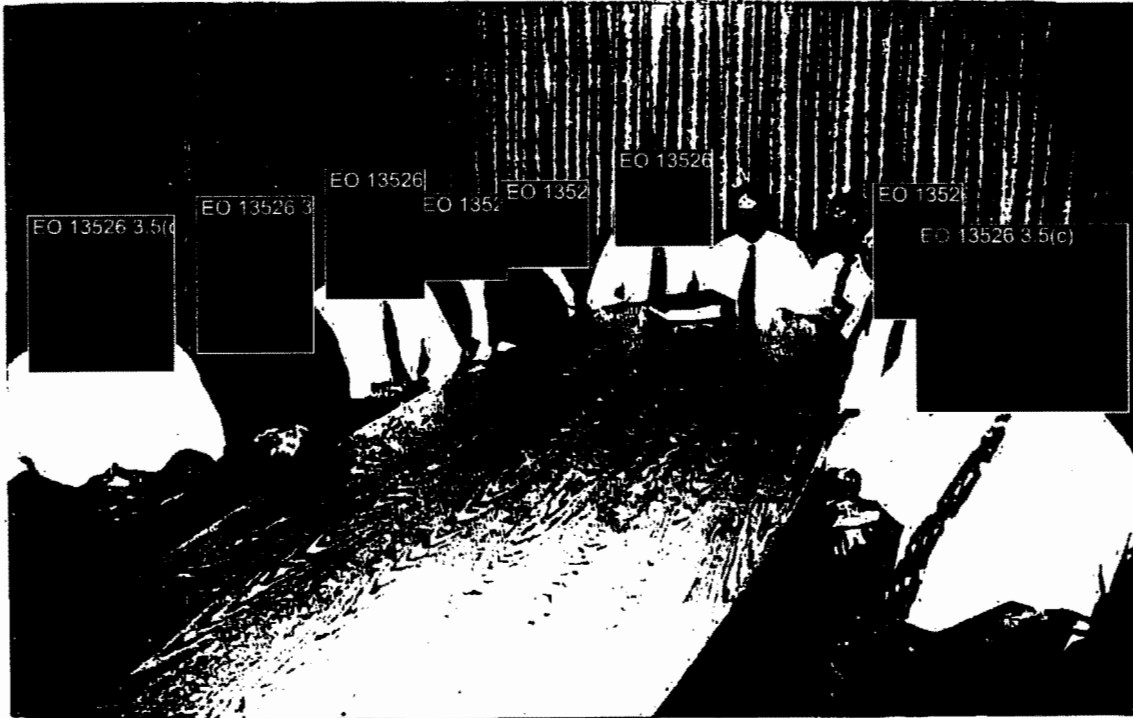
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The SIGINT Satellite Story

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Delivery of final draft to NPIC publications team, 14 July 1994

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Preface

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# 1 Introduction

The way the United States perfected and used space technology to solve intelligence problems is an important story; this remarkable technology helped ensure that the Cold War never turned "hot." In parallel with the crucially important development of ballistic missiles for our defense, there was the equally urgent program to develop reconnaissance satellites to provide advance warning of enemy military activity. Information about military, industrial, and political activities in the Soviet Union was the key to providing the United States with a survivable nuclear retaliatory force. The story of the photo reconnaissance satellites has been told in the three previous volumes in this series. This new story involves the challenge of collecting electronic signals being radiated from the Soviet Union using satellites in Earth orbit, some as high as geosynchronous altitude; sending those signals back to Earth; sorting and analyzing those signals with computers and with people; and providing to our national leaders the information needed to give our country a valuable advantage in confronting the threat of Soviet Communism during the most perilous times of the Cold War. The story now to be told is about the US SIGINT satellites.\*

\* When an intercepted electronic signal is from the transmitter of a radar set, the information collected is called electronic intelligence, or ELINT; when the intercepted signal is for written or spoken communications, the information collected is called communications intelligence, or COMINT; and when the intercepted signal is from telemetry, the information being collected is called telemetry intelligence, or TELINT. These three applications are collectively called

## Early History

During World War II, lookouts aboard surfaced German submarines used hand-held crystal-video radar receivers called ATHOS to detect pulses emitted by search radars on Allied warships and aircraft. This type of receiver consisted of a tuning coil and capacitor to select the approximate radio frequency to be received; a crystal diode, usually of silicon, that acted as a one-way gate, or rectifier, and produced an audible sound; and a simple amplifier that broadcast the "detected" sounds over a headset or loudspeaker. After the war, this same technology was adopted and applied in the direction-finding systems of American warships and airplanes because of its simplicity, small size, and "wide-open" frequency-detection characteristics.

Sputnik I, the world's first artificial satellite, inaugurated the Space Age on 4 October 1957. On 22 June 1960, another satellite, built by the US Naval Research Laboratory and containing an ATHOS-type receiver in low Earth orbit, became the first US military satellite designed to intercept signals from Soviet radars. This marked the beginning of a concerted campaign by the United States to develop

signals intelligence, or SIGINT. Prior to 1958 the term SIGINT was used to mean COMINT alone, and both were often written with only the first letter capitalized. In 1958, when ELINT was put under control of the National Security Agency, SIGINT came to mean both COMINT and ELINT. In the 1960s, TELINT came into use and was included under the term SIGINT.

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satellites for signals intelligence (SIGINT) to listen to and record radar, communications, and telemetry signals coming from the Soviet Union, and to transmit that data to US intelligence agencies.<sup>1</sup>

The SIGINT satellite history is part of the larger story of the use of reconnaissance satellites by the United States to provide crucial early warning of a Soviet surprise attack on this country, and to attempt to solve the larger riddle of the Cold War—what was the Soviet Union up to? Predicting the quick appearance of long-range rockets armed with nuclear bombs, Arthur C. Clarke described the potential strategic nuclear dilemma as early as 1946: "A country's armed forces can no longer defend it; the most they can promise is the destruction of the attacker."<sup>2</sup>

The problem foreseen by Clarke became a reality. Attacked with nuclear weapons, a country would have no time to mobilize its forces, much less to build new weapons for them. For the next 45 years, the secrecy of the Soviets, their explicit threats to the non-Communist world, and their eventual possession of nuclear weapons and intercontinental delivery systems occupied the attention of every US President and dominated every major foreign and domestic decision made by the United States. For American leaders, the central question became: How do we prevent the Soviets from mounting a surprise nuclear attack against us? Although Clarke had described both the nuclear dilemma and the potentials of satellites by 1946, his writing remained obscure and was not influential at the time.

Within the United States, a scientific and engineering team at the RAND Corporation contributed to the determination that an Earth-orbiting satellite could be built that would have utility for reconnaissance. The RAND work culminated with a 1954 report, Project FEED BACK, that provided the rationale and the engineering calculations that prompted the United States to proceed with reconnaissance satellite development programs.<sup>3</sup> On the basis of the RAND studies and its own in-house work, the US Air Force in 1955 issued contracts for development of military reconnaissance satellites. When the Soviets launched Sputnik I in October 1957, these projects were already in existence, awaiting only the additional impetus that the Space Age would provide.

After Sputnik, the Air Force reconnaissance satellite work, based in Los Angeles at the Air Force's Western Development Division (WDD), was accelerated and placed under a succession of different management arrangements. It was placed first under the Advanced Research Projects Agency (ARPA), then under the Air Force Ballistic Missile Committee (AFBMC),\*<sup>4</sup> and finally, in late 1960 at Presidential direction, under direct management of the Secretary of the Air Force. This decisive move resulted in clean, short

\* The ballistic missile programs under development at the Air Force Ballistic Missile Division (AFBMD) in Los Angeles were conducted under a streamlined management process called the Gillette Procedures, which provided for an Air Force Ballistic Missile Committee (AFBMC) and an Office of the Secretary of Defense Ballistic Missile Committee (OSDBMC) to expedite program decisions. The Air Force reconnaissance satellite project, then called SAMOS, was briefly placed under these Gillette Procedures and managed at the Air Force Secretarial level through the AFBMC, which was called the BMC for Space when in session for these programs.

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decision lines for these important projects. Within two years, by May 1962, this same central authority was extended to cover Navy and Central Intelligence Agency (CIA) satellite projects, when Under Secretary of the Air Force Joseph V. Charyk, reporting to the Secretary of Defense, became the first Director of the National Reconnaissance Office (NRO). The NRO would play a central, crucial role in satellite reconnaissance for the remainder of the Cold War.

### Mission Requirements

Considering the prospect of a nuclear war with the Soviet Union, United States leaders in the 1950s had to know two things. First, what were the Soviets doing in their strategic missile programs? They had already demonstrated a nuclear capability with an atomic detonation in 1949 and a fusion-weapon test in 1953. Could they launch a nuclear weapon on a rocket over intercontinental distances? Second, how effective might Soviet defenses prove to be against US forces? Could the Soviets detect and shoot down US long-range bombers? And could the Soviets counter the developing US missile capability?

Conventional intelligence sources in the 1950s collected bits of data on both of these concerns: spies, or human intelligence, were effective in some areas but encountered significant problems because of the strict security rules inside the Soviet Union. One early attempt to reach deep into the Soviet land mass was by Jim Trexler of the US Naval Research Laboratory (NRL). He pioneered work on

and tests of intercepting radar signals using the Earth's largest satellite, the Moon. He was successful in the late 1950s in collecting intercepts from Soviet EO 13526 (the NATO designator) early warning radars on NRL's 60-foot parabolic reflector antenna in Maryland, and then, with better reception, on the National Radio Astronomy Observatory's 150-foot reflector in West Virginia. He proposed building a 300-foot and, at one time, a 600-foot "big dish" to collect weaker Soviet radars.<sup>5</sup> In the early 1960s NSA built a special antenna feed for and successfully tested the 1,000-foot-diameter antenna at Arecibo Ionospheric Observatory, Puerto Rico, intercepting EO 13526 3.5(c), E and other signals.<sup>6</sup> This technique also allowed radars to be located with an uncertainty of 50 miles using multiple intercepts on separate days.

Listening to radio communications, or COMINT, was somewhat easier. The Soviets used short-wave radio bands extensively for communications, and the US military intercept stations, expanded from their World War II numbers, heard many Soviet-Union-wide operational military, industrial, and research networks, yielding some understanding of the Soviet threat. US strategic planners, though, needed more specific data on the exact locations and capabilities of Soviet military and industrial installations. Attempts to take pictures with balloon overflights proved generally unproductive, and conventional aircraft reconnaissance was limited to flights around the periphery of the Sino-Soviet bloc of states. For that reason, in November 1954 President Dwight D. Eisenhower approved development

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of the U-2, a highly secret high-altitude reconnaissance aircraft, which was rapidly engineered and put into use in 1956.



Dwight D. Eisenhower

Eisenhower came to believe that the U-2 could overfly parts of Soviet airspace at will. But this would have represented a clear violation of international law, unless the leaders concerned had agreed to such flights. On 21 July 1955, Eisenhower proposed to Soviet leader Nikita Khrushchev that the United States and the Soviet Union provide "facilities for aerial photography to the other country" and conduct mutually supervised reconnaissance overflights.<sup>7</sup> Before the day ended, Khrushchev rejected the plan, which came to be known as the Open Skies doctrine, as an American attempt to "accumulate target information." Eisenhower said later, "We knew the Soviets wouldn't accept it, but we took a look and thought it was a good move."<sup>8</sup> The Soviets were thus forewarned of our U-2 flights and the groundwork was beginning to be laid for the use

of reconnaissance satellites. Eleven months later Eisenhower approved the first U-2 overflight of the Soviet Union.<sup>9</sup>



Joseph V. Charyk

Beginning with the first operational flight in July 1956, US analysts found in the U-2 data an extensive Soviet air-defense system being built to counter US strategic bombers and reconnaissance flights, including the U-2 itself. They also saw research and development (R&D) installations for long-range missile systems and, eventually, operational missile sites. Soviet short-range missiles had already flown that same year. Soon, near Sary Shagan, U-2 cameras photographed what appeared to be Soviet antiballistic missile (ABM) R&D facilities. Because it had a great effect on major US resource decisions on its own ABM, intercontinental ballistic missile (ICBM), and countermeasures techniques, the "ABM problem" became the US's top intelligence priority, and eventually became the main focus of effort for SIGINT satellites.

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US reconnaissance satellites, the successors to the U-2s, were developed expressly to provide visual and electronic access to the Soviet Union. The very first SIGINT satellites, launched in 1960, were intended to detect and locate air defense radars, to determine the electronic order of battle (EOB, which listed the types and locations of Soviet defense system radars), and thus to assist American bombers to pass through Soviet defenses to military targets in the event of war. The US Intelligence Board (USIB)\* had not yet begun to issue formally documented requirements, but the US military and intelligence organizations perceived the nations of the world aligning themselves with one or the other of the superpowers, each with its respective spheres of influence. Thus, the US Air Force Strategic Air Command (SAC) wanted details on Sino-Soviet targets for attack, data on radars and antiaircraft weapons, technical information for design of electronic countermeasures, and exact locations of Soviet defensive installations in order to plan their aircraft penetration routes. The US Navy wanted to determine the threat from Soviet surface ships and submarines, and the US Army and NATO commanders were concerned about Soviet and Warsaw Pact air and ground forces.

Another driving force in the early development of SIGINT satellites was the electronic and rocket engineer's new

\* The United States Intelligence Board (USIB) was established by President Eisenhower on 15 September 1958 to establish priorities for US intelligence activities. It was chaired by the Director of Central Intelligence, with members from the Department of Defense, Department of State, the Federal Bureau of Investigation, and other government agencies.

technical ability to build more and more sophisticated intercept and recording equipment in lighter packages, place these packages in satellites that circled the Earth, and do really useful reconnaissance jobs for significant durations of time in the vacuum of space. Technology indeed moved rapidly in the 1950s. The transistor, which would replace the cumbersome electronic vacuum tube as an amplifier of weak signals, was invented at Bell Telephone Laboratories in 1948.<sup>10</sup> The first "junction transistor" appeared in 1951. By 1960, solid-state electronics began revolutionizing radio and data processing, the two fields on which SIGINT was based. Electronic hardware suddenly could be designed and built in ever smaller sizes and operated on lower power and would produce much less heat during operation. These advances, coupled with the new advances toward long-range rockets for military purposes, provided both the technology and the lifting capability to make possible the design and launch of SIGINT satellites.

US military reconnaissance satellites, already well along in planning when Sputnik I was launched—and in some cases, even with hardware under development (the Air Force's Advanced Reconnaissance System, Weapon System 117L [WS-117L] was an example)—would number among the pioneers of orbiting artificial satellites. For its reconnaissance satellites, the Air Force developed a general operational requirement and very specific technical specifications based on intelligence data, as it did for all its weapons systems. Nevertheless, construction of WS-117L and the other early SIGINT

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satellites turned on issues of what instrument might work, and, among those that did, which might be most useful as preliminary collectors of the needed data. At the time, ELINT seemed to be easier to try than COMINT, although COMINT was in the minds of some from the very beginning. Soon, feedback and crossfertilization networks developed among the groups building, using, and analyzing the ELINT data, from which new priorities would be set. The era of SIGINT satellites was starting and would enjoy many and varied forms and successes. The formal USIB requirements for the intelligence data these systems collected would come later.

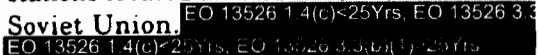
### **Imaging and Signals Intelligence Space Systems**

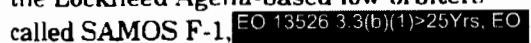
The major effort within the US satellite reconnaissance program in the 1960s and 1970s featured overhead visual imaging systems, which produced information not obtainable any other way. (CORONA, GAMBIT, and HEXAGON, the early film-based satellite systems, have already been well documented in this series of histories.) But there were important intelligence questions that could not be answered with pictures alone. The first question involved determining the location and characteristics of Soviet radars that could detect American strategic bombers. The second involved the performance capabilities of Soviet missiles—ICBMs and ABM systems. These two problems led the list of reasons favoring SIGINT satellites that could listen to and record the signals of Soviet radars, radio communications, and telemetry systems.

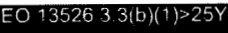
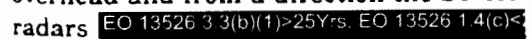
A SIGINT satellite system had many of the same elements as an imaging satellite system, but with important differences. Instead of a camera and film, a SIGINT satellite mounted antennas, receivers, and, sometimes, tape recorders. Instead of sending its information down on film in a reentry vehicle, a SIGINT satellite transmitted its findings by radio link in realtime or shortly after passing over the target area. On the ground, instead of a photo-processing laboratory, technicians used a SIGINT processing system, usually computerized and immensely complicated, to translate the raw electronic signals into intelligence listings and reports for release to analysts. The targets of the SIGINT systems were the actual radio signals radiated by Soviet transmitter equipment, which meant that the satellites had to be in the right place, looking in the right direction, tuned to the right frequency, at the very time the Soviet transmitters were on the air. This was an entirely different game from the photo-collection business, but one with the potential to get different and extremely important information. A number of different types of SIGINT satellites were employed to gather this vital information.


First launched on 22 June 1960 in a 70-degree-inclined, circular orbit about 500 miles above the Earth, the Navy's POPPY satellites searched for the main beams of Soviet scanning radars and provided wide-area coverage of and locations for radars on the surface of the Earth. POPPY satellites acted as "repeaters," encoding each radar pulse as it was received and then retransmitting the pulse stream in realtime to US-manned ground

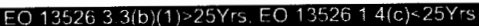
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stations located around the periphery of the Soviet Union. 

The SIGINT satellites most nearly like the photo satellites in their appearance and orbits were the WS-117L family, the Lockheed Agena-based low-orbiters called SAMOS F-1. 

 Starting with SAMOS F-1 on 31 January 1961, these satellites orbited at about 275 miles in 67-degree-inclined, circular orbits and searched for Soviet radars of all types, attempting to intercept the Soviet radars from high overhead and from a direction the Soviet radars 

 They operated by reading in and recording the radar information while over the Soviet Union, and reading out that data, by playback of onboard tape recorders, when they passed over the ground tracking stations of the US Air Force Satellite Control Facility (AFSCF) stations in California, New Hampshire, and Hawaii. These satellites, developed by the Air Force, were the first successful orbital collectors of the EOB for SAC. They provided ELINT technical performance details and locations of radars that could threaten our strategic bomber forces. Phased out in 1972, these low-altitude satellites were conceptual pioneers, succeeded by more powerful vehicles in different Earth orbits.



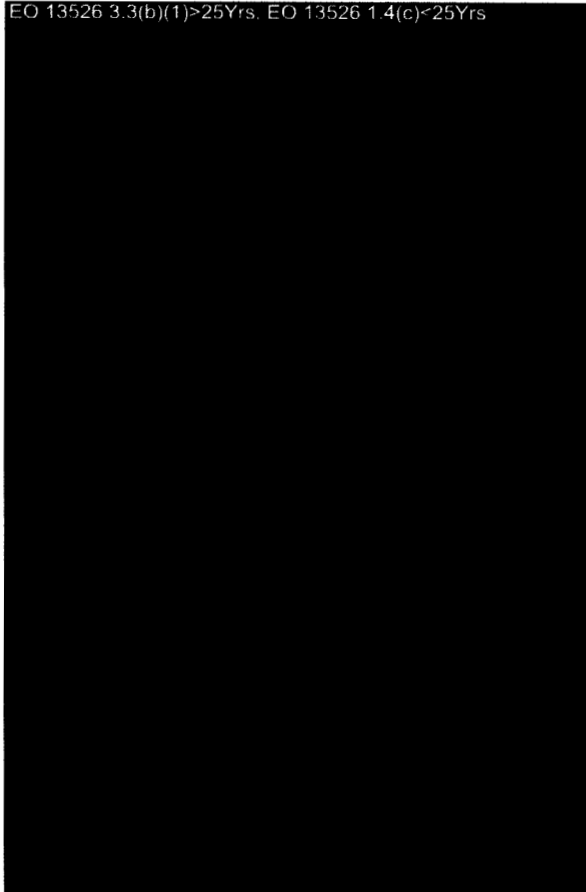
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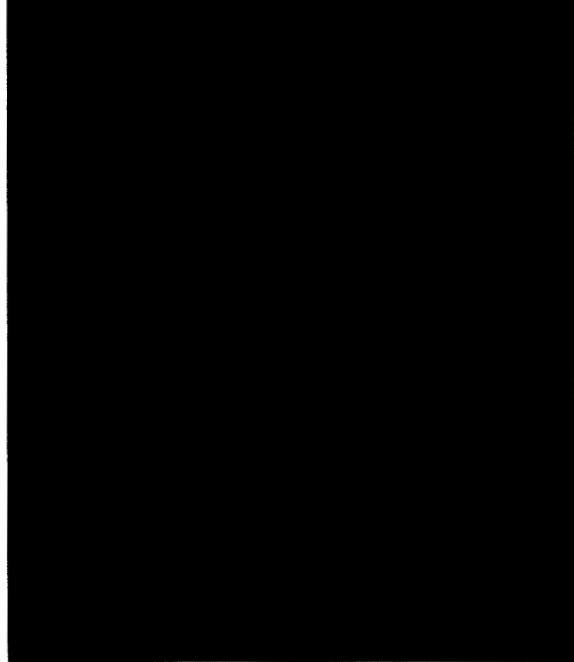
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remain motionless over one point above the Earth's equator; and near-polar orbits, which would allow reconnaissance satellites to cover the whole Earth in successive passes as the Earth rotated beneath it, each pass occurring at the same local time of day on the ground.<sup>11</sup> These near-polar, sun-synchronous orbits were chosen for the photo satellites so that the target areas could be viewed in sunlight. Low-orbiting SIGINT satellites, which did not need to have their targets in sunlight, used lower inclination (about 67 degrees), non-repeating Earth orbits to get the best coverage of the target areas over a period of days or weeks. At the geosynchronous equatorial orbit (22,000 miles high), perceived by Clarke as the orbit most suitable for relaying of communications from one point on the Earth to another, SIGINT satellites became signal interceptors.

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In 1945 Arthur C. Clarke described two key types of Earth satellite orbits: the high, geosynchronous orbits suitable for communications, where the satellite's orbital motion coincided with the Earth's rotation and would enable the satellite to

\* The term "geopositioning" here means "determining the location of a radar on the surface of the Earth." One method is by geometric reconstruction using the direction of arrival of the signal at a single intercepting satellite, whose location and orientation must be accurately known. The other method is "time difference of arrival" (TDOA), which depends upon knowing the exact location, but not the orientation, of two or more intercepting satellites and determining the location by measuring the difference in times of arrival of a particular signal as it takes different paths to the intercepting satellites and then to the receiving station

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By 1975, the US employed ~~EO 13526 3.3(b)(1)>25Yrs~~ SIGINT  
low-orbiters, POPPY ~~EO 13526 3.3(b)(1)>25Yrs, EO~~  
and ~~EO 13526 3.3(b)(1)>25Yrs~~ high orbiters ~~EO 13526 3.3(b)(1)>25Yrs,~~  
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~~EO 13526 3.3(b)(1)>25Yrs~~ Collectively, they represented an extraordinary, complementary set of reconnaissance satellites.

### SIGINT Data Processing and Exploitation

Just as solid-state electronic technology changed the capabilities of SIGINT satellites dramatically, the computer revolution that began in the 1950s, and that is still underway, changed the capabilities of computer processing, almost day to day. The capability to process SIGINT information was especially powerful and quick to develop, because the SIGINT satellites collected electrical signals that, with proper coding, were in a form that computers could work on directly. From 1960 to 1975 the multiplying effect of improved satellite collectors and improved computer processors would provide a many-fold increase in operational capabilities. Developing the processing methodology was the key. (See Appendix A for a discussion of NSA's role in computer evolution.)

It is fairly easy for a trained photo analyst to recognize missiles and radar structures if the photograph is taken by a

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properly focused camera with sufficient magnification on a clear day, with observable shadows. Likewise it is easy for the signals analyst or linguist to analyze an electronic signal if the signal structure is known and the signal is collected by a properly tuned receiver with sufficient sensitivity and no interference. Unfortunately, the SIGINT analyst usually encounters noise interference, competing signals on the same frequency, and little or no knowledge of the characteristics of any newly detected signal. Noise or interference impedes signal processing and analysis in much the same way as cloud cover impedes analysis of photo data. The denser the cloud cover in photographic data, or interference in SIGINT data, becomes, the more difficult it is to process or analyze the information; sometimes, analysis is impossible.

Multiple electronic signals intercepted at the same time by SIGINT collectors appear much the same as multiple exposures on a photographic print. Or perhaps a better description would be multiple transparencies of different pictures stacked one on top of the other. Analysis of any one signal or picture is virtually impossible until the competing signals or overlapping pictures are separated out, or, as it is termed by analysts, "deinterleaved."

Analysis of complex, structured signals such as telemetry or multichannel communications requires EO 13526 1.4(c)<25Yrs  
EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)  
EO 13526 1.4(c)<25Yrs. E before the data can be analyzed or processed. This is very much like the adjustment process required to successfully view a television picture. The

proper channel must be selected, the horizontal synchronization must be established, and the vertical hold must be set to prevent the picture or frames from rolling.

Encryption of electronic data to disguise their real information content introduces another major problem for the SIGINT processor and analyst. Encryption adds keying material, known only to the users, to the clear or unencrypted data, thus producing enciphered data for transmission. Anyone gaining unauthorized access to the encrypted data cannot read it without a major effort to remove the encrypting-key algorithm, thus permitting one to decipher the data. Solving encryption problems is much more difficult than, but is similar in some respects to, the problems faced by photo analysts when camouflage paint or nets have been used to hide an object from view.

Before electronic signals can be machine processed, extensive manual analysis of the captured signals is needed to clearly define the characters that are to be recognized, identified, and codified in special-purpose equipment or in computer software. This manual analysis involves listening to the signal, making signal measurements (often from hardcopy graphic representations of the signal), and developing an understanding of the signal structure (e.g., pulsewidth, type of modulation, pulse repetition rate). As a major designer, developer, and user of the latest in computer technology, the National Security Agency (NSA), established by President Harry S Truman in 1952 to exercise technical and operational control over US COMINT and communications security

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activities, eventually employed computers to improve decryption and for handling and screening extremely large volumes of ELINT, COMINT, and TELINT data collected from all sources, including reconnaissance satellites.

Beginning in the 1960s, ELINT data were processed to provide EOB of Sino-Soviet radars for the nation's strike forces in the Single Integrated Operating Plan (SIOP) and for distribution to the military intelligence community. NSA eventually provided direct reporting of the location of threat emitters to the field within hours of their intercept. ELINT data were also used to tip-off other intelligence collection activities. The technical analysis of ELINT allowed assessments of weapon and radar system capabilities to be made and electronic countermeasures to be designed.

COMINT data, often used by NSA linguists fluent in the native language of the target nation, provided databases on that nation's economic capabilities, such as manufacturing, technical level of competence, number and types of resources (both civil and military), and personal data on key people. Most important, COMINT

provided indications of target country political and military intentions, including military planning, deployment of troops, policy positions, and threats. NSA frequently applied special processing techniques to decrypt enciphered communications of target countries.

TELINT processed by NSA was furnished to the CIA, the Air Force System Command's Foreign Technology Division (FTD), the Army Missile Command (AMC) and other Intelligence Community customers, which analyzed the data to deter-

EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c), EO 13526 3.3(b)

By 1975 these intelligence products were being rapidly and routinely reported throughout the Intelligence Community. They represented an enormous capability to collect, sort, and distribute information that could hardly have been imagined as the story began in World War II, or even by the start of the satellite era in 1960. The NRO and the NSA, the satellite operator and the processor of the SIGINT information, respectively, were the organizations that made these things happen.

\* TELINT processing was the responsibility of NSA, although this assignment of responsibility was not accepted by the CIA for a long time—until the early 1970s—because of CIA's interest and early involvement

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**Development of SIGINT EOB operational capability**

Year	SIGINT Satellite	Accuracy of Location (Miles)	Radar Locations Produced Per Year	Time From Intercept, To Delivery, To User
1960	POPPY	400-8,000	—	1-2 months
1961/62	EO 13526 1.4(c)<	EO 13526 1.4	EO 13526 1.4(c)<	EO 13526 1.4(c)<25Yrs, EO
1964/65				
1966/67	POPPY EO 13526 1.4(c)<2			
1968/69	POPPY EO 13526 1.4(c)<			
1973/75				

The above chart of improving EOB capability over the years is typical of the kinds of improvement also made in ELINT and telemetry technical analysis, and large-volume COMINT reporting.

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## Chapter 1 References

1. *History of the POPPY Satellite System*, BYE-56105-78, pp. 1-3.
2. Clarke, Arthur C., *RAF Quarterly*, March 1946, pp. 61-69. Republished in John Wiley, *Ascent to Orbit*, 1984.
3. Davies, Merton E. and William R. Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related US Space Technology*, Santa Monica, CA: the RAND Corporation, 1988, pp. 57-58.
4. Martin comments, SIGINT Satellite History peer review, March 1994.
5. NRL Memorandum Report 1418, 20 May 1963.
6. EO 13526 3.5(c) "Extending the Radio Horizon for Intercept Purposes by Using the Moon as a Reflector," *NSA Technical Journal*, Vol. X, No. 2, spring 1965.
7. "Statement on Disarmament, 21 July," *The Department of State Bulletin*, Vol. XXXIII, No. 841, 1 August 1955, p. 174. Abel, Elie, "Eisenhower Calls Upon Soviet Union to Exchange Arms Blueprints," *The New York Times*, 22 July 1955, p. 1. See also John Prados, *The Soviet Estimate: US Intelligence Analysis and Russian Military Strength*. New York: The Dial Press, 1982, pp. 31-32. The term "Open Skies doctrine" was coined later by the popular press and applied to Eisenhower's statement on disarmament.
8. Parnet, Herbert S., *Eisenhower and the American Crusades*, New York: The MacMillan Company, 1972, p. 406. Rostow, W. W., *Open Skies: Eisenhower's Proposal of July 21, 1955*. Austin, TX: University of Texas Press, 1982, pp. 7-8.
9. Ambrose, Stephen E., *Ike's Spies: Eisenhower and the Espionage Establishment*, Garden City, NY: Doubleday & Co., 1981, p. 266 and pp. 31-34. Quoted in R. Cargill Hall, *The Air Force and the National Security Space Program, 1946-1988*, USAF Historical Research Center, 1988. (TS/PK)
10. *Encyclopedia Americana*, "Transistor," point contact.
11. Davies and Harris, pp. 15-17. See also Arthur C. Clarke, "A Short Pre-History of Comsats, Or How I Lost a Billion Dollars in My Spare Time," in *Voices from the Sky: Previews of the Coming Space Age*, New York: Harper & Row, 1965, pp. 119-128.
12. Lew Allen comments, SIGINT Satellite History peer review, March 1994.

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## Early SIGINT Satellite Organization, Development, and Evolution

### WS-117L Under ARDC and ARPA

In March 1946 MGen Curtis E. LeMay, the first Army Air Forces Deputy Chief of Staff for Research and Development, asked the Project RAND team, then part of Douglas Aircraft Company in Santa Monica, California, to prepare a quick engineering study on Earth satellites.<sup>1\*</sup> The resulting report, issued on 2 May 1946, was titled *Preliminary Design of an Experimental World-Circling Spaceship* and identified as missions the following: satellites to guide missiles, satellites as the missiles themselves, satellites as "observation aircraft," satellites for attack assessment, satellites for weather reconnaissance, and satellites for communications.<sup>2</sup> This RAND report was an important first step in demonstrating an independent competence in space technology for the Army Air Forces (to become the US Air Force in 1947) and in putting the Air Force on the track toward using Earth satellites for reconnaissance.<sup>3</sup> In April 1951 RAND issued an encouraging progress report and received authority from Headquarters, US Air Force, to place subcontracts for detailed subsystem studies.<sup>4</sup> In May 1953, believing that these studies would lead to hardware development, MGen Donald N. Yates, Air Force Deputy Chief of Staff for

Development, approved a request from planners at Headquarters, Air Research and Development Command (ARDC), in Baltimore, Maryland, to take responsibility for "active direction" of the RAND study by 1 June 1953.<sup>5</sup>

In the summer of 1953, LtCol Victor L. Genez, ARDC Director of Intelligence, was briefed on this study by personnel of the RAND "satellite office" at their facility in Santa Monica. Genez returned to Baltimore convinced that an immediate effort should be made to orbit an Earth satellite, even if a specific reconnaissance system was not yet available.<sup>6</sup> In December 1953 ARDC established Project 409-40, "Satellite Component Study," and in January 1954 established Project 1115 under a formal R&D system number, Weapon System 117L. At that time, pending completion of the RAND report, no funding was made available.

In March 1954 RAND published its report "Project FEED BACK." This comprehensive and far-sighted study asserted that satellites for reconnaissance of the Earth were feasible and recommended that the US Air Force should initiate a development program immediately.<sup>7</sup> In May 1954, with FEED BACK published and based on the premise that feasibility of hardware development had been demonstrated, Headquarters US Air Force (with the

\* In November 1948, Project RAND was separated from the Douglas Aircraft Company and became the RAND Corporation, an independent nonprofit corporation, in Santa Monica.

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approval of the Office of the Secretary of Defense (OSD)), authorized ARDC to initiate the necessary studies to implement Project 1115, the Advanced Reconnaissance System (ARS). Shortly thereafter, Detachment 1, ARDC, was created at Wright Air Development Center (WADC), Wright-Patterson Air Force Base (AFB), Ohio, to accomplish this task.

Maj Quentin P. "Q" Riepe, then assistant librarian at WADC, read the Project FEED BACK report as soon as it was received at WADC and immediately became interested in the idea. He began lobbying for implementation of the recommended developments. His obvious enthusiasm was rewarded in the summer of 1954 with his assignment as Chief of Detachment 1 at Wright-Patterson. Shortly thereafter, he was joined by LtCol William G. King, Jr., the former Chief of the Airborne Guided Missile Office at WADC. King had also read the Project FEED BACK report and became equally enthusiastic after he was briefed on the subject by the RAND team. With King now the leader and Riepe as his deputy, this small, closely knit team of "space cadets" included Capt William O. (Bill) Troetschel; Lt James (Jim) Coolbaugh, Lt Jack Herther, Fritz Runge (who came to the WS-117L staff as the only civil service member), and LtCol James (Jim) Seay. They set out to convince the Department of Defense (DOD), the Intelligence Community, and, through the Executive Branch, the President of the United States, that reconnaissance satellites were actually feasible and could provide needed surveillance of the interior of the Soviet Union so important to the defense of this country. This was a vision

that not many people yet shared, because the first Atlas missile had yet to achieve a successful flight, and data about the Soviet ICBM program remained sketchy at best.

Unbeknownst to King and Riepe, President Eisenhower had already triggered events in a related arena, when, on 27 March 1954, he asked some of his top scientific advisors, including James B. Conant and James R. Killian, Jr., to develop a solution to the problem of surprise attack by the Soviets. The probability of such an attack was increasing at an alarming rate, given the Soviet determination to develop nuclear weapons and delivery systems, possibly including missiles. Eisenhower asked Killian to chair a Technological Capabilities Panel (TCP) to study surprise attack and the US ability to meet it. The panel operated with three project committees, one on offensive forces, one on defensive forces, and one on intelligence. Edwin H. "Din" Land, the founder of Polaroid, chaired the Intelligence Committee, known as Project 3. On 24 November 1954, during TCP deliberations, President Eisenhower approved the development of the U-2 high-altitude reconnaissance aircraft; Richard M. Bissell, Jr., of the CIA was placed in charge of this highest priority project. On 14 February 1955 Killian and Land briefed President Eisenhower on the specific technological options that could alleviate uncertainties of strategic intelligence. These included systems for aerial overflight by aircraft or balloon and, somewhat farther in the future, satellite reconnaissance systems.<sup>6</sup>



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On 27 November 1954, three days after the Killian Panel presented its interim report to the President, ARDC issued System Requirement (SR) 5, calling for development of a satellite reconnaissance system. Indirectly, the Killian Panel was possibly a stimulant to this effort to define the Air Force's formal requirements for a reconnaissance satellite system.<sup>9</sup> On 16 March 1955, Headquarters USAF, endorsed SR 5 by issuing General Operational Requirement 80, which included Appendix 80-2, reaffirming the need for an electronic intercept capability as part of the WS-117L ARS.

With this clear authority to proceed, the ARDC Detachment 1 "space cadets" offered system study contracts to four of the major contractors who had been involved in component studies for RAND. Three companies accepted: Glenn L. Martin Company, Baltimore, Maryland; Radio Corporation of America (RCA) at Camden, New Jersey; and Lockheed Aircraft Company, Burbank, California. Bell Telephone Laboratories, Whippany, New Jersey, was also solicited but declined to participate. Some of the ongoing component studies that had been initiated by RAND were also continued. One of these, with the Ampex Company in Redwood City, California, was a small tag-on to the RAND studies aimed at developing a wide-band video recorder for photo missions. Ampex was spending a great deal of company money to develop the recorder for domestic TV use and this seemed like a great way to "get in on the act." Capt Bill Troetschel of ARDC Detachment 1 had

another use in mind: magnetic-tape recording of wide-bandwidth ELINT for technical analysis.<sup>10</sup>

The Air Force was not the only service interested in outer space. In April 1955 the Naval Research Laboratory (NRL) in Washington, DC, proposed a "Scientific Satellite Program" for the International Geophysical Year, to be known as the Vanguard Program. When this was approved in August 1955 the US was well on its way to establishing the principle in international law of "Freedom of Space."<sup>11</sup> The Vanguard activity looked attractive to Howard Lorenzen and his electronic payload development team, also at NRL. Just as WS-117L looked to the Atlas as a booster, the NRL electronics group saw the Vanguard as an excellent way to boost a small ELINT payload into orbit. Although there was no military mission involvement in the Vanguard Program, Lorenzen began some electronic intercept system studies, which led to a later Navy proposal for an ELINT satellite payload.

In the meantime, in Ohio, King and his Detachment 1 team were on the briefing trail. In the fall of 1955 they briefed, among others, Gen Curtis E. LeMay at SAC headquarters on the reconnaissance satellite. They took along Maj Sidney Greene, who had a contract with the University of Iowa to investigate ways to put a grapefruit-sized payload on the Moon. LeMay sat in the front row, a participant recalled, chomping his cigar, and at the conclusion asked, "How did you get TDY money to tell me this crap?"<sup>12</sup> This was a response typical of senior people

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who received briefings in these "pre-Sputnik" days. Most were skeptical, even Gen LeMay, who 10 years before had kicked off the RAND satellite studies when he was the first R&D Director for the Army Air Forces under Gen H. H. "Hap" Arnold. BGen (later advanced to Gen) Bernard A. Schriever, first Commander of the Air Force's Western Development Division (WDD) in Los Angeles, convinced LeMay that the "space cadets" were developing a viable program. Six years later, in 1961, when LeMay became Air Force Chief of Staff, he was a strong advocate for Air Force space reconnaissance programs.<sup>13</sup>



BGen Bernard A. Schriever

Shortly after the LeMay briefing, BGen Schriever requested a briefing at WDD because of concerns at the national level (ICBM Scientific Advisory Group) that an Air Force space program would compete for boosters with the missile program. King's boss at Wright Air Development Center (WADC) was BGen Howell M. Estes, who had become unhappy with the satellite effort partly because of its cool

reception at higher levels and partly because of bad public relations, including a letter from Governor Harold Stassen of Minnesota complaining that his constituents did not want a space satellite "spying on their activities." Stassen had been advised on overflight risks precedent to development of President Eisenhower's "Open Skies" proposal of 1955 by Col Richard Leghorn, who was familiar with RAND's studies on the political risk of high-altitude overflight.<sup>14</sup> As a result, Estes insisted that King develop a script for the briefing in Los Angeles and told him to give it verbatim. King was more than surprised when, looking out over the audience, he saw LGen Donald S. Putt, Deputy Chief of Staff for Development, Headquarters US Air Force. During this briefing, which took place in September 1955, BGen Schriever turned to Simon Ramo of the Ramo-Wooldridge Corporation, technical staff for the ballistic missile program, and asked, "What do you think, Si?" Ramo is said to have replied, "Let's do both space and missile work in Los Angeles, so we can avoid interference with the missile programs." Schriever took Ramo's advice. This was a vital decision, as it separated the satellite work from the Air Force's regular development chain of command at WADC and placed it under the special team established in Los Angeles in 1954 to develop the country's ballistic missiles.<sup>15</sup>

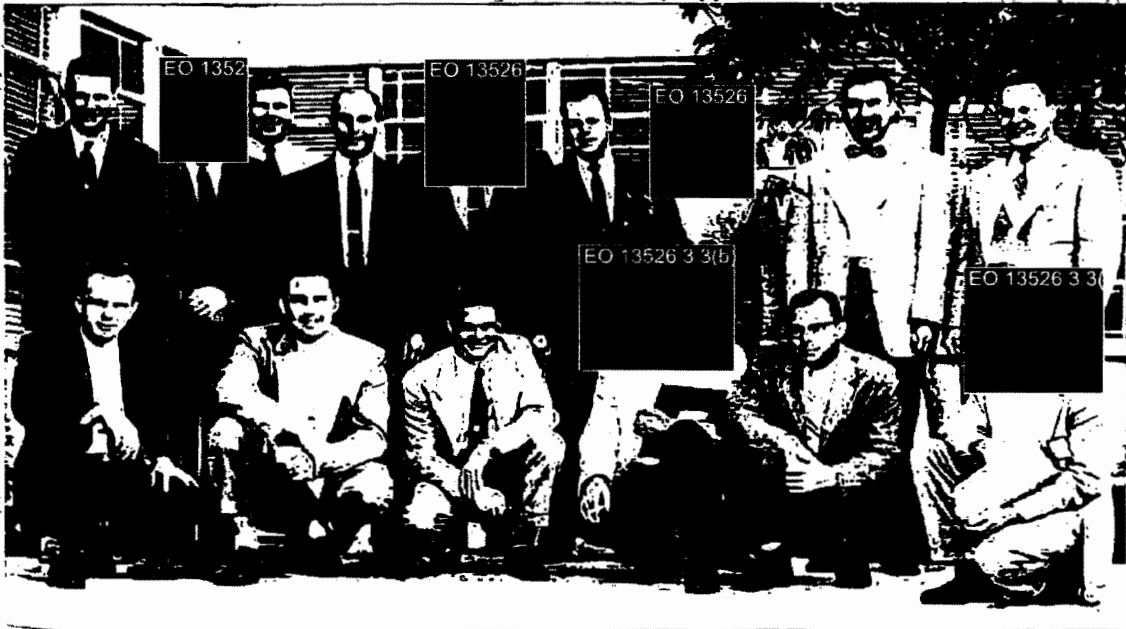
In October 1955, at Schriever's request, Air Research and Development Command (ARDC) leader LGen Thomas S. Power directed the transfer of the WS-117L Program Office from Wright-Patterson AFB in Ohio to the WDD in Inglewood, CA. The move took place in January 1956.

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Schriever picked Commander Robert C. Truax, a member of his staff and that year President of the American Rocket Society, to be head of the WS-117L Program Office. LtCol King stayed at Wright-Patterson as Project Officer for the SNARK guided missile project.

In November 1955 a Source Selection Board chaired by the WS-117L Office chose the Glenn L. Martin Company, RCA, and Lockheed to compete for a reconnaissance satellite development contract.

From 12 to 20 March 1956 (after the move to WDD), a joint ARDC/Air Materiel Command (AMC)/WDD/WADC contractor evaluation board met at WADC and recommended that Lockheed be selected for the WS-117L development contract. Subsequently, on 2 April 1956, WDD published the WS-117L Advanced Reconnaissance System Development Plan, calling for R&D funds in the amount of \$7.0 million for FY56, \$32.1 million for FY57, and \$75.6 million for FY58. On 24 July 1956 Headquarters USAF approved



Advanced reconnaissance system management transition planning meeting, Inglewood, California, 27 November 1956

Back row (left to right): Capt William O. Troetschel, USAF, Wright Air Development Center (WADC), Ohio; EO 13526 WADC; 1st Lt John C. Herther, USAF, WADC; LtCol William G. King, Jr., WADC; EO 13526 3 3(b) Intelligence and Electronic Warfare Laboratory (IEW Lab), Rome Air Development Center (RADC), New York; Capt James Suttie, USAF, IEW Lab, RADC; EO 13526 3 3 IEW Lab, RADC; Capt James S. Coolbaugh, USAF, WADC; Capt Frank Jasen, USAF, WADC. Front row (left to right): Fritz Runge, WADC; Capt Richard P. Berry, USAF, RADC; Cmdr Robert C. Truax, USN, Western Development Division, Air Research and Development Command, Inglewood, California; EO 13526 3 3(b)(1) WADC; LtCol George P. Jones, USAF, Air Force Cambridge Research Center, Massachusetts; EO 13526 3 3(b)(1) RADC.

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the plan, but the DCS/D Development Directive, published 3 August 1956, allocated only \$3.0 million for FY57. This low level of funding was continued until the launch of Sputnik on 4 October 1957.

Based on this initial funding approval, on 29 October 1956 the Air Force awarded contract AF 04(647)-97 to Lockheed to proceed with initial system development studies. Secretary of the Air Force Donald A. Quarles, who wanted the International Geophysical Year satellites to be first into orbit, insisted that this was to be for engineering studies only and that "no tin would be bent." By the summer of 1957, a total of \$10 million had been allocated and Quarles had relented enough to allow mockups to be constructed. It was anticipated that \$35 million might be available in 1958. The first launch would not be before 1961.

FY57 funds were sufficient to initiate studies in all the subsystem areas, including Subsystem F (S/S F), the electronic reconnaissance, or "ferret," system. An excerpt from the introduction to the winning S/S F proposal of the Airborne Instruments Laboratory (AIL), Mineola, Long Island, New York, dated April 1957, shows that this new job was taken seriously: "The contractor who develops the ferret portion of the 117L system assumes a responsibility to the country that cannot be lightly considered. In many ways this is an ideal vehicle: if the designer does not make the most of the unique opportunities afforded to him, he will have failed." The proposal described the three essential elements of an effective reconnaissance system: knowledge of the intelligence

requirements; ability to develop the collection system including limitations and growth potential; and the ground data-handling necessary to provide a useable product. Based on their experience in building many electronic-warfare systems for the government, Winfield "Win" Fromm and his AIL team knew that past collection systems had sometimes been built without processing capability or, in some cases, knowledge of intelligence requirements. The early SIGINT satellite programs were to be helped and shaped by these insights.

Following the Soviet launch of Sputnik I, the WS-117L Program received a great deal of national attention as the US scrambled to counter the Russian successes in space. President Eisenhower faced the problem of gaining control over the rivalry among government agencies seeking to lay claim to one or another area of space operation and reducing, if possible, the media speculation about their efforts. On 7 February 1958, he formed the Advanced Research Projects Agency (ARPA) to undertake basic research and to direct R&D projects within the Department of Defense (DOD), as assigned to ARPA by the Secretary of Defense. As its main job, ARPA was to oversee all US military space programs from the DOD level.<sup>16</sup>

In the spring of 1958, ARPA Director Roy W. Johnson issued an invitation to all military organizations to propose satellite systems whose development would further their goals. The Chief of Naval Operations (CNO) relayed the query to all Navy scientific and technical organizations, asking, "All hands consider how they could

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use space in their design ideas for the Navy." Howard Lorenzen at NRL proposed an ELINT system to the CNO that was a very straightforward extension of existing airborne ELINT systems. This became the DYNO program that flew piggyback with early Navy TRANSIT satellites and became the first US satellite ELINT system.

The ARPA space era commenced officially in Los Angeles on 30 June 1958 with ARPA Order 9-58, which said that Secretary of Defense Thomas S. Gates, Jr., had assigned responsibility for WS-117L to ARPA under DOD Directive 5105.15. The Air Force Ballistic Missile Division (AFBMD), successor to WDD, was to submit a Development and Financial Plan as soon as possible. This directive was followed by an 18-month period of continuous change, indicative of the national uncertainty in the arena of satellite reconnaissance policy. During this period funding fluctuated wildly, responsibility for WS-117L was transferred by ARPA from AFBMD to ARDC then finally to US Air Force Headquarters.

To remove "weapon system" from the designation and suggest a purely defensive system, in 1959 the program identifier was changed from WS-117L to SENTRY. This effort was then divided into DISCOVERER (scientific research system, Thor boosted), MIDAS (IR system, Atlas boosted), and SENTRY (reconnaissance system, Atlas boosted). All of these programs were to be developed at the DOD SECRET security level. This included the scientific aspects of DISCOVERER, although this program was actually the

cover effort for the covert CIA CORONA Photo Recovery Program, which had been approved by President Eisenhower in early February 1958.\* On 6 August 1959, to provide additional security for the SENTRY Program, it was redesignated SAMOS, in order to "... identify reconnaissance program with an innocuous name that does not, repeat not, have mission association."<sup>17</sup> The name SAMOS was actually selected by ARPA Director Admiral John Clark, in reference to the Greek island of the same name. Most people thought the new name was an acronym for "space and missile observation system," and the attempt to choose a name without mission association was not successful.<sup>18</sup> There were several reprogramming actions, driven by problems in the SAMOS photo payload, Subsystem E (S/S E), development, particularly the tradeoffs between read-out and recovery type systems. Since the ferret system was always considered essential but not as important as the photo system, it neither attracted the attention nor suffered quite the wild variations that plagued the photo programs.

\* A contributing reason for approving the CORONA program was that review suggested WS-117L was too elaborate, too complex to achieve an early operational capability, which was not a high priority in the Air Force. This led to more focused programs that were less ambitious and more likely to provide early, useful data. See Joseph V. Charyk comments, SIGINT Satellite History Round Table, 26 May 1994.

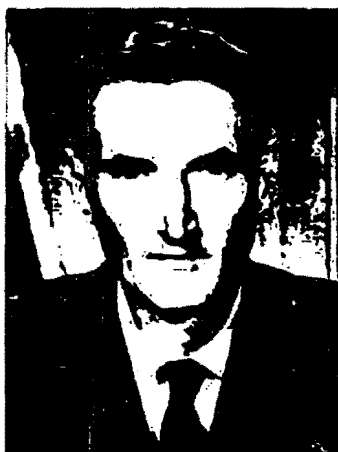
<sup>18</sup> Samos is a Greek Island where the astronomer Aristarchus lived (310-230 B.C.), referred to by Archimedes and Plutarch. He hypothesized that the heavens of the "fixed stars" remain at rest, and the Earth revolves in an oblique circle about the Sun, while it rotates, at the same time, about its own axis. The interpretation of SAMOS as an acronym for "space and missile observation system" was originated by the press and became the accepted interpretation among the uncleared population in and around the Pentagon and Washington. Within the cleared circles, it became a joke, as an acronym for "same old SENTRY."

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## Evolution of the National Reconnaissance Office (NRO)

Suite 4C1000 in the Pentagon became the location for some of the most secret and important activities in the US satellite reconnaissance programs. At the time of the Sputnik I launch, 4C1000 was occupied by the Air Force Office of Guided Missiles (AFCGM), headed by BGen Robert E. Greer,



BGen Robert E. Greer

whose responsibility was primarily the development of air-launched guided missiles.\*<sup>19</sup> The AFCGM staff also served as the secretariat for the AFBMC (a part of the special arrangements for managing the Air Force ballistic missile programs in Los Angeles), an activity that provided Greer's staff with insight into missile and space developments. In the Pentagon, most other R&D staff work was the responsibility of the Air Force Deputy Chief of Staff for

\* 4C1000 was an executive-level conference room used by the senior Air Staff and the Air Force Secretaries for many conferences. Greer's AFCGM offices adjoined this conference room. When SAFMS was established, they simply annexed the 4C1000 conference room and that door became the entrance to the reconfigured suite.

Development, LGen Roscoe C. Wilson. As ballistic missiles achieved operational status, they became the responsibility of AFCGM. When the MX-770 became the Atlas and deployment to operational sites began in 1958, LtCol Edwin J. Istvan became the Atlas project officer in AFCGM. Later, he and Greer calculated that an entire Atlas sustainer stage could be placed in low Earth orbit to counter some of the bad publicity engendered by the Soviet lead in space. They obtained President Eisenhower's approval to install a payload playing Christmas carols and a Presidential greeting (plus telemetry). Thousands of listeners around the world heard the message and the carols during the satellite's brief three-day lifetime. This became project SCORE, an Atlas-B ICBM launched into low Earth orbit on 18 December 1958.<sup>20</sup> Due to the extreme secrecy of the arrangements, this probably qualifies as the first operational "black" payload. With the successful launch of project SCORE, emphasis in AFCGM gradually shifted from missiles to boosters, then to the satellites boosted by the missiles.

On 26 May 1960, in the aftermath of the 1 May 1960 shutdown of F. Gary Powers' U-2 over the Soviet Union, an event that involved terminating all *aerial* overflights of Soviet territory, President Eisenhower asked his new science and technology advisor, George B. Kistiakowsky, to form an ad hoc group and assess the nation's defense intelligence requirements, the ability of the SAMOS Program to meet them, and the Defense Department plans for employing the system.<sup>21</sup> On 10 June 1960 Eisenhower gave the job formally to Secretary of Defense Thomas Gates, Jr., who appointed a committee consisting of

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Under Secretary of the Air Force Joseph V. Charyk, the Deputy Director of Defense Research and Engineering John H. Rubel, and science advisor Kistiakowsky.

The findings of this group were presented to and approved by the President at a meeting of the National Security Council on 25 August 1960. Among the actions ordered were that "... this (reconnaissance) program be managed with the directness that the Air Force has used on occasion, with great success, for projects with overriding priority. This can best be accomplished by direct line of command from the Secretary of the Air Force to the general officer in operational charge of the whole program ...," and that "... the so-called F payloads for gathering electromagnetic intelligence should be given lower priority than that assigned to photography."<sup>22</sup> This action was implemented on 31 August 1960 when the SAMOS Project Office was established at AFBMD, El Segundo, California, with BGen Robert E. Greer in charge, reporting directly to Under Secretary Charyk.<sup>23</sup>

The Pentagon office, 4C1000, became the home of the Air Force Office of Missiles and Space (SAFMS), headed by BGen Richard Curtin, who had served at AFBMD in Los Angeles and in the office of the Deputy Chief of Staff for Development in Washington. Curtin's mission was to provide direct staff support to Charyk and function as the Washington staff for Greer. The 4C1000 staff served the vital function of providing liaison to other military organizations involved in military space programs.

On 6 September 1961, the National Reconnaissance Program (NRP) was formally established, with Charyk named "Assistant for Reconnaissance" to the Secretary of Defense, in charge of Air Force Satellite Reconnaissance Programs, and Richard M. Bissell, Jr., CIA Deputy Director for Plans, in charge of the CIA programs. The staff in 4C1000 became the Office of Space Systems (SAFSS), continuing to support Charyk as Under Secretary of the Air Force and Greer as the Director of the Air Force Office of Special Projects (SAFSP). Greer's earlier title, "Director of the SAMOS Project Office," had been dropped in favor of the less revealing "Director of Special Projects."<sup>24</sup> On 2 May 1962 Charyk was designated Director of the National Reconnaissance Office (DNRO) on the basis of a DOD/CIA agreement, signed by Roswell Gilpatric, Deputy Secretary of Defense, and John A. McCone, Director of the CIA (DCI).<sup>25</sup> This agreement established a single Director of the NRO, responsible directly to the DCI and the Secretary of Defense for management of the entire NRP. It also established the NRO itself and designated the Under Secretary of the Air Force as the Director. This was made effective within the DOD on 14 June 1962.<sup>26</sup> On 23 July 1962 Charyk established the internal NRO structure and responsibilities. He also arranged for participation within the NRO by the CIA, the National Photographic Interpretation Center (NPIC), the National Security Agency (NSA), the Navy, and the Army through provision of qualified personnel

\* Since the NRO was a covert ("black") facility, in the overt ("white") world it was known as the Office of Space Systems, Office of the Secretary of the Air Force (SAFSS), and the DNRO, a "black" title, was known in the "white" world as (and actually was) the Under Secretary of the Air Force (SAFUS).

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from those agencies and services to serve full-time tours on an interagency exchange basis. Charyk designated the Air Force NRO projects as Program A, the CIA projects as Program B, the Navy projects as Program C, and the overhead covert aircraft (U-2 and SR-71) as Program D.<sup>27</sup> LtCol Ed Istvan inherited the Electronic Systems position on the NRO staff in 4C1000 and handled all SIGINT matters until his retirement in 1963. Although the NRO was to face many reorganizations in the years to come, the stage was now set for the development of a series of satellite reconnaissance programs that were to become indispensable to the security and defensive preparedness of the United States.

### Evolution of the National Security Agency (NSA)

NSA can trace its earliest beginnings as a national organization to a proposal in 1943 to merge the Army and Navy radio-intelligence units. These Army and Navy intercept organizations dated back to the early 1930s, when they were separate groups, usually competing vigorously for the collection and processing of diplomatic traffic.<sup>28</sup> Their merging was "delayed until the cessation of hostilities [in World War II] because of the inevitable disruptions which occur as a result of major reorganizations."<sup>29</sup>

<sup>27</sup> Japanese PURPLE is one example. In the areas of Japanese or German Army and Navy traffic, little cooperation was possible because of the easily recognized distinctive characteristics of the respective opponent Service traffic. Post-World War II, the common or centrally controlled supply of (Russian) communication security doctrine made traffic source recognition quite difficult and a cooperative attack (AFSA, then NSA) feasible and desirable.

Also during World War II, the Army/Navy Radio Intelligence Coordinating Committee was established under the Joint Military Chiefs of Staff. This group, set up by a purely verbal "gentleman's agreement," later became the Army/Navy Communications Coordinating Committee of the Army/Navy Communications Intelligence Board. In 1945 the Department of State was added, because much of the COMINT collected during the war involved diplomatic targets, and the group was formalized as the State/Army/Navy Communications Intelligence Board (STANCIB).

In early 1946 Gen Hoyt S. Vandenberg and Adm Thomas B. Engles of STANCIB met with J. Edgar Hoover to arrange for FBI membership in STANCIB.<sup>30</sup> On 13 June 1946 the US Communications Intelligence Board (USCIB) was established to replace STANCIB and to carry out the same functions: to coordinate, develop policy for, control, and assign requirements for COMINT.<sup>31</sup>

In 1947 President Harry S Truman signed Public Law 253, "The National Security Act of 1947," which created the Secretary of Defense as a cabinet post over the National Military Establishment and the three "co-equal" Secretaries of the Army, Navy, and Air Force. The 1947 Act also established the National Security Council, the National Security Resources Board, and the CIA. The first Secretary of Defense was James V. Forrestal. During this period Congress also established an executive organization study group, and President Truman appointed former President Herbert Hoover its chairman. The Hoover



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group produced 19 reports, which included 196 recommendations, in two years. In 1949, by an amendment to the 1947 Act, DOD, destined to become a large and powerful institution, was formally created.<sup>32</sup>

The CIA, established by the National Security Act of 1947 from the Central Intelligence Group (CIG), was the successor to President Roosevelt's World War II quasi-military Office of Strategic Services (OSS), which was organized and led by intelligence coordinator, collector, and analyst William J. Donovan. CIA's responsibilities were defined in Secret NSC directives. The first DCI, Admiral Sidney W. Souers, had already been heading the CIG since January 1946. In 1947, the second DCI, Air Force Gen Hoyt S. Vandenberg, began to influence COMINT planning as a member of USCIB, although there were very few formal procedures for intelligence collection or reporting at that time. Adm Roscoe H. Hillenkoetter and, in the early 1950s, Gen Walter Bedell Smith, former Chief of Staff to General Eisenhower during World War II, continued to strengthen the role of the CIA in the Intelligence—and especially the COMINT—Community.<sup>33</sup>

In the years after World War II, traditional turf battles between the Army and Navy intensified when the new Air Force, the State Department, and the new CIA were added to the list of intelligence contestants who would be involved in COMINT activities. In 1949, based on recommendations by several joint service committees and discussions with the members of the USCIB, Secretary of Defense Louis A. Johnson established, by executive order, the Armed Forces Security Agency

(AFSA). This put all COMINT under one military organization consisting of the Army and Navy radio intelligence groups as well as the new Air Force's own Air Force Security Service (AFSS). The Air Force had been created mainly from the Army Air Forces, so the Army's Signals Intelligence Service also had a piece split off to form AFSS. But AFSA only made matters worse: CIA and State were cut out of COMINT and the military services were subordinated to a new agency.

On 24 October 1952, having received much criticism of AFSA, President Harry S Truman signed an Executive Directive<sup>\*</sup> making COMINT a national, not just a military, effort; this Directive changed the name of AFSA to the National Security Agency (NSA) and gave to the Director of the NSA, who reported to the Secretary of Defense, technical and operational control of all communications intelligence resources as well as responsibility for all "communications security" activities.<sup>†</sup> This Presidential directive, like the earlier AFSA, was resisted at first by the Army, Navy, and Air Force because it placed NSA firmly in control of their COMINT activities. From the CIA perspective, the new plan effectively took the CIA out of the COMINT chain by making COMINT a business of the DOD. There was also a process in which the Secretary of State and the Secretary of Defense, as a "Special

\* President Truman sent a memo dated 24 October 1952 to Secretary of State Dean Acheson and Secretary of Defense Robert A. Lovett outlining the mission of NSA: on the same day National Security Council Intelligence Directive No. 9 was issued, assigning NSA the COMINT mission for the US Government.

† Communications security is defined as making US military and other high-level government communications secure from unauthorized readers.

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Committee," coordinated on sensitive national security matters and at times kept out the DCI and CIA. After the 1952 decision, in spite of resistance and with some exceptions, the bulk of the COMINT remained under NSA.<sup>34</sup> On 4 November 1952, LGen Ralph J. Canine, US Army, was named the first Director of NSA and it was under his strong leadership that NSA became a truly national communications intelligence and communications security organization.<sup>35</sup>

On 10 July 1953 newly elected President Dwight D. Eisenhower, following the lead of his predecessor, Harry S Truman, once again called upon former President Herbert Hoover (under Congressional mandate of PL 108) to study the complete reorganization and streamlining of the Federal Government after 20 years of Democratic control. This second Hoover Commission operated for two years, studied 60 agencies, and made 314 recommendations to Congress, many relative to reducing costs. A special task force, headed by General Mark W. Clark, investigated all the intelligence activities of the government and was charged to make appropriate recommendations. On 25 May 1955 two reports were submitted. An unclassified report recommended that President Eisenhower appoint a committee of private citizens to report to him periodically on foreign intelligence activities; this was to become the President's Board of Consultants on Foreign Intelligence Activities (the Killian Board). A classified intelligence annex called for expansion of the COMINT effort "during an era when not only our national security but our national survival as well may depend on

adequate intelligence." The Intelligence Task Force also observed that the "national interests will be better served, and more economical and efficient operation will result, if ELINT is placed under NSA."<sup>36</sup>

On 13 July 1955 Secretary of Defense Charles E. Wilson issued DOD directive S-3115.2, on ELINT. Although the Hoover Commission had recommended that ELINT be assigned to NSA, this directive assigned implementation responsibility in the ELINT field to the Secretary of the Air Force, pending the issuance of further recommendations by the USCIB and the Joint Chiefs of Staff.<sup>37</sup>

President Eisenhower's Executive Order of 6 February 1956 established the President's Board of Consultants on Foreign Intelligence Activities (the Killian Board, later the President's Foreign Intelligence Advisory Board (PFIAB)), chaired by Dr. James R. Killian, President of Massachusetts Institute of Technology, to review and make semiannual reports on the foreign intelligence activities of the government. In its report of 24 October 1957, the board recommended that the functions of the USCIB and the Intelligence Advisory Committee be combined into a single body, the US Intelligence Board (USIB), and that this new board be chaired by the DCI.<sup>38</sup>

While considering the Killian Board recommendations in February 1958, President Eisenhower requested USCIB to look again at ELINT management. Responding to his memorandum the board established a special ELINT task force, the

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Louis W. Tordella

"Strong Committee," with retired US Marine Corps BGen Philip G. Strong, then of the CIA, as chairman.<sup>39</sup> Other members on the committee were Robert F. Packard, State Department; Louis W. Tordella, formerly Chief of NSA's Office of Analysis, then DOD Office of Special Operations, and soon to become Deputy Director, NSA; Col Russell H. Horton, US Army; Capt Charles M. Bertholf, US Navy; and Col Linscott A. Hall, US Air Force. The committee studied the US ELINT organizational structure and submitted its report on 11 June 1958. The Strong Committee concluded that there should be a single national operational and technical authority to direct and control all US ELINT activities and noted it was "logical, desirable, and feasible" that a single national authority direct and control both the COMINT and ELINT activities of the US Government, to wit, NSA.<sup>40</sup> The President approved these recommendations, and on 15 September 1958 this action was directed by NSC Intelligence Directive (NSCID) No. 6. Also issued on

this date were NSCID No. 1, which created the US Intelligence Board and incorporated USCIB's COMINT/ELINT responsibilities into overall responsibility for national intelligence requirements and also described the national responsibilities of the DCI, including his chairmanship of the USIB; NSCID No. 5 dealing with the CIA; and NSCID No. 7 for Critical Communications.<sup>41</sup>

Secretary of Defense Neil McElroy signed the implementing directives for NSCID No. 6 on 19 March 1959 (DOD S-3115.4), officially assigning NSA operational and technical control of ELINT. NSA had no organization at that time to accept this responsibility for ELINT except for the National Technical Processing Center (NTPC), which had been formed previously from the World War II Army-Navy Electronics Evaluation Group. NTPC processed ELINT and TELINT collected from conventional military ground and airborne sources. CIA continued to operate the U-2 and to provide data (selected on CIA's determination of need-to-know) to members of the Intelligence Community.<sup>42</sup>

At this time (the late 1950s), some NSA personnel in the ELINT processing organization, the Soviet and European collection organization, and the R&D organization had become aware of the ELINT satellite work in the Navy and the Air Force. Those NSA employees who used the U-2 photography to verify and collate SIGINT intercepts were among the first to be exposed to the possibility of satellite reconnaissance. Some with Navy contacts learned of the NRL effort to orbit the

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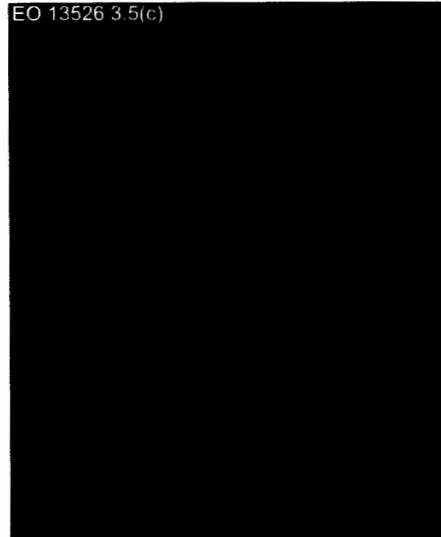
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DYNO satellite and the Navy's plans to use NSA's cryptologic stations on the periphery of the Soviet Union and China for reading out the data. Some in NSA R&D were tracking the RAND Corporation "Project FEED BACK" work for the Air Force and thereby learned of the WS-117L Reconnaissance Satellite Program Office and its activities. These individuals became aware that the satellite program had been well underway in the Air Force before NSA received clear responsibilities for ELINT in 1958.

Many ELINT policies had already been initiated, plans developed, responsibilities assigned, and close working relationships established in the Air Force ELINT satellite programs before NSA became involved. In 1955, DOD Directive 3115.2 had given responsibility for ELINT to the Air Force. In March 1955 the Air Force had started design studies for WS-117L. On 29 October 1956 the Air Force awarded contract AF 04(647)-97 to Lockheed Missiles and Space Division (LMSD) as prime contractor for the WS-117L program. This contract included development of processing equipment for ELINT data located at the Vandenberg Tracking Station and the Satellite Test Center in California.<sup>43</sup> Because of progress made in these early activities, NSA had difficulty being accepted as a contributing team member. These difficulties were compounded by security rules and the limited distribution of NSCID No. 6 and the DOD implementing Directive S-3115.2 (Rev).

NSA personnel had also begun to look at the possible use of satellites for COMINT. In August 1959 NSA issued a pioneering

EO 13526 3.5(c)



"Study Report on COMINT Collection from Satellite Vehicles." TECHDOC No. 33 144, which showed that the "basic philosophy and some of the equipment of Subsystem F, the ELINT reconnaissance portion of the WS-117L program, is generally adaptable to the requirements of COMINT data collection." An article by <sup>EO 13526 3.5(c)</sup> that summarized the report concluded that the then-imminent low-orbit satellite system was technically capable of COMINT collection and suggested that higher altitude COMINT satellites would be most practical, should be very specialized and not duplicative, and "based on careful consideration of the value of the expected end-product."<sup>44</sup>

At the crucial meeting of President Eisenhower and the NSC on 25 August 1960, which resulted in the formation of what would become the NRO reporting directly to the Under Secretary of the Air Force, Eisenhower also authorized another evaluation of all US intelligence agencies. On 15 December 1960 a "Joint Study Group Report on Foreign Intelligence Activities of the United States Government,"

the Kirkpatrick Report, was issued. Chaired by Lyman B. Kirkpatrick, Inspector General, CIA, this group had studied the most effective and efficient use of intelligence resources. The group recommended that DOD unify ELINT resources under the operational and technical control of the Director of NSA and that DOD strengthen NSA control over the service cryptologic agencies. As had the Kistiakowsky survey earlier, it also "cautioned about military domination of the intelligence process."<sup>45</sup>

### Resolution of NRO and NSA Roles and Missions

Both the NRO and the NSA were formed for the same basic reason: to consolidate fragmented national intelligence efforts to face the challenges of a rapidly expanding Cold War. It was soon apparent that the NRO charter to develop and operate reconnaissance satellites, including SIGINT satellites, would overlap the NSA mandate (NSCID No. 6) to control all national SIGINT efforts.

On 18 January 1961, two days before Eisenhower left office, the NSC recommended approval of a revised NSCID No. 6, "Communications Intelligence and Electronic Intelligence," proposed by the Secretary of Defense, in regard to collection and processing of COMINT and ELINT. Though never issued, this revision specified that "only the Secretary of Defense may exercise or delegate authority to perform these functions within the Department of Defense."<sup>46</sup> This would

enable the Secretary of Defense to control SIGINT activities, roles, and missions, and the revision was resisted at NSA.

Infighting and power struggles ensued. On 17 February 1961 NSA Director VAdm Laurence H. Frost sent a memorandum, "Development of Advanced Intelligence Collection Programs," to the new Secretary of Defense, Robert S. McNamara, citing NSA's responsibilities and authorities to task COMINT/ELINT resources, especially satellites. Frost also asserted that NSA had approval authority over military research and engineering programs involving COMINT/ELINT. Frost's memo pointed out the unique authority of the Director of NSA in COMINT/ELINT operational planning and collection tasking. It was intended to assert NSA's authority over COMINT/ELINT satellites.<sup>47</sup> Frost's memo did not lead to any changes within the Office of the Under Secretary of the Air Force (later the NRO), nor did the USIB change any of its then-current delineations of existing roles and missions. However, the Under Secretary of the Air Force (later Director, NRO), Joseph V. Charyk, sent a memorandum on 21 March 1961 to NSA Director Frost inviting NSA to work with and assist the Air Force in planning and executing the national satellite reconnaissance program. Frost accepted the invitation in memorandum N1093, dated 31 March 1961.<sup>48</sup> This exchange strengthened the DNRO's hand, but more work would be needed to define NRO and NSA roles.

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Eugene G. Fubini

With the 6 September 1961 agreement between CIA and DOD to establish a National Reconnaissance Program (NRP), Secretary of Defense Robert S. McNamara turned to the interagency tension in the SIGINT area. On 7 September 1961, to provide an arbitrator for some of the SIGINT trouble spots, he appointed Gene Fubini, from the office of the Deputy Secretary of Defense for Research and Engineering (DDR&E), to examine all matters pertaining to SIGINT satellite programs. Fubini formed a study group to attack the problem, with himself as chairman. The group met first on 14 September 1961. Included were Herbert L. Conley of NSA as alternate chairman, Walter G. Deeley of NSA as recorder, Howard C. Barlow of NSA, LtCol Edwin J. Istvan of SAFMS, Howard A. Stadermann of DDR&E, Cmdr Frank R. Sperberg (OP94G), William E. W. Howe from Navy (ONI), Maj Abram V. Rinearson, III, of Army, and Harold Willis, CIA.

The Fubini group produced a blueprint, "Space Vehicle Electronic Intelligence Program Responsibilities and

Resources." which was approved by Roswell Gilpatric, Deputy Secretary of Defense, on 20 October 1961. This document required the Air Force and NSA to work together to support the Air Force responsibility for development and operation of SIGINT satellite collection systems. In turn, NSA assumed the responsibility for processing and analysis of SIGINT satellite-collected data and provision of results to the Intelligence Community. Technical Instruction 1301 was provided to the NRO by NSA in 1963 to establish data formats, information requirements, and procedures. This arrangement continued essentially unchanged until the 1972 revision of NSCID No. 6 when NSA was given the responsibility for payload tasking while the NRO retained satellite technical tasking to maintain vehicle integrity.

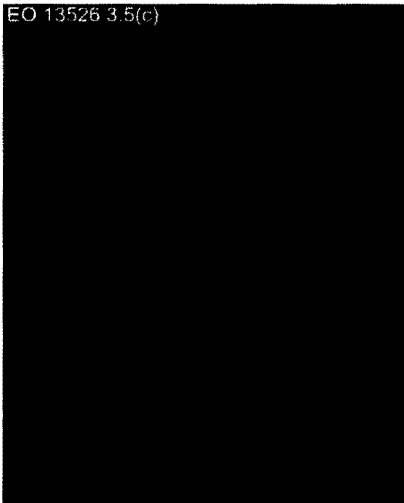
To further strengthen the ties between NSA and the NRO, a meeting was held on 25 May 1962, and was attended by DIRNSA Frost, Deputy Director of NSA Louis Tordella, and Herbert Scoville, Jr., Deputy Director for Research, CIA. The purpose of the meeting was to further clarify the NSA and NRO roles in responding to national requirements as determined by the US Intelligence Board (USIB). They agreed to cooperate in the implementation of a collection and processing program based on stated USIB requirements.<sup>49</sup> In response to paragraph 2b of this agreement EO 13526 3.5(c) of NSA's ELINT processing organization, who had become a chief architect of NSA participation in satellite ELINT, moved over to the Pentagon SAFMS staff in June 1962. He was to assure that NSA recommendations were fully available to NRO planners at

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all times. EO 13526 3.5(c) proved to be an invaluable asset in planning and executing a system approach to determining and reconciling SIGINT collection and processing developments.

After more months of discussions, mostly between DOD and CIA, another agreement between the DCI and Secretary of Defense on the roles and relationships of CIA and NRO operations was signed on 2 May 1962. On 13 March 1963, still a third agreement was issued: "AGREEMENT BETWEEN THE SECRETARY OF DEFENSE AND THE DIRECTOR OF CENTRAL INTELLIGENCE ON MANAGEMENT OF THE NATIONAL RECONNAISSANCE PROGRAM." The agreement stated, in part: "To carry out his responsibilities as Executive Agent for the National Reconnaissance Program, the Secretary of Defense will establish as a separate operating agency of the Department of Defense, a National Reconnaissance Office, under the direction, authority and control of the Secretary of Defense." With respect to SIGINT, this

agreement said the NRO should provide for "... decommutation, conversion, technical correction and reconstruction of the collected electronic signal data to yield a usable collection product, and delivery of such collection product in proper format together with associated data necessary for exploitation to NSA or other user."<sup>50</sup> The definition of how SIGINT should be handled was essentially in place.<sup>51</sup>

A major reorganization of the NRP occurred in 1965 with the formation of the NRP Executive Committee (ExCom) composed of three high-level officials—the Deputy Secretary of Defense, the Director of Central Intelligence, and the President's Science Advisor—with sole authority to approve or modify the NRO budget. This arrangement gave the DNRO a needed management mechanism, especially with respect to issues involving the CIA. In 1967 and 1968 the Eaton Committee under DCI Richard Helms made another study of US SIGINT, and in 1972 NSA and NRO roles and missions were modified to give NSA a little more control over satellite collection. Most of the time, though,

<sup>50</sup> To carry out the necessary liaisons among the Intelligence Community members and the NRO, especially on the subject of national requirements, special committees came into being. The earliest forerunner of this kind of coordination of operations was the "Special Committee" of the Secretary of Defense and the Secretary of State in the early 1950s; this arrangement did not include the DCI or the CIA. In 1958, with the formation of USIB out of the earlier USCIB, COMINT was made the responsibility of the SIGINT Committee of USIB, and thus moved to a position of relatively less importance in the intelligence world. In the early 1960s all SIGINT satellite requirements were made the responsibility of the USIB's Committee on Overhead Reconnaissance (COMOR). In 1963 this responsibility was placed under the COMOR SIGINT Working Group (CSWG). In 1967 the CSWG became the SIGINT Overhead Reconnaissance Subcommittee (SORS) of the SIGINT Committee of the USIB, an arrangement that has continued for many years.

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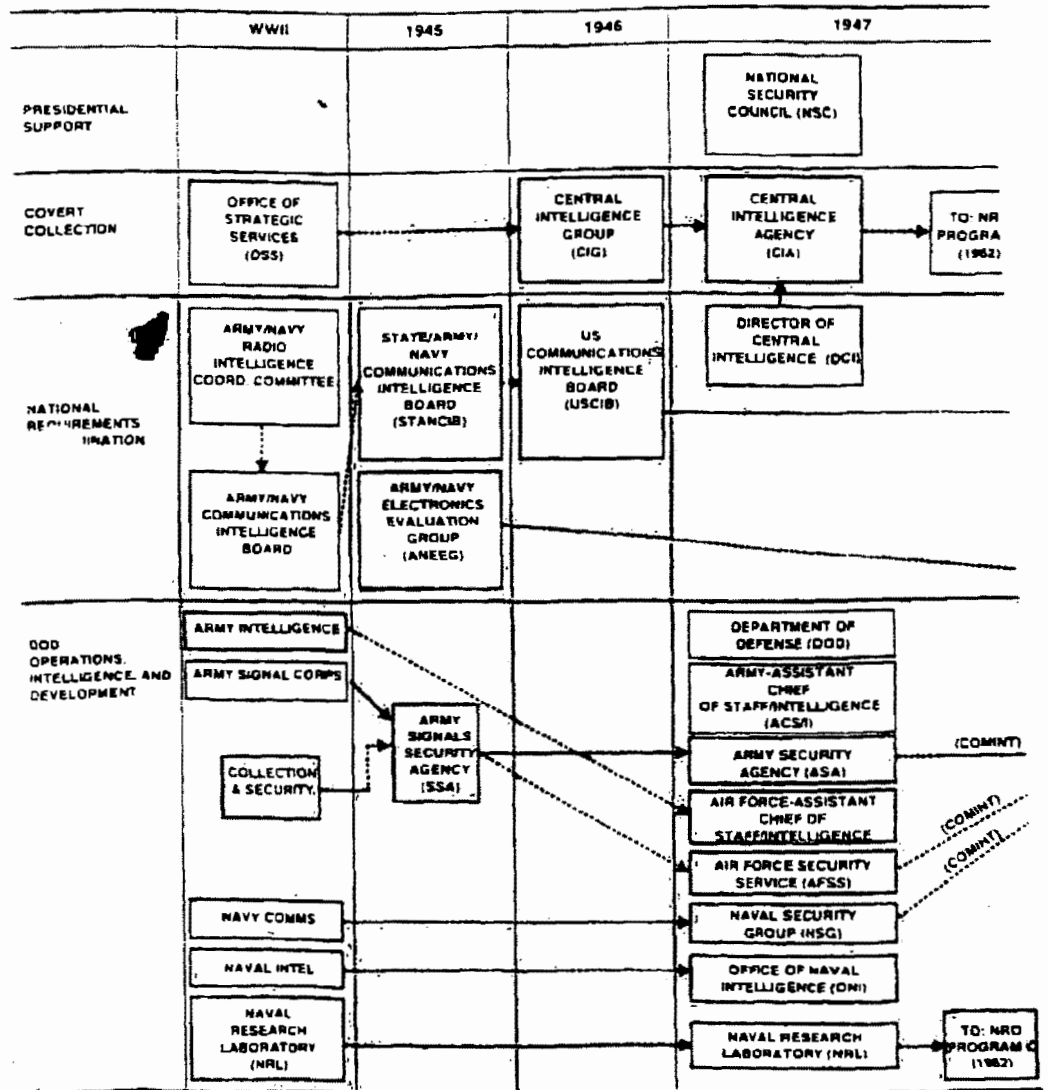
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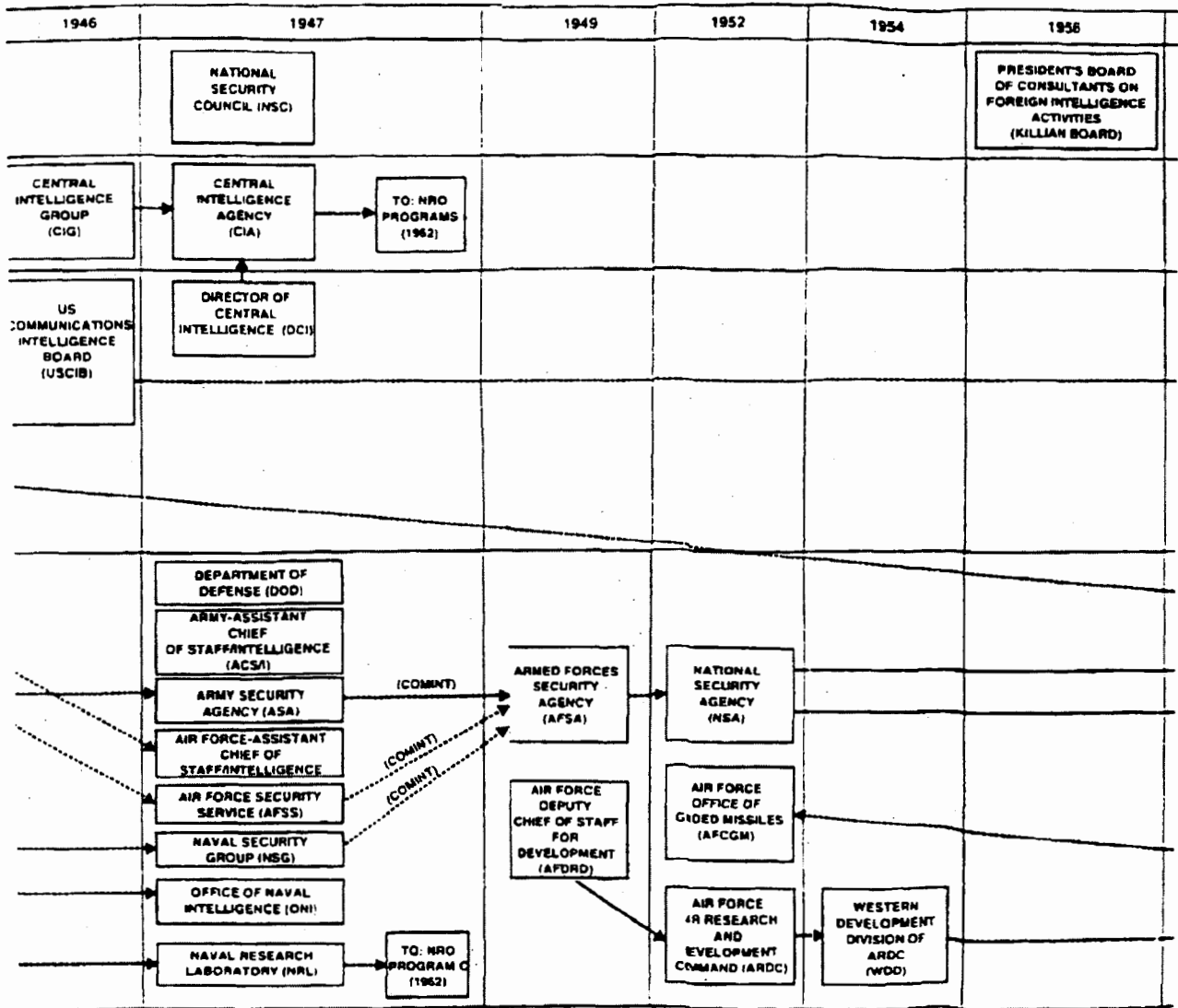
especially at the working level, there was so much enthusiasm for what was being done in the new era of space SIGINT that institutional prerogatives were forgotten. The next chapters detail the systems that were built and operated with this team spirit.\*

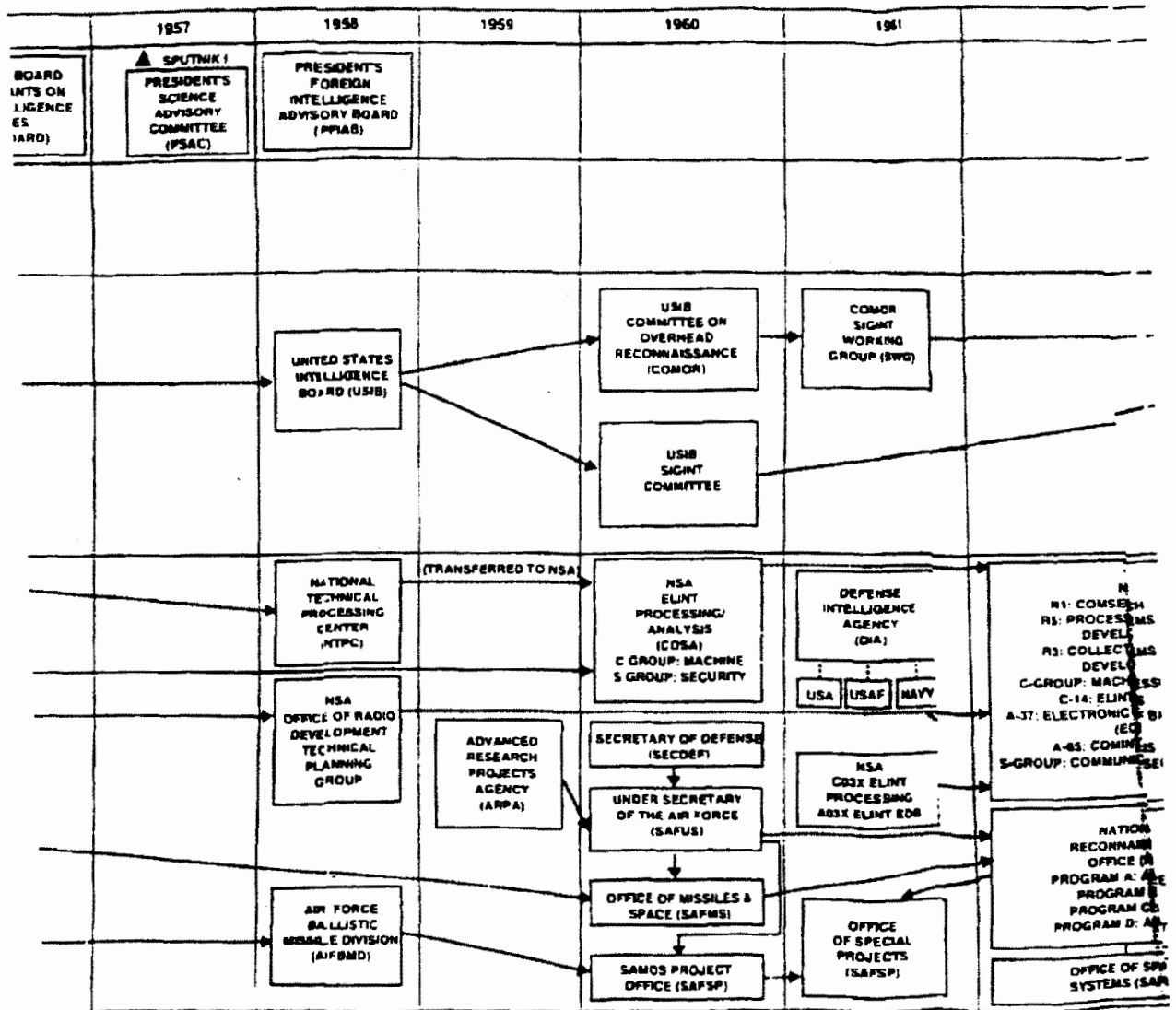
\* Appendix E contains the full text of documents referenced in this chapter.

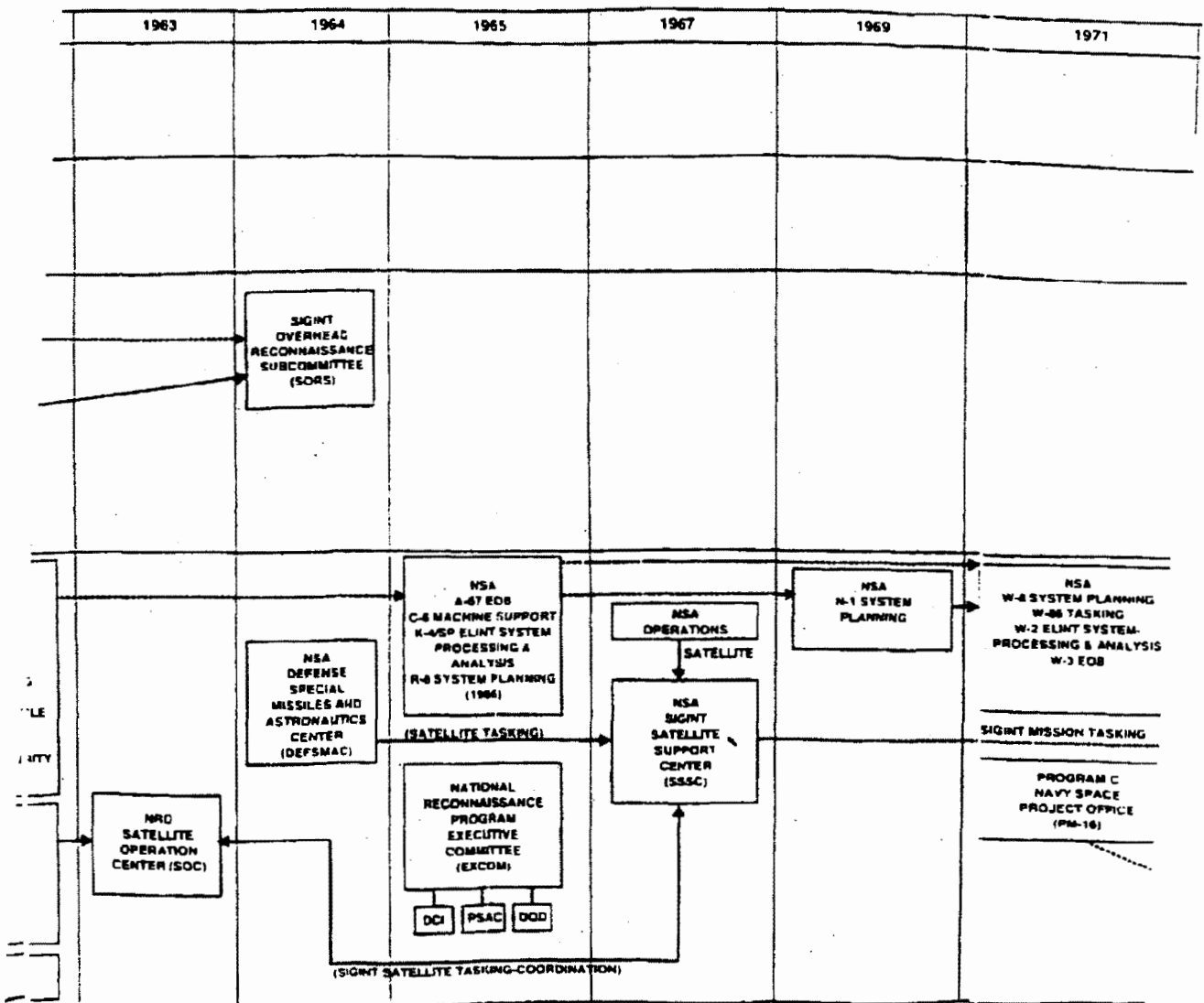
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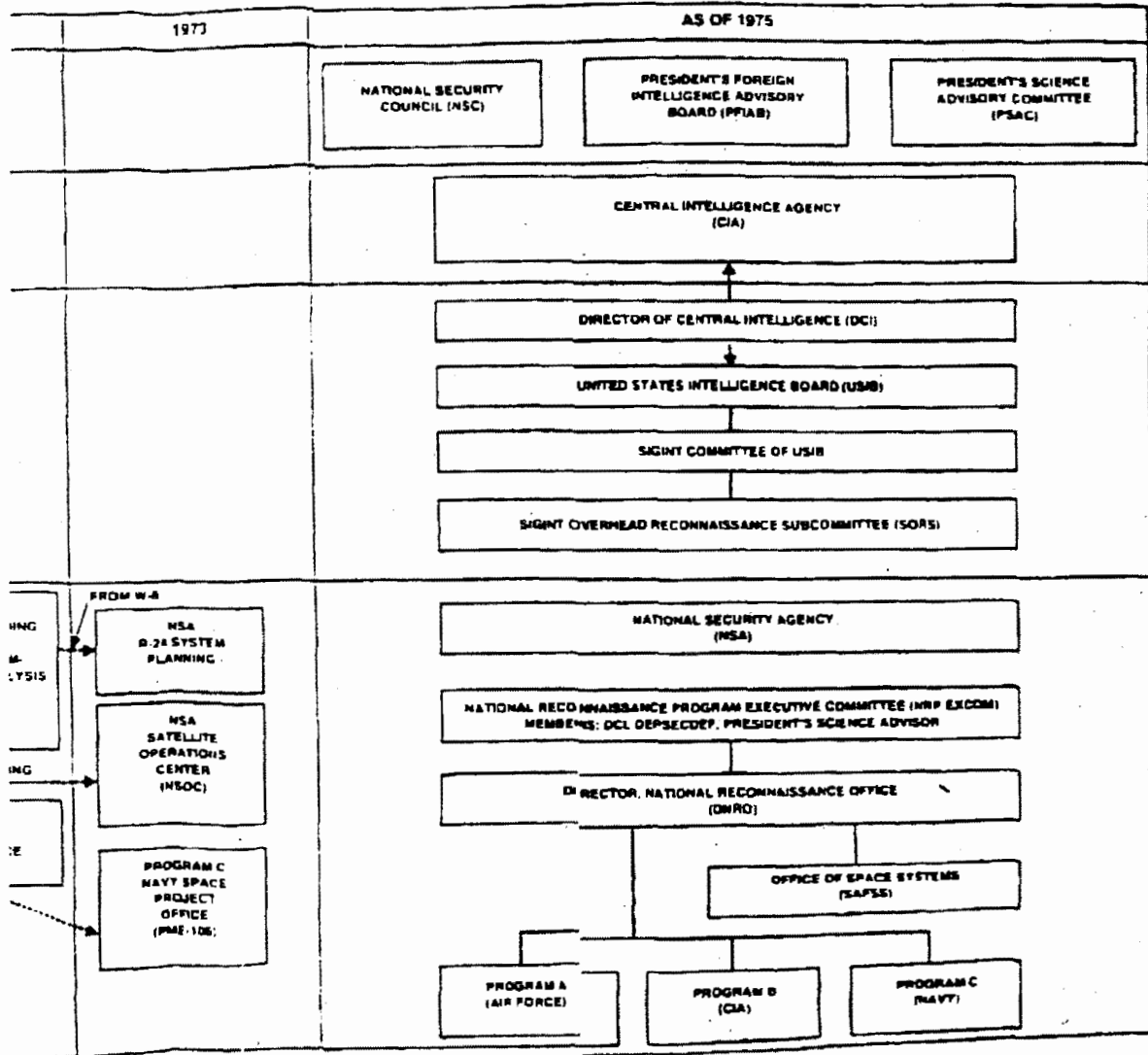






## Evolution of organizations involved in SIGINT satellite programs

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## Chapter 2 References

1. LeMay, Curtis E., with MacKinlay Kantor, *Mission with LEMAY: My Story*. Garden City, NY: Doubleday & Co., Inc., 1965, pp. 399-400.
2. Douglas Aircraft Company (Santa Monica Plant, Engineering Division), "Preliminary Design of an Experimental World-Circling Spaceship," Report No. SM-11827, 2 May 1946. Quoted in Merton E. Davies and William R. Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related US Space Technology*, Santa Monica, CA: the RAND Corporation, 1988, pp. 8 and 9.
3. Davies, Merton E. and William R. Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related US Space Technology*, Santa Monica, CA: the RAND Corporation, 1988, p. 18.
4. *Utility of a Satellite Vehicle for Reconnaissance*, The RAND Corporation, R-217, April 1951 (Group 3 review, 30 April 1971) (S/TK).
5. Letter from MGen D. N. Yates, DCS/D, USAF, to CG, ARDC, "Project FEED BACK," 22 May 1953.
6. Memo for the Record, Lt Col V. L. Genez, D/I, Deputy for Development, ARDC, "Conference with RAND Corporation re: FEED BACK Program," 13 August 1953.
7. Lipp, James E. and Robert M. Salter (editors), *Project FEED BACK Summary Report*, The RAND Corporation, R-262, Vol. I, 1 March 1954 (Group 3 review, 1 March 1974) (S/TK).
8. Davies and Harris, p. 61.
9. Davies and Harris, p. 61.
10. William O. Troetschel interview, 27 March 1991.
11. Hall, R. Cargill, *The Air Force and the National Security Space Program*, Chapter 1, p. 28.
12. William G. King interview, 17 September 1991.
13. King interview.
14. Davies, Merton E. and William R. Harris, Research Note N-1532, July 1987.
15. King interview.
16. DOD Directive 5105.15, 2/7/58.
17. MSG CITE DEF 963459 from ARPA SGD CLARK, 062217Z August 1959.
18. Martin comments, SIGINT Satellite History peer review, March 1994.
19. Martin comments, SIGINT Satellite History peer review, March 1994.
20. TRW Systems Group, *TRW Space Log*, 1970-71, 1972, p. 85.
21. Memo, BGen A. J. Goodpaster, "Memorandum of Conference with the President, May 26 1960, Others Present: Dr. Kistiakowsky, Mr. Gordon Gray, Gen. Goodpaster," 31 May 1960 (S/TK).
22. Memo from James S. Lay, Jr., Executive Secretary NSC, to Thomas S. Gates, Jr., SECDEF, "Reconnaissance Satellite Program," 1 September 1960 (S/TK).

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~~NOFORN-ORCON~~

23. SAF Order No. 116, "Director of the Samos Project Office," from Dudley C. Sharp, SAF, 31 August 1960.
24. Memo from Robert S. McNamara, Secretary of Defense, to the Secretaries of the Army, Navy, and Air Force, et al., Subject: "Assistant for Reconnaissance," with attached agreement "Management of the National Reconnaissance Program," 6 September 1961 (S/PK).
25. Charyk memo, 8 March 1963.
26. DOD Directive TS5105.23, 14 June 1962.
27. Memo for Record, Col Paul E. Worthman, 8 March 1963, with attached draft "A Summary Review of the National Reconnaissance Office," 15 February 1963, prepared for Joseph V. Charyk's report to Gilpatric and McCone.
28. Louis W. Tordella comments, SIGINT Satellite History peer review, March 1994.
29. Burns, Thomas L., United States Cryptologic History, Series V, Volume 1, *The Origins of the National Security Agency, 1940-1952*, NSA Center for Cryptologic History, 1990, and *Reference Guide to Selected Historical Documents Relative to the NSA/CSS 1931-1985*.
30. Minutes, STANCIB meetings, 20 February, 27 February, and 12 June 1946.
31. Burns.
32. *IEEE Spectrum*, February 1986, p. 8, and *Encyclopedia Americana*.
33. Burns, pp. 19, 39-41, 45, and 49-57.
34. Tordella comments, SIGINT Satellite History peer review, March 1994.
35. Tordella comments, SIGINT Satellite History Round Table, 26 May 1994.
36. Hoover Commission Report, Report on Intelligence Activities in the Federal Government, Appendix I, Part 1. "Report of Survey of the National Security Agency" from the NSA Historical Collection: Series VI.C.1.7, 25 May 1955 (TS). The report was prepared by a Task Force that included Gen Mark W. Clark, Chairman; Adm Richard L. Connolly, USN (Ret); Ernest F. Hollings, Lt. Governor of South Carolina; Henry Keanns; Edward V. Rickenbacker; Donald S. Russell; and MGen James G. Christiansen, USA (Ret), Staff Director.
37. NSA Historical Collection: Series XII, H.30. (S)
38. Killian Board Report, "The Report from the President's Board of Consultants on Foreign Intelligence Activities," 24 October 1957, from *The Killian Board for the President and the National Security Council*, NSA Cryptologic Archival Holding Area: Accession No. 7507N.
39. King interview, 17 September 1991.
40. Strong Committee Report, "Report of the USCIB ELINT Task Force," 11 June 1958, from the Strong Committee to the USCIB, NSA Q4 Office.
41. NSCID No. 5, No. 6, and No. 7, NSA Historical Collection, Series V, A.28.
42. Tordella comments, SIGINT Satellite History peer review, March 1994.
43. *USAF Space Programs 1945-1962* (S) and *NSA in Space*, April 1975, BYE-19385-75, p. 6 (TS/B/TK/C).

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44. ~~EO 13526 3.5(c)~~ "COMINT Satellites—A Space Problem" *NSA Technical Journal*, Vol. IV, No. 4, pp. 39-48, October 1959 (S).
45. NSA History Collection Series VI, C.1.32.(TS), and R. Cargill Hall, *The Air Force and the National Security Space Program 1946-1986*, draft, p.42 (TS). Kistiakowsky, p. 384; Welzenbach history; see Prados pp. 122-124.
46. NSA Historical Collection: Series V, A.28. (TS)
47. NSA Cryptologic Holding Area: Accession No. 2852. (TS)
48. *NSA in Space*, BYE-19385-75, p. 70 (TS//~~BAK/C~~).
49. Memorandum of Agreement Concerning NSA Participation in the (S) National Reconnaissance Office, 25 May 1962, signed by Louis W. Tordella, Herbert Scoville, Jr., and Joseph V. Charyk.
50. AGREEMENT BETWEEN THE SECRETARY OF DEFENSE AND THE DIRECTOR OF CENTRAL INTELLIGENCE ON MANAGEMENT OF THE NATIONAL RECONNAISSANCE PROGRAM, 13 March 1963, signed by John A. McCone, Director of Central Intelligence, and Roswell Gilpatric, Deputy Secretary of Defense. (Supersedes DOD-CIA NRO agreement, 2 May 1962.) (TS) ~~EO 13526 3.3~~



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# 3 The Navy Program (Program C)

## The DYNO Concept

The Navy SIGINT Satellite Program, conceived in early 1958 by personnel of the Naval Research Laboratory (NRL), combined the NRL's long experience in the fields of radar and electronic intercept systems with the more recent space experience gained through their development of the Vanguard Satellite Program. Thus, Navy personnel could take full advantage of a call in early 1958 from the newly formed Advanced Research Projects Agency (ARPA) for military space-related projects. The Chief of Naval Operations (CNO) relayed the query to all Navy scientific and technical organizations, asking, "All hands consider how they could use space in their design ideas for the Navy."<sup>1</sup>

This call struck a responsive note with Reid Mayo, an engineer in Howard Lorenzen's electronics group at the NRL. Mayo proposed that a crystal-video receiver, such as the ones they were installing in submarine periscopes, be mounted in a Vanguard-type satellite in orbit around the Earth. When connected to an appropriate antenna on the satellite, such a receiver could "see" (intercept) the "main beam" from radar antennas on Earth whenever the antennas were pointed at the satellite. He further reasoned that if this signal were sent from the crystal-video receiver to a transmitter on the satellite, it could be



Howard Lorenzen

returned to any ground station in view of the satellite or, in other words, to a ground station with a line-of-sight path to the satellite.<sup>2</sup>

By the late 1950s, the US intelligence services responsible for intercepting hostile (primarily Soviet) radio and radar signals had established a ground network of intercept stations ringing the Soviet Union on all sides except the Arctic north. It was possible, by locating satellite data-receiving equipment at intercept stations in countries such as EO 13526 3.3(b)(1) >25Yrs. EO 13526 1.4 to see a satellite at a 67-degree-inclined, 500-mile-altitude orbit, for many hours every day.<sup>3</sup> At the same time, the satellite could see the main beam signals from the radars in the Soviet Union. This concept of realtime "transponding" of radar signals

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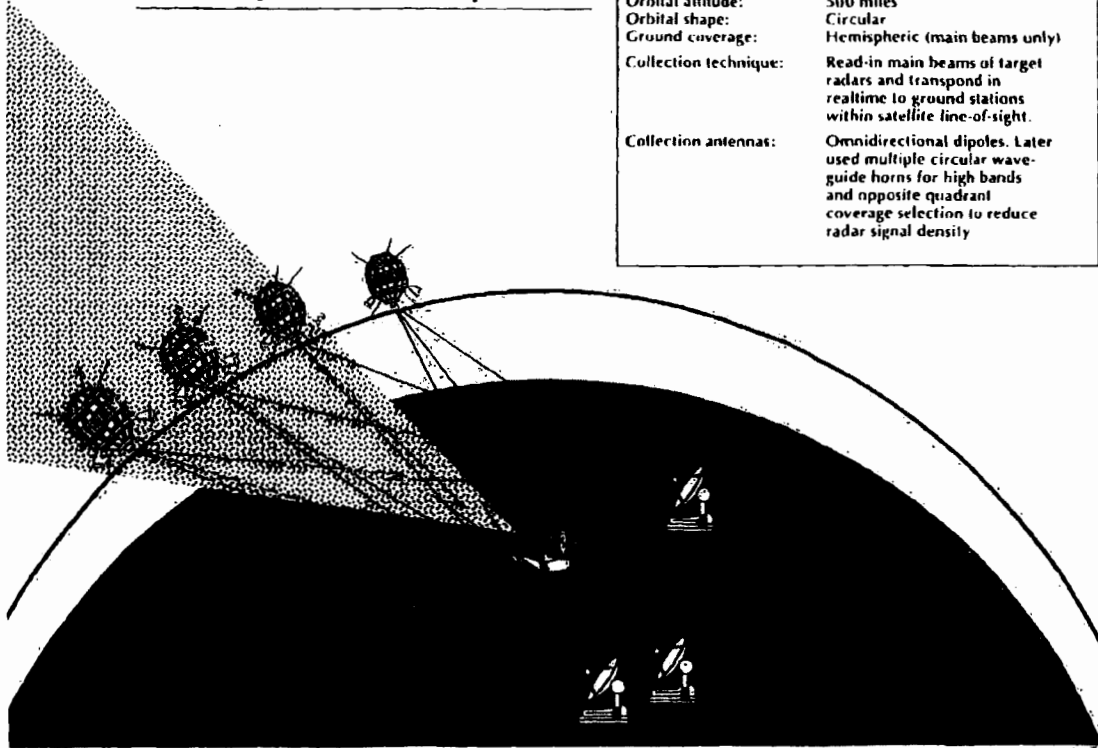
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The SIGINT Satellite Story

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### POPPY operational concept

Project POPPY	
Orbital inclination:	66° - 70°
Orbital altitude:	500 miles
Orbital shape:	Circular
Ground coverage:	Hemispheric (main beams only)
Collection technique:	Read-in main beams of target radars and transpond in realtime to ground stations within satellite line-of-sight.
Collection antennas:	Omnidirectional dipoles. Later used multiple circular waveguide horns for high bands and opposite quadrant coverage selection to reduce radar signal density



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to peripheral listening posts became the foundation of the Navy satellite program, starting with GRAB/DYNO, POPPY<sup>EO 13526</sup>  
EO 13526 3.3(b)(1)-25Yrs. EO 13526 1.4(c)-25Yrs

sensitive only to the main beam signal from each radar as the radar looked in the direction of the satellite. The time between looks would determine the rate of rotation, or "scan rate," of the radar. This adjustment



Reid Mayo



Marty Votaw

The response to the ARPA request, sent by NRL to the CNO in March 1958, featured a "transponder" designed by Mayo and his fellow engineers of Howard Lorenzen's electronics group. The transponder was mounted in a spherical satellite, 20 inches in diameter, designed by engineers of the Vanguard Program Office under the leadership of Marty Votaw. The receiver section of the transponder, the ELINT system, utilized six monopole antennas deployed around the surface of the sphere in such a way as to provide omnidirectional coverage of all radar beams impinging on the satellite. Each of these antennas was connected to a single crystal-video receiver consisting of a filter to determine the frequency coverage and a detector and amplifier with adjustable sensitivity. The receiver system was adjusted to assure that it was

also provided a "threshold" to mask out lower power signals that could cause interference to the desired main beam intercepts. Since the satellite was not stabilized in any plane, great care was taken to assure that regardless of the direction of arrival, all pulses would be received with the same amplification. At the output of the receiver, each pulse was "stretched" to a length of 450 microseconds, permitting it to be transmitted to the ground stations by a narrow-bandwidth transmitter connected to an omnidirectional turnstile antenna. In that way, any ground station in line of sight could receive the signals, but they were almost impossible to detect by an adversary if the satellite downlink frequency was not known with great accuracy. This technique provided a great deal of security from Soviet intercept (but not as great as standard encryption could).<sup>4</sup>

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In addition to the transponder, the satellite contained a power system consisting of a storage battery plus six 9-inch-diameter round patches of 156 solar cells located symmetrically on the surface of the sphere, so that one watt of power would be available for any orientation of the satellite. A telemetry system provided engineering data on the status of the satellite as well as the state of commanding of the transponder. The command system consisted of a receiver and decoder that translated tones transmitted from the ground command station into relay closures, controlling such functions as "data link on/off" and "timer start" to turn on the transponder. The command system shared the turnstile antenna with the data link transmitters and could receive commands whenever it was in view of a ground station having a command transmitter.<sup>5</sup>

The Naval Research Laboratory (NRL) proposed to place this satellite in a 67-degree-inclined, circular orbit, at an altitude of 500 miles, as an added payload along with the much larger TRANSIT IIA navigation satellite. According to the plan, it would be launched from the Cape Canaveral Air Force Station in Florida. Ground stations to receive the data transmitted from the satellite were to be located at **Intelligence Community intercept sites**

in **EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs**

**EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)** The

ELINT mission was very straightforward: to intercept and identify known types of radars in the Soviet Union and to discover and describe new types of radars not previously intercepted by peripheral ground, sea, and airborne means. A further ELINT goal was to locate these radars as accurately as possible.

To utilize the facilities of the existing ground intercept sites, maintain security, and minimize interference with ongoing activities, the DYN0 ground stations were installed in self-contained transportable shelters known as Earth satellite vehicle (ESV) huts. These were lightweight, aluminum structures designed for worldwide service conditions. All equipment was installed at NRL and the huts were shipped as essentially standalone facilities, transportable by helicopter, aircraft, truck, rail, or ship. Once at the sites they were mounted on concrete pedestals, pavement, or on elevated platforms equipped with carport-type canopy roofs. All that was required was electrical power and they were ready to go! Multielement Yagi antennas (similar to those used for commercial television reception) were installed on the roof of each hut and were rotated manually from inside the hut to point in the direction of the satellite. Standard military vacuum-tube radio receivers (R-390/URR) with crystal-controlled converters were used to tune in both the radar signals transponded from the satellite and the telemetry signals containing the satellite's status. A two-track magnetic-tape recorder was provided for recording the intercept data. One track contained the radar signals, and the other track contained both the operator's comments prior to turn on of the intercept receiver and a digital representation of time during the intercept period. A chart recorder was installed to indicate the strength of the signal from the satellite as well as the state of the equipment on the satellite. A 250-watt transmitter provided the ability to send commands, in the form of audio tones, to the satellite via a second Yagi antenna mounted on the ESV mast along

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with the receiving antenna. The plan was to deploy these transportable ground stations to ground sites operated by the Naval Security Group (NSG), headquartered in Washington, DC. <sup>6</sup>

According to the NRL plan, these **ESV sites would be manned and operated by NSG while the funding for operation would be provided as part of the Consolidated Cryptologic Program through NSA.** In order to obtain adequate coverage of the Soviet Union it was also proposed to locate some of the huts at **stations manned by the Army, Air Force** <sup>EO 13526 1.4</sup> Furthermore, the data, collected on magnetic tape, would be forwarded through the Armed Forces Courier Service to the National Technical Processing Center (NTPC) at Headquarters, NSG. This center was shortly to be relocated and integrated into NSA in accordance with National Security Council Directive No. 6 (NSCID-6) dated 15 September 1958, which assigned responsibility for national ELINT data processing to NSA. In 1959, NTPC was moved to the NSA operations building at Fort Meade, Maryland, where it became part of the fledgling ELINT organization with the office symbol COSA-5. Here the data would be interpreted and distributed to intelligence users as required.

On 29 July 1958 the National Aeronautical and Space Act became law, and on 10 October 1958 the National Aeronautics and Space Administration (NASA) commenced operation, charged with responsibility for all of the national non-military space programs. Vanguard fit this category and was officially assigned to NASA early in 1960. The DYN0

program was directly impacted by the departure from NRL of Marty Votaw and other spacecraft designers along with the Vanguard program. Most importantly for this story, the Navy, though it retained responsibility for the TRANSIT and DYN0 military programs through the Applied Physics Laboratory (APL) at Johns Hopkins University, Baltimore, Maryland, now found it necessary to find a military booster. The Thor missile, with a second stage added in a configuration called Thor/Able-Star, was the booster selected. This combination could launch the DYN0 satellite as a piggyback payload on the much larger TRANSIT satellite. Ed Dix of NRL took over design of the DYN0 satellite and coordinated the launch efforts at Cape Canaveral.

Howard Lorenzen, along with Jim Trexler of NRL, worked on this new plan and coordinated with other organizations to provide for interagency participation, the use of SIGINT stations for data collection, and forwarding of the data to NSA for processing and product dissemination. With Lorenzen's and Trexler's support, the Office of the Director of Naval Intelligence (DNI) undertook the task of obtaining program approval through DOD, ARPA, and the Executive branch of the government.

### GRAB/DYN0-1 Development

Radm Allan Reed of the Office of Naval Intelligence (ONI) shepherded the NRL DYN0 proposal through the Navy, ARPA, DOD elements, and the Executive branch to obtain final approval by President Eisenhower in August 1959.

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The DYN0 program was to be conducted at the DOD SECRET security level under the code name TATTLETALE.<sup>7</sup>

The DNI, who was designated as the DYN0 program manager in August 1959, formed a Technical Operating Group (TOG) to function as the steering committee. The TOG consisted of representatives from NRL, NSG, NSA, and the ONI Scientific and Technical Intelligence Center (STIC) at Suitland, Maryland. The NRL member of TOG was designated as the project manager/technical representative. NRL was responsible for the overall system concept as well as satellite and ground station development and support; in addition, NRL provided engineering and technical direction through the operational exploitation phase, training of mission ground station personnel, and launch/on-orbit monitoring of spacecraft status and data quality.

The NSG member was designated the project operational representative. NSG was responsible for directing and coordinating all mission ground station operations (including commanding the satellite operations); it acted as the focal point for all electrical communications associated with the operations of the project; and it provided sites, support facilities, and operating and maintenance personnel at the NSG mission ground stations.

The NSA member of the TOG was designated the advisor to the staff. NSA authorized the allocation of service cryptologic personnel to man and operate the mission ground stations; it also processed all intercept data and disseminated the

ELINT product to the Intelligence Community. With this responsibility, NSA also interpreted national intelligence collection and processing requirements, made recommendations for commanding satellite collection periods (tasking), and furnished the magnetic tapes for recording data at the mission ground stations.

The STIC member provided intelligence requirements to the director, provided signal analysis support to NSA, monitored the signal analysis program, and disseminated quality control technical data to the mission ground stations.<sup>8</sup>



William E. W. Howe

The TOG initially met at NSG Headquarters at the Naval Security Station in Washington, DC. Early members of the group were Navy Capt Fred Weldon of OP-94, representing the DNI; William E. W. Howe, a senior analyst from STIC; EO 13526 3.5(c) Chief of COSA-5 (ELINT Processing Organization), NSA; Howard Lorenzen, DYN0 Program Director at NRL; and Cmdr Frank R. Sperberg, representing NSG.

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DYNO-1 was designed to receive in the radio frequency range of [EO 13526 3.3(b)(1)] MHz. This was the most densely populated range of frequencies and covered a variety of radar types, including derivatives of many widely used US, West European, and Soviet World War II "S-band" early warning and search radars. In the more recent JAN Electronic Warfare Frequency Channel Designators, these radars are designated "E-band." Since no formal national requirements for satellite ELINT collection had yet been established, it was up to the TOG to determine the collection requirements for this first satellite ELINT mission. Intelligence Community representatives felt that intercepts from this frequency range, which contained many descendants of World War II prototypes, would yield a very productive harvest of significant radar information. The success of DYNO-1 proved this to be a very accurate prediction.

The initial mission ground stations for DYNO were located at [EO 13526 3.3(b)(1)>25  
EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)>25Yrs]

[EO 13526 3.3(b)] All the stations had the ability to collect data, but only [EO 13526 3.3(b)(1)] could transmit commands to direct the satellite when to turn on and off. Whenever the collection system was turned on, all the sites within range could receive the data. NRL also maintained an engineering

data readout and interrogation site at Hybla Valley, Virginia, [EO 13526 3.3(b)(1)>25Yrs]  
[EO 13526 3.3(b)(1)>25Yrs]

Unfortunately, the DOD SECRET security system did not provide adequate security protection for the TATTLETALE program, and shortly after program approval in August 1959, *The New York Times* printed a complete program description. Given President Eisenhower's intention of achieving "Open Skies" through a national policy stressing peaceful uses of space, it was necessary to cancel the program at the DOD SECRET level to avoid any further disclosures that could lead to unwanted international repercussions. To ensure no further disclosures of this kind, the program was reclassified as TOP SECRET, and security control was to be exercised by the ONI under the WALNUT security system. Access required the approval of ONI, ARPA, or the Office of the Special Assistant to the Secretary of Defense for Special Operations and was limited to individuals with a strict need-to-know. Those individuals granted access were required to execute a project secrecy agreement.<sup>10</sup>

Additional security was provided by adding an NRL scientific experiment as a cover. The experiment was designed by Marty Votaw to telemeter measurements of solar activity in X-ray, Lyman-Alpha, and ultraviolet radiation above the Earth's atmosphere. This cover experiment became the first of a series of SOLRAD satellite experiments designed and exploited by the NRL. The cover name GRAB (galactic radiation and background) was used for the combined DYNO intelligence mission

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THE SICINT SATELLITE STORY

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and SOLRAD scientific mission. In the classified world the first satellite became known as GRAB/DYNO-1, but in the unclassified world it was simply GRAB-1.<sup>11</sup>

### GRAB/DYNO Program Launches

On 22 June 1960 the first US SIGINT satellite, GRAB/DYNO-1, was launched from Cape Canaveral, Florida, by an Air Force Ballistic Missile Division (AFBMD, at El Segundo, California) team headed by Maj James S. "Jay" Smith with Maj David D. Bradburn as guidance officer. The Air Force team was supported by a Space Technology Laboratories (STL) launch vehicle integration team headed by Adolf K. "Dolf" Thiel. The GRAB/DYNO-1 spacecraft, a piggyback payload attached to TRANSIT IIA and the whole mounted on a Thor/Able-Star booster, attained a 330-by-565-mile orbit, inclined at 66.7 degrees to the equator, with an orbital period of 101.6 minutes. Although DYNO did not separate from the TRANSIT IIA, this caused no problems since the two satellites had no common command or data links.<sup>12</sup>

Following the shutdown of F. Gary Powers' U-2 on 1 May 1960, President Eisenhower directed that no reconnaissance overflight of the Soviet Union could collect intelligence information without his specific permission. Because of this strict limitation, at the President's direction, the DYNO payload could be turned on for only EO 13526 3.3(b)(1) periods during the EO 13526 lifetime of the satellite. On 4 July 1960, exactly four years after the first U-2 mission, the payload was turned on and the

ELINT capability of GRAB/DYNO-1 was checked out at Wahiawa, Hawaii, well out of Soviet ground station range.<sup>13</sup>



Adolf K. Thiel (center) and Capt David D. Bradburn (right) pictured with Werner Von Braun and model of Thor/Able launch vehicle, Inglewood, California, 1958

Despite the limited tasking, the collection technology of the satellite and the functions of the mission ground stations were clearly demonstrated. Processing and analysis of data received from the first DYNO SIGINT satellite system, and the following POPPY satellites, was an interesting and challenging adventure. In the beginning, the best "all source" estimates of the signal environment and the volumes of data available for analysis were far short of reality. The real magnitude and complexity of the processing and analysis job was not understood until the first satellite was on-orbit, collecting data. Each successive satellite had new and/or expanded capabilities and presented new challenges. For the first few years, the development of the processing systems ran behind the power curve. Frequently, processing was planned and developed based

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on poor estimates of expected data. Processing systems then had to be modified, or sometimes actually invented, to handle the data collected by satellites already on-orbit. Fortunately, the early satellite collection systems were fairly simple and had short operational lives. This allowed for an evolutionary development of ground processing and analysis systems and for feedback to the design of the satellite collection system, which did result in later successful total collection/processing systems.

Processing consisted of manual analog data analysis performed at NSA by the personnel of the former NTPC, which was now COSA-5, the ELINT processing group at NSA, Fort Meade, Maryland. EO 13526 3.5(c) was in charge of ELINT processing at NSA and directed the DYN0 processing effort. Technical advice and recommendations were provided by Bill Howe. STIC EO 13526 3.5(c) supervised the manual analog analysis effort with major assistance from EO 13526 3.5(c) and EO 13526 3.5(c) both of whom supervised a number of military and civilian analysts. This group provided technical feedback to the mission ground stations to assist them in evaluating their operation. This manual data analysis allowed the determination of radar characteristics of pulse repetition frequency, scan rate, and radio frequency band. A very rough approximation of location could be determined by comparing the first and last time the radar was intercepted at different ground stations and noting signal up and down times.<sup>14</sup>

Soviet early warning radars were found to be numerous and extremely powerful. Signal density was more than four times greater than anticipated. This highlighted the need for some form of automated data processing. Howard Lorenzen, NRL DYN0 Program Director, knew that computer processing could be used very effectively for this type of data, and early in 1961 he approached Louis W. Tordella, the Deputy Director of NSA, for assistance in developing such a capability.

Tordella asked EO 13526 3.5(c) and EO 13526 3.5(c) both of whom had been involved in development of missile and space processing, to join them to discuss the problem. Earlier, in April 1960, EO 13526 3.5(c) had published a technical article, "Determination of Missile and Earth Satellite Trajectories from Radar Observations." This article was an unclassified mathematical treatment of the determination of orbital plane and the least squares estimate of position, subvehicle point, and predictions, including perturbations due to Earth oblateness.<sup>15</sup> Lorenzen showed the assembled group a roll of visacorder paper, a tracing showing a longitudinal analog presentation of a few minutes of GRAB/DYN0 collected data. EO 13526 3.5(c) were given the job of automating this data reduction and processing.<sup>16</sup> NRL developed the original analog-to-digital converter to convert the analog signal into digital format for input to the NSA BOGART computer.\*

\* BOGART was a special-purpose computer designed by NSA and built by Engineering Research Associates (ERA), later UNIVAC, in St. Paul, Minnesota, for efficient data conversion and formatting. It was a 24-bit machine using diode/magnetic-core logic, with memory-cycle time of 20 microseconds and IBM 727 magnetic tape for storage and input. BOGART led to the design of UNIVAC and Control Data Corporation's (CDC) commercial computers.

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DYNO-1, operating on frequencies  
between ~~EO 13526 3.3(b)(1)>25Yrs. EO~~ intercepted  
~~EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)~~



~~EO 13526 1.4(c)-25Yrs. EO 13526 3~~ Only a few unidentified radar types were intercepted, which indicated the accuracy of US intelligence regarding high-power Soviet emitters. Altogether, 612 emitters were identified, 42 of which were located approximately and correlated to known installations.<sup>17</sup>

On 30 November 1960 the second GRAB/DYNO was launched using essentially the same configuration as GRAB/DYNO-1. Unfortunately, the Thor booster burned out 12 seconds early and was destroyed by the range safety officer. Fragments landed in Cuba and killed a cow in a farmer's field.<sup>18</sup> This incident was memorialized as, "The herd shot round the world" (a takeoff on Ralph Waldo Emerson's heroic line, "... and fired the shot heard round the world"). The incident resulted in the prohibition of any future launch trajectories that passed over the land mass of Cuba, thereby causing subsequent launches to include a dogleg in the launch sequence in order to obtain the desired 67-degree orbital inclination.

Since this required more booster energy, it resulted in a reduced payload weight capacity.\*

The third launch, designated GRAB/DYNO-2, occurred 29 June 1961. It consisted of GRAB/DYNO-2 from NRL, and INJUN, sponsored by Dr. James Van Allen of the State University of Iowa. The two smaller satellites were connected together and mounted on top of the larger TRANSIT IIIB satellite. It was launched by a Thor/Able-Star booster from Cape Canaveral. An orbit 475 by 540 miles was achieved, inclined 66.8 degrees with a period of 103.8 minutes. Separation from the TRANSIT IIIB occurred, but the INJUN and GRAB/DYNO-2 failed to separate from each other. Because the two satellites shared common up- and down-link radio frequencies, it was necessary to operate the two satellites on alternate days, thereby cutting the collection time in half.<sup>19</sup>

In 1961, because of the apparent worldwide acceptance of overflight by peaceful satellites, the requirement for Presidential approval of each reconnaissance collection period (read-in) had been lifted.<sup>7</sup> However, operating at ~~EO 13526 3.3(b)~~

- \* The possibility of any accident involving Cuba was given an "extreme" review before the launch. Only when "somewhat simplified and somewhat biased analyses" showed an extremely low probability was the flight authorized. Fortunately, the consequences were not major. See Joseph V. Charyk's comments, SIGINT Satellite History Round Table, 26 May 1994.
- † The decision for special security for satellite programs was in part to avoid international reactions to what some would claim were "non-peaceful applications." It was believed the Soviets understood and supported the concept since otherwise they would be forced politically to protest. It would clearly add problems to their own efforts to develop such capabilities. Special security helped both efforts. To President Eisenhower, the results of the F. Gary Powers shootdown and the impact on the summit meeting in Paris were especially sensitive. See Joseph V. Charyk's comments, SIGINT Satellite History Round Table, 26 May 1994.

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EO 13526 3.3(b)(1)>25Yrs, E GRAB/DYNO-2 collected very little useful data. The alternate-day tasking accounted for this in part, and the choice of the intercept radio-frequency bands accounted for the balance.<sup>20</sup> Since the launch of DYNO-1, a national requirement for satellite SIGINT collection had been published by the US Intelligence Board (USIB-D-33.6/8, dated 5 July 1960). To satisfy this requirement to search for new and unusual signals, particularly those associated with the ABM network, the radio frequency bands

EO 13526 3.3(b)(1)>25 were selected by the Technical Operating Group (TOG) for GRAB/DYNO-2 collection. To identify the frequency band of the intercepted signals, a different-length stretched pulsewidth was used on the down-link transmissions for each band. On subsequent launches, when more than two bands were intercepted, a separate pulsewidth would be assigned to each band. The satellite continued to operate until EO 13526 3.3(b)(1) although the lower band gradually lost sensitivity as the mission progressed.

Although DYNO-2 ELINT collection results were sparse compared with DYNO-1, the gradual loss of sensitivity in the lower band demonstrated the extremely high power radiated by the EO 13526 3.3(b)(1)>25 early warning radar, which was the only signal that could be received near the end of the mission. Earlier, in the low band, a signal called EO 13526 (US ELINT designator) was intercepted and classified as the first Soviet ABM-type radar. Also intercepted were the EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c) EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

Magnetic tapes with data from this flight were sent to NSA where, in addition to analog analysis, a new analog-to-digital converter called AUDICO, capable of digitizing data with a time interval accuracy of 67 microseconds for each count or machine unit, was used to prepare the data for computer processing. These out-

EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

AUDICO runs. Short-term tape-speed variations were a problem. Comparisons with analog analysis did not produce very satisfactory results.<sup>22</sup> Quality-control efforts instituted in the conversion process and at the collection sites helped improve this situation. Deinterleaving and scan-sort techniques and programs were continually improved over the years and were

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applied to processing all ELINT data collected by POPPY and all other SIGINT satellite systems.

Early attempts to identify radar locations from the GRAB single-satellite system were very crude. [redacted] EO 13526 1.4(c)<25Yrs, EO

EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

[redacted] EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c) did not produce very accurate or useful locations.

Because of political pressures within the Intelligence Community and lack of confidence within NSA, the US Air Force Strategic Air Command's 544th Reconnaissance Technical Group (RTG) was provided copies of the GRAB/DYNO-1 tapes, thus duplicating processing as a backup.<sup>23</sup> SAC processing at this time was primarily visual analysis of the filmed version of the stream of intercept pulses. Late in 1961

[redacted] EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

During this same period NSA developed a [redacted] location system called [redacted] EO 13526 3.3(b)(1) Radars with stable rotation rates lent themselves to this technique of analyzing their rotation rate doppler. With this technique a location was iteratively determined that yielded the best fit to the observed sequence of scan periods by the method of least squares. But the [redacted] EO 13526 3.3(b)(1) system also produced unreliable results with large uncertainty in the radar location.

The satellite ground stations were improved along with the satellites on-orbit. The first change was transfer of the [redacted] EO 13526 3.3(b)(1)> ground station in the

[redacted] EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.5(c)

[redacted] EO 13526 3.3(b)(1)>25

The fourth launch occurred from Cape Canaveral on 24 January 1962 using a Thor/Able-Star booster, and it was intended to launch five satellites into orbit using a single booster. The launch was unsuccessful when the guidance system on the Able-Star upper stage failed.<sup>26</sup> When the National Reconnaissance Program (NRP) was formed on 16 September 1961, the Navy ELINT program was made part of the NRP and redesignated as the POPPY project. Thus, the launch was assigned the name POPPY-1.

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The fifth launch, POPPY-2, on 26 April 1962 was from Vandenberg AFB in California and used a Scout vehicle as a booster. These changes were made to avoid the launch sequence dogleg necessary at Cape Canaveral and to provide a dedicated launch vehicle for the DYNOSAT satellite. In this way, the near-polar orbit most suitable for reconnaissance could be selected. This launch, too, was a failure, because of a procedural oversight, the Scout fourth stage contained no attitude control gas, and the entire system plunged into the Pacific Ocean within sight of the launch pad.<sup>27</sup>

### The POPPY Project

On 23 July 1962 the Director of the NRO (DNRO), Joseph V. Charyk, formally established NRO Program C as an organizational component to continue operation and management of the POPPY ELINT satellites. The Director of Naval Intelligence was designated to continue as Director, Program C, and funding formerly provided by ARPA and the Navy was transferred to the National Reconnaissance Program (NRP) as of fiscal year 1963. The Navy Bureau of Weapons (BUWEPS) provided a fiscal representative to the Technical Operating Group (TOG) who was responsible for preparing the annual budget, disbursing funds to the NRL, and submitting records of expenditures to the Director, Program C. NSA continued funding, through the Consolidated Cryptologic Program (CCP), for manning and support of mission ground stations, magnetic-tape costs, and NSA processing and analysis. The Air Force's Program A was assigned

the responsibility for launching Program C satellites and for launch vehicle/satellite integration.<sup>28</sup>



Capt Frank R. Sperberg, USN

In 1962 the President's Foreign Intelligence Advisory Board (PFIB) concurred in DNRO Charyk's recommendation that "... all satellite projects of the NRP should be handled in the same manner by a single operations unit of the NRO staff."<sup>29</sup> The Satellite Operations Center (SOC), in room BD944 of the Pentagon, commenced operations in April 1962, primarily to direct operations of the photographic satellites of Programs A and B. To assure coordination of NSG tasking of the POPPY satellites with US Intelligence Board (USIB) requirements, the Director of Program C transferred Cmdr (later Capt) Frank Sperberg, USN, from the NSG Operations Center to the NRO offices in the Pentagon to work with the SOC personnel. Sperberg's primary responsibility was to assure that commanding of the POPPY system was responsive to requirements as initially stated by both the USIB's Overhead

Reconnaissance (COMOR) and SIGINT Committees. USIB direction was further clarified in the spring of 1963 when the SIGINT Overhead Reconnaissance Subcommittee (SORS) of the COMOR was formed to consolidate the responsibility for all satellite SIGINT requirements. The Operations Center for translating the SOC interpretation of these instructions into actual commands to the POPPY network remained at NSG Headquarters.<sup>30</sup>

By December 1962 the BYEMAN security system was completed for Program C, whose ELINT satellites were designated as the POPPY series. The BYEMAN <sup>EO 13526</sup> compartment, formed by combining the codename from <sup>EO 13526 3.3(b)</sup> with the Program C codename POPPY, superseded the earlier WALNUT security system.<sup>31</sup> The final intelligence product, as delivered by NSA to users, would be handled under the TALENT-KEYHOLE system, which had been initially instituted for photo results. The primary reason for this arrangement was to make it possible to deliver the data to cleared personnel of the Intelligence Community, while avoiding the necessity of providing them access to BYEMAN information about satellites and collection operations.

With the arrival of the BYEMAN system, mission numbers in the <sup>EO 13526</sup> series were assigned to POPPY launches. A switch from the Scout to the Thor/Agena booster, launched from Vandenberg AFB on the West Coast, permitted multiple POPPY satellite launches with much greater weight capability. Additionally, no over payloads were required since there

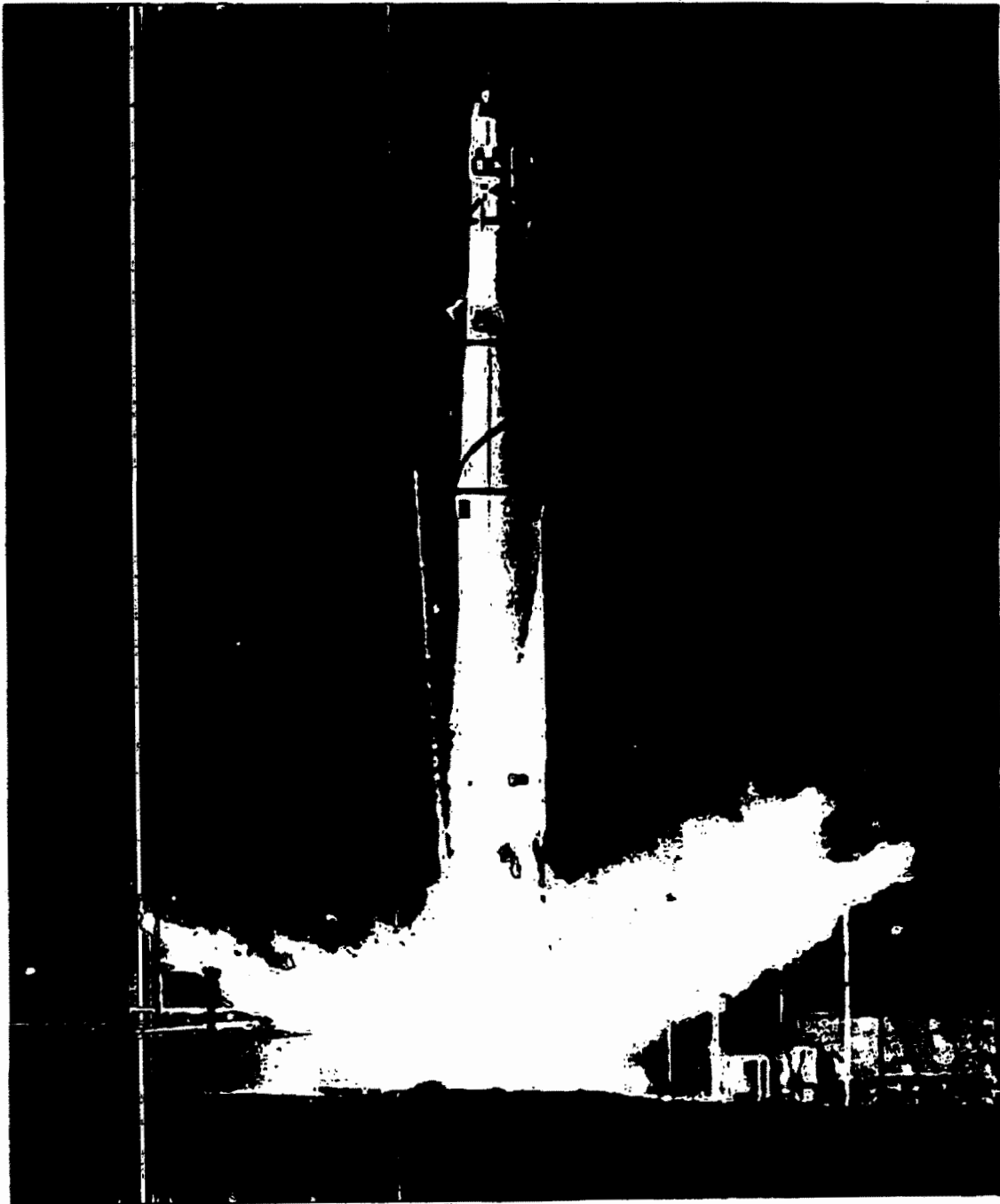
were frequent military Thor/Agena launches from Vandenberg that were not announced in the press except as classified launches about which no details could be revealed.

The initial Program C launch, <sup>EO 13526 3.3</sup> on 13 December 1962, was the first POPPY launch using a Thor/Agena booster from Vandenberg AFB. The Agena vehicle failed to cut-off at the end of first burn, producing a very eccentric orbit of 124 by 1,500 miles at 70.3 degrees inclination. This made reception of data at the ground sites difficult, but it did produce a satellite lifetime of over <sup>EO 13526 3.3(b)</sup>. The objective of the mission was to search parts of the radio frequency (RF) band between <sup>EO 13526 3.3(b)(1)>25Yrs</sup> for new radars and RF bands in use by the <sup>EO 13526</sup> Soviet Bloc.

This Thor/Agena launched another Van Allen INJUN payload and two other scientific satellites along with the two satellites of <sup>EO 13526 3.3(b)(1)</sup>. The POPPY satellites were somewhat larger than DYN0 due to the addition of a four-inch-diameter "belly band" to accommodate additional capabilities, which made the spherical satellites slightly thicker in the middle. <sup>EO 13526 3.3(b)(1)>25Yrs</sup>

<sup>EO 13526 3.3(b)(1)>25Yrs</sup>

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First POPPY/Thor/Agena launch, Vandenberg Air Force Base, 13 December 1962

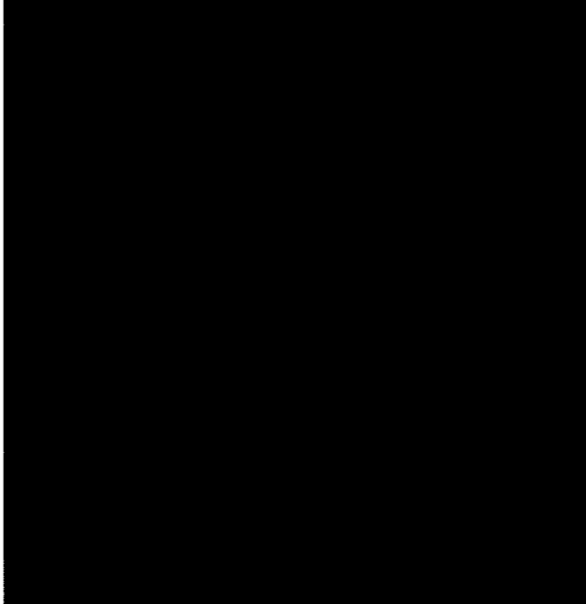
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EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, FO 13526

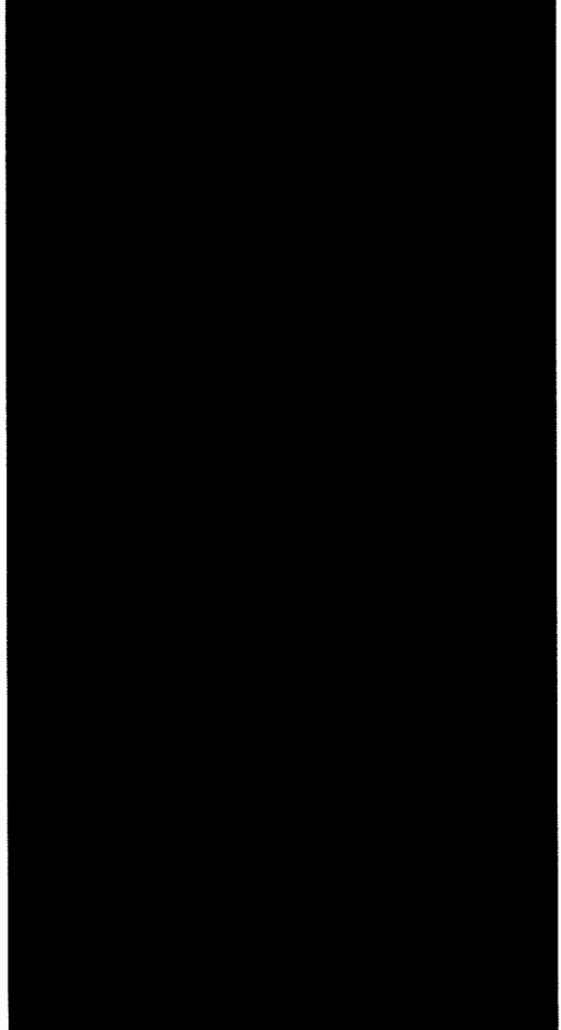


EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 135



**Following up on this suggestion.**

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 135



gested when the President's Scientific Advisory Committee (PSAC) initiated a special study in 1963 to stimulate new ideas in emitter location finding. Richard Garwin of IBM, representing the PSAC, chaired a series of meetings at NSA with personnel from SAC and NSA who had been working on techniques to produce emitter locations from POPPY data. These discussions were very open. Many hours were spent at the computer, with lots of explanations, lots of "what ifs," and lots of worry about what had been overlooked.

Following the launch of POPPY 1, and as a result of the 1963 meetings with Garwin.



*Dr. M. M.*

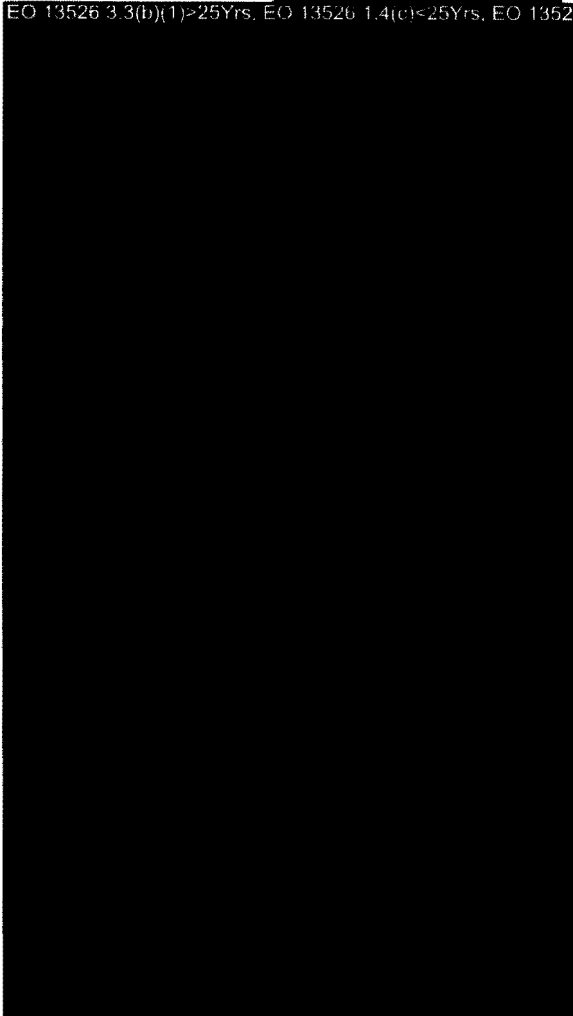
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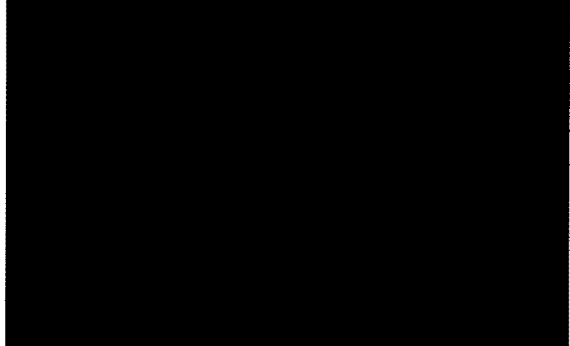
EO 13526 3.3(b)(1)>2 and then recording them on separate tracks of a GR-2500 instrumentation magnetic-tape recorder. These recorders had been installed in late 1961 as upgrades to the mission ground stations. The analog tapes were later digitized by AUDICO at NSA using the stable reference tone recorded on the tapes at the time of collection to control the digitizer clock. The digitized data were processed on an IBM 7094 computer to deinterleave the signals and form

EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1352

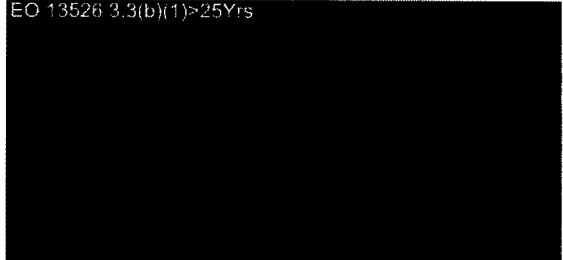


EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1352



Early attempts involved considerable manual effort using electromechanical Frieden desk calculators to associate

EO 13526 3.3(b)(1)>25Yrs



be a major problem. In the early 1960s, orbit determination programs were very elementary. Vanguard I was placed in a highly eccentric orbit on 17 March 1958 and transmitted its signal for over six years. This stable orbit with constant transmission from the satellite permitted the first long-term observation of orbital dynamics. This resulted in a series of sophisticated modeling efforts of the oblate Earth's gravity field, which were important for predicting satellite positions versus time. This early work in orbital dynamics was essential to the development of accurate emitter locations.

Papers appeared in many publications in the open literature providing new gravitational constants, new closed-form solutions, new estimates of the size and



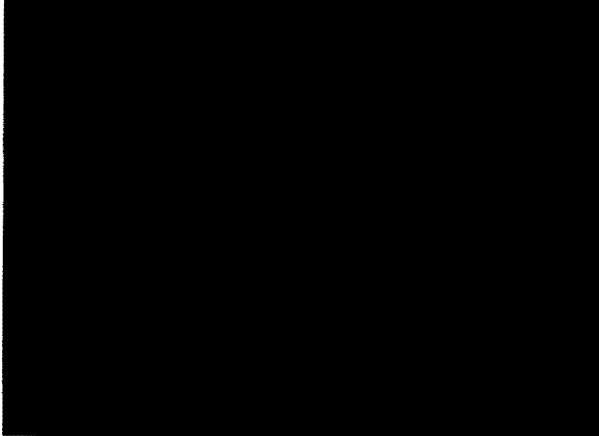
shape of the Earth, and many ideas on how atmospheric drag would affect the orbits. Among the early important contributors was <sup>EO 13526 3.5(c)</sup> of NSA, who published an article, "Maximum Likelihood Estimation of an Orbit," in 1961.<sup>34</sup> Orbital elements were available from the Navy Space Surveillance Center (NAVSPASUR), established at Dahlgren, Virginia, on 9 April 1960 to operate NRL's space surveillance system. North American Air Defense Command (NORAD) also produced orbital elements. NSA attempted to use the NORAD data, but at that time the data were frequently incomplete, not timely, or, in some cases, inaccurate. At first, none of the calculated orbital elements were consistent.

To help solve the problem, <sup>EO 13526</sup> and a group of mathematicians from NSA visited Hunt Small at Lockheed Missile and Space Company (LMSC) and met with John V. Breakwell at Stanford University. As a result of these discussions, NSA arranged for NAVSPASUR to provide magnetic tapes containing the satellite location and velocity vectors on a regular-time grid. NAVSPASUR was able to provide accurate orbital data, greatly aiding NSA. NSA also prepared the predictions for the POPPY orbits that the Naval Security Group (NSG) sent to the sites to guide the antenna steering.<sup>35</sup>

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO



EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3



<sup>EO 13526 3.3(b)(1)</sup> was very similar to <sup>EO 13526</sup> but consisted of three satellites and <sup>EO 13526</sup> <sup>EO 13526 3.3(b)</sup> The mission covered in large part RF bands not covered by <sup>EO 13526</sup> continuing the mission of discovering new radars and frequency band usage. The launch occurred on 15 June 1963 from Vandenberg AFB. This time, the Agena cut-off properly after the first burn but failed to circularize the orbit by means of a second burn. The resulting orbit was 95 by 495 miles, at an inclination of 69.9 degrees. The low perigee severely limited the orbital lifetime and the satellites reentered the atmosphere after <sup>EO 13526</sup> <sup>EO 13526</sup> As a consequence, very few data were collected.<sup>37</sup>

In the meantime, ground station upgrades continued, and in 1963, various site facilities were equipped to do field screening and analysis. The POPPY collection positions in the portable aluminum shelter huts had a playback capability but limited analysis equipment. However, by 1963, all of the original magnetic-tape recorders had been replaced by instrumentation-type machines with seven tracks using 1/2-inch magnetic tape.

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EO 1.4.  
PL 86-36/50 USC 3605

Solid-state digital-time generators also were added. EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

led to advancements in the technical analysis of the analog data. As successive satellites were equipped with more RF bands and data links, analysts noted the

EO 13526 1.4(c)<25Yrs EO 13526 3.5(c)

The new collection tape recorders at the POPPY ground stations enabled the NSA playback recorder to use a frequency synthesizer to play the tapes at the same speed with which they were recorded by the field station during collection by using the 50-kHz reference signal. Other equipment could be used to record and repeatedly cycle through a short segment of data, to stop the recorder and display the pulses on the scope, or to print a chart of pulse amplitude versus time. This equipment aided in the

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs In April 1963 NSG operators began searching for and reporting new or unusual signals detected from analog analysis.<sup>38</sup>

A Memorandum of Understanding governing Navy processing and analysis of POPPY data was signed by ONI and NSA in July 1963. NSA provided planning support and furnished tapes to the Naval Scientific and Technical Intelligence

Center (STIC) for processing and technical analysis. NSA also provided support and guidance.<sup>39</sup>

Some of the POPPY sites also had been equipped with an operator position dedicated to checking the quality of the data. These positions were installed in permanent buildings where proper security could be maintained for the SIGINT data. These quality-control positions were used by collection operators for post-pass playback of recordings to verify verbal annotations, the presence of data, and correspondence with collection logs. With the aid of training tapes sent by NSA, collection operators were trained to listen for and recognize signals with the desired characteristics. Collection operators noted in their logs occurrences of

EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

After a collection pass, analog analysts at the ground stations played back the tapes at their analysis and quality-control positions and performed audio and visual scans of each of the recorded data links. Parameters of these signals of interest and unidentified signals were measured and tabulated. Additional collection time was provided by the installation of an interrogation capability a

EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.3(b)(1)>25Yrs

for orbital passes not available from the site.

EO 13526 3.3(b)(1)>25Yrs

This online manual analysis produced the

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EO 13526 3.3(b)(1)>25Yrs

EO 13526 1.4(c)< These alerts enabled NSA to set priorities for the processing and technical analysis of the POPPY data after they were couriered back to NSA.<sup>40</sup>

EO 13526 3.3(b)(1)>

launched on 11 January 1964 from Vandenberg AFB, achieved for the first time a planned near-circular orbit, 490 by 506 miles at 69.9 degrees inclination. This was the first mission boosted by a thrust-augmented Thor (TAT), which permitted heavier and/or more payloads. This was the second three-satellite launch, with some overlapping RF coverage on satellites

EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

devised by R. T.

deal of NKL. EO 13526 3.3(b)(1)>25Yrs, EO 1352

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1

Although the EO 1352 continued to operate for a record EO 13526 3.3(b)(1)>25 and EO lost battery power after EO 13526 3.3( All of the satellites used a solar array/battery combination power system; the solar

arrays were used to charge the batteries and the systems operated from battery power

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1352

Mission 7104, launched on 9 March 1965, achieved a 490- by 506-mile circular orbit, inclined 70.1 degrees. This was the first simultaneous launch of four POPPY satellites. The 24-inch-diameter satellites were launched

EO 13526 3.3(b)(1)>25Yrs, EO 135

EO 13526 3.3(b)(1)>25Yrs, EO 13

This activity was limited by the failure of the batteries in EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1 respectively. EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1 during their lifetimes of EO 13526 3.3(b)(1)>25Yrs respectively. EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs Unfortunately, the satellite stabilized on its side, thereby making it impossible to conduct the micro thruster test. The RF coverage was extended without a gap to

EO 13526 3.3(b)(1)>25Yrs After a satellite commanding capacity was installed at EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs in March 1966, the EO 13526 3.3(b)(1)>25Yrs facility was deactivated. For these

missions, NSA in-house processing was upgraded to EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs and to accommodate the large volumes of data being collected. Appendix A shows the increasing volume of data processed. The

EO 1.4.(c)  
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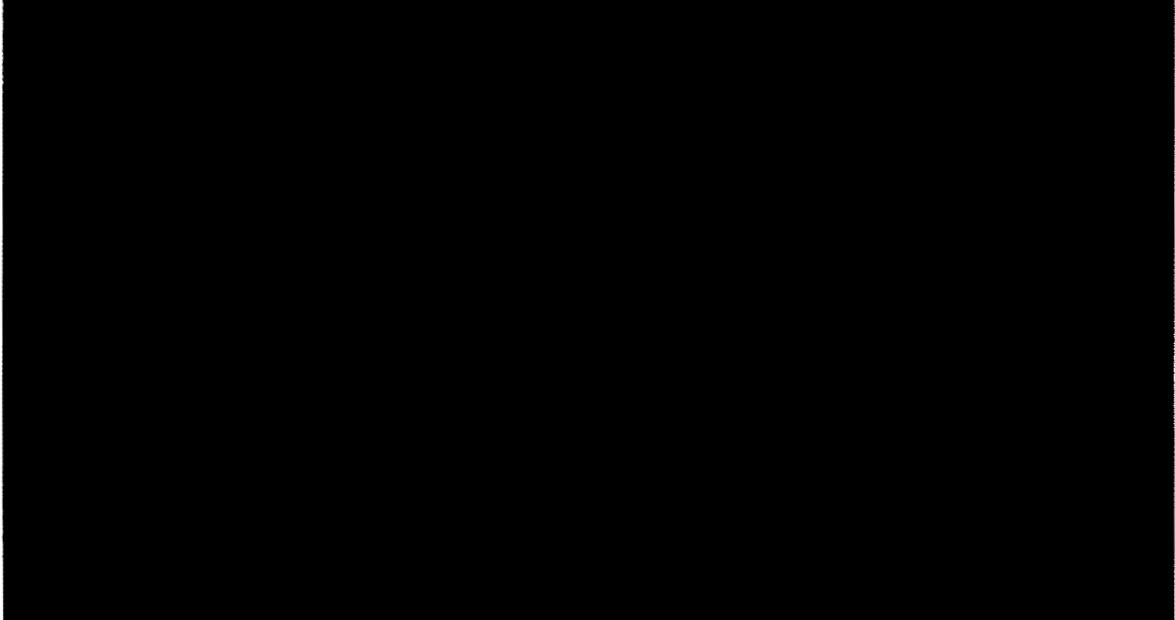
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EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.3 EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1352



The regular satellite and processing system upgrade process was given a great boost on 18 November 1966 when the USIB approved an urgent requirement for satellite SIGINT collection directed

EO 13526 3.3(b)(1)>25Yrs

program. As a result, the PSAC, which had a powerful review function on intelligence equipment and technology development, formed the Harry Davis Committee. The Davis Committee recommended, and DNRO Alexander H. Flax directed, modification of EO 13526 3.3(b)(1) to provide EO 13526 3.3 EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1 range, on which the Davis Committee wanted POPPY to concentrate its efforts.

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13

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EO 1.4.(c)  
PL 86-36/50 USC 3605

MHz, within which the Davis Committee believed the [redacted] systems would be found.

[redacted] EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 1

Just six months after this direction, the launch of [redacted] on 31 May 1967 from Vandenberg demonstrated that the NRO space and NSA ground technology had come of age. The four satellites were launched into a near-perfect 500- by 508-mile orbit, inclined at exactly 70.0 degrees! During the almost [redacted] lifetime of this mission a major advancement in system performance was realized. The previously used spherical configuration of the satellite was replaced with a multiface design for the [redacted] increasing their diameter to 27 inches and average weight to 180 pounds. Two of the satellites used [redacted]

[redacted] EO 13526 3.3(b)(1)>25Yrs

[redacted] EO 13526 3.3(b)(1)>25Yrs Following this launch, all subsequent PUPPY satellites used a [redacted]

[redacted] EO 13526 3.3(b)(1)>25Yrs

[redacted] EO 13526 3.3(b)(1)>25Yrs Anhydrous ammonia crystals were heated in the satellite to produce control gas for thrusting whenever a correction was required. This thrusting system worked so well that it was used in all subsequent satellites. Other innova-

[redacted] EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13

On the ground, to meet the [redacted] requirement, an analog-to-digital conversion system (ADCS) was installed to convert the analog down-link data to computer-processable digital data at the [redacted] This change allowed on-site digital processing. Also, by this time a program to move all equipment from the original Earth satellite vehicle (ESV) huts into permanent facilities was well underway. This move included installing remote control of the antenna, adding elevation control, and doubling the number of Yagi antennas. Vertical polarization was added to the existing horizontally polarized Yagi antennas to further improve signal reception from the satellite regardless of the polarization of the signal from the satellite (which might vary from vertical to horizontal depending on position of the satellite relative to the ground station and/or the attitude of the satellite). In 1967 the engineering data readout and commanding facility operated by NRL was moved from Hybla Valley, Virginia, [redacted]

Starting in 1967, [redacted] developed at NRL, replaced the World War II-type R-390A/URR receivers that were used in the original huts for reception of the satellite down-links. Each receiver was calibrated to minimize any [redacted] between receiving channels. The "half amplitude threshold" included in this receiver design also eliminated all time measurement error associated with amplitude variations in the data

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**Flight summary: Program C, Project POPPY satellites**

MISSION NUMBER	PROJECT and PAYLOAD	MISSION (All payloads are ELINT)	OPERATIONAL LIFETIME								LIFETIME Months
			1960	1961	1962	1963	1964	1965	1966	1967	
N/A	GRAB/DYNO-1	GS/TI	EO 13526 3.3(b)(1)>25Yrs								EO 13526
N/A	GRAB/DYNO-2	GS/TI									Booster failure
N/A	GRAB/DYNO	GS/TI									Booster failure
N/A	POPPY-1	GS/TI									Booster failure
N/A	POPPY-2	GS/TI									Booster failure
EO 13526	POPPY-3	EO GS/TI									EO 13526
	POPPY-3	GS/TI									
	POPPY-4	GS/TI									
	POPPY-4	GS/TI									
	POPPY-4	GS/TI									
	POPPY-5	GS/TI AND EOB									
	POPPY-5	GS/TI AND EOB									
	POPPY-5	GS/TI AND EOB									
	POPPY-6	GS/TI AND EOB									
	POPPY-6	GS/TI AND EOB									
	POPPY-6	GS/TI AND EOB									
	POPPY-6	GS/TI AND EOB									

GS = General Search      EOB = Electronic Order of Battle  
TI = Technical Intelligence

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Chapter 3

61

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POPPY missions to:



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The SIGINT Satellite Serv

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**Flight summary: Program C, Project POPPY satellites (continued)**

MISSION NUMBER	PROJECT and PAYLOAD	MISSION (All payloads are ELINT)	OPERATIONAL LIFETIME									LIFETIME
			1967	1968	1969	1970	1971	1972	1973	1976	1977	Months
EO 13526	POPPY- POPPY- POPPY- POPPY-	EO ABM, EOB, GS/TI	EO 13526 3.3(b)(1)>25Yrs									
EO 13526 3.3(b)(1)>25Yrs												

GS = General Search      EOB = Electronic Order of Battle  
TI = Technical Intelligence      ABM = Antibalistic Missile Radar

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EO 1.4.(c)  
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stream and in both the recording and the playback systems.<sup>49</sup> The highly stable data were furnished to the ADCS, which

EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

EO 13526 1.4(c)<25Yrs, EO 13526 3.5 Field digitization significantly reduced time variations and the resulting digital tape was forwarded to NSA.<sup>50</sup>

With the high priority of the ABM radar search requirement directed by the DNRO at the recommendation of the Harry Davis Committee, NRL procured a System Engineering Laboratories SEL-810 computer in three weeks, developed software to conduct ABM search, and deployed the computer-aided manual search (CAMS) system to the site at EO 13526 3.3(b)(1)>25Yrs four months prior to the launch of EO 13 in May 1967.<sup>51</sup> Haller, Raymond and Brown, later HRB-Singer Company of State College, Pennsylvania, was given the contract to develop the computer-aided manual data processing system for the SEL-810 computer.

V. Hellrich of NRL was the architect of the SEL-810 computer configuration. L. M. Hammarstrom of HRB-Singer specified the requirements for the initial field EO 13526 1.4(c) software. R. Daniels of HRB-Singer developed the initial algorithms/software. Refinements and additions in the years following were made by Navy Lt Ronald L. Potts\* (no relation to NSA's

\* In recalling these events, Ronald Potts said, "When I think of the contributors to the Navy program over the years, I remember Reid Mayo most gratefully as the gentle man who inspired and challenged so many people in the field. He would come to the stations and tell us what the nation needed and what we could do to help, and it would be as though he were coming directly to us from the CNO or the



Lt Ronald L. Potts, USN

Ray Potts) and Petty Officer C. Jorger, at EO 13526 3.3(b) M. Keebaugh, J. Riale, W. Bickam, and R. Daniels of HRB-Singer; and Ens L. A. Eichel, at EO 13526 3.3(b)(1) 52

Collected ELINT reconnaissance data were sorted EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.3(b)(1)>25Yrs known Soviet ABM-related test-site geographic coordinates were used to calculate a sequence of EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1

of interest, many individual radars were located. Although originally these intercepts required manual analysis to determine the actual radar characteristics and location, by 1969 the analysis routines had been automated by HRB-Singer personnel and could be selected on demand.

The CAMS system was installed in EO 13526 3.3(b)(1)>25Yrs in April 1969 and EO 13526 3.3(b)(1) in late 1970. Processing

DIRNSA or the NSC. Reid would listen and act on our needs for equipment or technical information or logistics support or even a water cooler. At any hour you might find him sitting the posts with the sailors, and we could talk about signals with him as though they were mutual acquaintances."

results were reported by teletype message to NSA at Fort Meade and to selected military organizations, with emphasis on those requiring time-critical signals. NSA, in turn, reported them electrically as preliminary ELINT technical reports (ELTs) to the Intelligence Community.

These improvements in the ground station receiving system made it possible for NSA's [redacted] and [redacted] to develop another technique to compute locations from [redacted]

[redacted]

table at the end of Chapter 1 shows the increases in location accuracy achieved from satellite ELINT data over time as improvements were made.<sup>53</sup>

The rapidly increasing volume of data to be processed from POPPY satellites began to tax analysis capabilities, and NSA adjusted processing priorities in 1967. This adjustment required Navy ground stations with analog analysis capability to

do on-site screening of collected data and report results to NSA. Only those tapes carrying signals of special interest were forwarded to NSA for technical analysis. Since several ground stations collected the same data, only tapes from the station with the best coverage were forwarded for [redacted] by machine processing.

NSA identified in advance which POPPY site had the best [redacted] processing. This site was then notified which tape to forward for [redacted] processing. NSA also requested all POPPY tapes collected at the same time that other collectors intercepted signals of interest or when a high-interest event took place. Recordings not forwarded were retained for 90 days and then reused, unless requested by NSA for analysis. By this time the POPPY [redacted] system at NSA had been validated. The system was basically an all-automatic computer process that routinely produced [redacted]

[redacted]

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PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526

[REDACTED]

The SEL-810 conversion of data processing in [REDACTED] from analog to digital in 1967 had other far-reaching consequences totally apart from the ABM problem. Because the accuracy of the digital manipulation of the data permitted the [REDACTED]

[REDACTED]

A number of special tasks were levied on mission ground stations to exploit the new overhead ELINT capabilities. In August 1967 USIB approved an NRO request that NSG task mission ground stations to identify and report on a not-to-interfere basis the details of intercepts of [REDACTED]

[REDACTED] In April 1968, NSG performed at the POPPY station in [REDACTED]

[REDACTED]

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526

[REDACTED]

analyzed, and located on a not-to-interfere basis sufficiently often to show feasibility and establish processing techniques.

However, major emphasis was placed on the [REDACTED]

In July 1969 NSG obtained authorization and directed [REDACTED] station to use suitably tasked passes and ordinarily untasked fringe passes to locate and report elements of a [REDACTED]

[REDACTED]

Throughout this period, Adm Thomas Moorer, CNO, was being briefed periodically

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EO 1.4.(c)  
PL 86-36/50 USC 3605

on the POPPY capability to identify and track ships at sea and on the results of these preliminary tracking exercises.<sup>59</sup>

EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)> providing coverage of a total of EO 13526 3.3(b)(1)>25Yrs was launched from Vandenberg AFB on 30 September 1969 into a 491- by 506-mile orbit, with an inclination of 70.0 degrees. It consisted of four multiface satellites weighing an average of 235 pounds each. Five other scientific satellites were also launched on the same booster. EO 13526 3.3(b)

EO 13526 3.3(b)(1)>25Yrs EO 13526 1.4(c)<25Yrs, EO 135

On 27 August 1969 the USIB SORS, responding to the CNO, made ocean surveillance an official function of POPPY in SORS 10./96, BYE-1565-69, "Mission Guidance" EO 1352 In July 1970 NSG directed EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1) was launched on 14 December 1971 into a nearly circular 530- by 540-mile orbit, inclined 70.0 degrees. It was to be the last POPPY launch and consisted of four multiface satellites weighing 270 to 280 pounds each, containing a total EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3

EO 13526 3.3(b)(1)>25Yrs

Four transponded pulsewidths were used on each data link, thereby doubling the collection capability. By this time, the EO 13526 3.3(b)(1)>25Yrs ground stations had been closed, concluding the participation of the AFSS in the POPPY Program. This left EO 1 improved ground stations in the network. EO 13526 3.3(b)

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PL 86-36/50 USC 3605

### Key accomplishments, Project POPPY

- First SIGINT satellite, 1960; demonstrated intercept of foreign radars using the realtime transpond technique to relay signals directly to US stations.

- Discovered <sup>EO 13526</sup> radars very dense in <sup>EO 13526 3.3(b)(1)>25Yrs</sup> USSR.

- Many intercept firsts, including <sup>EO 13526 1.4</sup>

<sup>EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)</sup>

<sup>EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO</sup>

- <sup>EO 13526 3.3(b)(1)>25Yrs</sup> first satellites launched simultaneously, 1962.

- First ocean surveillance of shipborne radars, 1967.

<sup>EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526</sup>

NSA added a CDC 6600 computer in 1968 to be used full time with the CDC 6400 computer to handle the increased volume of POPPY data being collected. NSA machine processing with the 6600 computer produced and reported over <sup>EO 13526</sup> radar locations, with accuracies of about <sup>EO 13526 3</sup> or less in the first 15 months of its operation. Many new/ unidentified signals reports were issued and technical measurements made.<sup>63</sup> During the first five months of operation, information was developed by NSA

In July 1970 authority was granted by USIB SORS for ongoing <sup>EO 13526 3.3(b)(1)>25</sup> <sup>EO 13526 3</sup> to engage in ocean surveillance in support of US fleet commanders. Specifics of this mission were stated by COMNAVINTCOM in August 1970. By this time USIB mission guidance added search for new or unusual emitters in


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EO 13526 3.3(b)(1)-25Yrs, EO 13526 1.4(c)-25Yrs, EO 13526 3.5(c)



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RAdm Robert K. Geiger

Bradburn of the NRO Staff, and Capt  
Geiger worked out the EO 13526 3.3(b)(1)>25Yrs  
EO 13526 3.3(b)(1)>25Yrs

POPPY Project director functions were to be performed within the System Project Office (SPO) of PM-16.\*

Picking up on earlier planning that had been started by the Director, Naval Security Group in July 1969, Geiger carried out some funded studies to determine which ELINT technology would be most effective in an EO 13526 3.3(b)(1)>25Yrs  
EO 13526 3.3(b)(1)>25Yrs

During a trip to Europe in late 1971, DNRO McLucas visited the POPPY site at EO 13526 3.3(b)(1)>25Yrs. That evening, in a hotel in EO 13526 3.3(b)(1)>25Yrs DNRO McLucas, Robert J. Hermann of NSA, Col David D.

\* For a further description of the POPPY system management relationships see NRO/NSA/CIA/USN Management Agreement for the POPPY System, 5 November 1971 (Appendix E).

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EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c) EO 13526 3.3(b)(1)>25Yrs EO 13526 1.4(c)<25Yrs, EO 13526 3

Meanwhile, on the POPPY front, in September 1972 a further improvement in intercept capability occurred when the new POPPY Automated Processing System (PAPS) was added to the [redacted] EO 13526 3.3(b)(1)>25Yrs. This NRL/HRB-Singer development used the SEL 86 computer to achieve the goal of a higher volume of [redacted] EO 13526 3.3(b)(1)>25Yrs. The new computer made possible processing in a continuous stream. PAPS was fed by either digital tape or for online processing by a priority data extractor (PDE). The system became operational two weeks after receipt at the site. About two months later, DNRO McLucas was shown the speed and ease of PAPS operations when two Soviet Naval combatant ships were located and reported [redacted] EO 13526 3.3(b)(1)>25Yrs

In June 1973, the Navy's PM-16 was redesignated PME-106 of the Naval Electronic Systems Command, with its manager continuing as Director, Program C. Coordination continued with the Naval Intelligence Command, and NRL continued to be responsible for technical develop-

[redacted] EO 13526 3.3(b)(1)>25Yrs

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PL 86-36/50 USC 3605

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EO 13526 3.3(b)(1)>25Yrs

POPPY's strengths stemmed from its utilization of traditional concepts and methods and an insistence on proven hardware and techniques not only to guarantee success, but also to hold costs to a bare minimum. Between 1959 and ~~EO 13526 3.3(b)~~ the development cost amounted to only ~~EO 13526 3.3(b)~~. The costs of launch and of the Consolidated Cryptologic Program (CCP) are not included in this calculation. POPPY utilized existing personnel and facilities whenever it was reasonably possible, and although innovative in many ways, the designers added only those improvements that involved minimal risk to the program. It grew from a single satellite with limited ELINT capability to a sophisticated ~~EO 13526 3.3(b)~~ satellite configuration per launch, which comprised an overhead ELINT reconnaissance system capable of ocean surveillance, search and

~~EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.3(b)(1)>25Yrs~~

characteristics. This low-cost success story is unlikely ever to be duplicated.\*

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EO 1.4.(c)

\* This account of POPPY ~~EO 13526 3.3(b)~~ covers the highlights of the projects. Additional information can be found in the *History of the POPPY Satellite System*, BYE-56105-78, which has been extensively referenced here

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### Chapter 3 References

1. *NRO, Program C, Organization Manual*, 18 May 1989, BYE 56 255-89 (hereafter referred to as *Navy Org Manual*), p. 73. Also: *History of the POPPY Satellite System*, BYE-56105-78 (hereafter referred to as *POPPY History*), p. 2.
2. *POPPY History*, pp. 2 and A3-3.
3. *POPPY History*, p. 8.
4. *POPPY History*, pp. 8 and 12.
5. *POPPY History*, p. 10.
6. *POPPY History*, pp. 4-5.
7. *Navy Org Manual*, p. 73.
8. *POPPY History*, pp. 4-5.
9. *POPPY History*, p. 17, paragraph 5.
10. *POPPY History*, p. 2.
11. *POPPY History*, pp. 2, 8, and A3-3.
12. *POPPY History*, p. A1-2.
13. *POPPY History*, pp. 2-3.
14. *POPPY History*, p. A3-5.
15. *NSA Technical Journal*, Vol. V, No. 2, pp. 67-78. (S)
16. EO 13526 3.5(c) paper (provided 10 September 1990).
17. *POPPY History*, p. 44.
18. *POPPY History*, p. 39.
19. *POPPY History*, p. 39.
20. *POPPY History*, p. 39.
21. *POPPY History*, p. 45.
22. *POPPY History*, p. 30.
23. *NSA in Space*, April 1975, BYE-19385-75, p. 17.
24. *POPPY History*, p. 31.
25. *POPPY History*, p. 17.
26. *POPPY History*, pp. 39-40.
27. *POPPY History*, p. 40.
28. *Navy Org Manual*, p. 75.
29. Memo from Col Henry C. Howard, USAF, "A cursory Review of the Evolution of the SOC," July 1968.

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30. Letter from DNI to DNRO, Subject: "System POPPY, reassignment of responsibilities for" (TS), 21 January 1963 (see Appendix E).
31. *Navy Org Manual*, p. 75.
32. *POPPY History*, pp. 40, A1-8, and A1-9. PL 86-36/50 USC 3605
33. EO 13526 3.5(c) [REDACTED] paper (provided 10 September 1990).
34. *NSA Technical Journal*, Vol VI, Fall 1961, No. 4, pp. 39-50.
35. EO 13526 3.5(c) [REDACTED] paper (provided 10 September 1990).
36. *POPPY History*, pp. 45 and 46.
37. *POPPY History*, p. 46.
38. *Navy Org Manual*, p. 75.
39. *NSA in Space*, p. 73.
40. *POPPY History*, p. 6.
41. *POPPY History*, pp. 46, 47, A1-13, and A1-14.
42. *NSA in Space*, p. 18, and Raymond Potts' personal notes (hereafter Potts' notes).
43. *POPPY History*, pp. 33, A1-13, and A1-14.
44. Potts' notes.
45. *POPPY History*, pp. 31 and 33.
46. *NSA in Space*, p. 18.
47. *POPPY History*, p. 47.
48. *POPPY History*, pp. 15, 16, A1-15, and A1-16.
49. *POPPY History*, pp. 24 and 26.
50. *POPPY History*, p. 35.
51. *POPPY History*, p. 35.
52. *POPPY History*, p. A3-6.
53. EO 13526 3.5(c) [REDACTED] interview, 11 August 1992.
54. *POPPY History*, p. 48.
55. *POPPY History*, p. 48.
56. *POPPY History*, pp. 48-49.
57. *POPPY History*, pp. 48-49.
58. *Navy Org Manual*, p. 77.
59. RAdm Robert K. Geiger comments, SIGINT Satellite History peer review, March 1994.
60. *POPPY History*, pp. 50, 51, 52, A1-17, and A1-18.
61. *NSA in Space*, p. 20.
62. *POPPY History*, pp. 52 and 53.

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63. K4SP Status Board, 20 December 1970.
64. *POPPY History*, p. 51.
65. K4SP Status Board, 20 December 1970.
66. *POPPY History*, p. 51.
67. *POPPY History*, p. 52.
68. Geiger comments, SIGINT Satellite History peer review, March 1994.
69. Geiger comments, SIGINT Satellite History peer review, March 1994.
70. Robert J. Hermann comments, SIGINT Satellite History peer review, March 1994.
71. Hermann comments, SIGINT Satellite History peer review, March 1994.
72. Geiger comments, SIGINT Satellite History peer review, March 1994.
73. Geiger comments, SIGINT Satellite History peer review, March 1994.

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## 4 The Air Force WS-117L-Derived Projects

**SAMOS E-1/F-1 (WS-117L)** EO 13526  
EO 13526 3.3(b)(1)

The requirements for the Advanced Reconnaissance System, Weapon System 117L (WS-117L), were incorporated in System Requirement No. 5, published by Headquarters, Air Research and Development Command (ARDC), on 29 November 1954, and were validated in General Operational Requirement 80-2, issued by Headquarters, US Air Force, on 15 March 1955. At that time ELINT was the responsibility of the US Air Force, as spelled out in DOD Directive S-3115.2 issued on 13 July 1955. Intelligence requirements for the ELINT satellites of WS-117L were developed under guidance from Air Force Assistant Chief of Staff for Intelligence (AFCIN), MGen James Walsh. On 29 October 1956 the Air Force awarded contract AF 04 (647)-94 to Lockheed Missiles and Space Division (LMSD) in Sunnyvale, California, for initial system development studies on WS-117L. In June 1957 LMSD awarded the first contract for US ELINT satellite payloads to the Airborne Instruments Laboratory (AIL) at Mineola, Long Island, New York. The work on contract was Subsystem F (S/S F), the ELINT payload of WS-117L.

Because the US did not have radar data from the interior of the Soviet Union at that time, the requirements for WS-117L

were stated in very general terms. Consequently, the S/S F ELINT payload designs were based on various national estimates of the Soviet radar environment. These estimates were contained in the RAND Corporation's Report 280, "Signal Density Study," published 1 September 1955; the Air Force Technical Intelligence Center (ATIC) report, "Handbook of Soviet and Satellites RADAR Equipment," 9 November 1955; and in estimates by the Planning Research Corporation, a subcontractor to Ramo-Wooldridge, Inc., under contract to the Air Force for development of the WS-117L Intelligence Data Processing Subsystem I (S/S I). These estimates relied on peripheral intercepts from ground sites, airplanes (including limited U-2 collection), and ships. Radar data collected by the early satellite ELINT payloads (Navy GRAB/DYNO in 1960 and Air Force ferret systems in 1961) showed that the actual density of radar data collected over the Soviet interior was many times greater than anticipated. Accommodating this large volume of data slowed the development of data processing systems, changed payload-tasking plans, and resulted in some payload modifications.

The first true source of national requirements for satellite reconnaissance systems was published by the US Intelligence Board (USIB) in USIB-D-33.6/8, "Intelligence Requirements for a Satellite

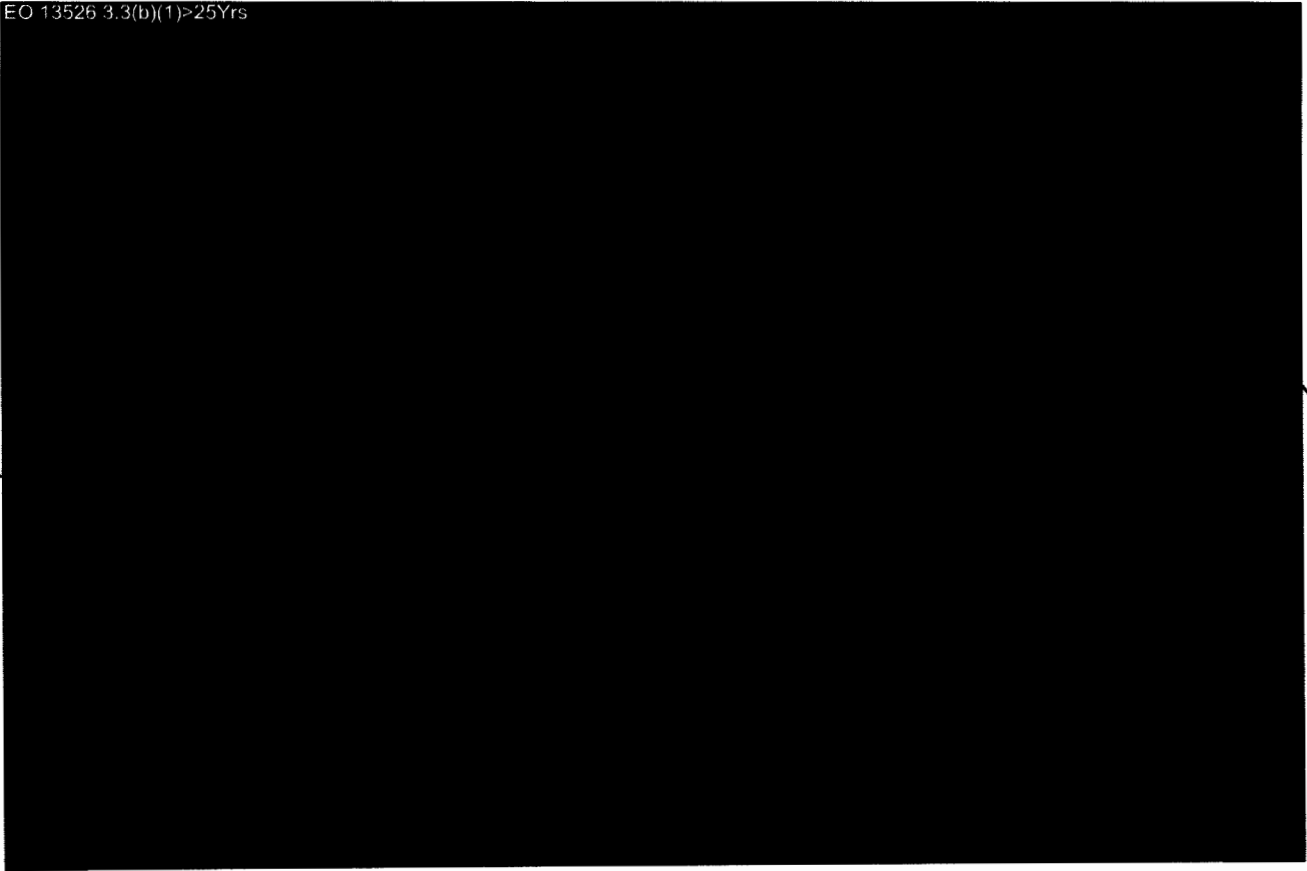
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The SIGINT Satellite Story

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Reconnaissance System of which SAMOS is an Example," 5 July 1960. It stated, in part, "There are important problems toward which electronic reconnaissance could contribute critical information during the research and development phase . . . One of the most important of these is the search for emissions associated with an ABM system." Paragraph 1c. stated, "Additional types of directed coverage may be required. Provision should be made to procure such equipment by Quick Reaction Capabilities (QRC)." Also " . . . a close working relationship between the R&D organization and the intelligence community is required."<sup>1</sup>



Col John O. Copley

Prior to the publication of USIB-D-33.6/8, Maj (later Col) John O. Copley, the Air Force WS-117L Project Officer for S/S F at the Air Force Ballistic Missile Division (AFBMD), Inglewood, California, had worked with LtCol John Poe of the AFCIN staff, Capt John Marks of the Headquarters SAC Intelligence staff, and Jim Foreman and Art Thom, who were senior analysts at ATIC, Wright-Patterson

AFB, Ohio, to determine collection requirements for the S/S F payloads. They decided that the urgent requirement of SAC for an electronic order of battle (EOB) was the most important factor guiding payload design. These data were essential to SAC in planning bomber penetration routes. Next in order of importance were the detailed technical characteristics of these radars, especially for the early warning and ground-to-air missile systems. The F-1 and F-2 ELINT payloads, with their compressed digital description of the radar intercepts, were designed for the EOB and general-search missions, while the F-3 payloads, with their wide-band (6 MHz) analog output, provided the fine grain technical characteristics of selected radars.

The 5 July 1960 USIB guidance appeared to validate the design of the S/S F payloads, if a QRC effort were included. The QRC requirement was met by a separate series of relatively simple, single-mission payloads that could be developed rapidly and mounted EO 13526 3.3(b)(1)>25Yrs Lockheed Agena spacecraft.

The S/S F payloads were mounted on EO 13526 3.3(b)(1)>25Yrs vertically stabilized Agena, which was continuously Earth-oriented when in orbit. The three-axis stability of the vehicle was provided by control moment gyros supplementing the natural gravity-gradient force that tended to orient the vehicle vertically. Nickel-cadmium batteries supplied the power, limiting average spacecraft life to five or six days, depending on the weight of batteries that could be carried.

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The S/S F-1 payload covered the frequency range of 2.5 to 3.2 and 9.0 to 10.0 GHz. These frequency bands were the popular World War II S-band and X-band in which most of the area search, air-to-air, and ground-to-air missile radars were still operating. One additional frequency band, from 100 to 400 MHz, was used by the higher power, ground-based early warning radars, but the F-1 vehicle was incapable of carrying an antenna of sufficient size to be effective in that radio-frequency range. This was remedied in the follow-on F-2 payloads by extending frequency coverage down to EO 13526 3

The F-1 superheterodyne receiver scanned the radio frequency bands, measuring two pulse repetition intervals (PRIs), pulsewidth (PW), radio frequency (RF), and time for each signal intercepted. This information formed a digital word for each intercept that was then transmitted at a 10-kilobit rate via a very high frequency (VHF) down-link to the tracking stations. The data could be transmitted in realtime or stored on a magnetic-tape recorder over the target area and played back when the satellite was in contact with a tracking station. Spacecraft and payload status data were transmitted on a second VHF telemetry link using pulse amplitude modulation of various tones to frequency-modulate the down-link (PAM/FM). Commands were sent to the vehicle via a 3,200-MHz transponder on the Agena vehicle, which was also used for tracking.

The payload intercept antennas were nadir-pointing directional arrays, with a coverage circle on the ground about 100 miles in diameter at the center frequency

of each band.\* Additional nondirectional antennas performed an inhibit function, preventing signals originating outside the coverage circle of the directional antennas from reaching the payload via the sidelobes of the directional antennas. The system was known as a "sidelobe" interceptor because it intercepted the sidelobes of the ground radar antennas using its own main beam while, at the same time, it rejected signals (mostly main beams) from other ground radars that entered its sidelobes. The payload intercept antenna main beam looked only at the zenith lobes (sidelobes) of the ground radar, thereby eliminating the scan rate of the ground radar main beam as an influence on the probability of intercepting the radar. This system was the reverse of the Navy DYNO payloads, which depended on seeing the main beams of the ground radars. In both systems the sensitivity of the system was adjusted very carefully to assure reception of only the portion of the ground radar antenna power that was desired (sidelobes for S/S F and main beams for DYNO).

The S/S F and follow-on payloads were built by the AIL at Mineola and Deer Park, Long Island, New York, under the direction of Win Fromm. The F-1 payload used components of a vacuum-tube-type ELINT receiver, the AN/APR-9, which AIL had developed for the Air Force in 1948. This equipment was extensively modified to operate in the space environment and was unique in being the only vacuum-tube-type ELINT payload ever flown in space by the United States. F-1 used motor-driven mechanical CAMS for frequency scanning, which was also unique to satellite-borne ELINT systems.

\* For a fixed antenna size, the diameter of the coverage circle is an inverse function of frequency.



Participants in the dedication ceremony of the Airborne Instruments Laboratories, Inc., facility at Melville, Long Island, New York, where Subsystem F ~~EO 13526 3.3(b)(1)>25~~ payloads were built, 13 October 1959

(Partial listing from left): Don Clark, Phil D. Doersam (third), George P. Ainalga (fourth), Pete Siefman (sixth), Maj. Walt H. Spindler (eighth), John L. Hvrne (ninth), Eugene Fubini (11th), Maj. Bill Bean (12th), Sid Hassin (13th), George W. Price (14th), George Heinger (15th), Bob Hunter (20th), William M. Harris (24th), James J. Foreman (26th), Col. Will Ray (27th), Capt. Don Wipperman (28th), LtCol Robert Yundi (29th), LtCol John E. Poe (30th), Maj. John O. Copley (31st), Maj. Donald Furr (32nd), Winfield E. Fromm (33rd), Ken Knorr (34th), Jim Stevenson (35th), Jack Wieland (37th), and Gregg Stevenson (38th).

To translate the 10-kilobit data stream received at the ground tracking site at Vandenberg AFB, California, into the actual PRI, PW, and RF of the individual intercepts, an F-1 ground data handler was furnished by AIL. This equipment used logic circuits constructed of hardware components to interpret the data stream and produce an output that listed PRI, PW, RF, and time of each intercept for each readout of the payload. This information was used at the tracking station to determine the payload status, particularly on realtime readouts, that contained data from special LMSC-operated calibration vans and known local radars. A second F-1 ground data handler unit was located at

the Satellite Test Center (STC) at Sunnyvale, California, to provide input data for the CDC-1604 computer. The readout data, recorded on magnetic tape at the Vandenberg tracking station, were transported by courier to the STC. There the data were translated by the F-1 ground data handler in the same manner as at Vandenberg and were processed on the CDC-1604 computer. The computer contained acceptance criteria to validate the individual intercepts and, using the spacecraft ephemeris, translated the time of intercept into the location of each valid intercept. These data were then manually checked against the characteristics and location of known ground radars and the

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calibration van transmitters to evaluate the accuracy of the output data. It was planned that readout data played back from the vehicle recorder, consisting of data intercepted over the Soviet Union or other areas outside the coverage circle of the ground tracking station, would be recorded at the tracking station and furnished to the processors at the Strategic Air Command (SAC) Headquarters at Omaha, Nebraska. There, functions similar to those used at the STC would be performed using the WS-117L Subsystem I Data Management System to develop finished intelligence data.

When the SAMOS Program Office (SAFSP) was formed at Los Angeles Air Force Station, California, on 30 August 1960, two development areas were defined. Program I included the readout projects of Subsystems E and F. The E-1, E-2, and E-3 photo payloads (in increasing order of ground resolution) became Project 101, while the F-1, F-2, and F-3 ELINT payloads became EO 13526 3.3(b) Program II was reserved for the photo recovery projects. In Program I, the SAMOS 1 payload was unique, combining as it did the F-1 ferret and E-1 photo readout payloads. This arrangement was developed during the regime of the Advanced Research Projects Agency (ARPA) as a cost-saving measure. The F-1 was mounted in front of the E-1 lens; that lens looked Earthward through a hole cut in the S-band horn antenna of the F-1. This novel arrangement severely vignetted the view of the E-1 camera. The problem was solved by installation of a squib which, when fired on orbit 21, detached the F-1, thereby providing the E-1 a full field of view.

To determine the accuracy of the PRI, PW, and RF measurements made by the payload it was necessary to use the real-time mode to collect radar signals with known parameters and then check the payload measurements against the signals being transmitted. The S/S F Project Officer, Maj John Copley, remembered that in his previous assignment as the QRC Officer at Rome Air Development Center, New York, he was responsible for the modification of several AN/GPQ-T1 training sets, which were van-mounted radar receivers and simulated radar transmitters used by SAC for training electronic warfare officers. Since the radar transmitters could simulate known radars, they seemed an excellent choice for calibration vans, or "cal vans," to transmit radar signals to the satellite receivers. Copley located three vans in Air Force inventory and they were provided to LMSC to modify for this use. These vans were used for several years until requirements for radar simulation became too sophisticated for this relatively ancient equipment, originally built for the Korean War. In 1965 they were replaced with more modern equipment mounted in modified tour buses.

The SAMOS 1 used an Atlas booster to lift the Agena vehicle into a low Earth orbit. The first ignition of the Agena main engine placed it in an eccentric transfer orbit with an apogee of 275 miles. A second ignition at apogee circularized the orbit at 275 miles. Polar inclination of the orbit assured coverage of the entire Soviet land mass.

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Despite all obstacles, on a clear, crisp day on 11 October 1960, Copley, George Price (the LMSC payload manager), Vince Henry (the AIL F-1 specialist), and the rest of their crew stood in the Vandenberg tracking station parking lot looking out over the launch base. The great day had arrived and SAMOS 1 was on the pad, ready to launch. They watched it rise out of a plume of white smoke in a picture-perfect launch until it was out of sight. Jubilation reigned momentarily until they reentered the tracking station control room and discovered that, during the launch, the umbilical connector had stuck to the cold-gas bottle connection, thereby releasing all the attitude-control gas. Because this gas was needed to control the vehicle during the burning of the orbital engine, the Agena did not attain orbit.

The launch of SAMOS 2 a few months later was somewhat different. It was a gray, rainy day on 31 January 1961 and the launch pad was not even visible from the tracking station. This did not deter the launch crew, and vehicle 2102 was launched into the desired orbit with both the E-1 and F-1 payloads working as expected. On orbit 8 a realtime readout at the Vandenberg tracking station produced the first orbital intercept data from the F-1 system. These data were processed on the F-1 ground data handling equipment, which transformed the 10-kilobit data stream into individual intercepts. This was done at Vandenberg and the STC in Sunnyvale. Output of the F-1 ground data handler at the STC was processed on the 1604 computer, producing 69 identifiable intercepts of signals from US West Coast radars and the cal vans. This verified

beyond doubt that the AIL concept had produced a working system. The 2-kilocycle inverter in the payload power supply failed shortly thereafter and no more intercepts, friendly or otherwise, were made.

In the meantime the E-1 photo payload was collecting pictures through the hole in the S-band horn and there was great elation at the tracking station as the E-1 ground processing system produced 100-foot-resolution pictures on many orbits, even though they were rather vignettted. There was great anticipation of bigger and better pictures when the squib was fired on orbit 21 to remove the F-1 payload, but the results suggest that a catastrophe had occurred. The spacecraft was never heard from again.

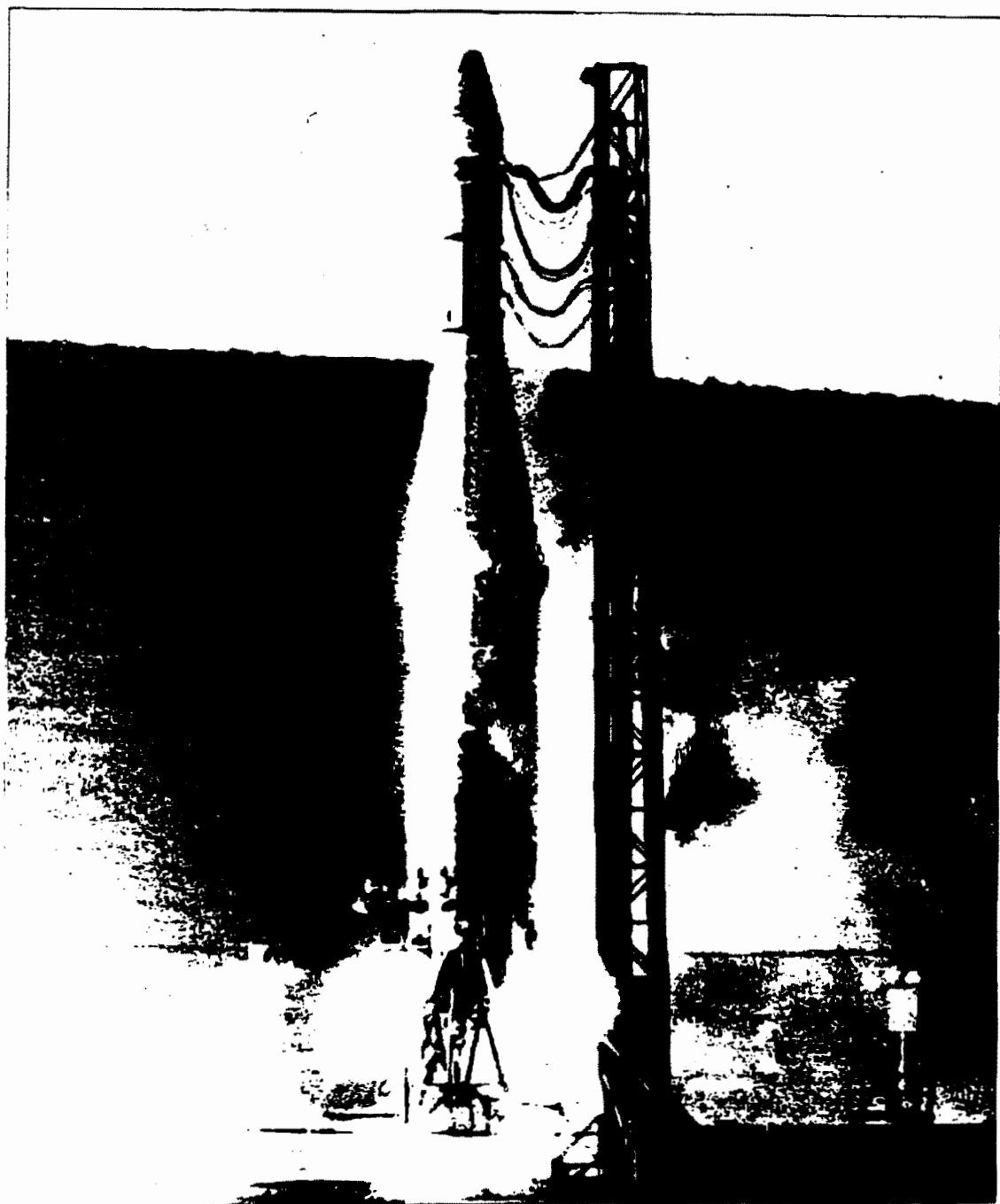
This proved to be the only successful SAMOS Atlas/Agena readout program launch, and it was only a partial success. The third E-1/F-1 was cancelled to save money for the E-2 launch the following spring. Unfortunately, in April 1961 the Atlas booster for that vehicle blew up on the pad; consequently, shortly thereafter, the photo readout program was cancelled in favor of the more promising photo recovery programs (the already successful CORONA, and GAMBIT, approved for development). The third E-1/F-1 payload was placed in storage.

EO 13526 3.3(b)(1)>25Yrs

The F-1 payload worked long enough to produce 69 intercept words, but that was not the whole story. Just as importantly, under the leadership of Frank

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COMINT Control Channels jointly  
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SAMOS 2/Atlas/Agena launch, Vandenberg Air Force Base, 31 January 1962

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Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels to/niv~~  
RYE-919794

...ing, the LMSC crew at the STC pro-  
cessed the data on the CDC 1604 com-  
puter. Using known West Coast radars  
and the cal van signals for verification,  
they proved that a workable system had  
been developed. Not only could the data  
be collected, but the data could also be  
processed and a useful output produced.

EO 13526 3.3(b)(1)>25Yrs



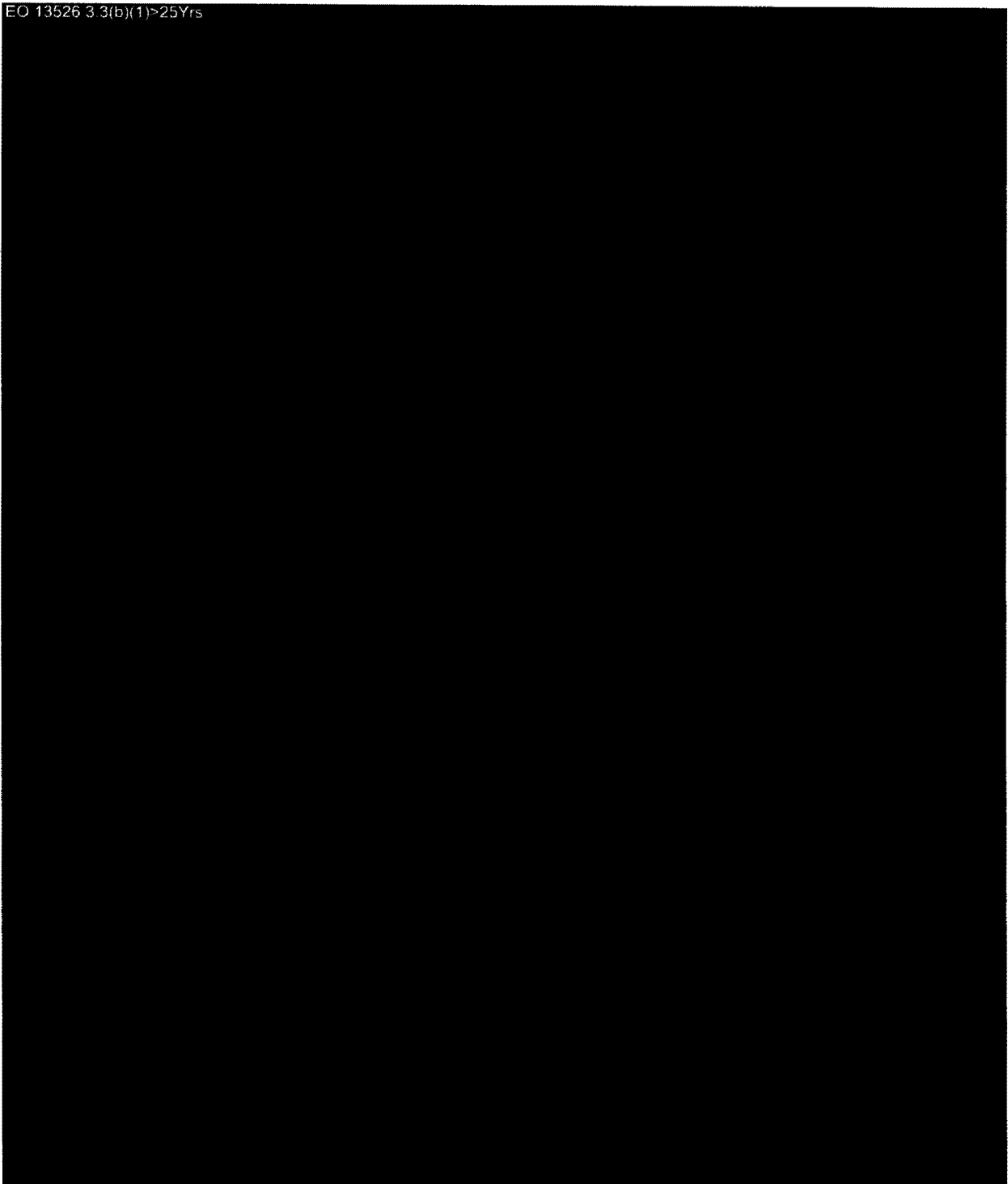
BGen William G. King, Jr.

EO 13526 3.3(b)(1)>25Yrs

\* During the SIGINT Satellite History peer review in  
March 1994, BGen William G. King, Jr., who played a  
prominent role in this history, said, "The curt nature of  
Dr. Charuk's direction to redirect EO 13526 was typical  
of the explicit and direct instructions we received in the  
field. Suggest you highlight this fact. It probably was  
basic to the DNRO management approach."

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EO 13526 3 3(b)(1)>25Yrs

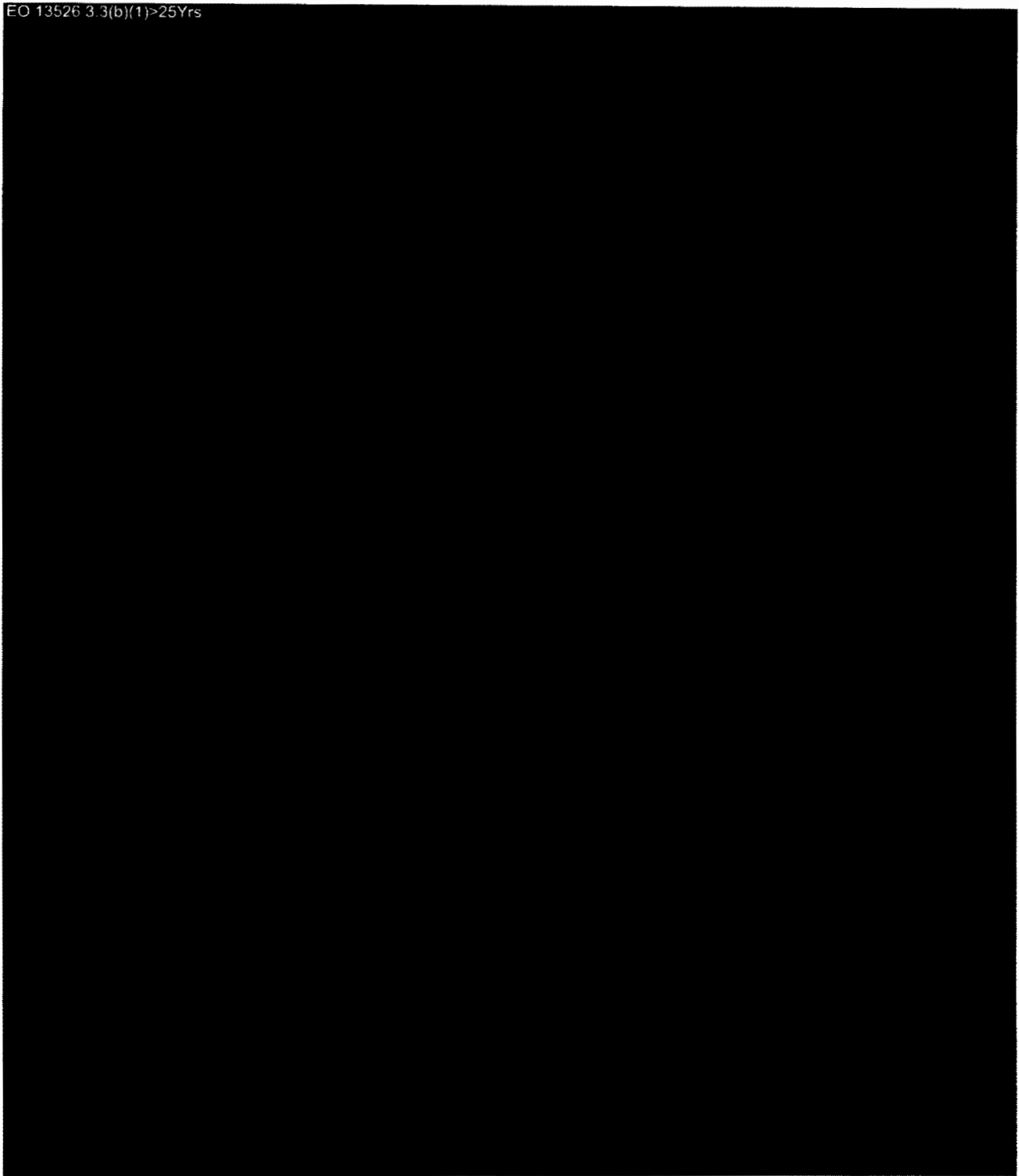


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~~HYE-919793~~



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NOFORN-ORCON~~

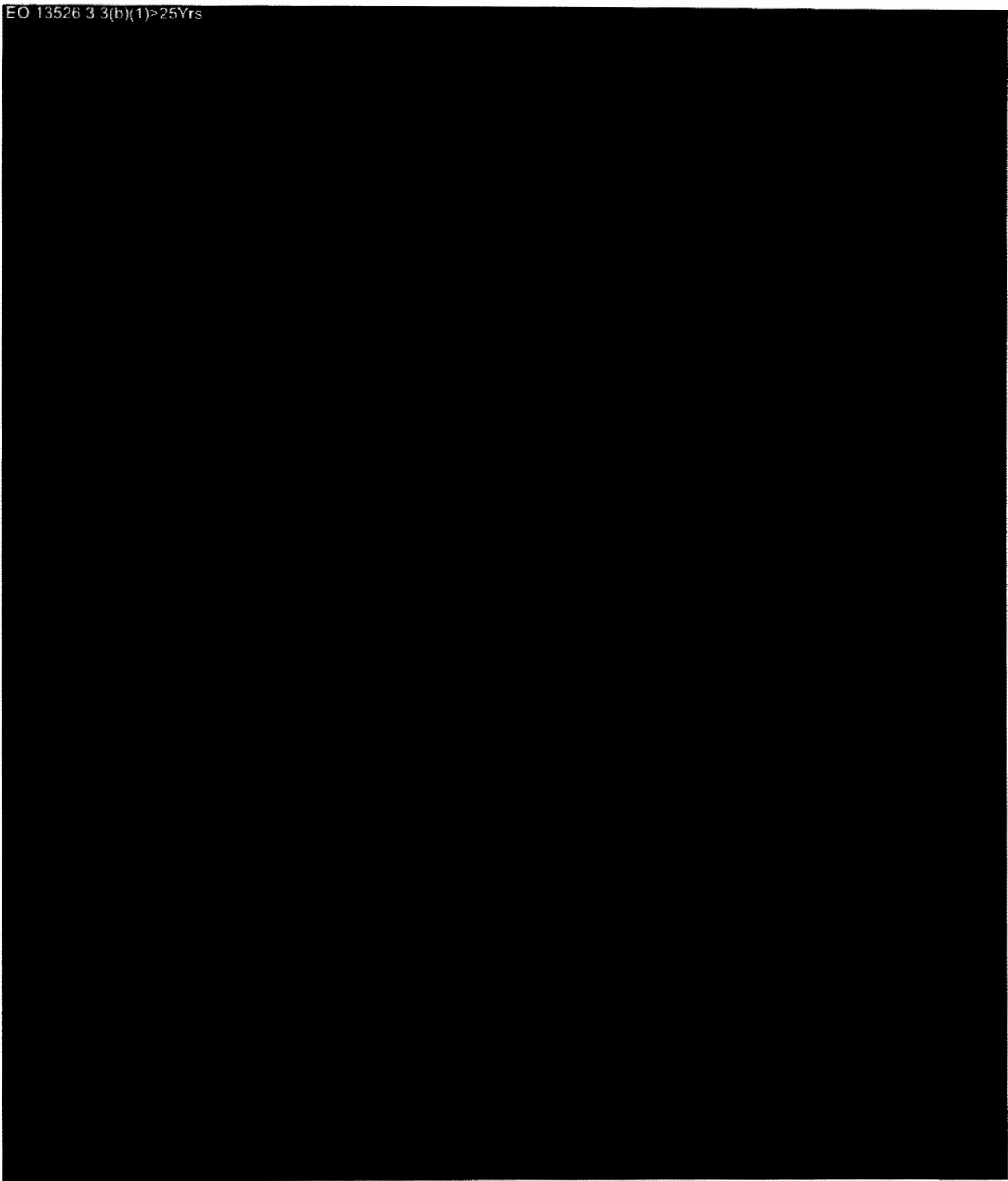
EO 13526 3.3(b)(1)>25Yrs



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Handle via BYEMAN TALENT KEYHOLE  
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BYE-9197/94~~

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~~NOFORN-ORCON~~

EO 13526 3 3(b)(1)-25Yrs

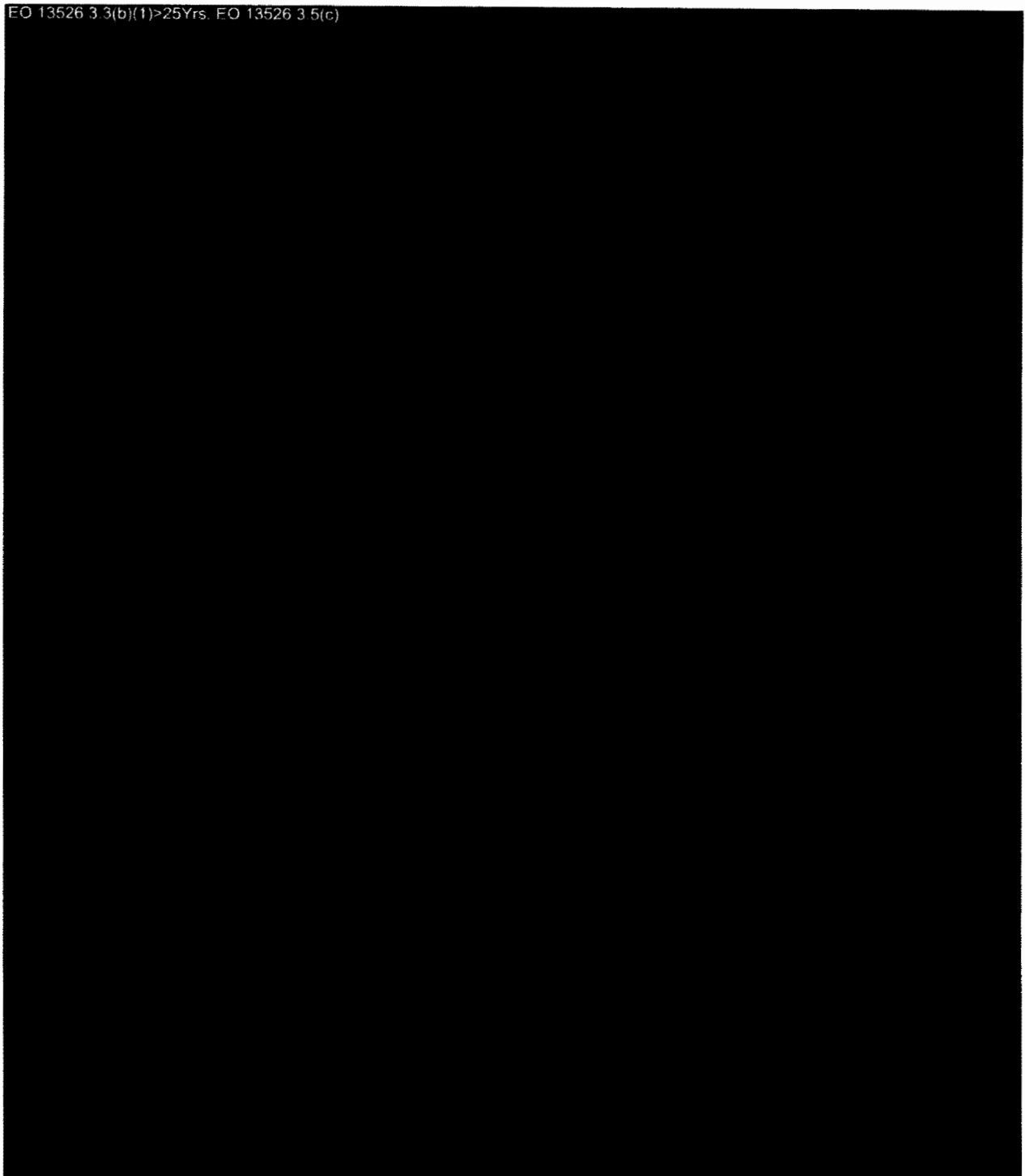


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~~RYE-9197-04~~

~~NOFORN ORCON~~

PL 86-36/50 USC 3605

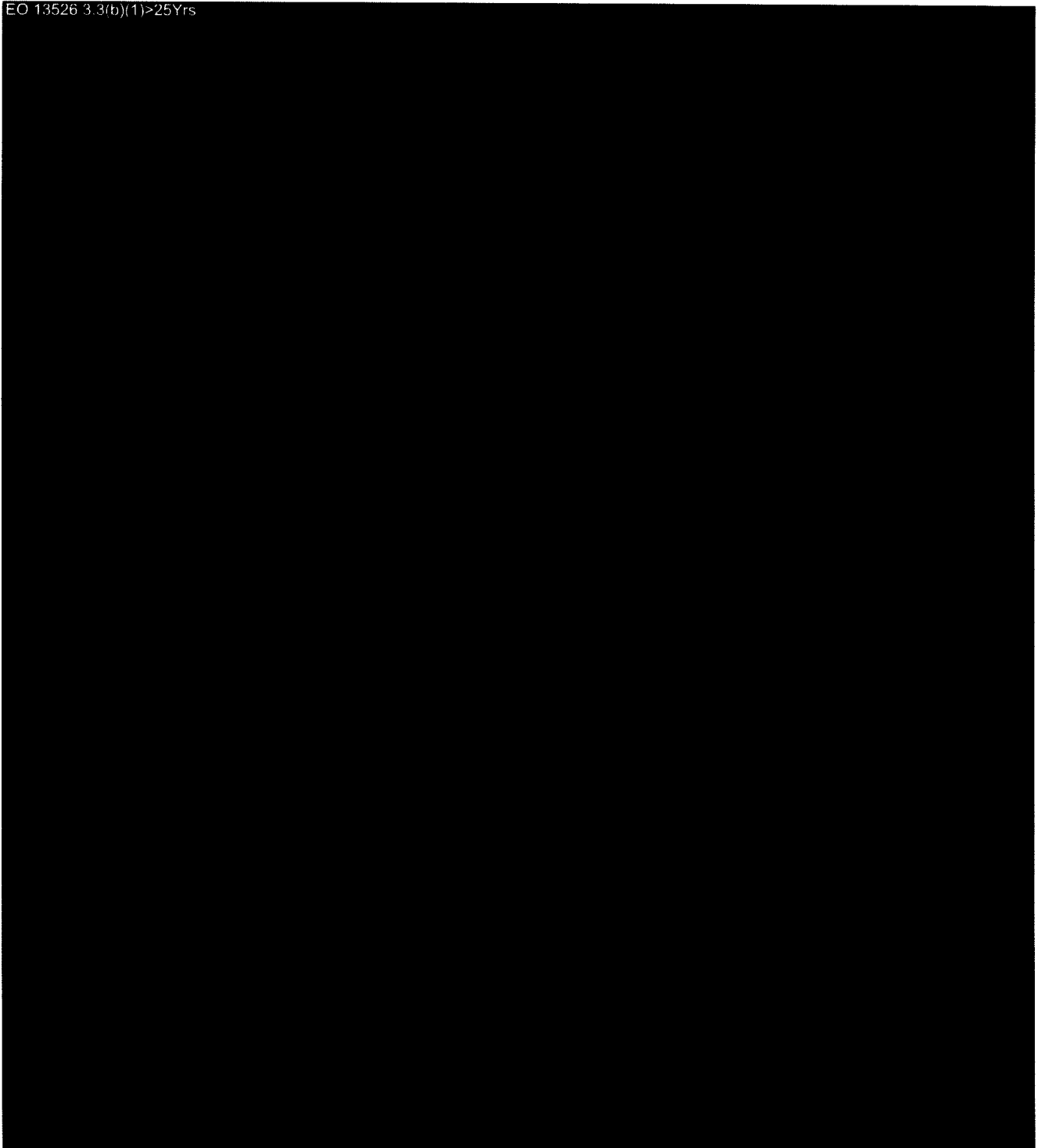
EO 13526 3.3(b)(1)>25Yrs. EO 13526 3.5(c)




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Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly~~  
~~BYE-919794~~

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NOFORN-ORCON~~

EO 13526 3.3(b)(1)>25Yrs



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Handle via BYEMAD-TALENT-KEYHOLE-  
COMINT Control Channels Jointly  
BYE-9197/94~~



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~~NOFORN ORCON~~

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



PL 86-36/50 USC 3605

EO 1.4.(c)  
PL 86-36/50 USC 3605

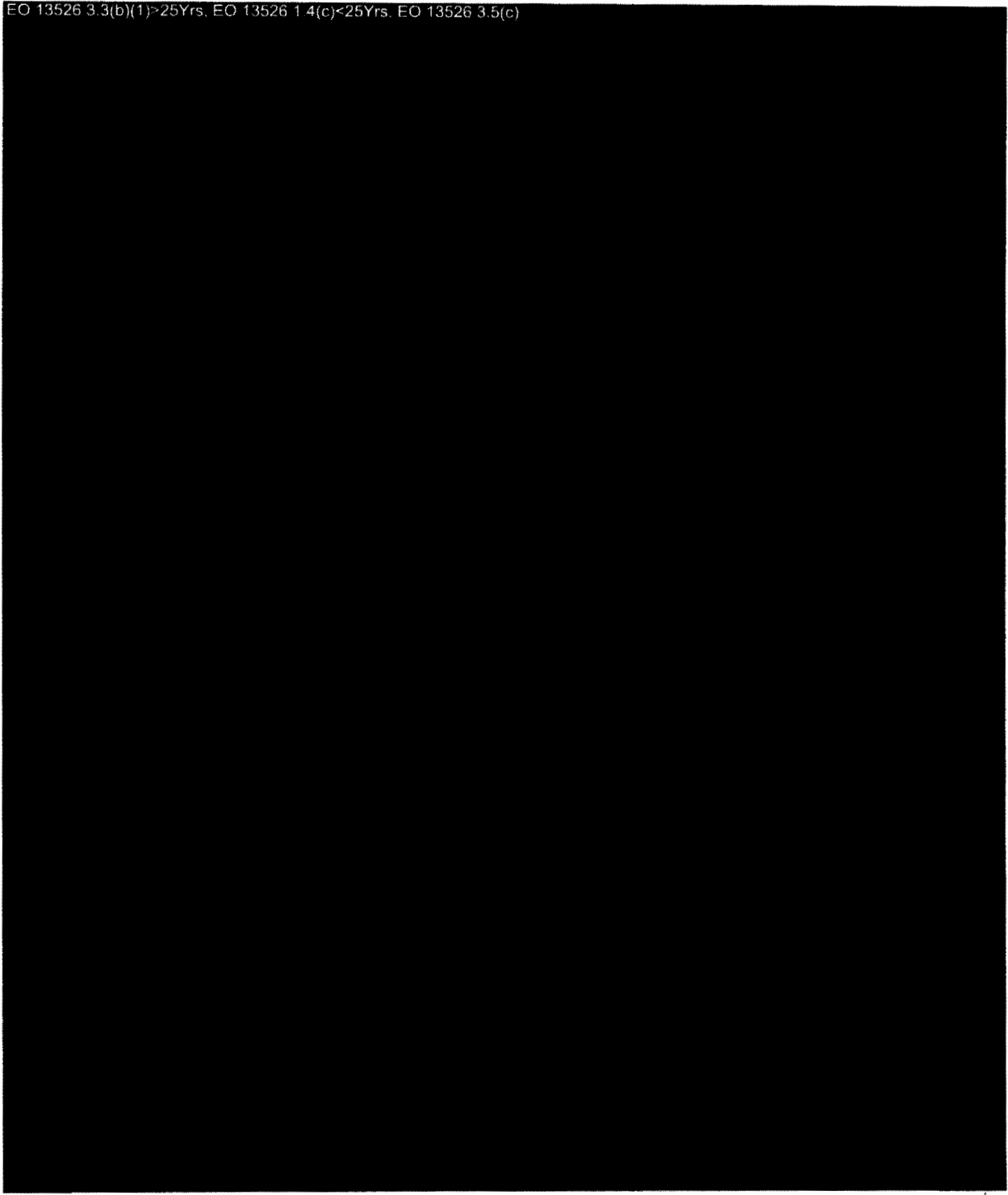
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~~COMINT Control Channels jointly~~  
~~BYE-919794~~

Chapter 4 89

~~Top Secret~~  
~~NOFORN/URCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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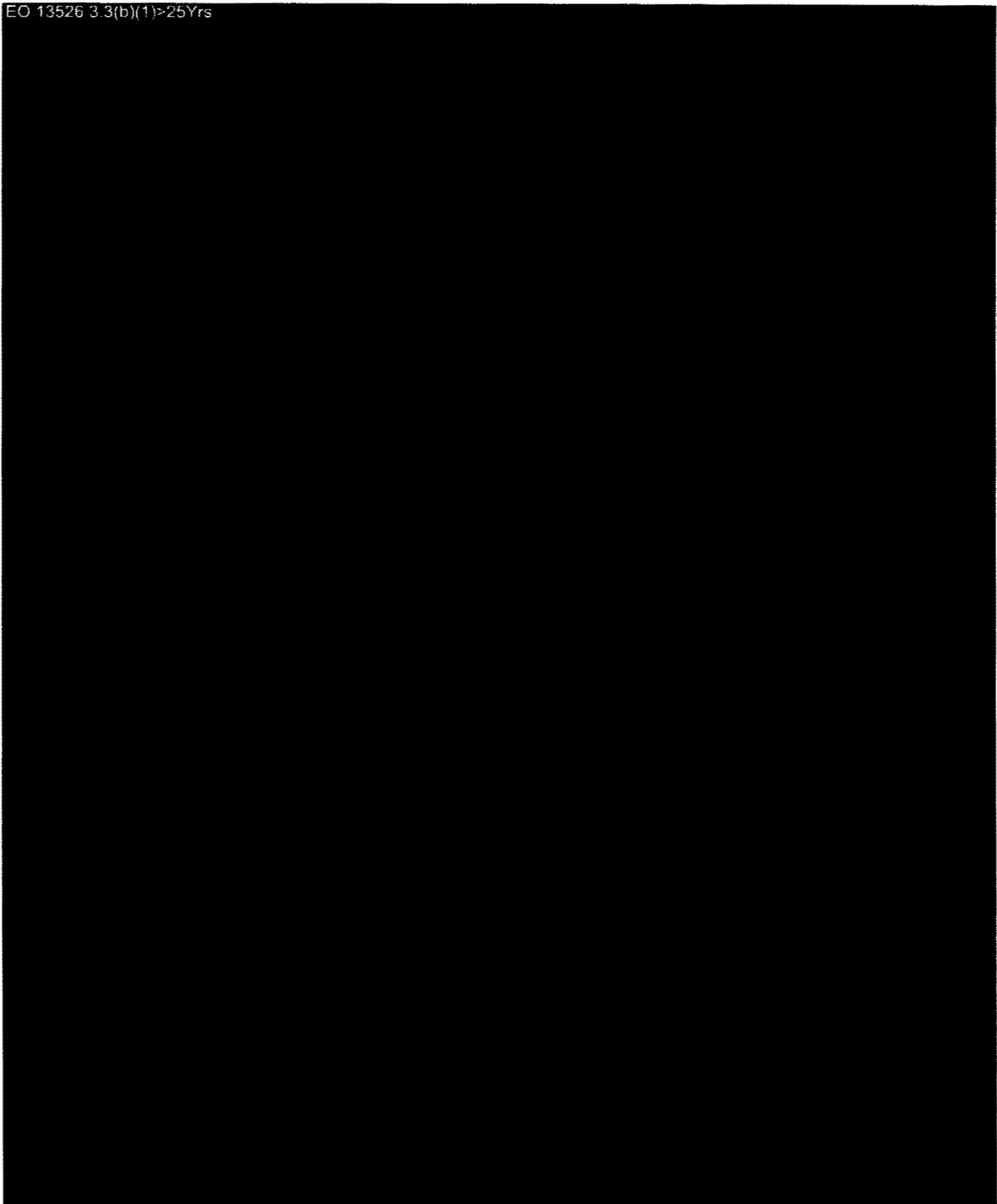


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~~COMINT Control Channels Identity~~  
~~BYE-919784~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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~~NOFORN/ORCON~~

EO 13526 3.3(b)(1)>25Yrs



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Handle via ~~BYEMAN/TALENT-KEYHOLE-~~  
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~~BYF-4197/94~~

~~Top Secret~~  
~~NOFORN-ORCON~~

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EO 1.4.(c)  
PL 86-36/50 USC 3605

PL 86-36/50 USC 3605

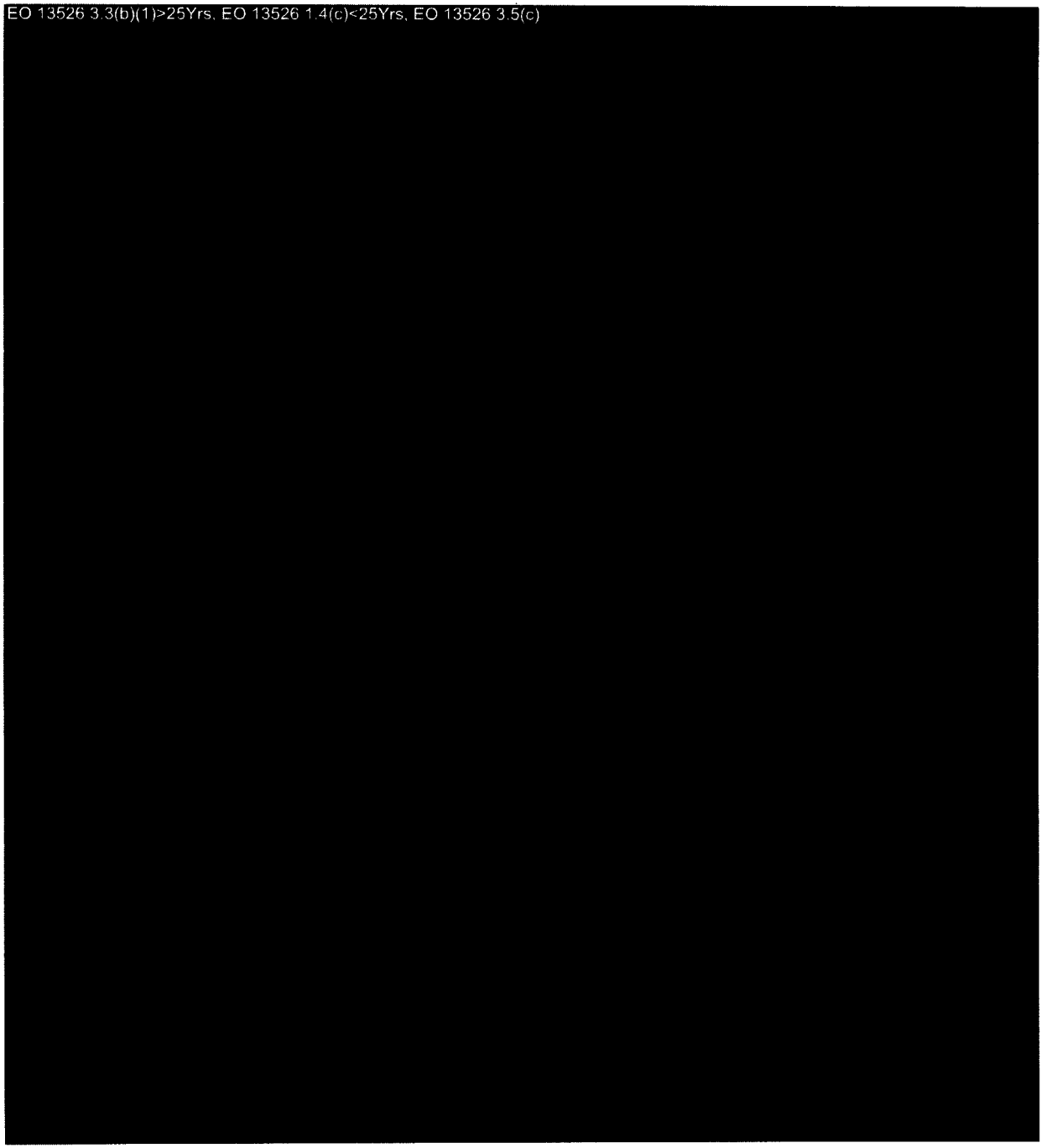
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~~BYE-917793~~



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~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYF-9197-92



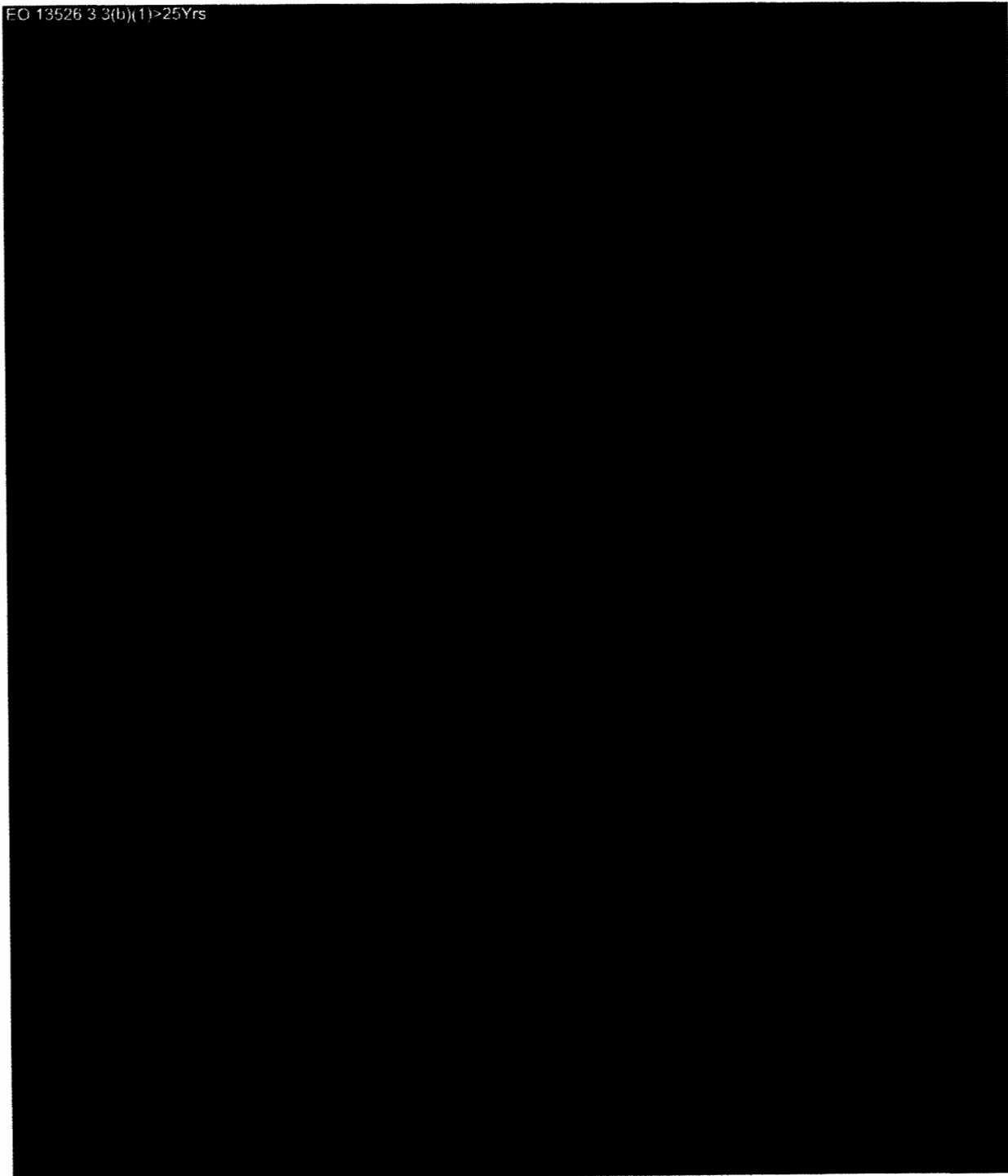
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~~Top Secret~~  
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07/01/94

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NID/KIN/DIRCON

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NOFORN-ORCON~~

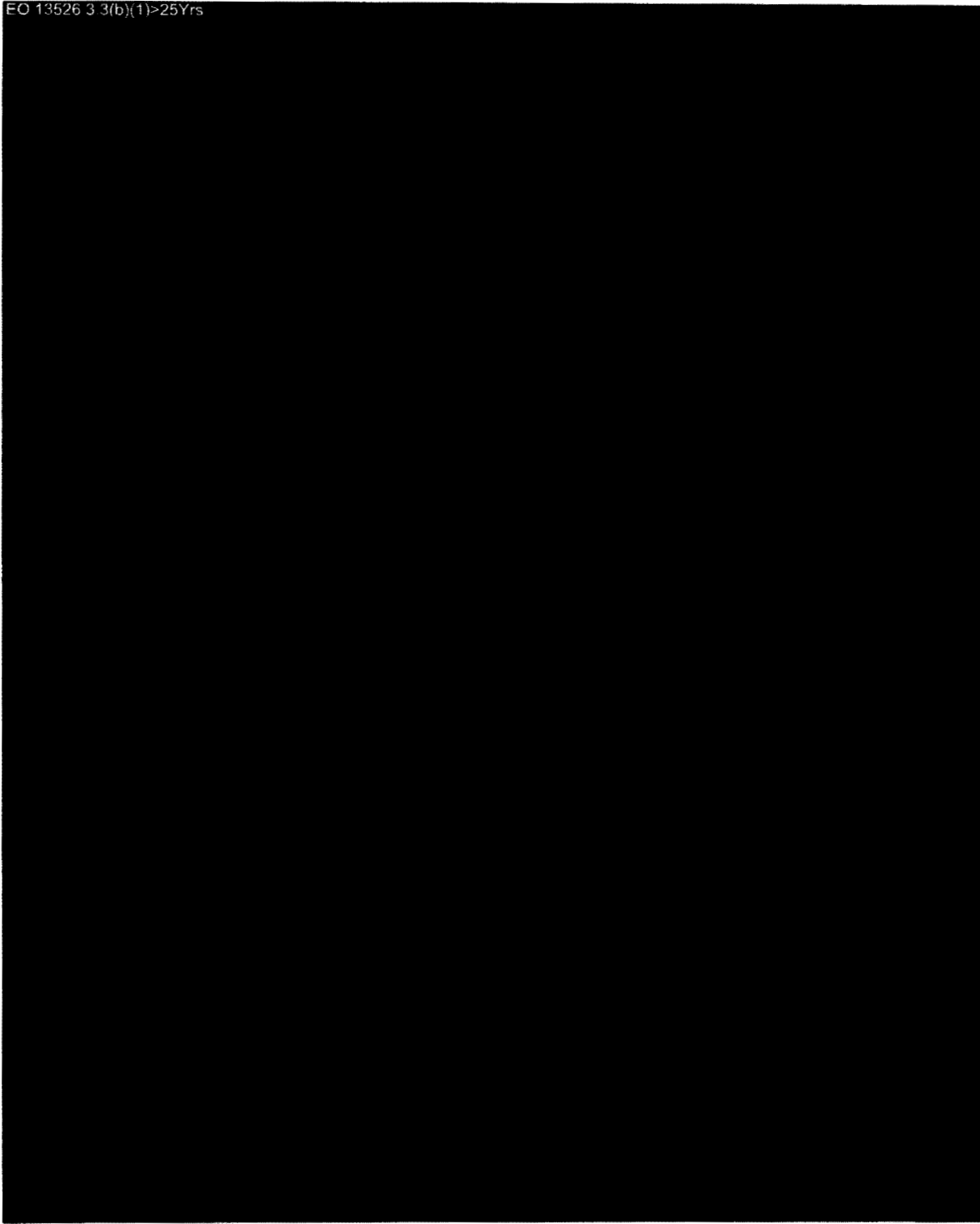
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Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
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~~NOFORN-ORCON~~

EO 13526 3 3(b)(1)>25Yrs



~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly.~~  
~~BYF-91,0-04~~

~~Top Secret~~  
~~NOFORN-ORCON~~



Col Robert W. Yundt

EO 13526 3.3(b)(1)>25Yrs. EO 13526 3.5(c)

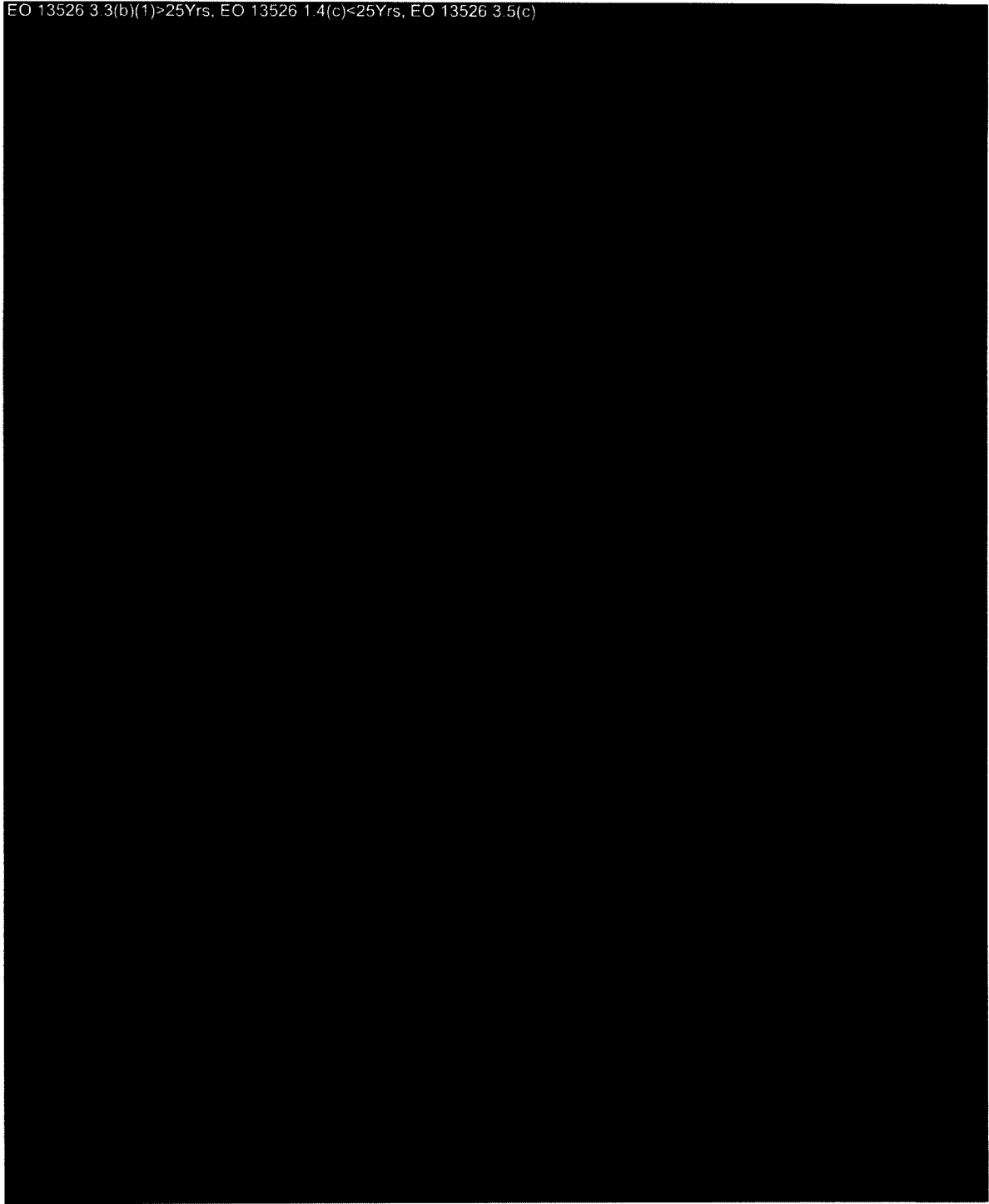
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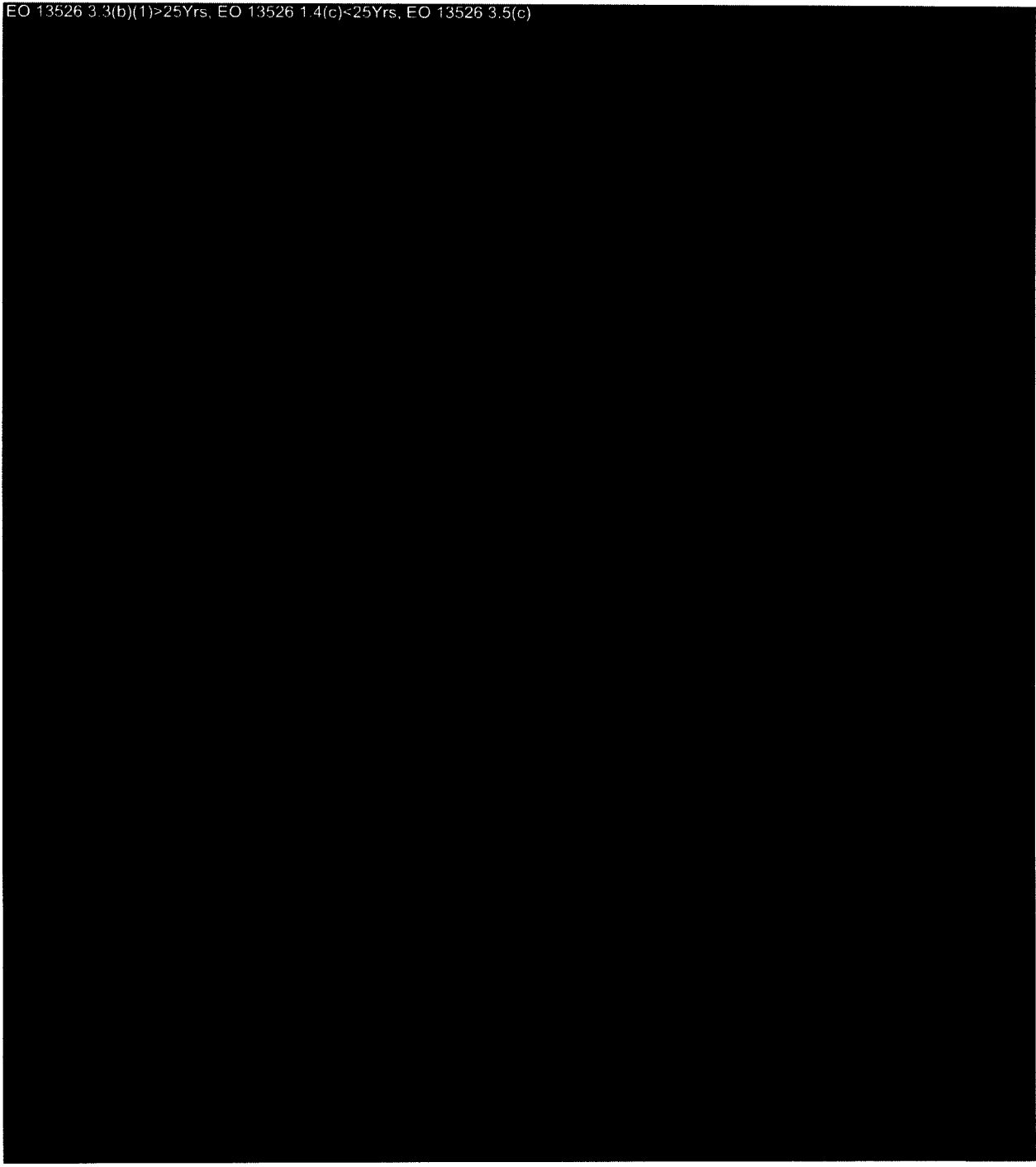
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PL 86-36/50 USC 3605

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~~RVF 010702~~

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
~~NOFORN-ORCON~~

EO 13526 3.3(b)(3)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs



EO 1.4.(c)  
PL 86-36/50 USC 3605

**MGen John L. Martin, Jr.**

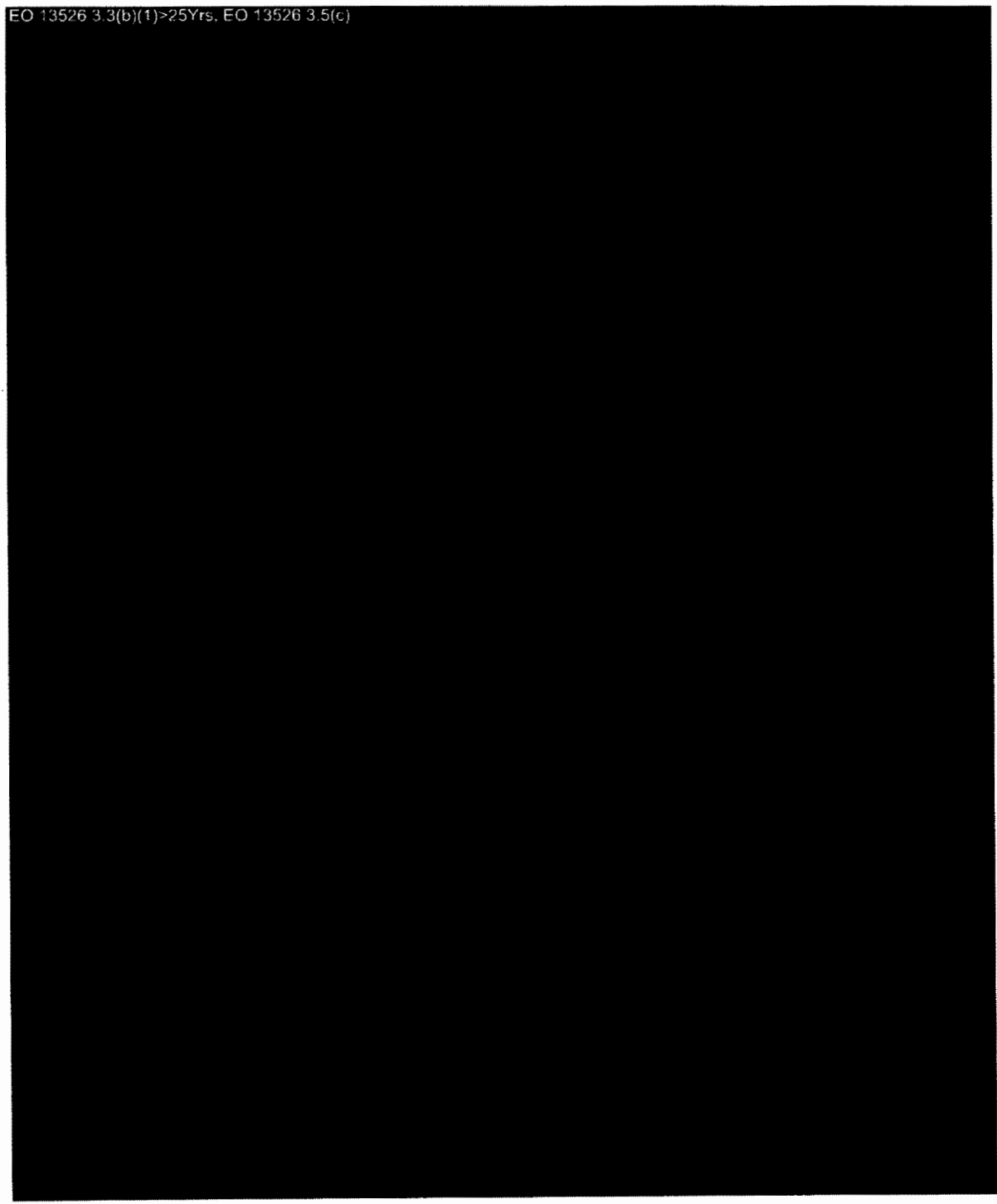
**BGen (later MGen) John L. Martin, Jr., named Director of Special Projects at El Segundo, California, on 1 July 1965.**

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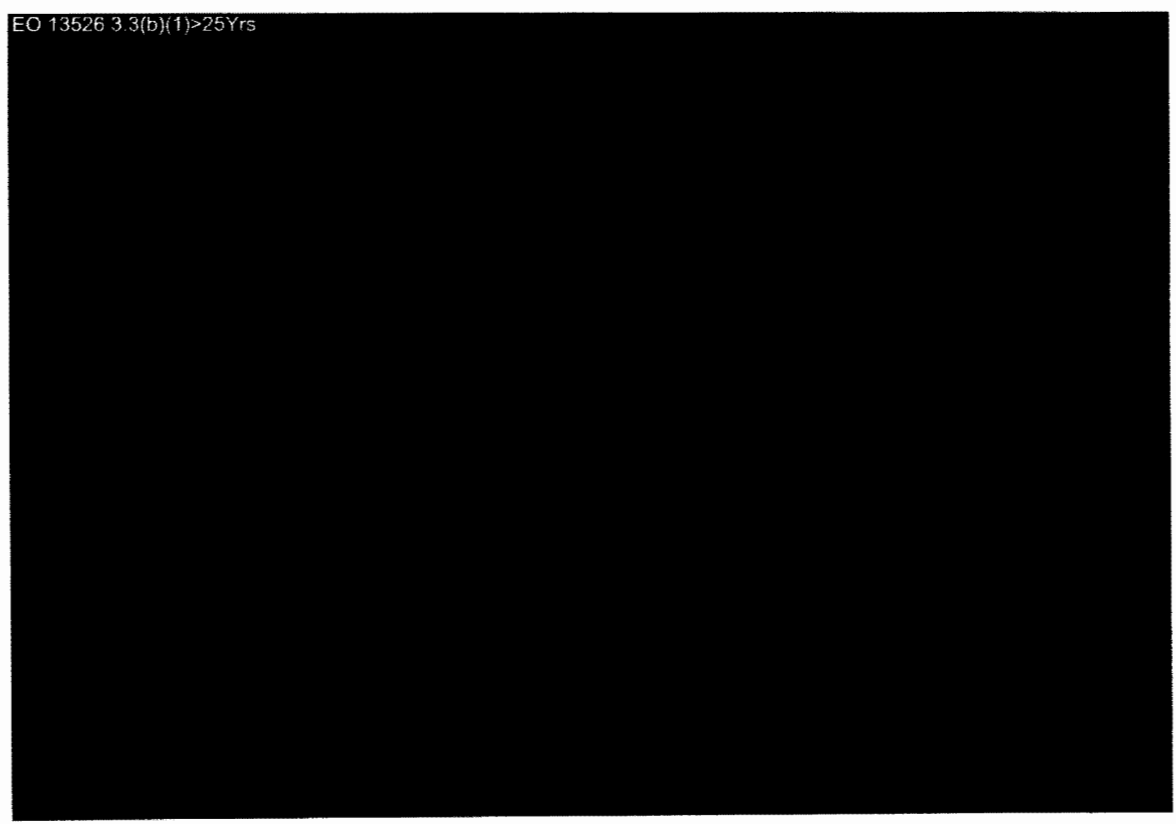


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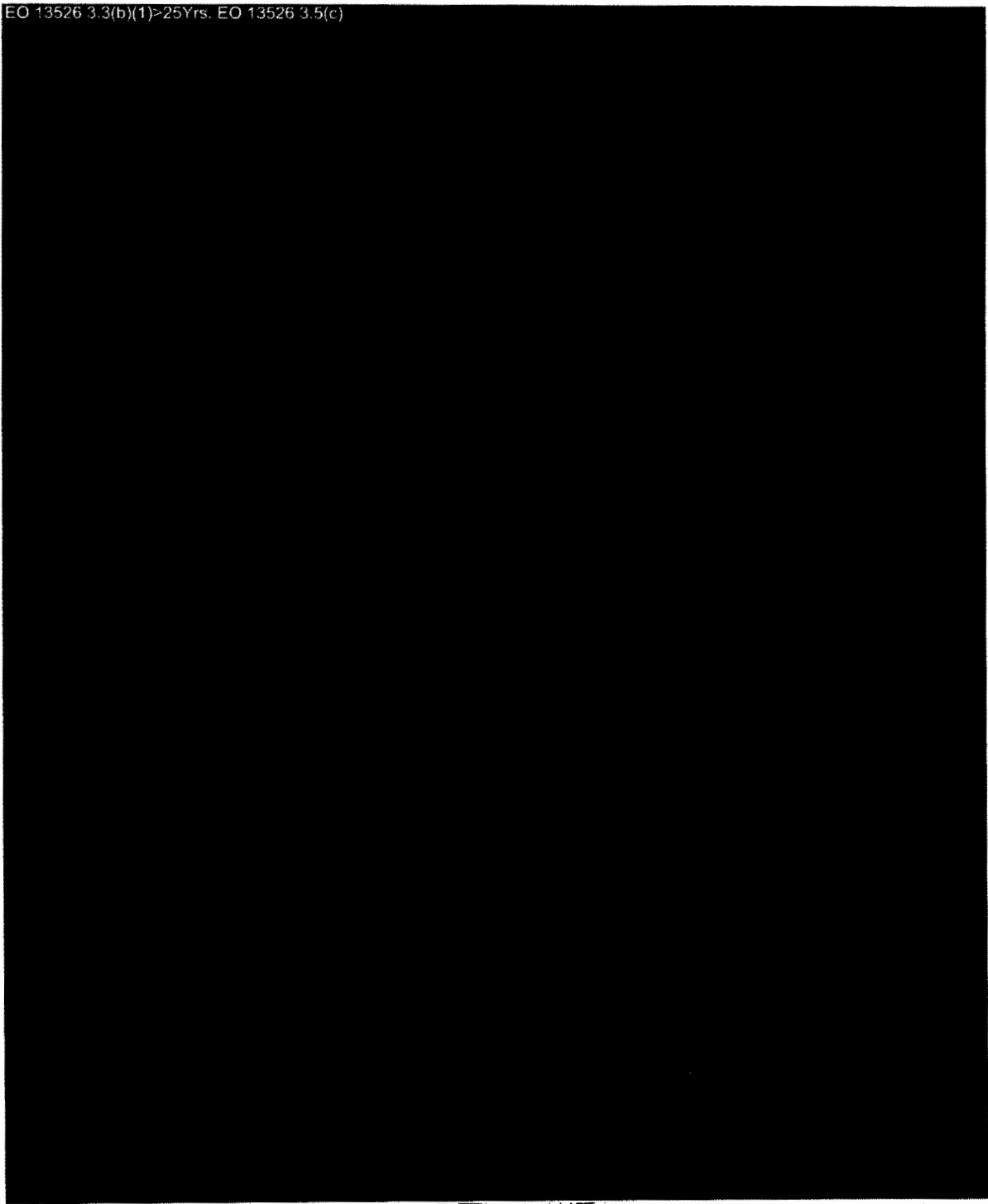
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~~Under an Executive Order of the President~~  
~~of the United States~~

~~Top Secret~~  
~~NOFORN (EXCLUDED)~~

~~Top Secret  
NOFORN/ORCON~~

PL 86-36/50 USC 3605

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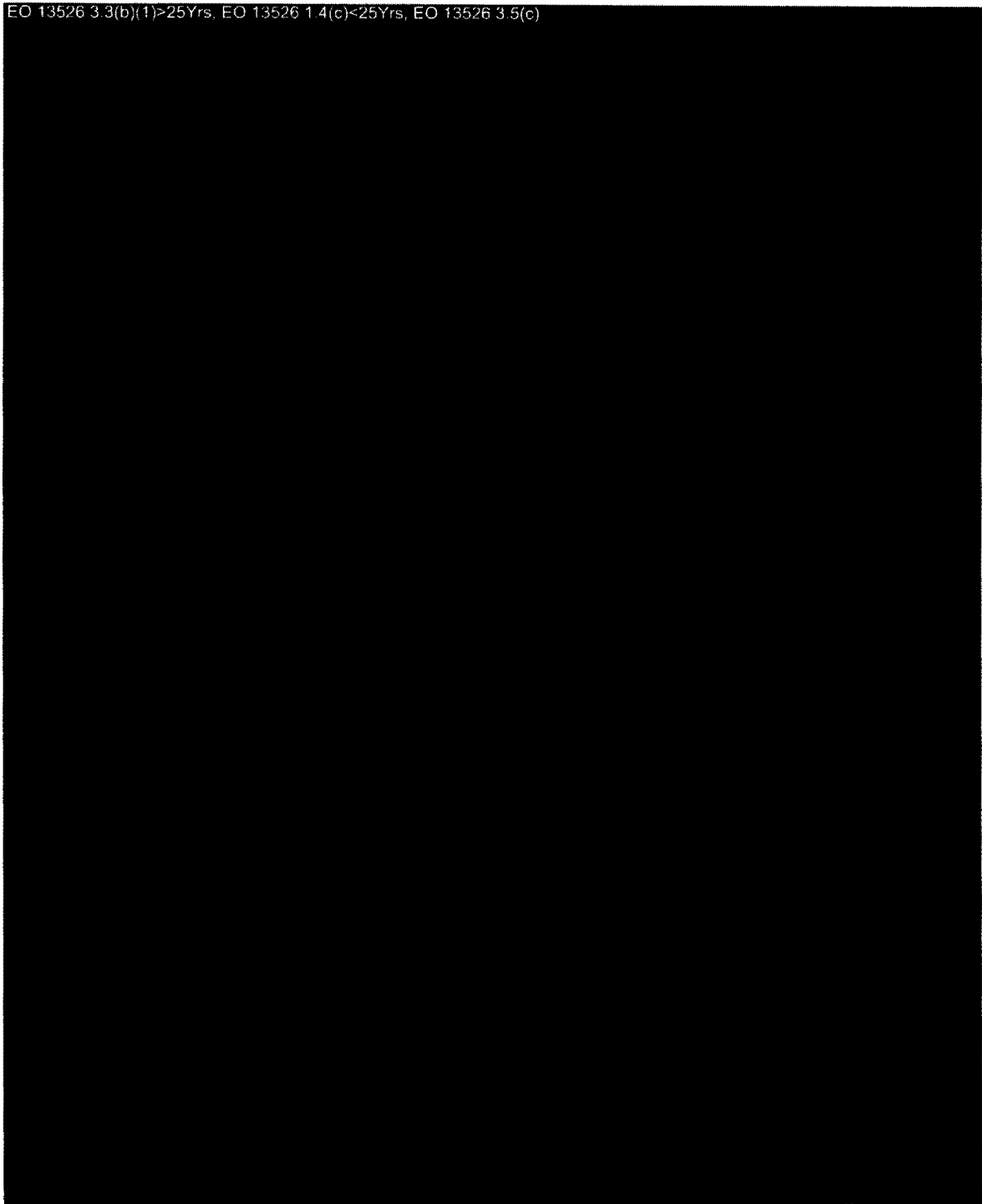


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BYE-919793~~

~~Top Secret~~  
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PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



PL 86-36/50 USC 3605  
EO 1.4.(c)

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Handle via BYEMAN-TALENT-KEYHOLE-  
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BYE-9197/94

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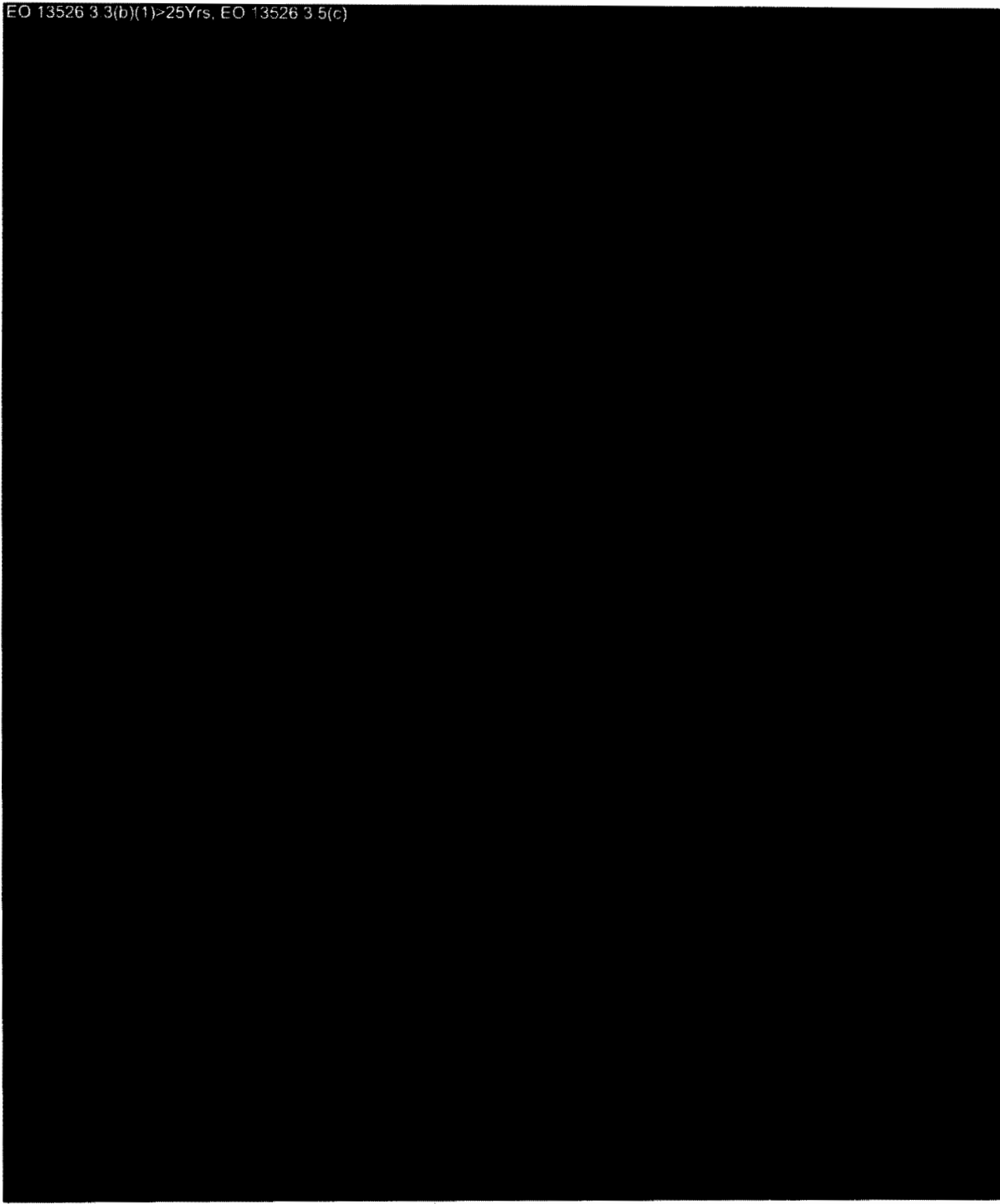
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NOFORN/NOCON  
COMINT/COMINT/COMINT/COMINT  
REF: 019294



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PL 86-36/50 USC 3605

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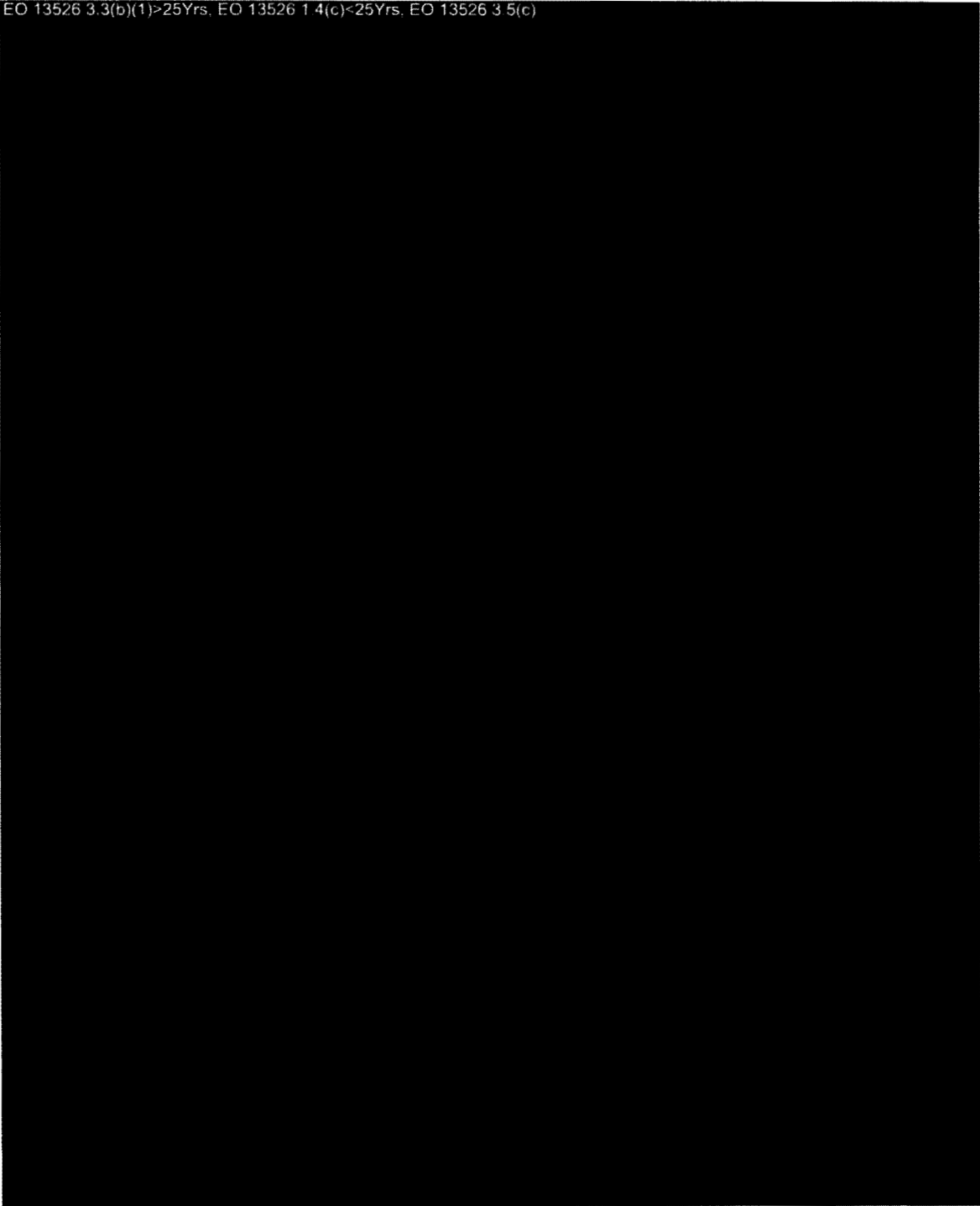


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~~BYE-919791a~~

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EO 1.4.(c)  
PL 86-36/50 USC 3605

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Handle via BYEMAN/TALENT-KEYHOLE-  
COMINT Control Channels Inuitly  
81F-9197-04

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



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The SIGINT Satellite Store

Handle via B7E/B7C/B7D/B7F/B7G/B7H/B7I/B7J/B7K/B7L/B7M/B7N/B7O/B7P/B7Q/B7R/B7S/B7T/B7U/B7V/B7W/B7X/B7Y/B7Z  
C/OWINT/COMINT/INTCOM/INTSEC/INTTEL/INTTRAC/INTVAL/INTVINT/INTWINT/INTXINT/INTYINT/INTZINT  
8/20/1979

~~TOP SECRET~~  
NOFORN-DICOM



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12 JUNE 2015  
EO 13526 3 3(b)(1)-25Yrs



~~Top Secret~~  
Handle via BT/DA/IN/TA/INT/SEC/OF-  
COMINT/Control Channel/and/or  
RNF 9197M

Chapter 4

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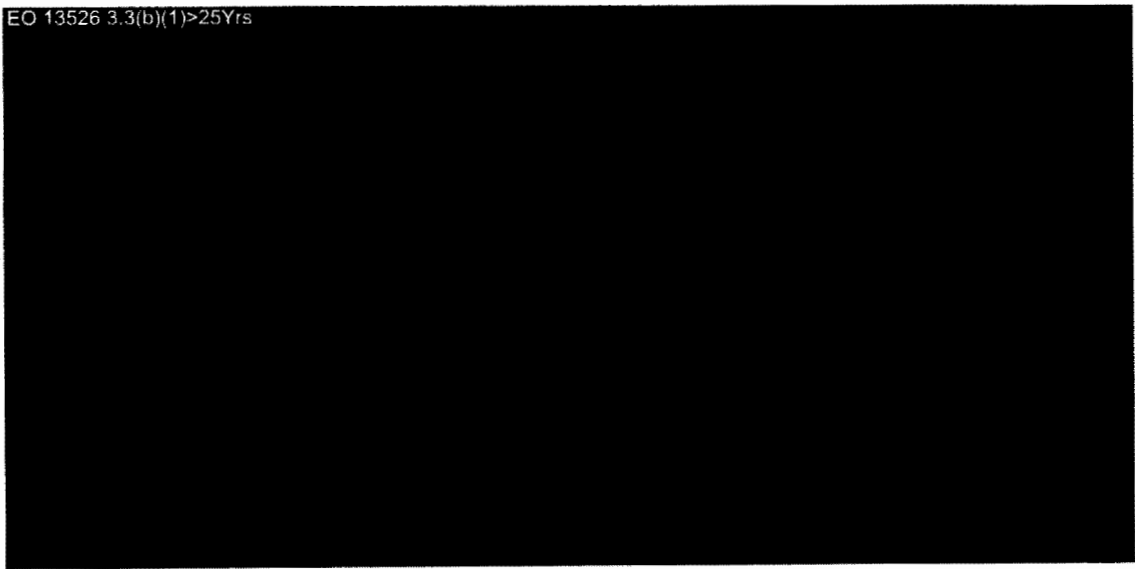
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NOFORN/COMINT/IN



110

The SIGINT Satellite Story

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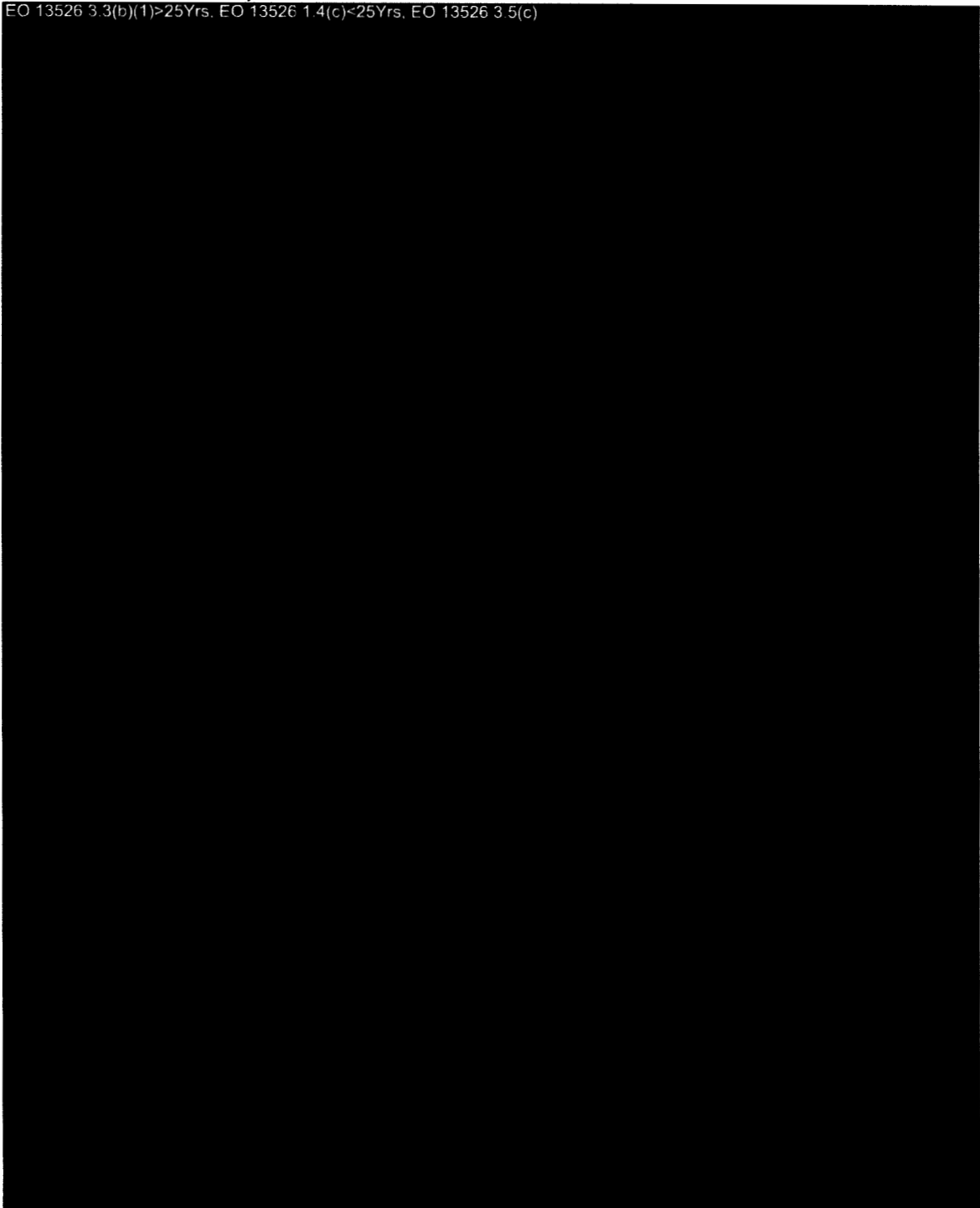
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COMINT/COMINT/COMINT/COMINT  
07/01/02

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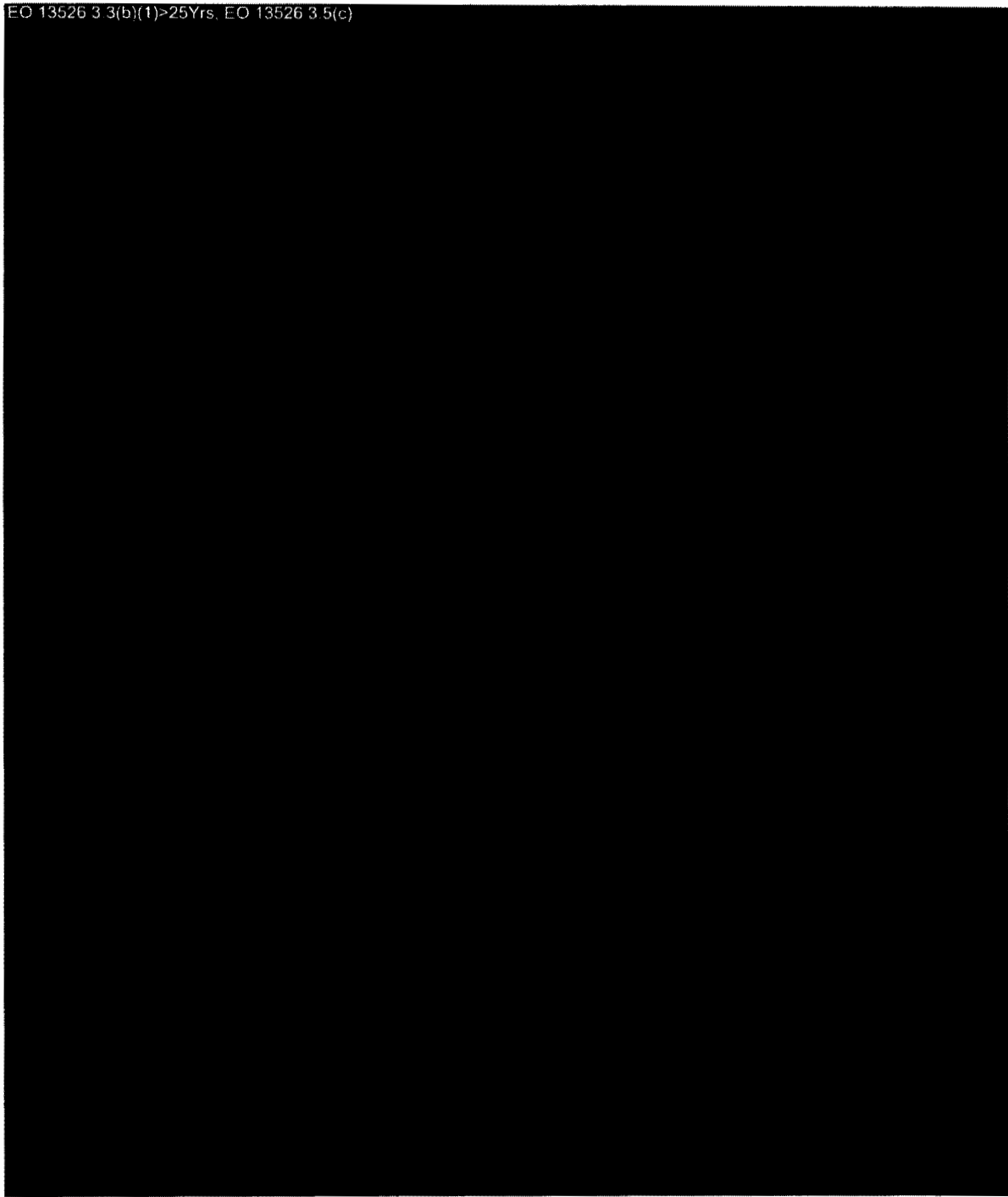
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~~COMINT Control Channel Jointly~~  
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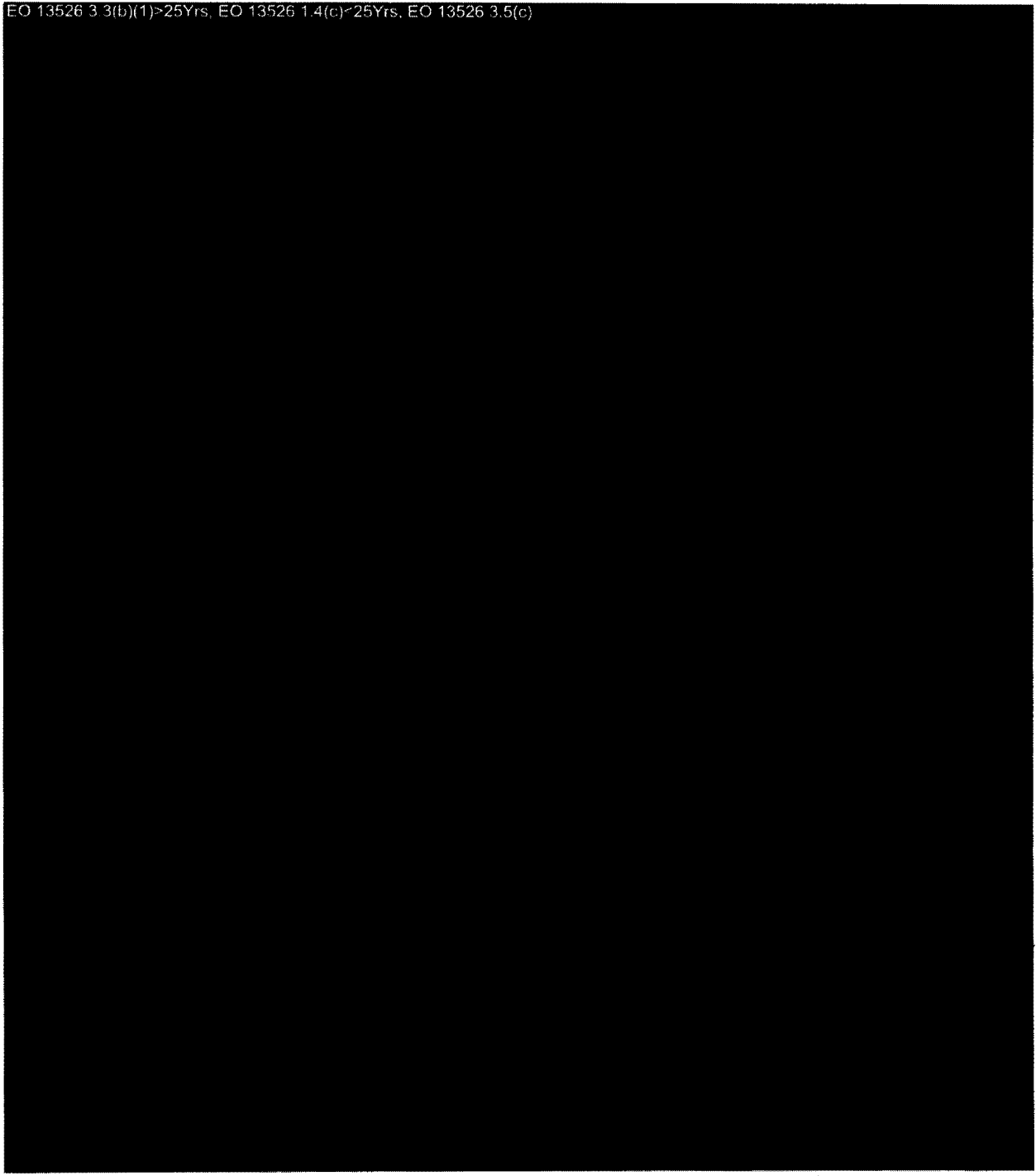


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~~BYE-919794~~

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EO 13526 3 3(b)(1)-25Yrs, EO 13526 1.4(c)-25Yrs, EO 13526 3.5(c)



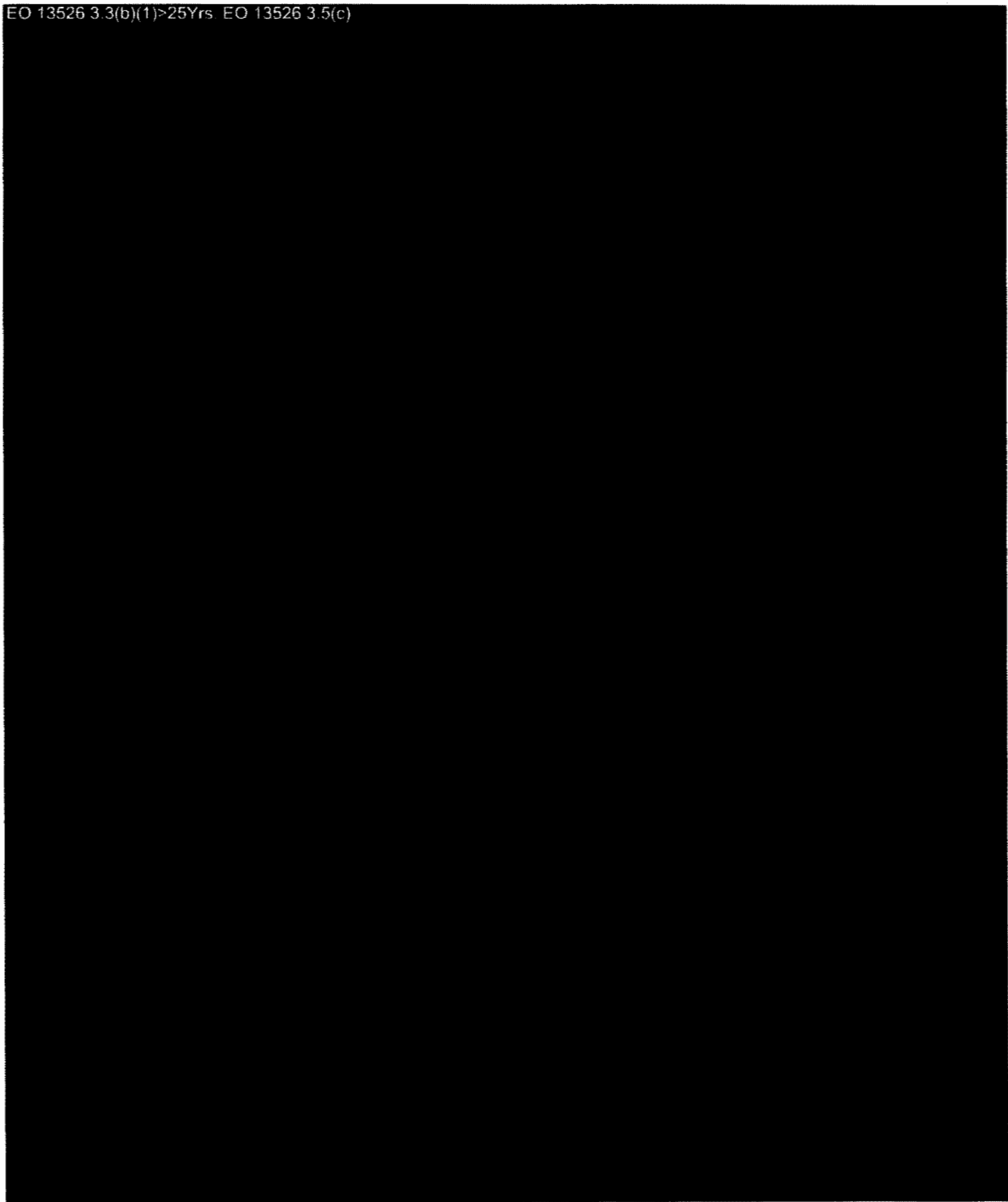
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PL 86-36/50 USC 3605

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COMINT Central Channels Unit  
BYF-0197-02

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EO 13526 3.3(b)(1)>25Yrs EO 13526 3.5(c)



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PL 86-36/50 USC 3605

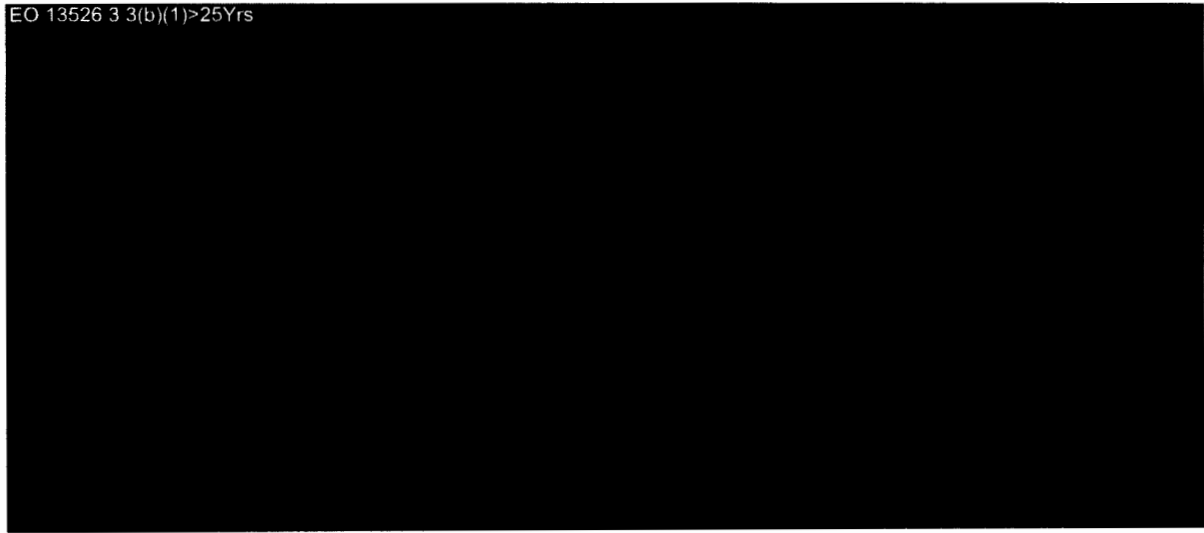
EO 13526 3 3(b)(1)>25Yrs. EO 13526 1 4(c)~25Yrs. EO 13526 3 5(c)



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~~BYE #192742~~

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EO 13526 3 3(b)(1)>25Yrs



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Handle via BYEMAN/TALENT-KEYHOLE-  
COMINT Control Channels jointly  
~~BYE-9197/94~~



~~Top Secret~~  
~~NOFORN-ORCON~~

## Chapter 4 References

1. USIB-D-33.6/8, "Intelligence Requirements for a Satellite Reconnaissance System of which SAMOS is an Example" 5 July 1960.
2. MSG ~~SECRET~~/SAFMS SEN-61-29, Part I, EO 13526 3.3(b)(1)>25Yrs 9 March 1961.
3. MSG ~~SECRET~~/SAFMS PHOTO 60-68, 23 December 1960.
4. MSG ~~SECRET~~/SAFMS SEN-61-29, Part I, EO 13526 3.3(b)(1)>25Yrs 9 March 1961.
5. Letter from Roswell L. Gilpatric, Deputy Secretary of Defense, to Allen W. Dulles, Director of Central Intelligence, "Management of the National Reconnaissance Program," 6 September 1961.
6. S/MSG to LMSC, Sunnyvale, CA, fm HQ SSD, SSZDK-12-12-15, EO 13526 3.3(b)(1)> Reorientation," signed EO 13526 3.3(b)(1)>25Yrs Contracting Officer, 27 December 1961.
7. Memo from Col Henry C. Howard, USAF, "A Cursory Review of the Evolution of the SOC," July 1968.
8. TWX (S) SAFMS-INS-60-31, quoting memo from Joseph V. Charyk to Chief of Staff, USAF, "Memoranda Relating to the Disposition of EO 13526 3.3(b)(1) 4 November 1960.
9. EO 13526 3.3(b) interview, 28 February 1991.
10. LMSC Data from EO 13526 3.3(b)(1) History, BIF003/2-021054-69, 22 July 1969.
11. NSA in Space, April 1975, (BYE-19385-75) p. 71.
12. Raymond Potts' personal notes (hereafter Potts' notes).
13. NSA-BYE-17835-4.
14. Potts' notes.
15. Potts' notes.
16. EO 13526 3.3(b) 1535-6 (TS//B//PK).
17. NSA-BYE-60000-67, and NSA in Space, p. 33.
18. NSA-BYE-60051-67, and NSA in Space, p. 34.
19. NSA in Space, p.34.
21. Potts' notes.
22. SAFSP SUPPORT FOR NSA PROCESSING OPERATIONS (BYE-70872-67)(S//B): Appendix 4.
23. EO 13526 3.3(b) interview, 28 February 1991.
24. EO 13526 3.3(b) interview, 28 February 1991.
25. K4SP Status Board, 20 December 1970.
26. EO 13526 3.5(c)
27. [REDACTED]
28. [REDACTED]

PL 86-36/50 USC 3605

~~Top Secret~~  
Handle via BYEMAN/TALENT-KEYHOLE-  
COMINT Control Channels jointly  
REF: 914774

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PL 86-36/50 USC 3605

- EO 13526 3.5(c)
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  - 30.
  - and
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  - 33.
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Handle via BYEMANTALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE 919794

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NOFORN-ORCON~~



EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

## The Origins of Quick Reaction SIGINT in Space

In the summer of 1957, Col Frederic C. E. "Fritz" Oder, Director of the WS-117L Project Office at the Air Force Ballistic Missile Division (AFBMD), Inglewood, California, struggled with a very difficult budgetary crisis. Funds for missile and space activity had fallen victim to an austere DOD budget, providing only \$10 million



Col Frederic C. E. Oder

for FY57, with promise of little more in FY58. Oder and BGen Osmond J. Ritland, the Deputy Commander of AFBMD, decided a new approach was required to obtain effective support for the project. Their previous associations with the CIA on the U-2 project led them to the belief that a covert approach would be more

palatable and effective, particularly in view of President Eisenhower's desire to secure "Open Skies." The plan would involve the concept of covert overflight from orbit, participation of the CIA, and a definite project acceleration. Oder's secretary Betty Hawkins called it the "second story" because she was required to keep the details in a file separate from the WS-117L documentation.

The centerpiece of the plan was a covert photo payload with a recoverable film capsule, to be launched on Thor boosters, earlier than the already planned Atlas launches. On 7 February 1958 President Eisenhower, in a meeting with James Killian, approved the plan. Eisenhower's decision was prompted in part by the launch of Sputnik I in October 1957. Richard Bissell, Assistant Director of the CIA and the U-2 Project Director, had agreed to head the CIA effort that would be responsible for the covert security system and procurement of the photo payload. Also in February 1958, President Eisenhower established the Advanced Research Projects Agency (ARPA) to consolidate all military space systems development. Since ARPA would be responsible for the "white" development of the reconnaissance spacecraft, booster, and all support systems, Oder arranged for his assistant on WS-117L, Capt Bob Truax, US Navy, to be assigned to ARPA to assure

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COMINT Control Channels jointly  
81E-9197-94~~

~~Top Secret~~  
~~NOFORN-ORCON~~

adequate coordination between the white support systems and the "black" CORONA payload. ARPA named the cover for the capsule recovery project DISCOVERER and assigned to it biomedical and other scientific activities to disguise its real mission.

In November 1959 the DISCOVERER project was reassigned from ARPA to the Air Force as an "operational" project. When BGen Robert E. Greer became Director of the SAMOS Project in August 1960, he used the authority of his "second hat" as Deputy Commander of AFBMD to incorporate Col Lee Battle and the DISCOVERER Project Office into his organization. To the unwitting ("white") Air Force and to the world at large it appeared that DISCOVERER was an AFBMD scientific project.



Harold Willis

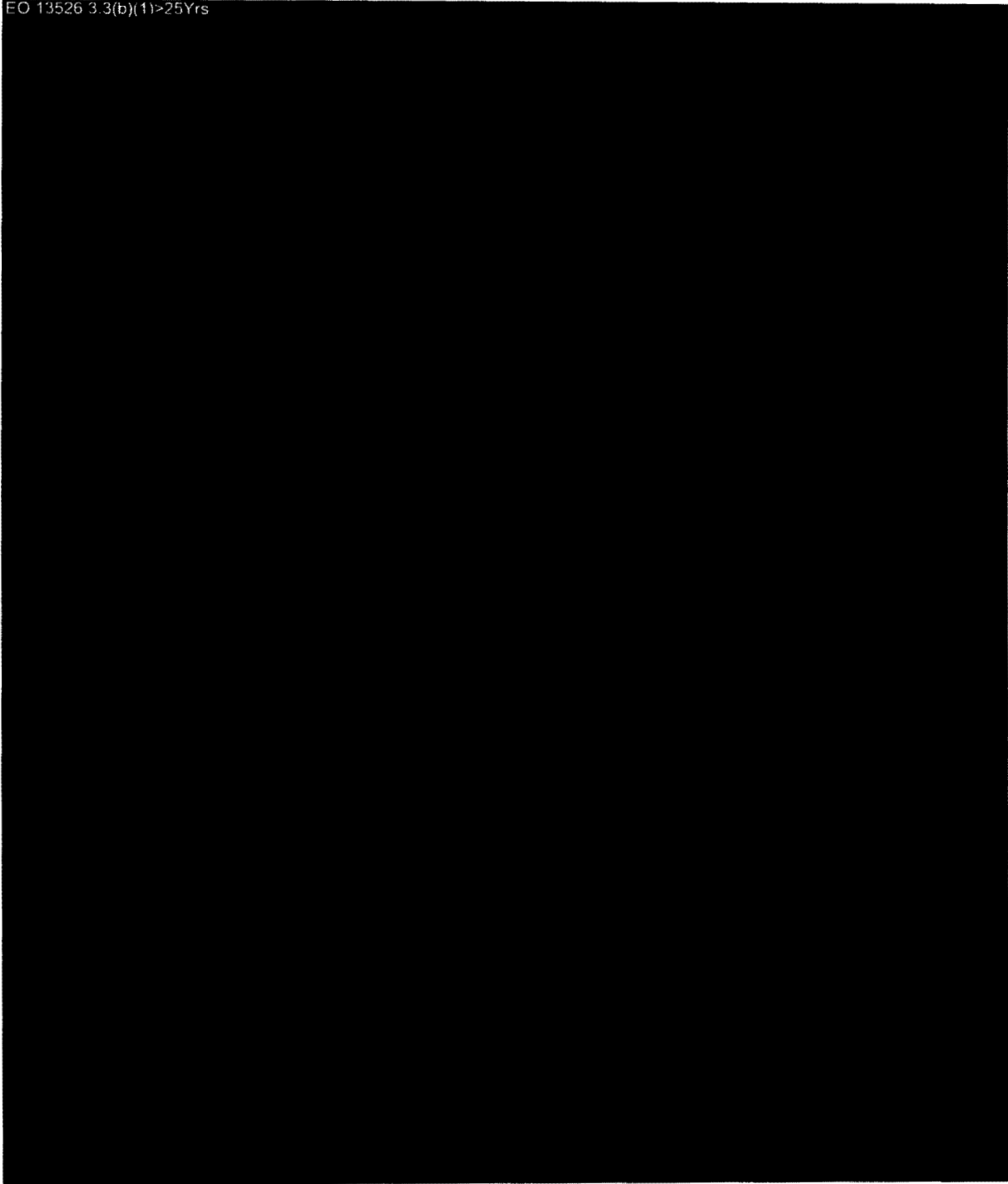
EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

~~Top Secret~~  
~~NOFORN-ORCON~~



EO 13526 3.3(b)(1)>25Yrs

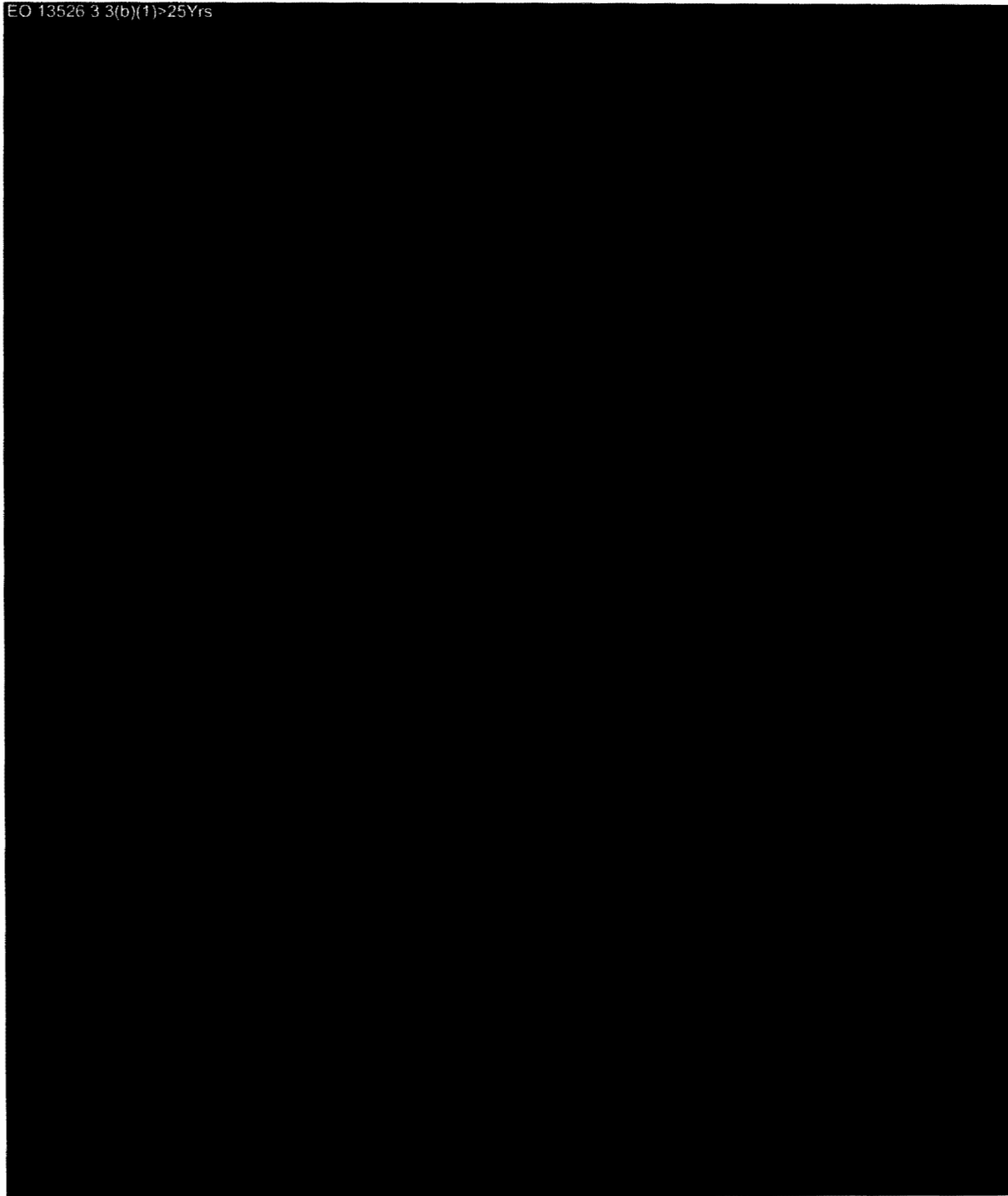


~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
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~~REF. 010704~~



~~Top Secret~~  
~~NOFORN-ORCON~~

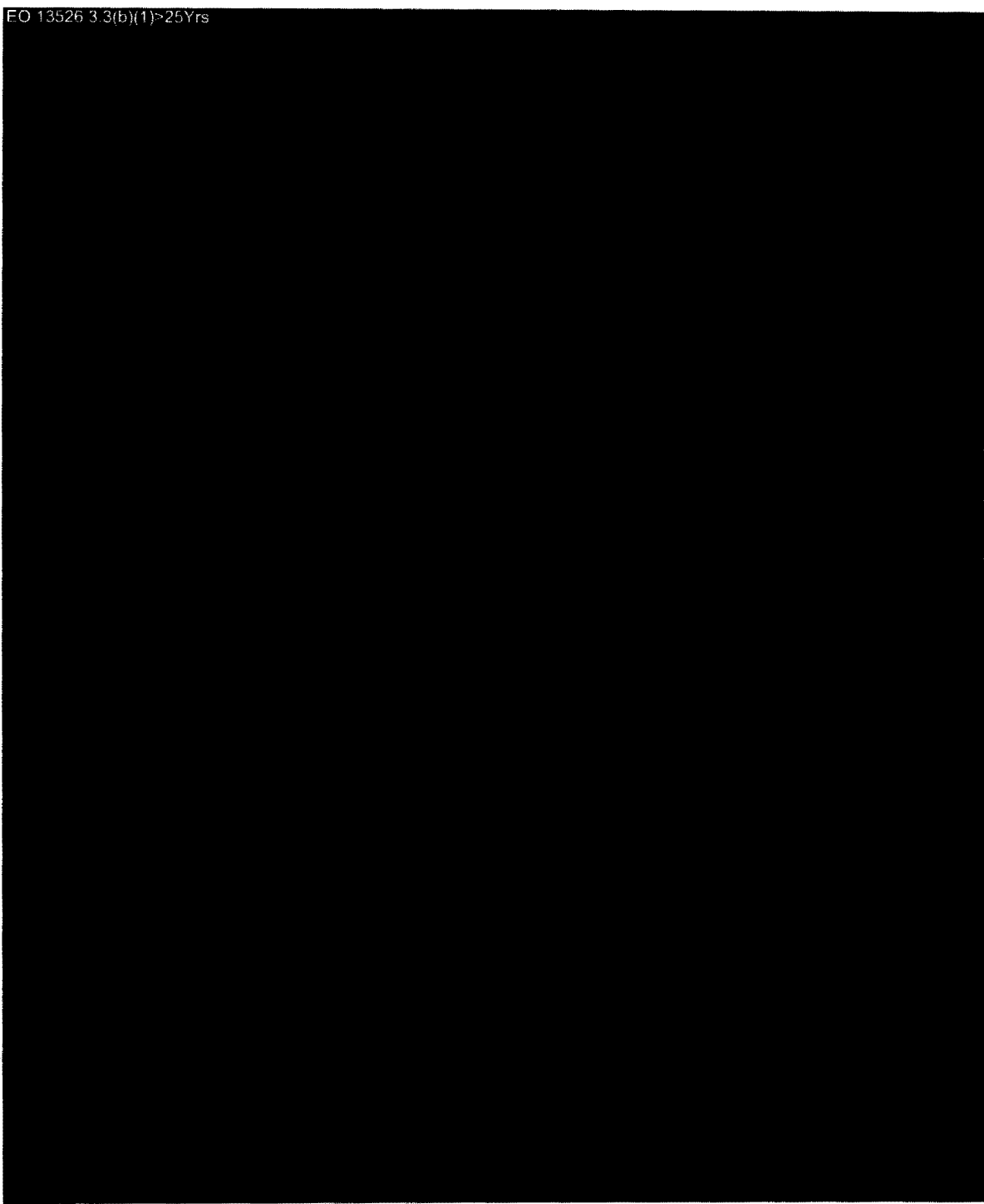
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~~Top Secret~~  
Handle via ~~BYEMANTALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly~~  
~~BYE.010702~~

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 13526 3.3(b)(1)-25Yrs



~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly~~  
~~BYE-919794~~

EO 13526 3.3(b)(1)-25Yrs

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The SIGINT Satellite Story

~~Top Secret~~  
Handle via BYEMAN/ALB/ET/KE/MO/LF  
COMINT Control Channel Ident.  
R/S 1/1/04



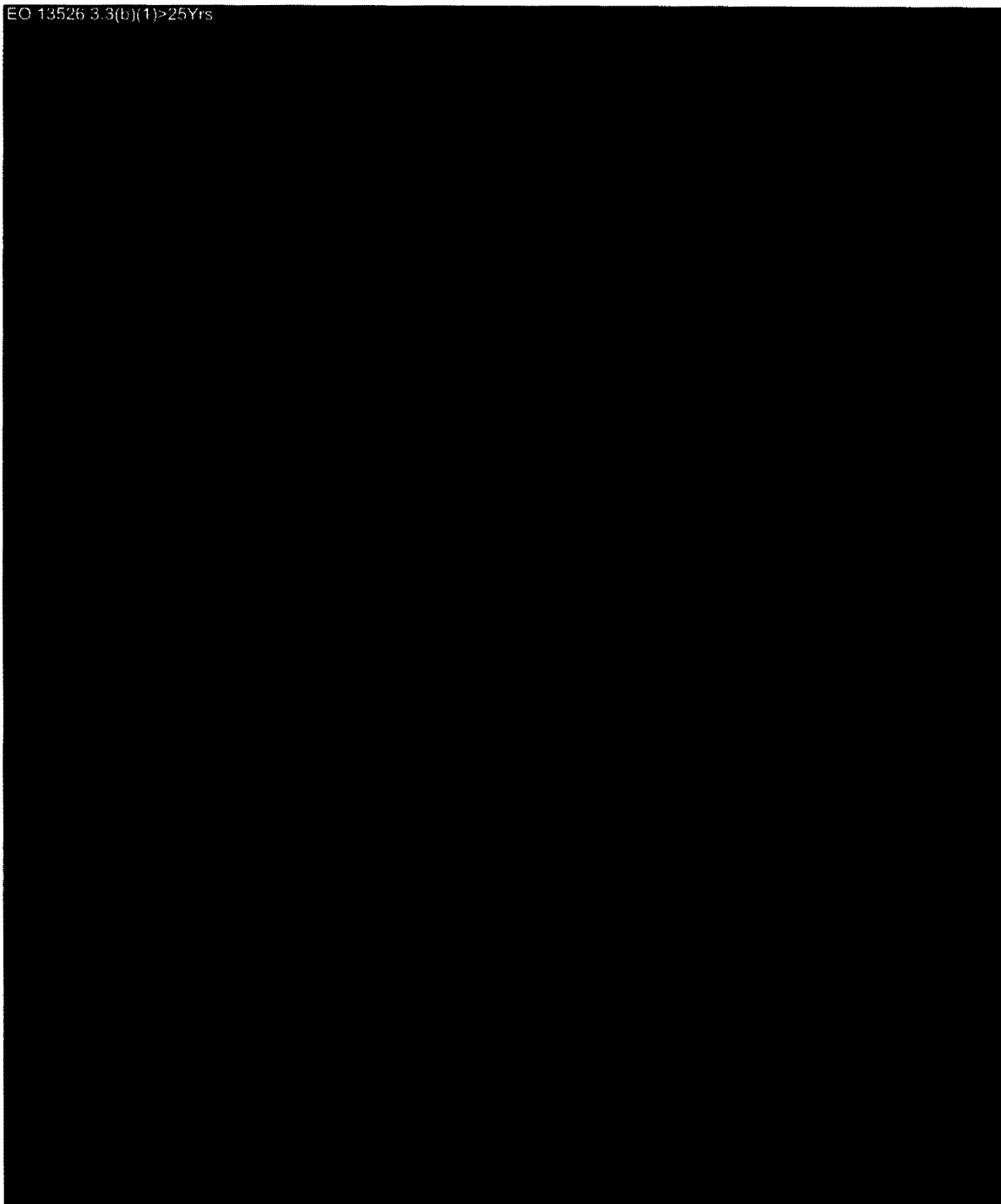
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NRO/NSA/ORM/CON



~~TOP SECRET  
NOFORN-ORCON~~



EO 13526 3.3(b)(1)>25Yrs



~~TOP SECRET~~  
Top Secret  
Handle via BYEAM/TALENT-KEYHOLE-  
COMINT Control Channels only  
BYE-914792

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

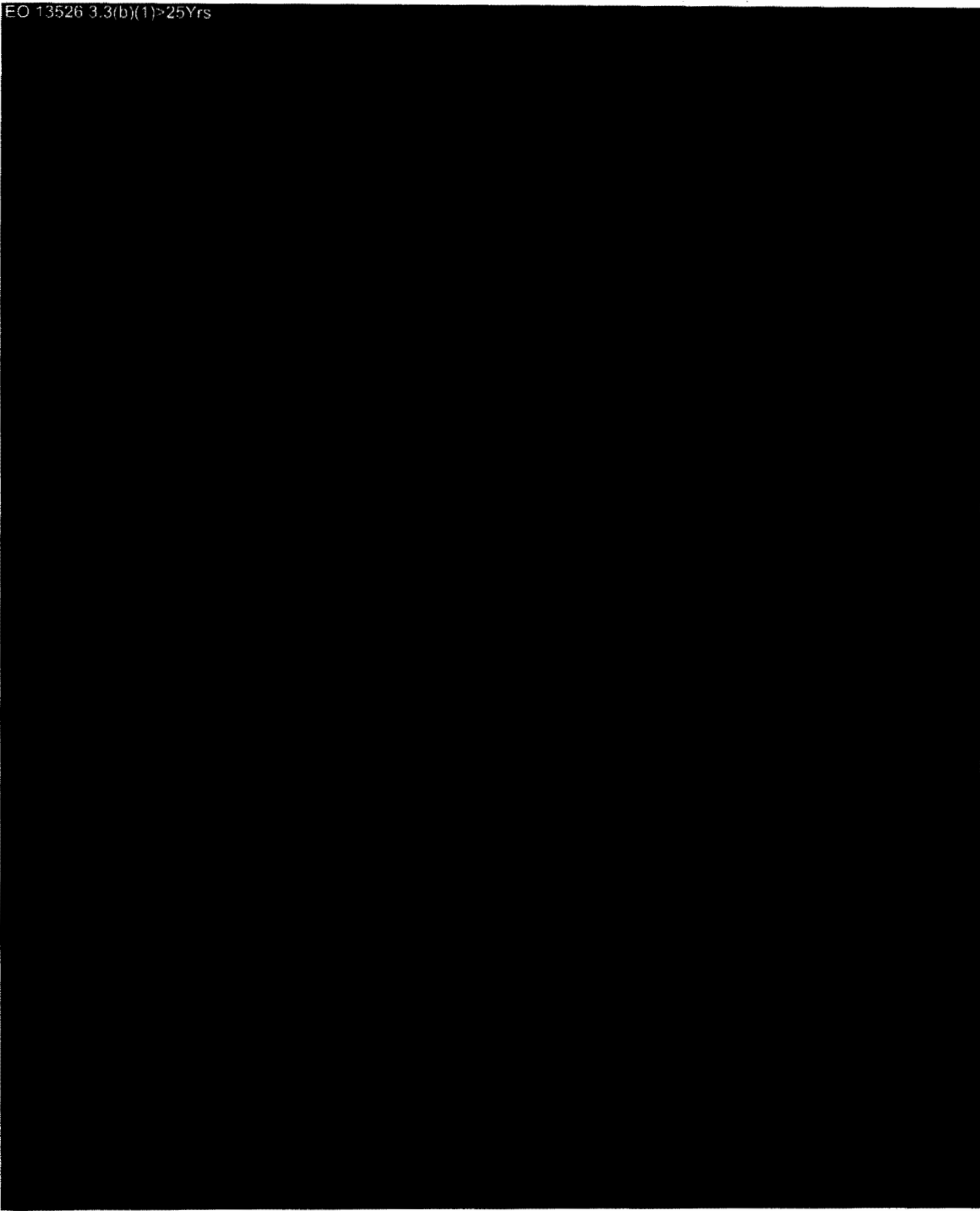
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
~~Handle via BYEMAN-TALENT-KEYHOLE-~~  
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~~Top Secret~~  
~~NOFORN-ORCON~~

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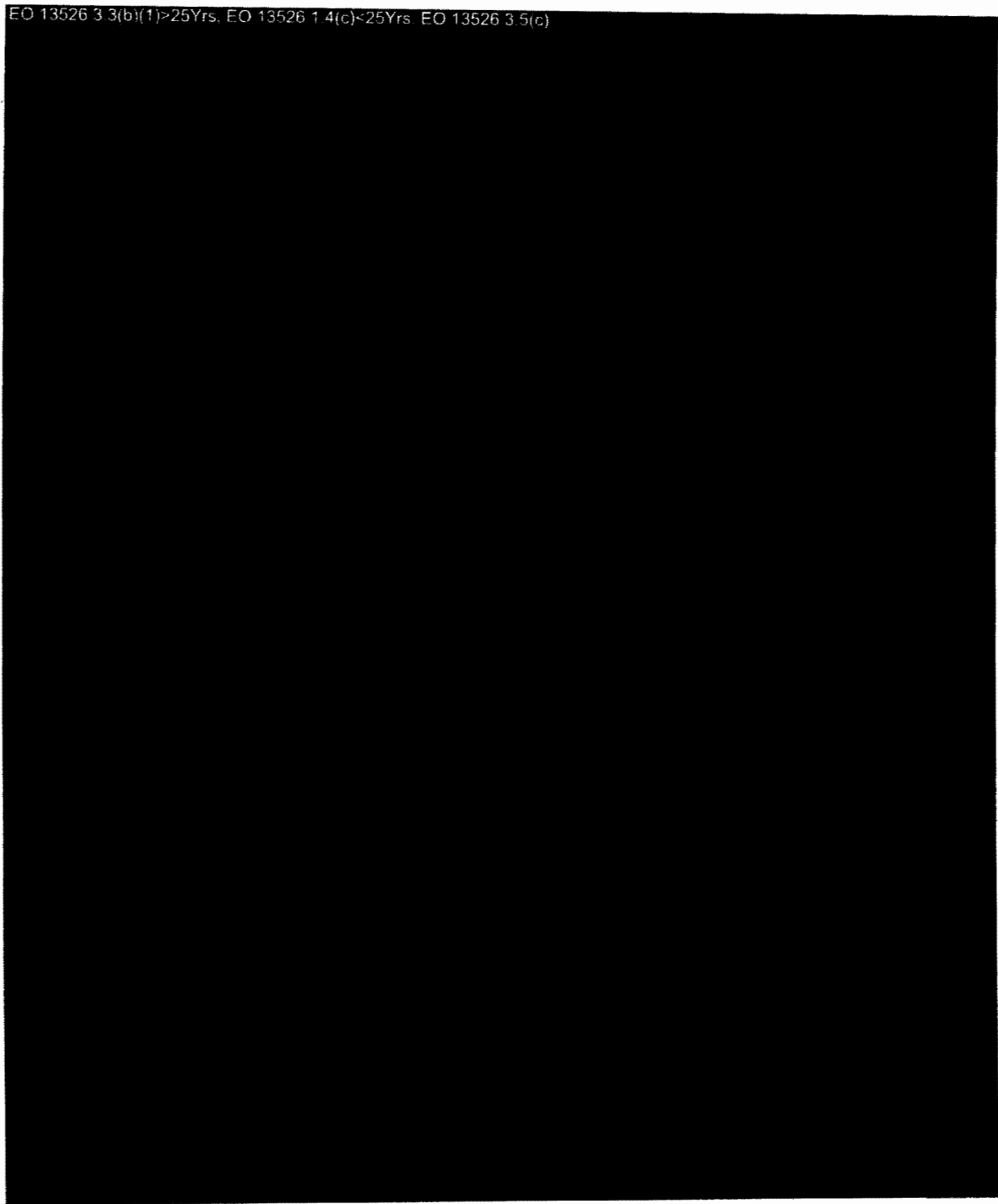


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Handle via ~~BYEMAN TALENT-KEYHOLE-~~  
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~~RVE 010 01~~

~~Top Secret  
NOFORN, ORCON~~

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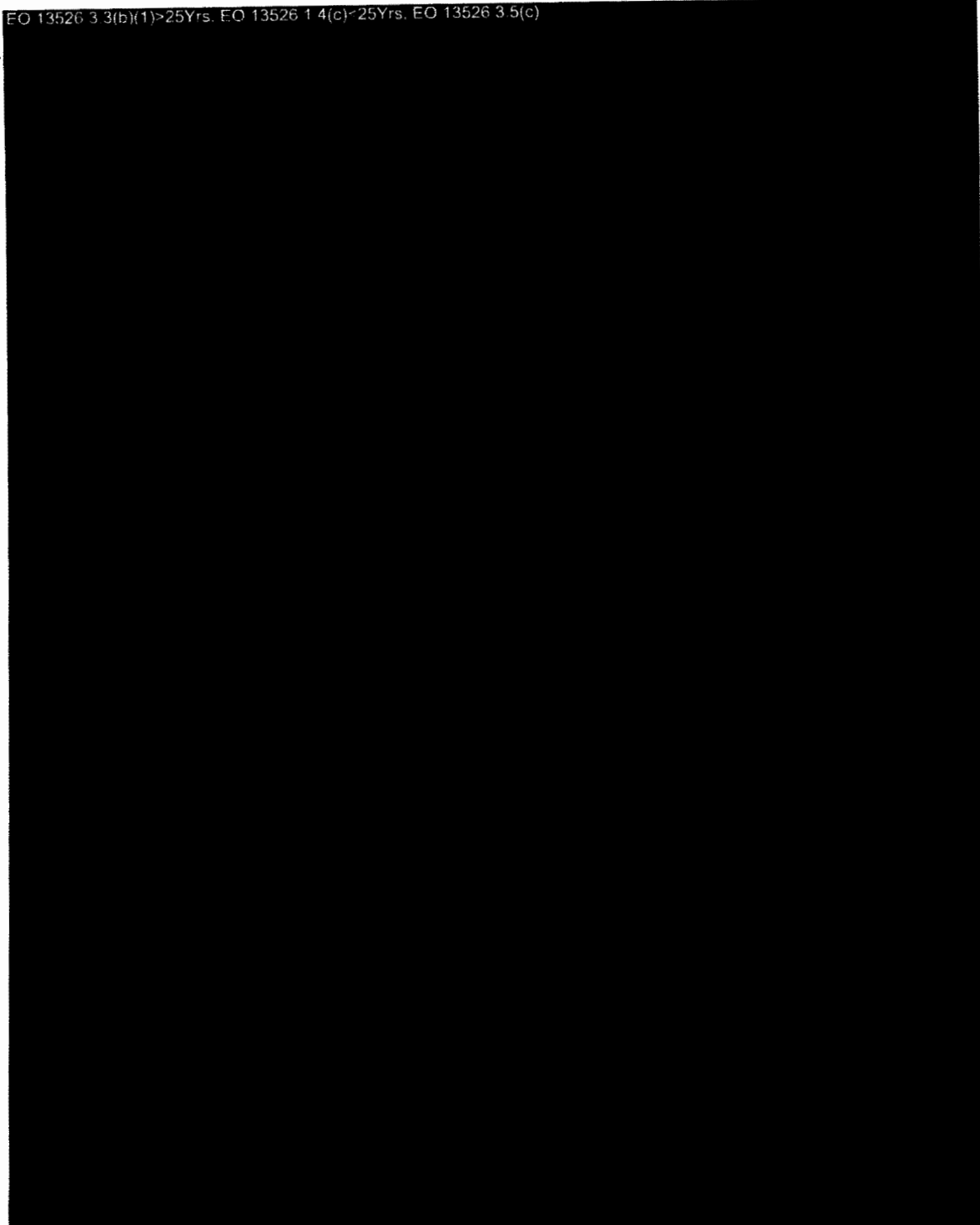
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PL 86-36/50 USC 3605

~~Top Secret  
Handle via BYEMAN, FALENT-KEYHOLE-  
COMINT Control Channels Intiv  
BYE-019794~~

~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)-25Yrs. EO 13526 1.4(c)-25Yrs. EO 13526 3.5(c)

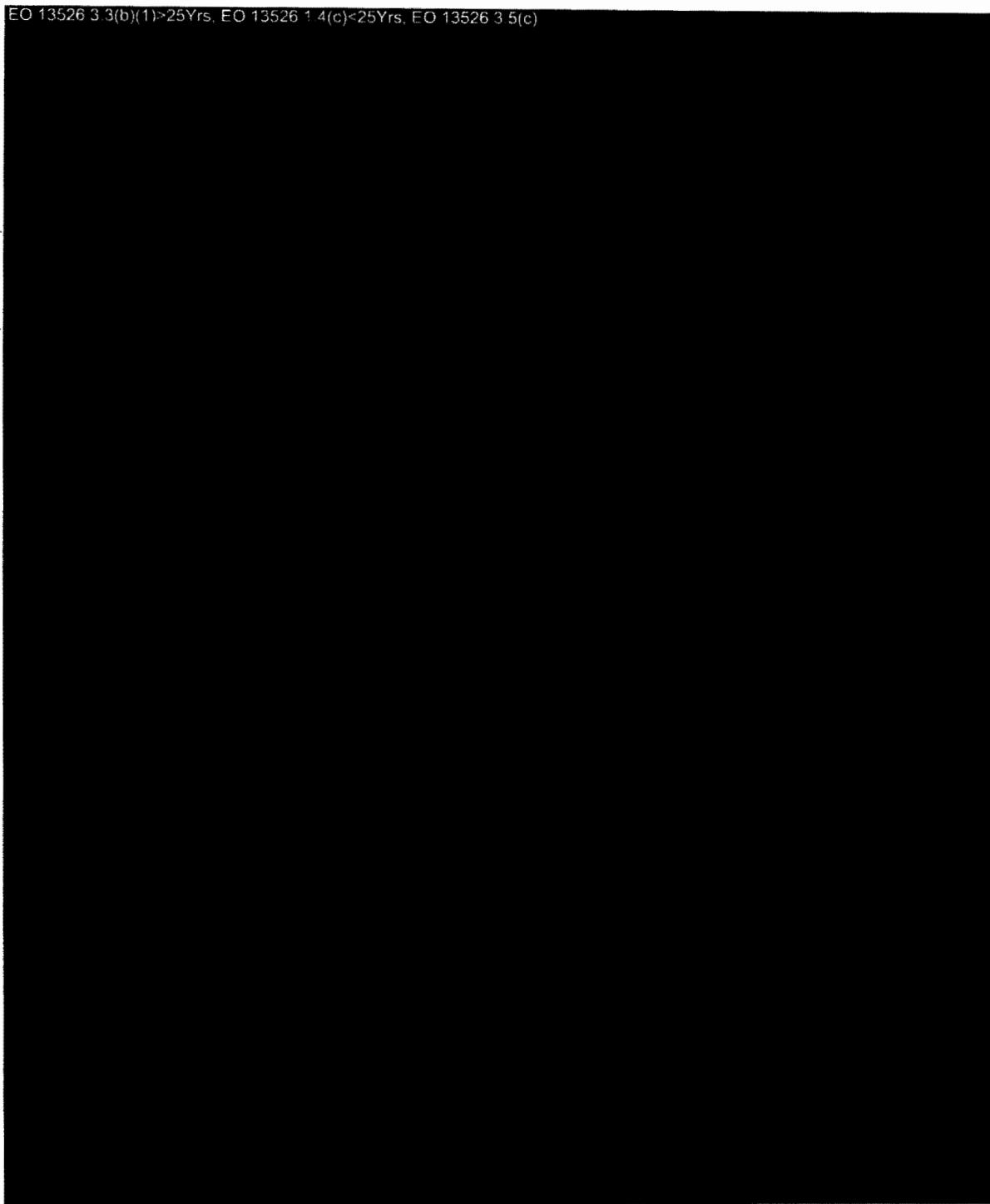


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Handle via BYEMAN-JALENT-REYNOLDE-  
COMINT Control Channels jointly  
BYT-9197A4

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYMOLE-~~  
~~COMINT~~ Control Channels jointly  
BYF.014702

12 JUNE 2015

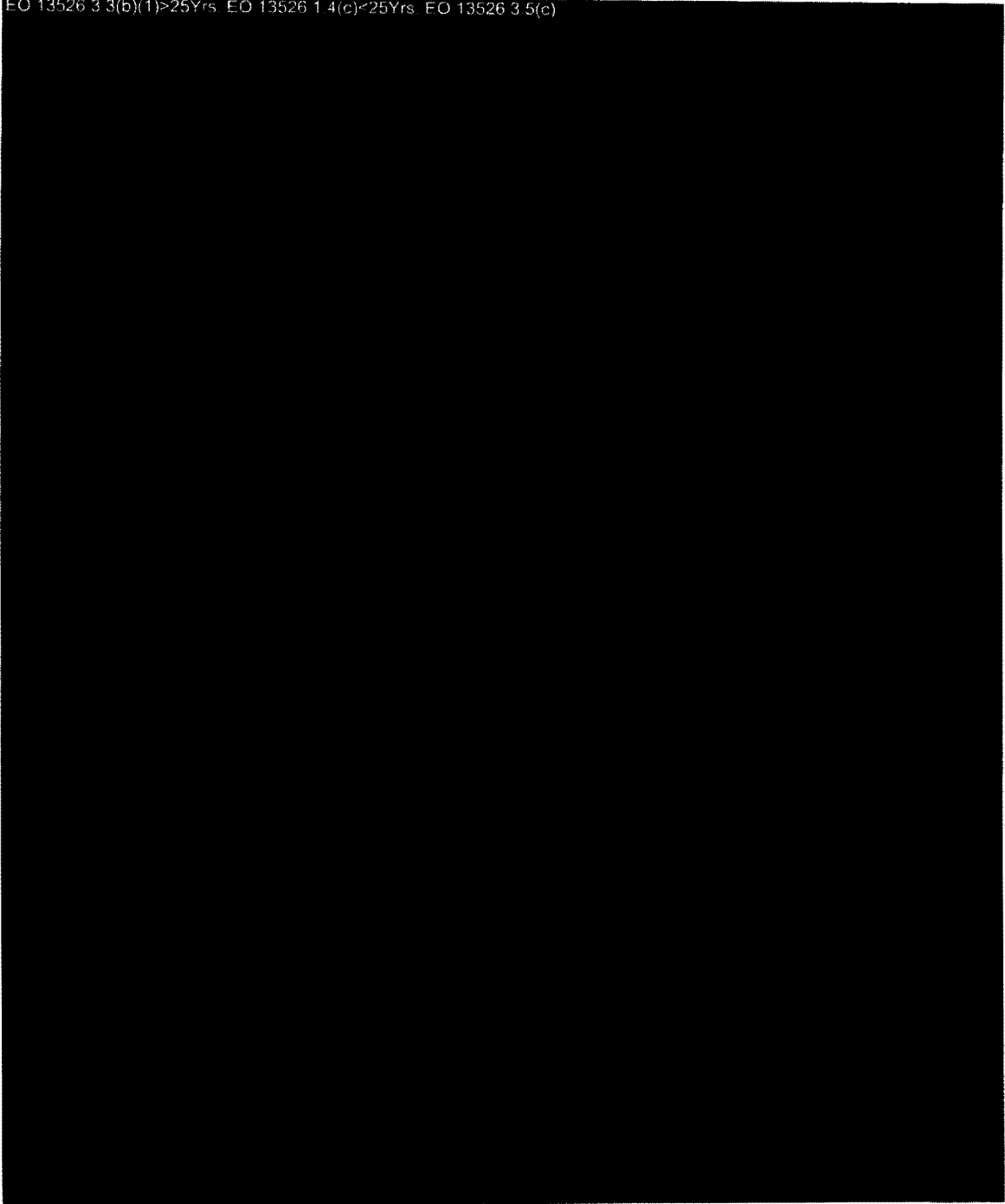
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EO 1.4.(c)

PL 86-36/50 USC 3605



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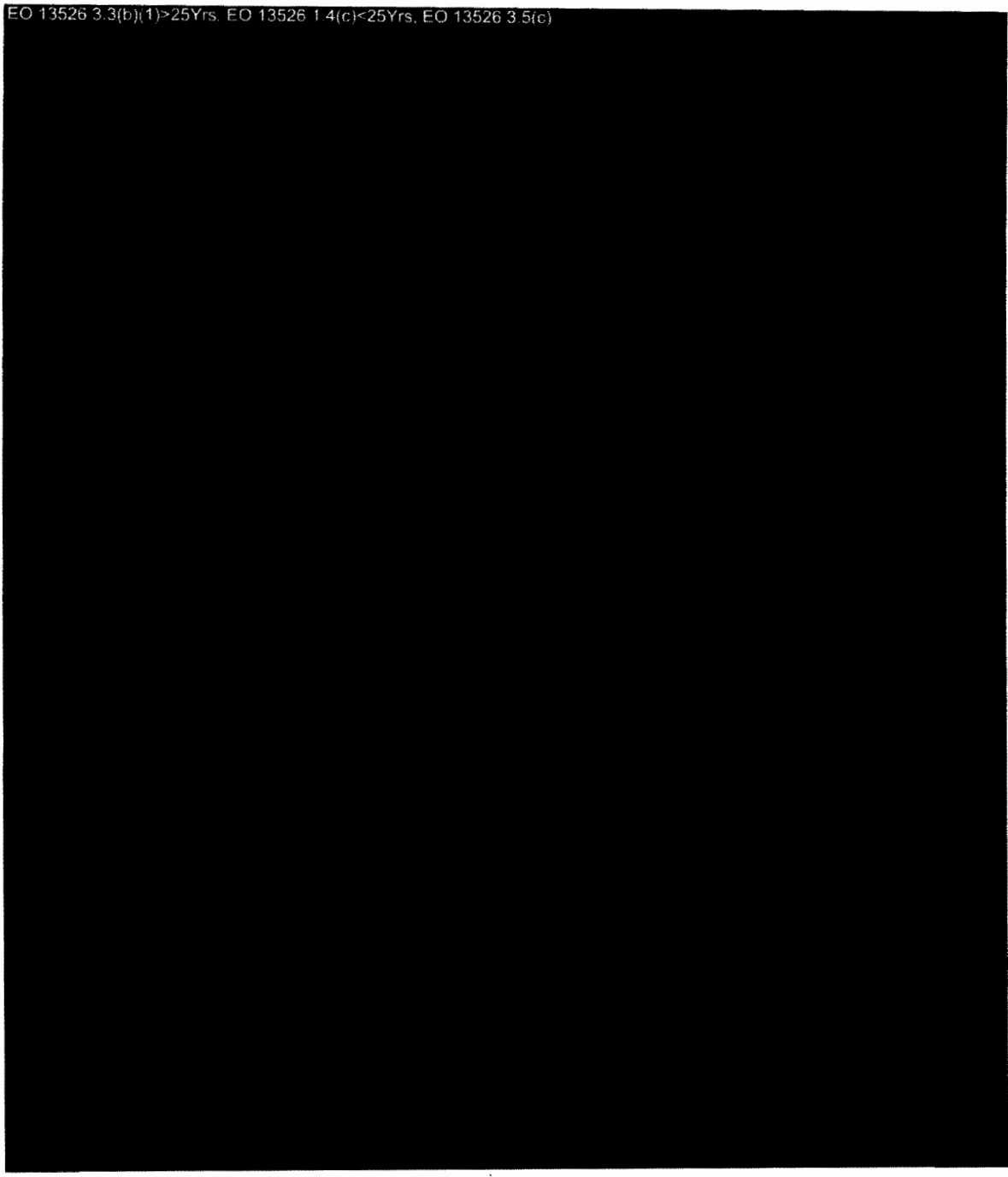
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~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels Jointly  
BYE-9197A4

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly~~  
~~81E-9197-94~~



12 JUNE 2015

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



~~TOP SECRET~~  
HANDLED VIA BIRMINGHAM (INT) - AETNOLC  
COMINT CONTROL CHANNELS MONTH  
REF: 019704

~~TOP SECRET~~  
NOFORN/NOCON

Chapter 3

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134

The SICINI Satellite Storm




~~Top Secret~~  
Handle via BTEA/AF/ENI/AFHQ/AF-  
COMINT Control Channel monthly  
87F-519782

~~Top Secret~~  
AF/ENI/AFHQ/AF-  
COMINT Control Channel monthly  
87F-519782

12 JUNE 2015

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
Handle via BRYAN/ALE/AL/RES/QUE-  
1 (ADMIN) Control Clearance Mark  
9-913724

~~Top Secret~~  
NOFORN/COMINT

EO 1.4 (c)  
PL 86-36/50 USC 3605

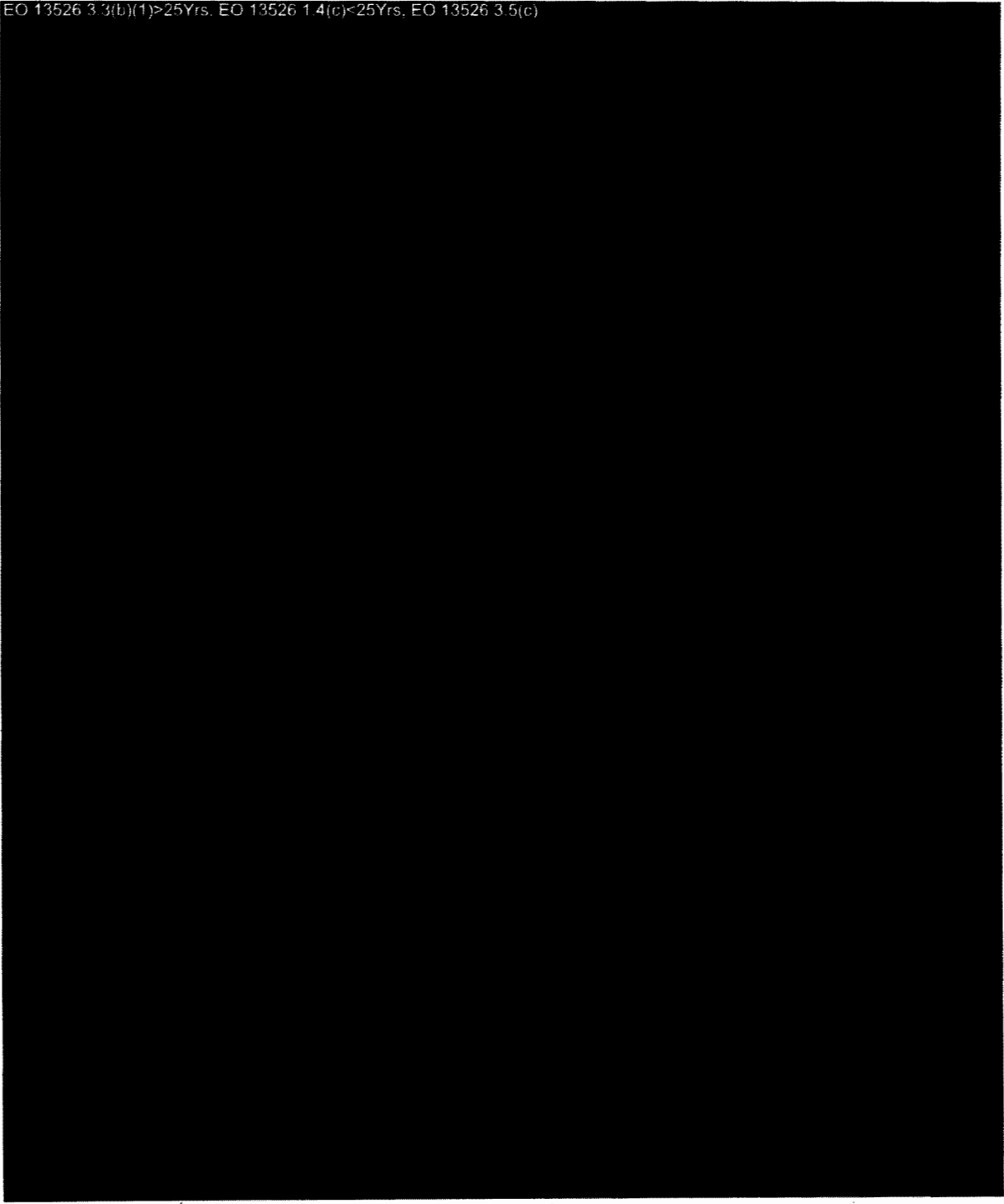
Chapter 5

135



~~Top Secret  
NOFORN-ORCON~~

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE-919794~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

~~BYEMANTALENT~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

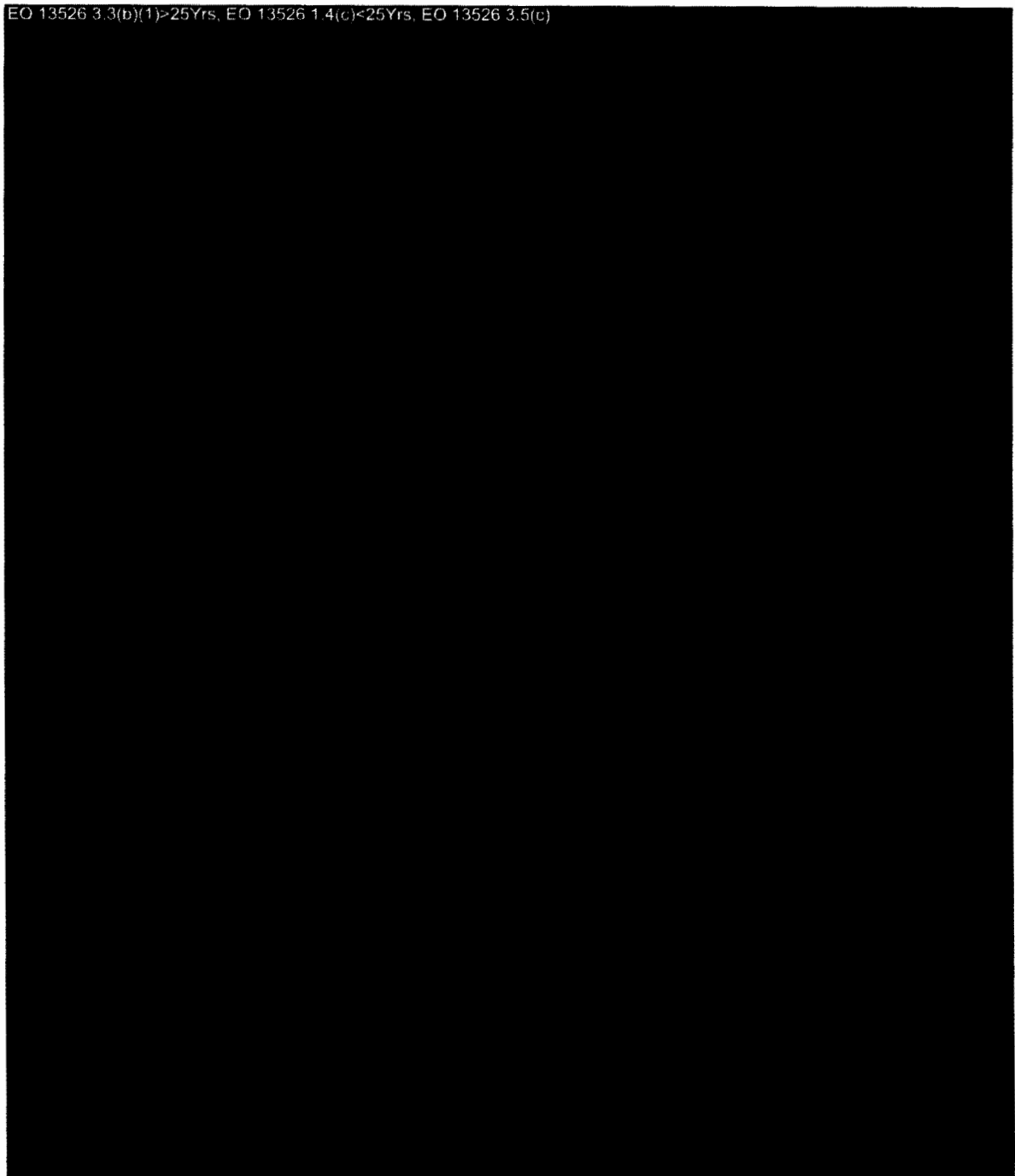
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~~Top Secret~~  
Handle via ~~BYEMANTALENT-KEYHOLE-~~  
~~COMINT Control Channels family~~  
~~BYI-919794~~

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
~~Handle via BYEMAN-VALENT-KEYHOLE-~~  
~~COMINT Control Channels Intlv~~  
~~BYE-919704~~

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PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)-25Yrs

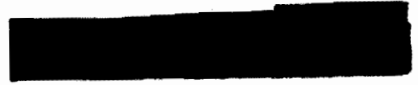


~~Top Secret~~  
Handle via BYRON J. TALBOT KEYWORD  
COMINT Control Channel, Jernin  
07/11/1979

Chapter 5

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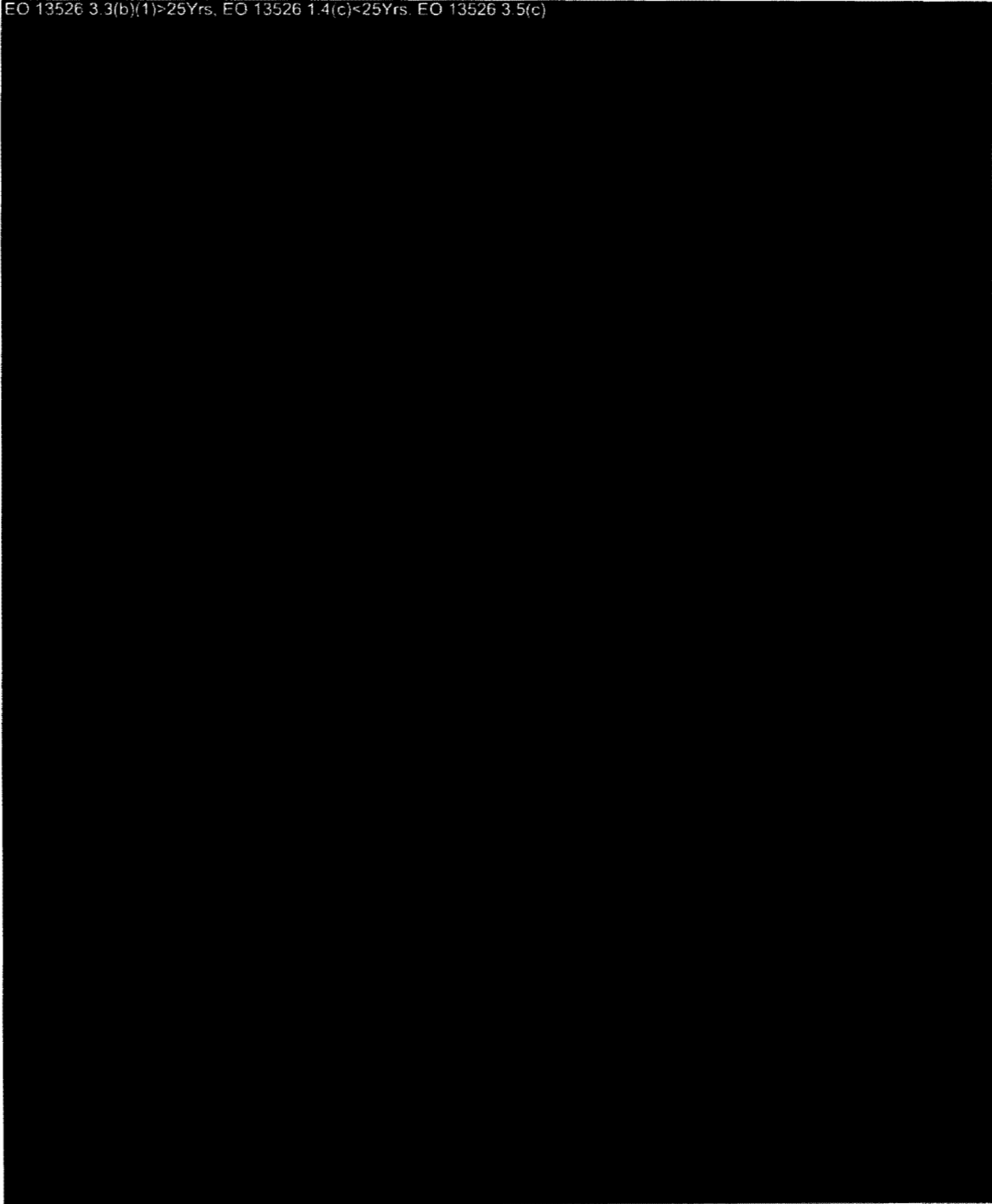
~~TOP SECRET~~  
COMINT CONTROL CHANNEL



~~Top Secret~~  
~~NOFORN, ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
Handle via BYEMAN, TALENT, KEYMOLE,  
COMINT Control Channels family  
BYE, ORCON

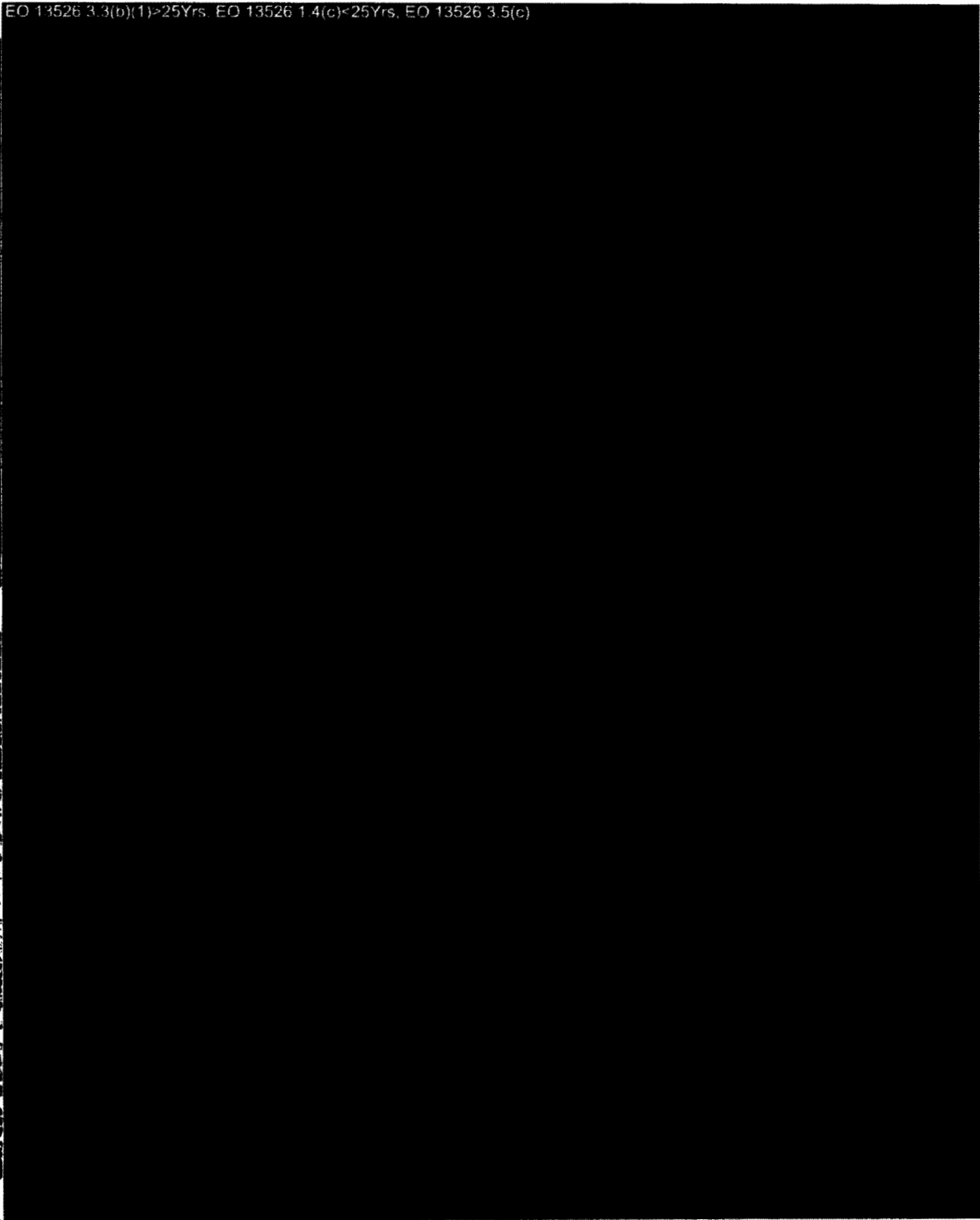


~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605



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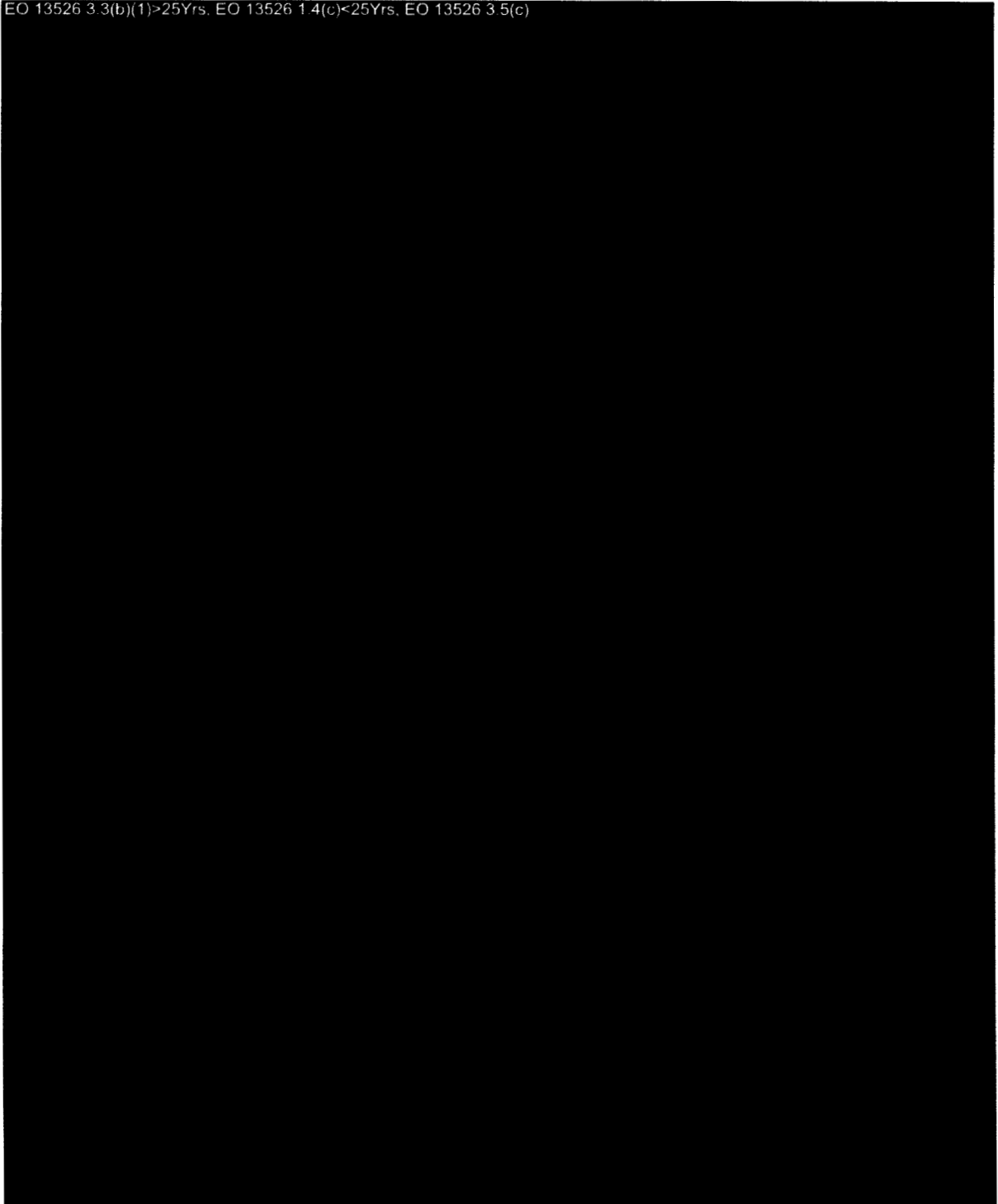
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Handle via ~~BYEMAN/TALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly~~  
~~BYE-9197/94~~



~~Top Secret  
NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

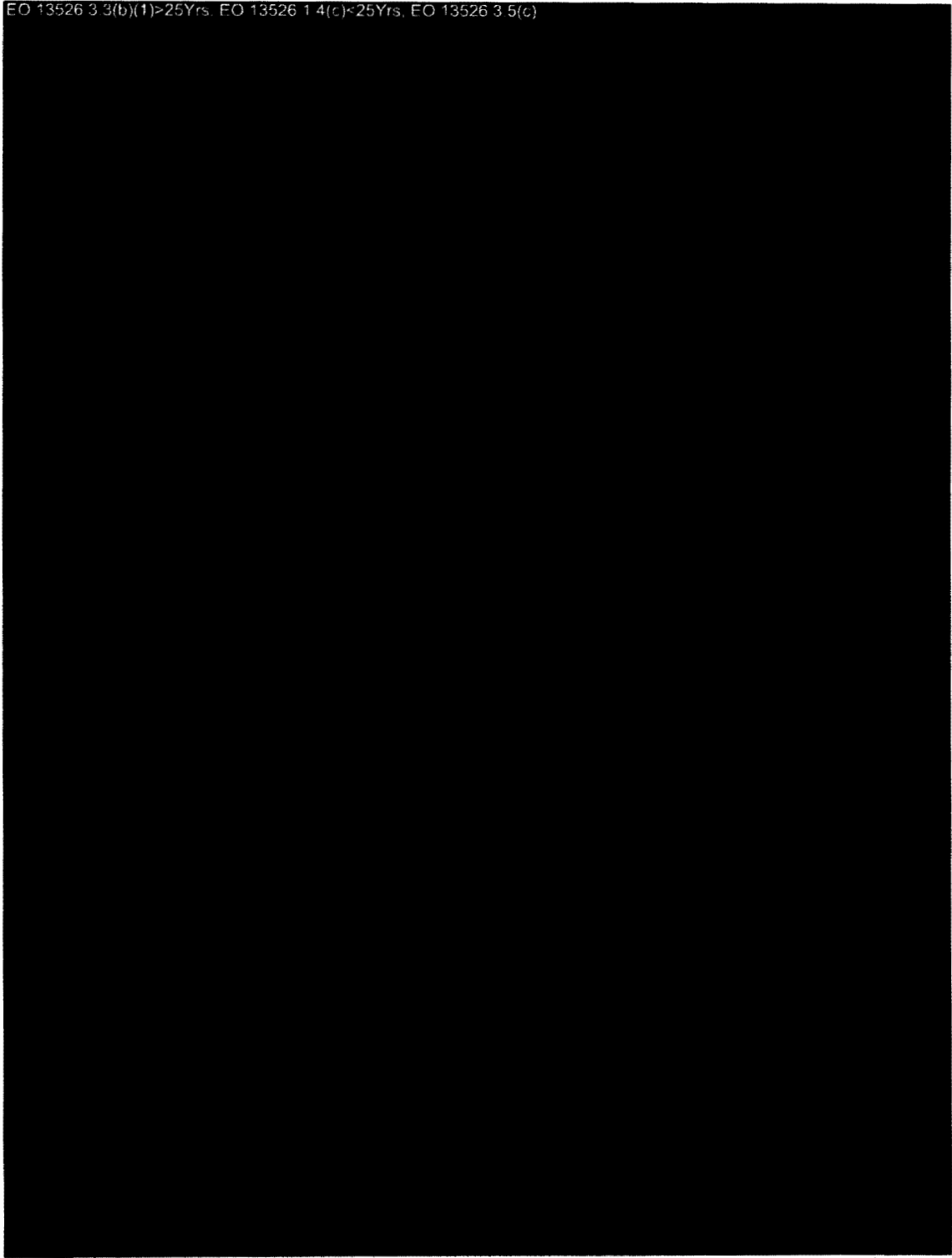
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~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly~~  
~~BYE-919794~~



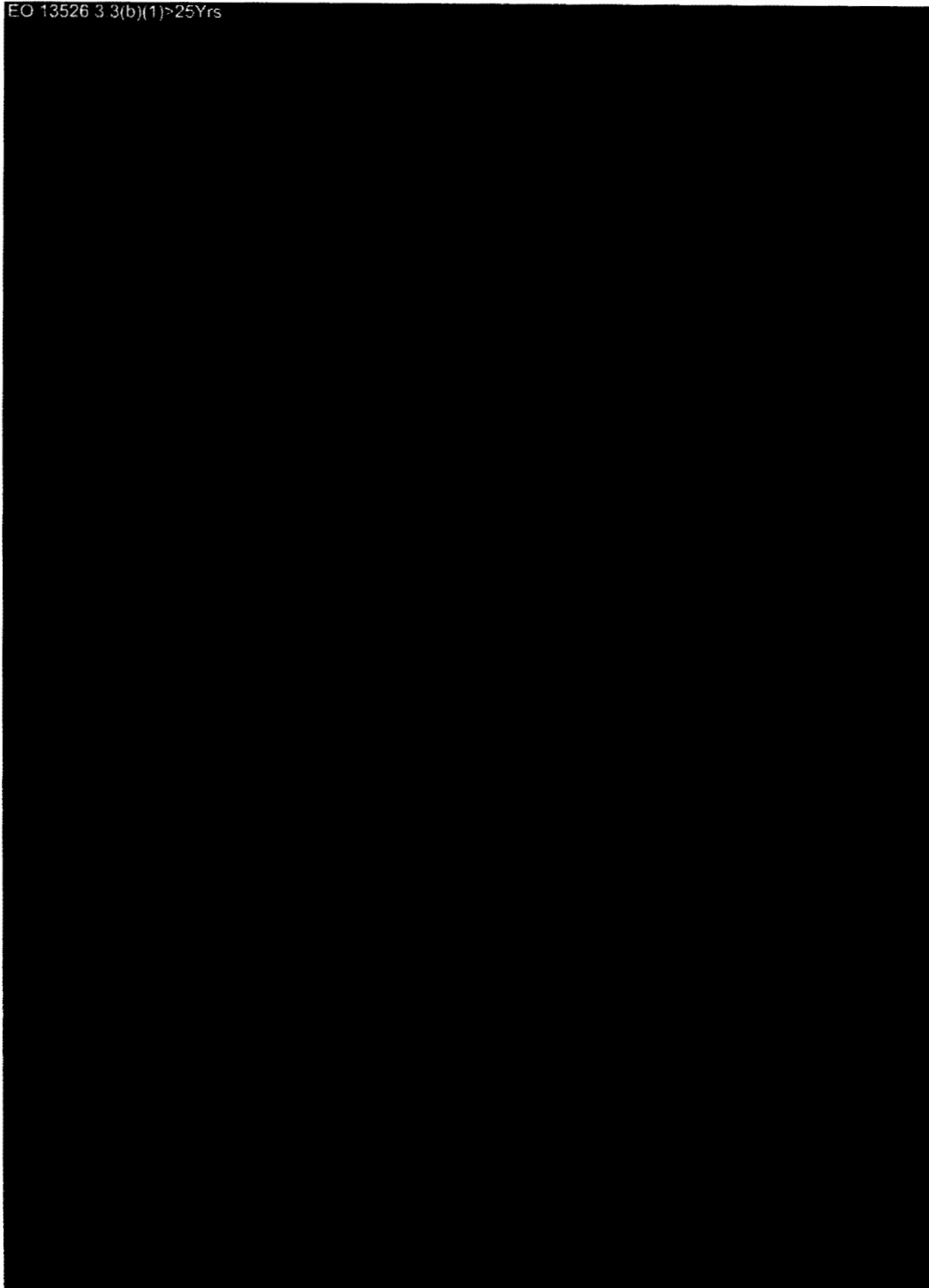
EO 13526 3 3(b)(1)-25Yrs. EO 13526 1 4(c)-25Yrs. EO 13526 3 5(c)



~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE-919793

~~Top Secret  
NOFORN ORCON~~

EO 13526 3 3(b)(1)>25Yrs



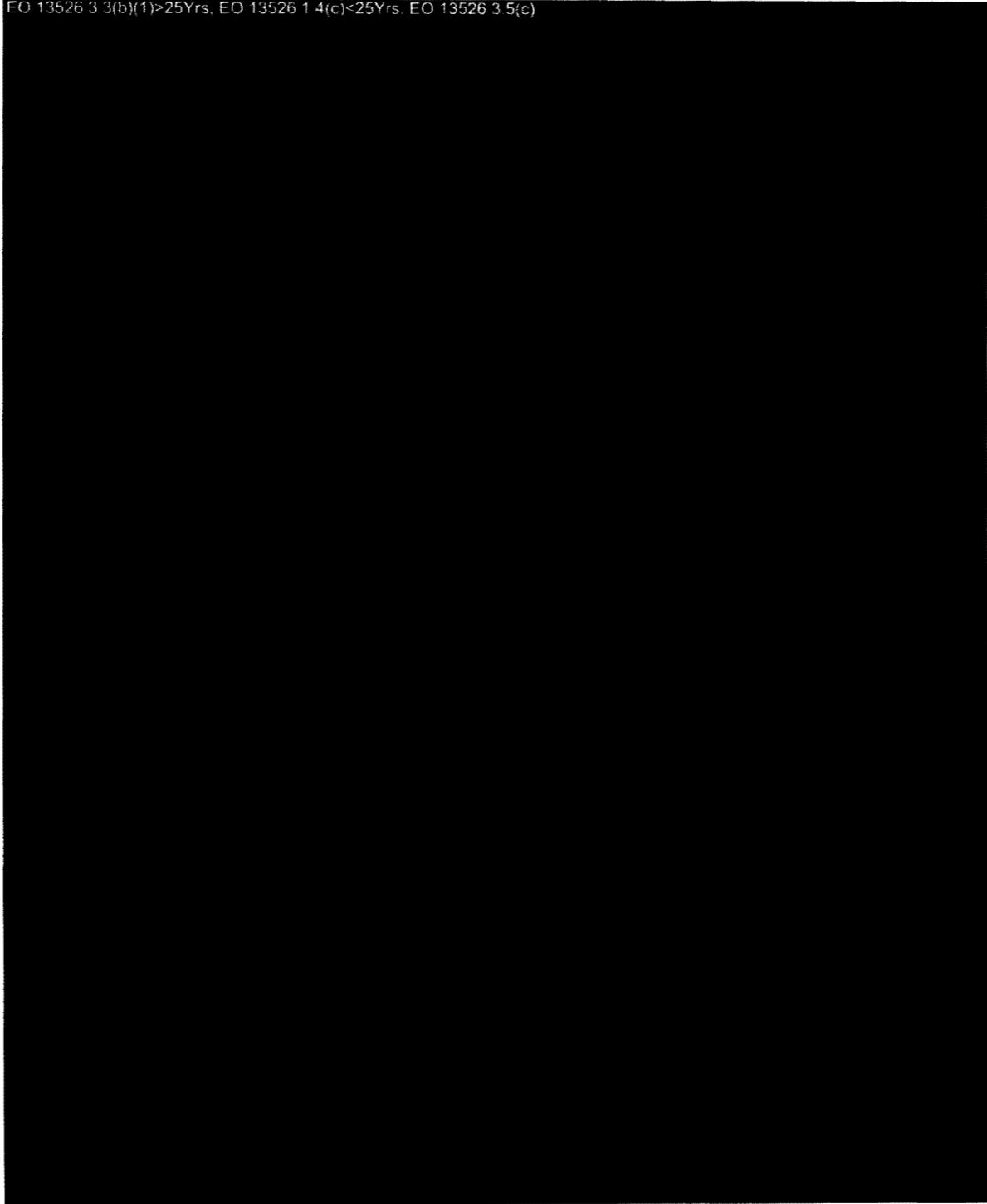
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Handle via BYEMO-TALENT-KEYHOLE-  
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BYE-019792~~

~~Top Secret  
NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605



EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



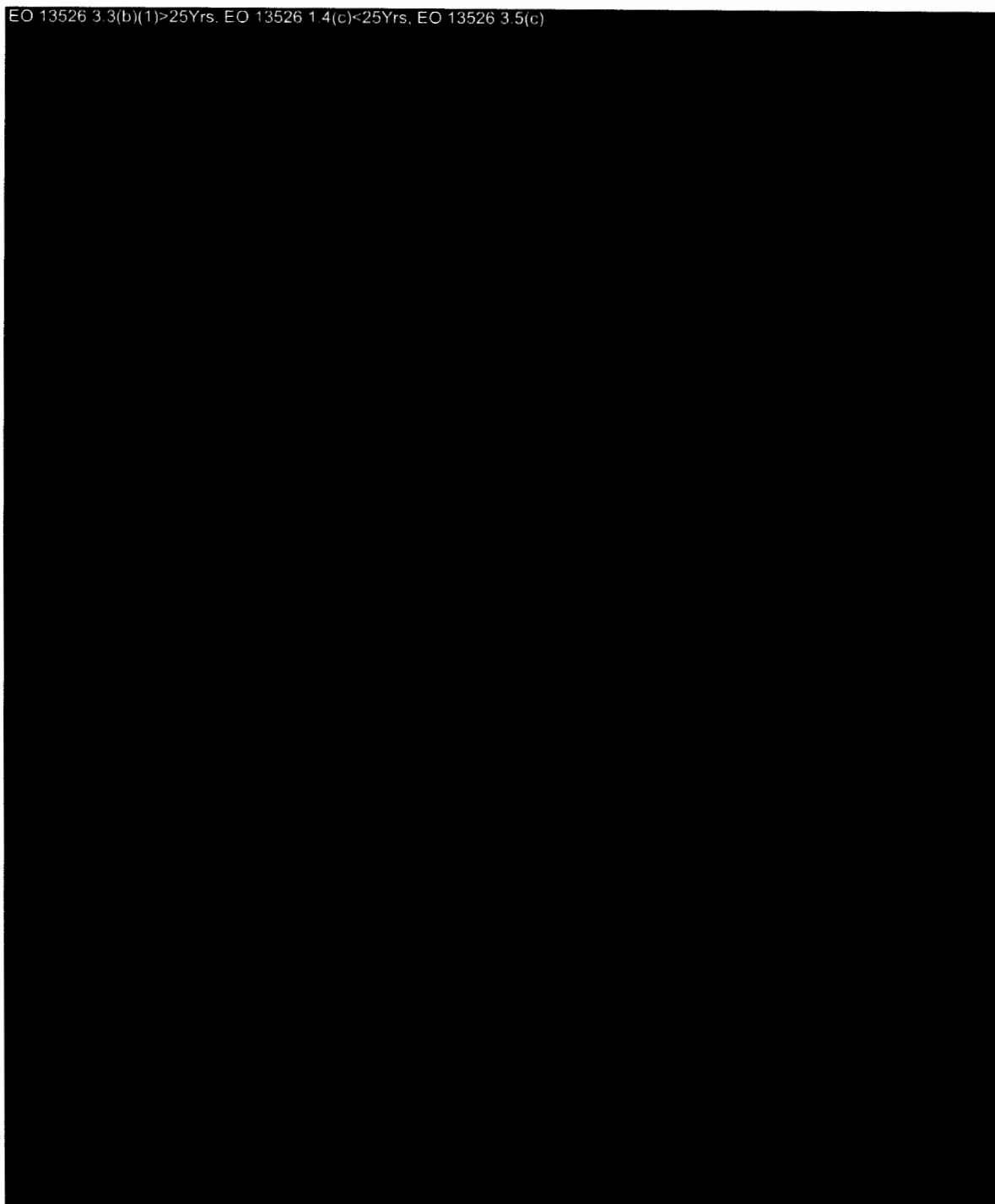
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Handle via BYEMAN/TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE-9197/94~~



~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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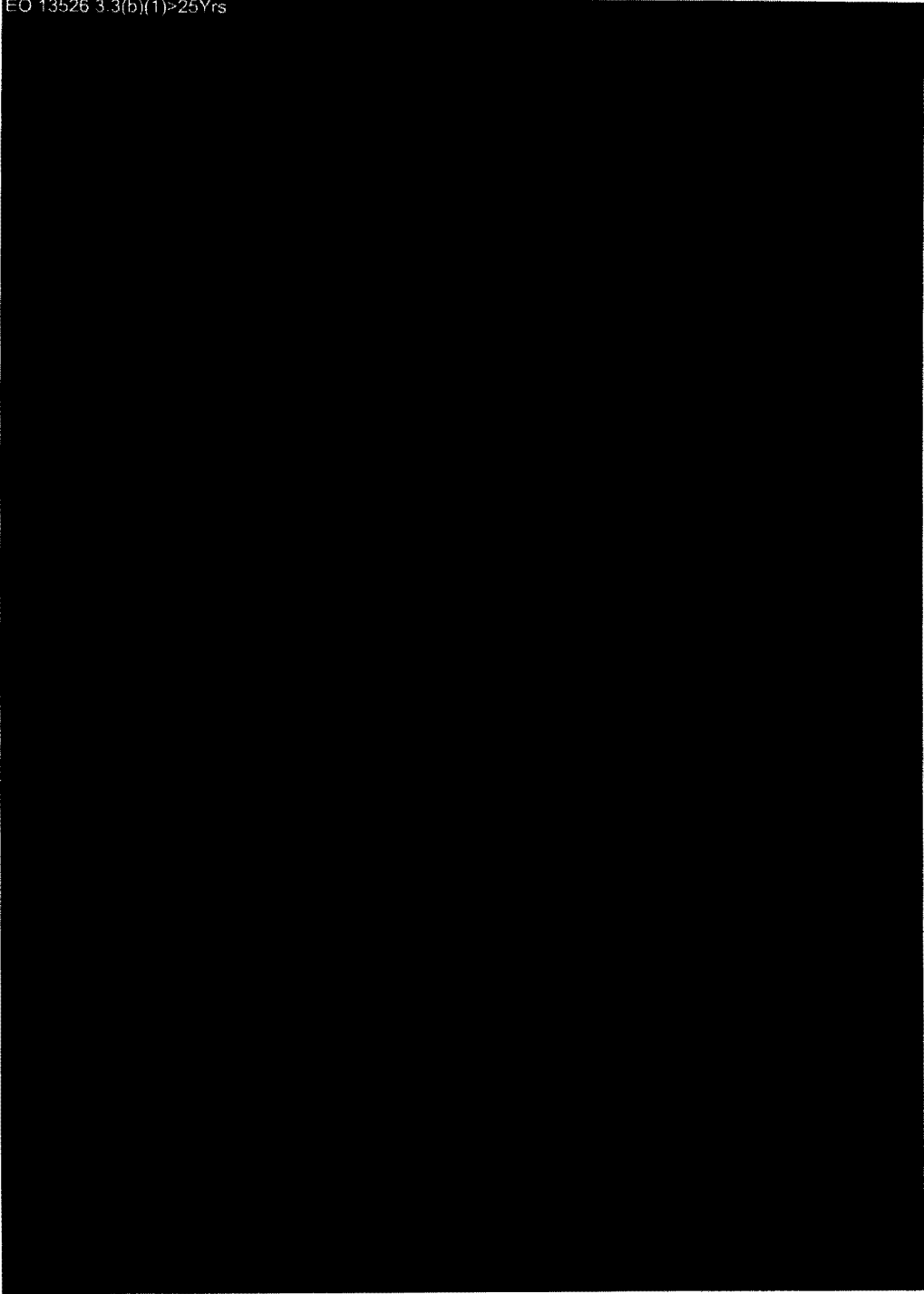


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Handle via BYEMAN-TALENT-KEYHOLE-  
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BYE-017-04

~~Top Secret~~  
~~NOFORN ORCON~~



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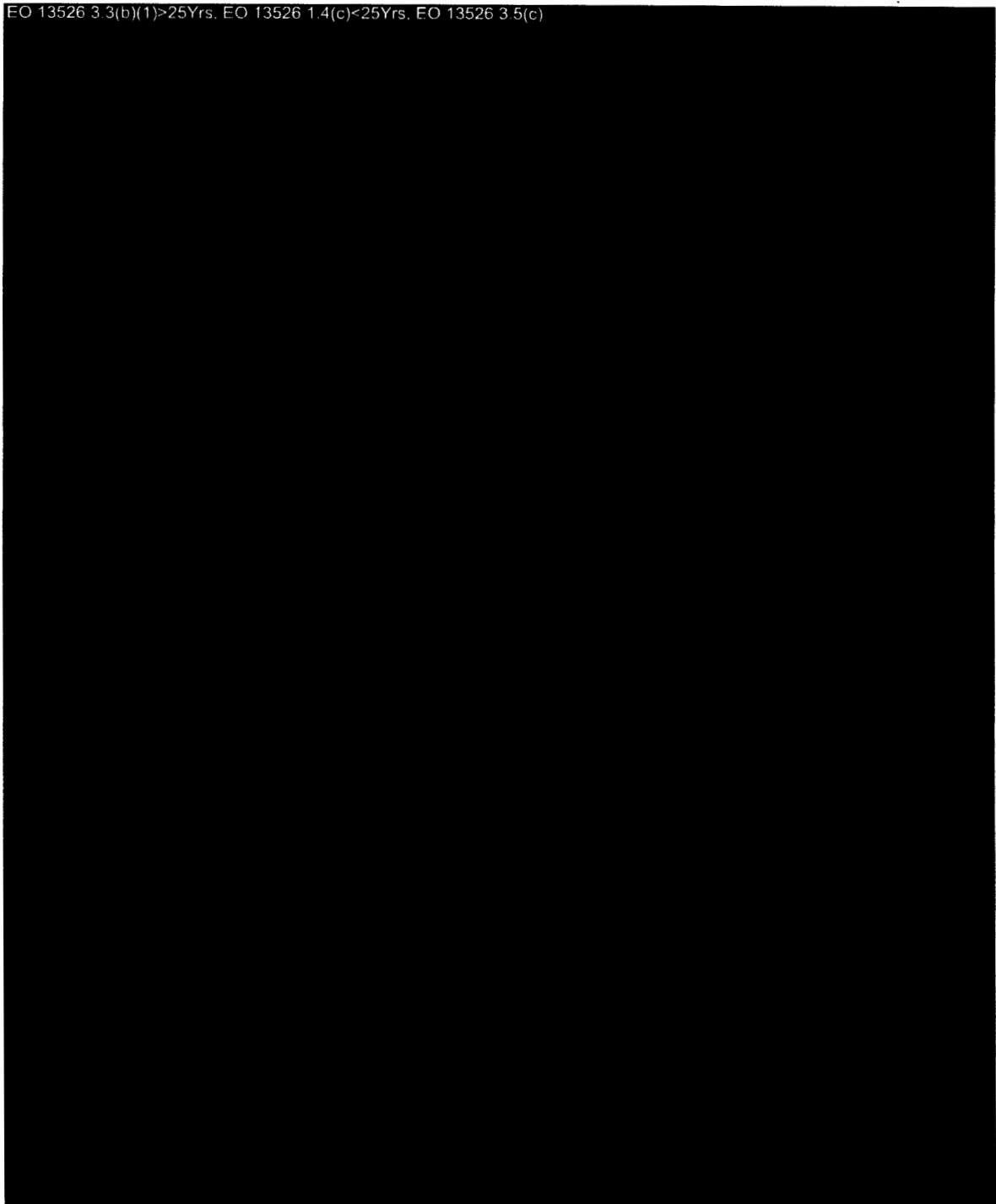
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~~Top Secret  
NOFORN-ORCON~~

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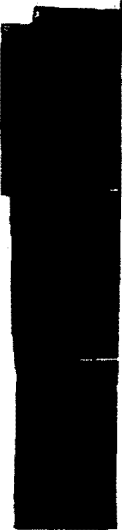


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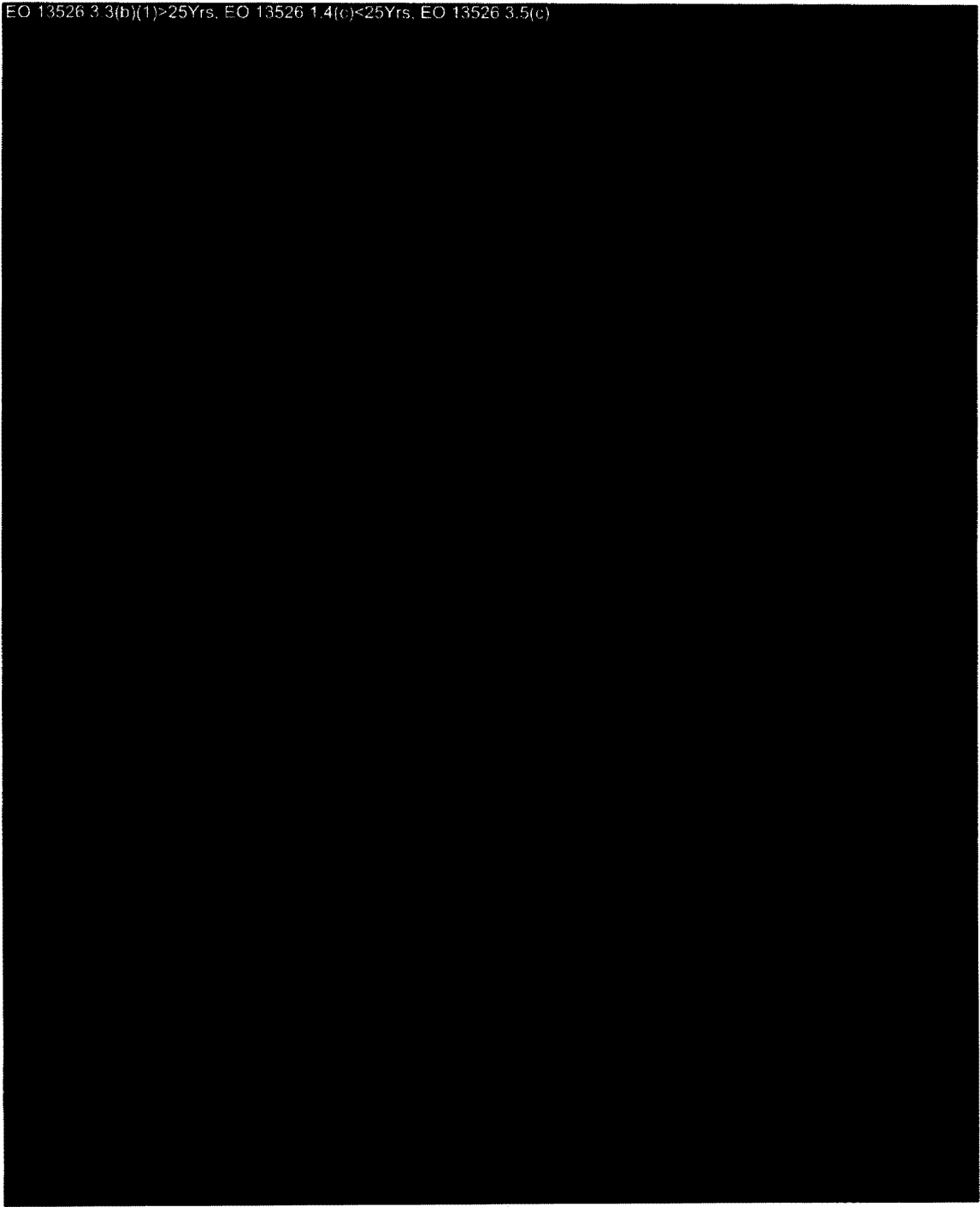


~~Top Secret  
NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605



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~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels Monthly  
BYE-219732~~



~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)-25Yrs. EO 13526 1.4(c)-25Yrs. EO 13526 3.5(c)

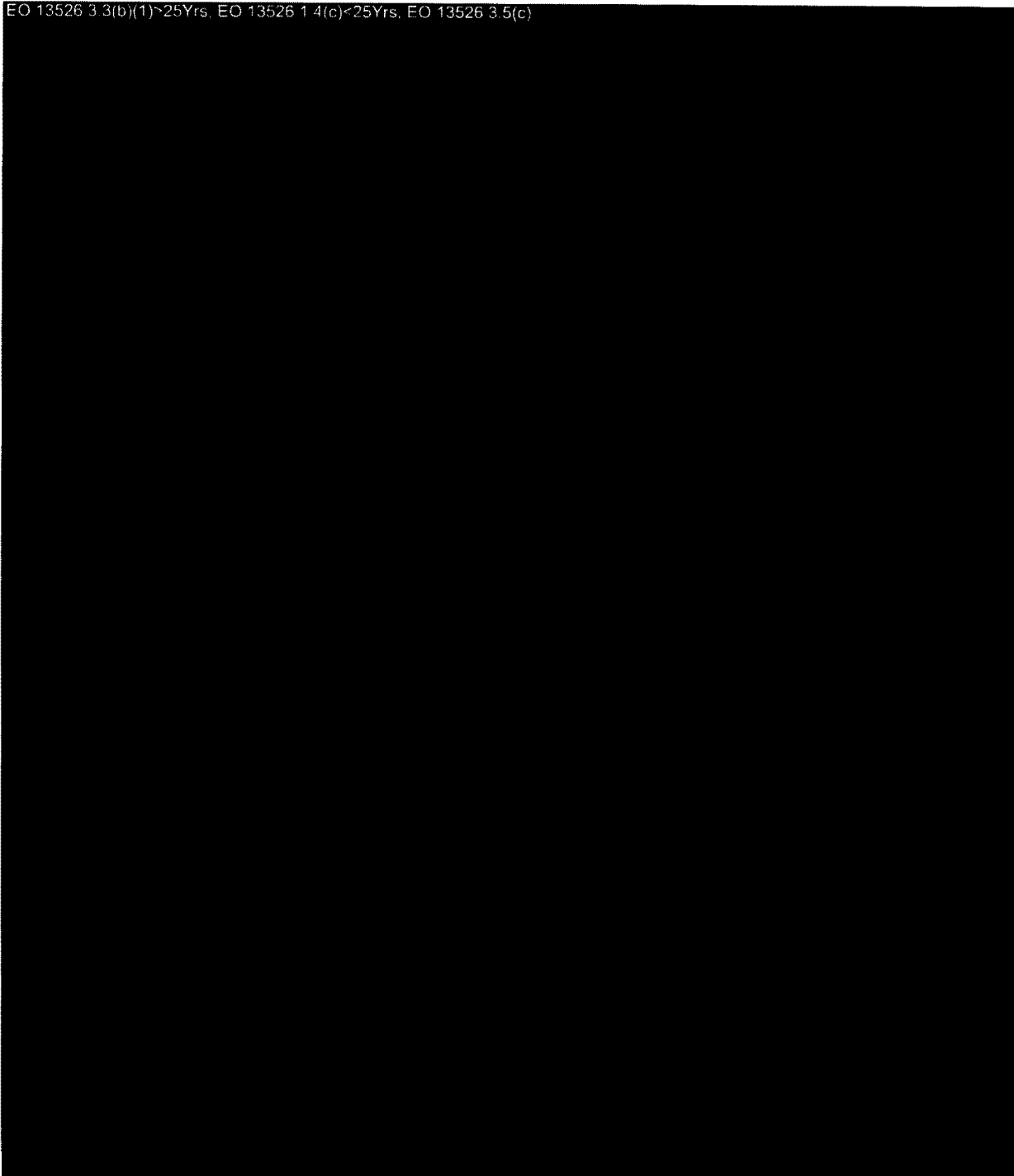


~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels Jointly~~  
~~BYF-010793~~

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)-25Yrs. EO 13526 1.4(c)-25Yrs. EO 13526 3.5(c)

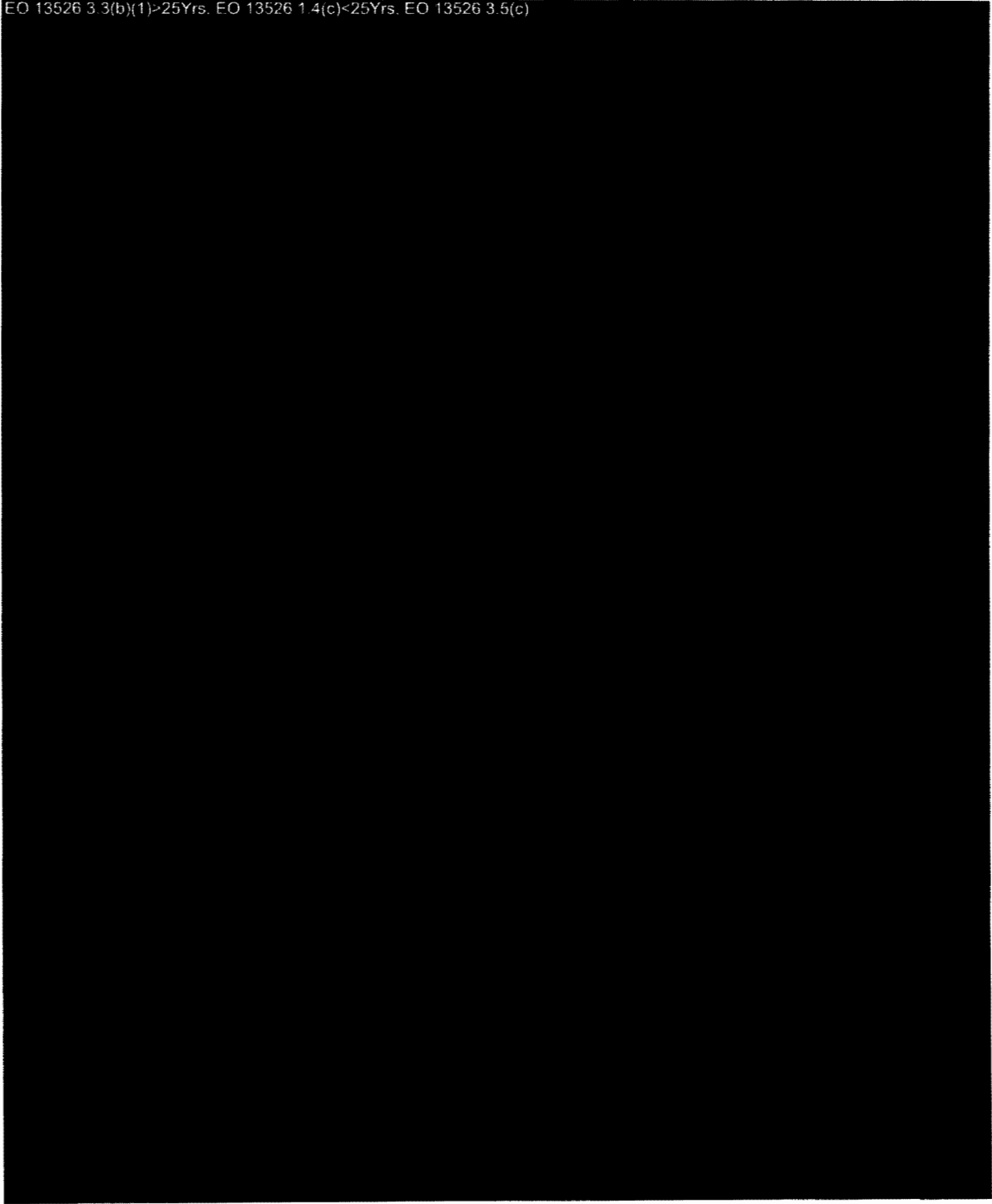


~~Top Secret~~  
Handle via BYEMAN/TALENT-KEYHOLE-  
COMINT Control Channels only  
~~BYE-9197/94~~

~~Top Secret  
NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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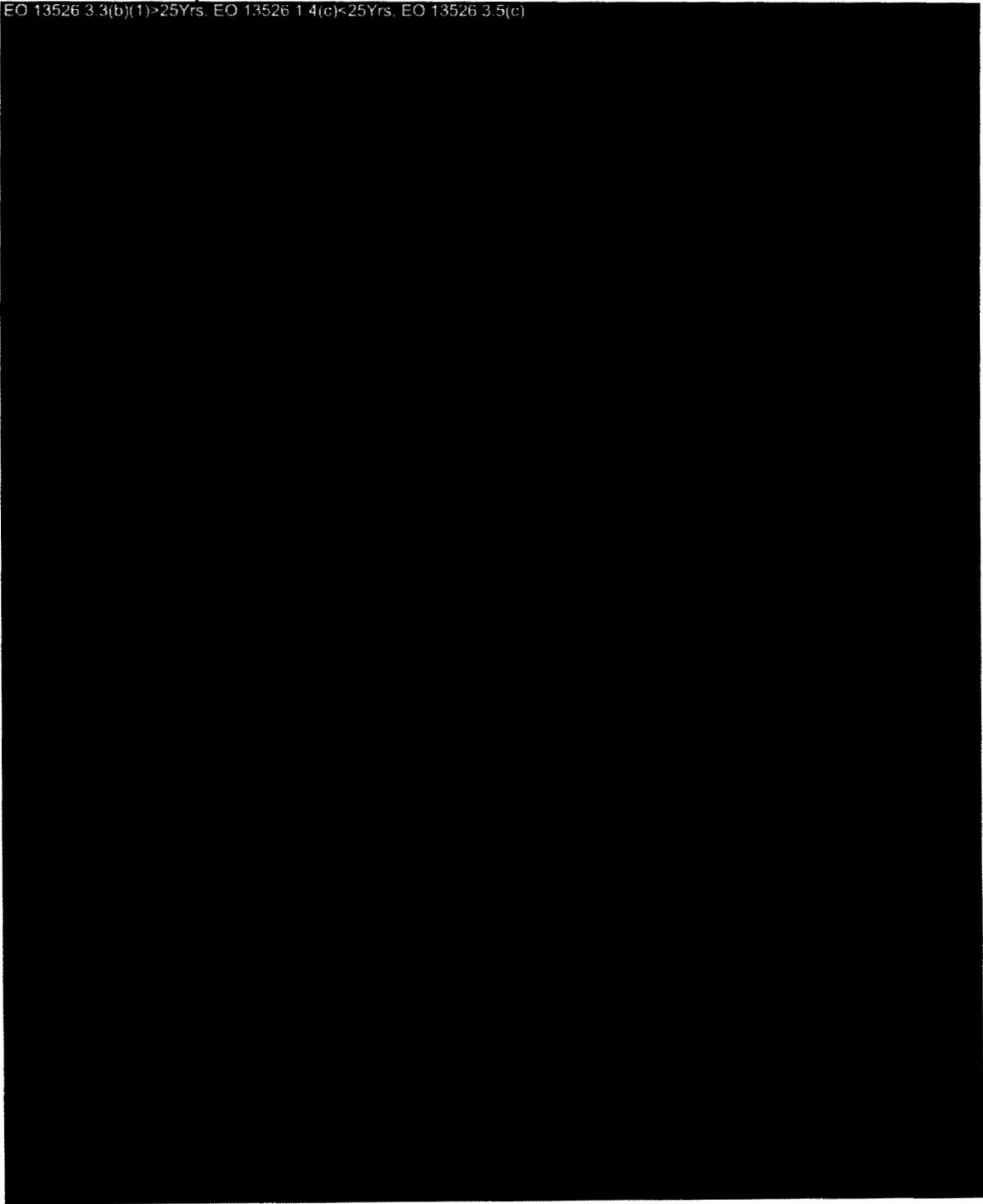


~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels Internly  
BYE-9197/94~~

~~Top Secret~~  
~~NOFORN/NOFORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels Intnlly~~  
~~BYE-4197/04~~

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The SIGINT Satellite Story

~~Top Secret~~  
Handle via BTRM, TALENT, ATHOL, COMINT, CRYPT, and CRYPTOLITH  
NY 91924



~~Top Secret~~  
NOFORN, ORCON

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
NRO/NSA/DIRCOM  
Handed via BRS/AF/INT/AT/WHOLE  
COMINT Control Channel/Brady  
1/10/79

~~Top Secret~~  
NRO/NSA/DIRCOM



EO 1.4 (c)  
PL 86-36/50 USC 3605

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The SIGINT Satellite Story

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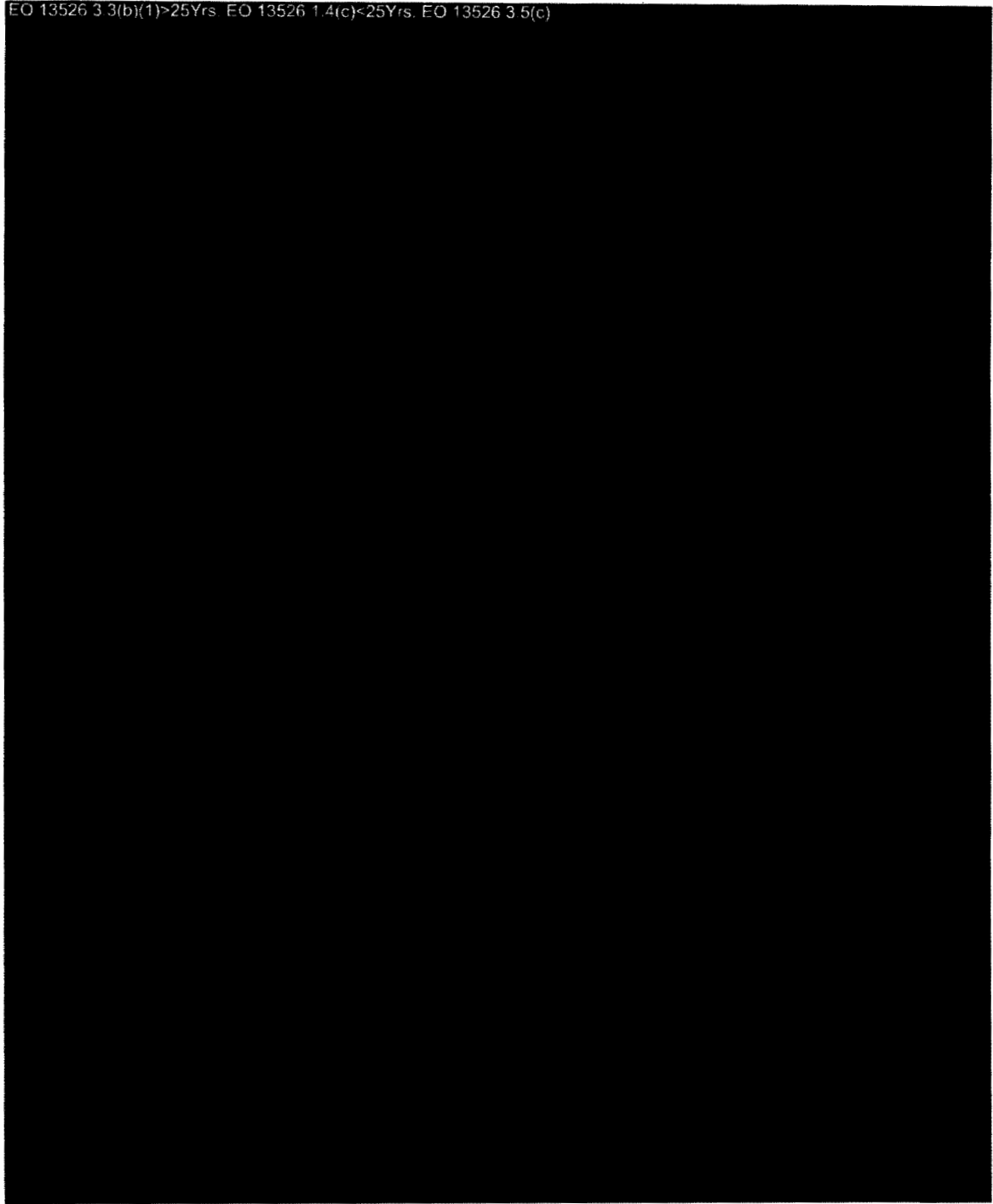


~~Top Secret~~  
Handle via BRISAC/ALSO/AFHQ/OLC  
COMINT/COMINT/COMINT/COMINT/COMINT  
817 518 72

~~Top Secret~~  
NOFORN/NOFORN



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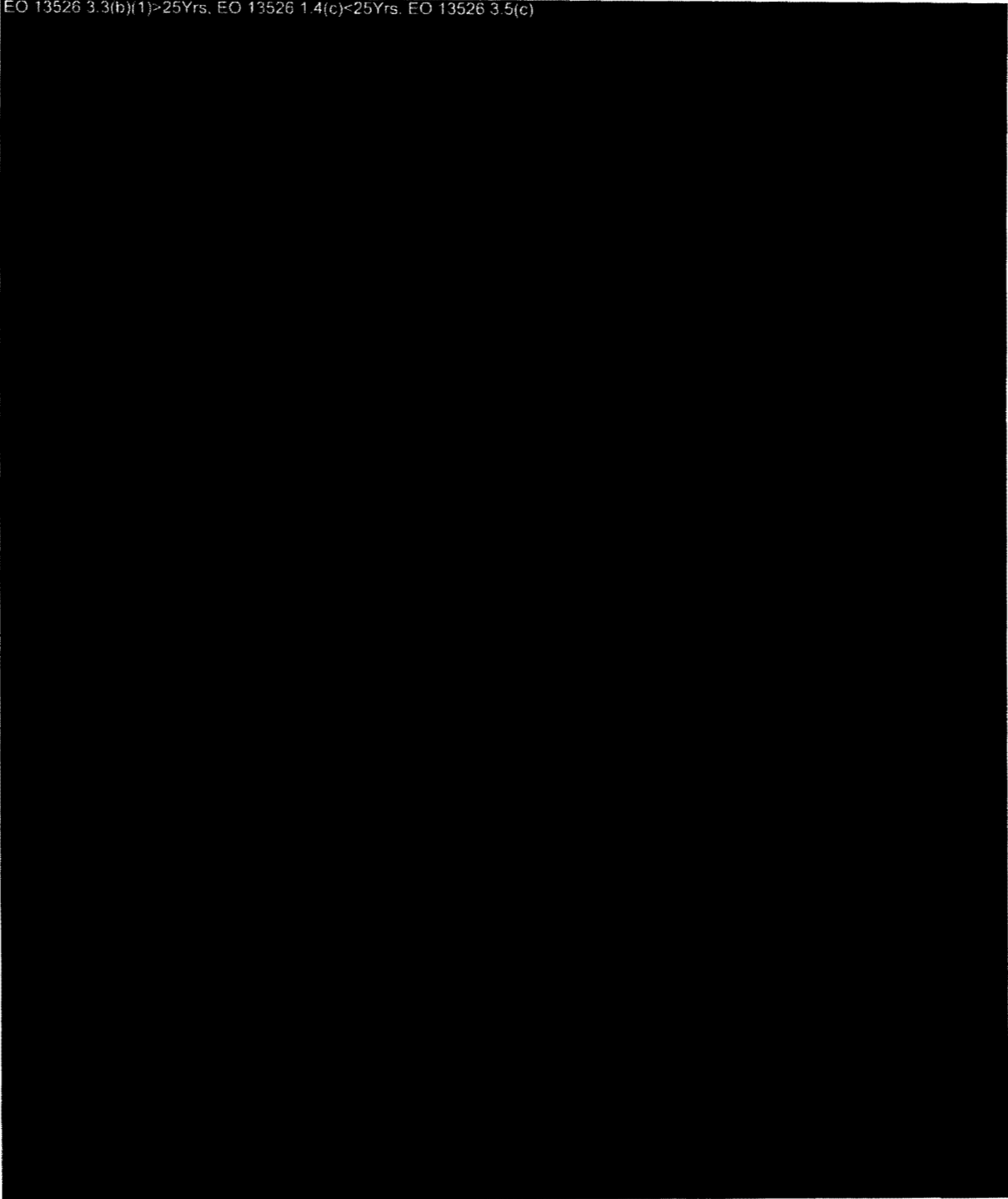


~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels Jamiv  
BYE-919704

~~Top Secret  
NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

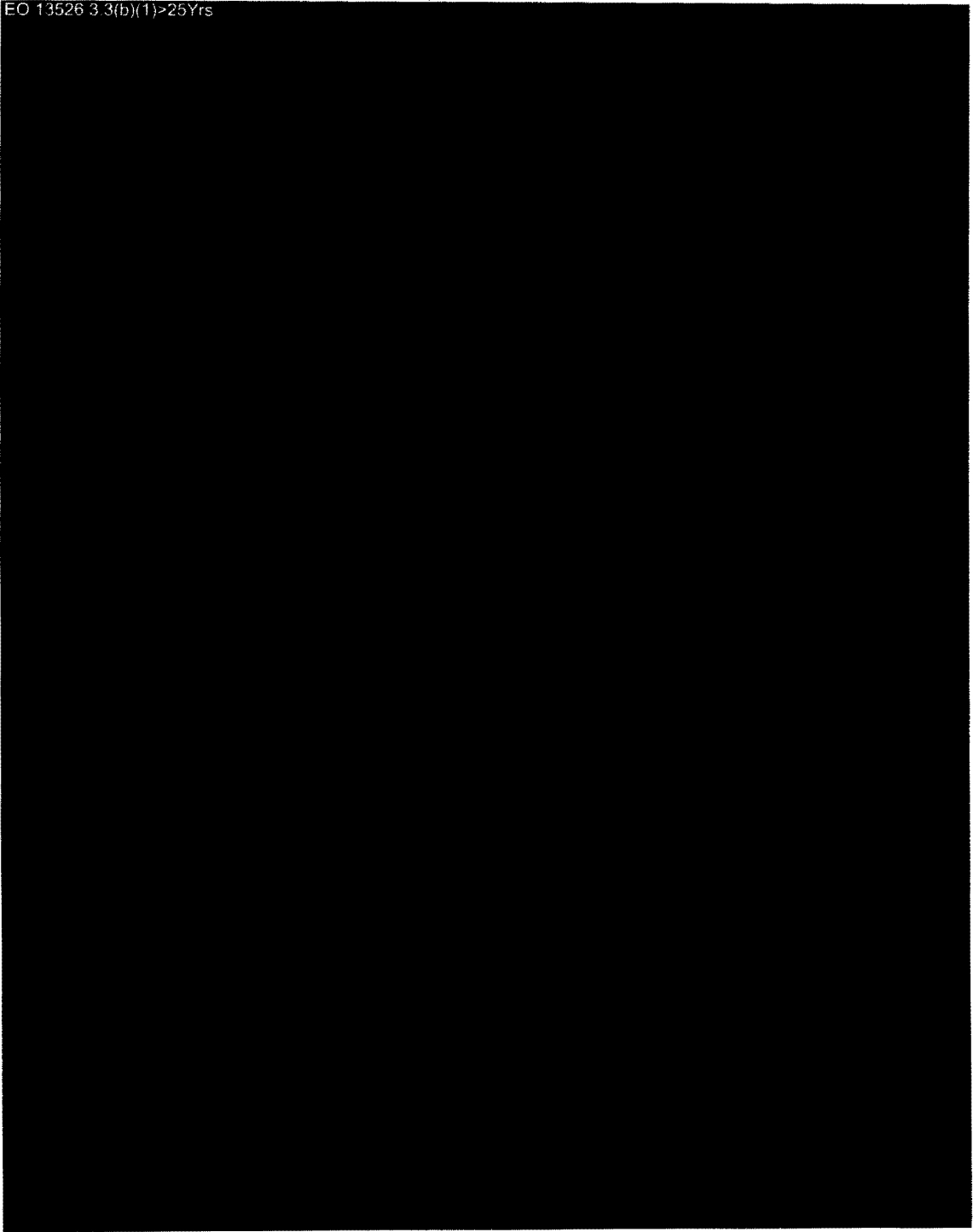
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~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels Jointly  
BY 919794~~

~~Top Secret~~  
~~NORFOR ORCON~~

EO 13526 3.3(b)(1)>25Yrs

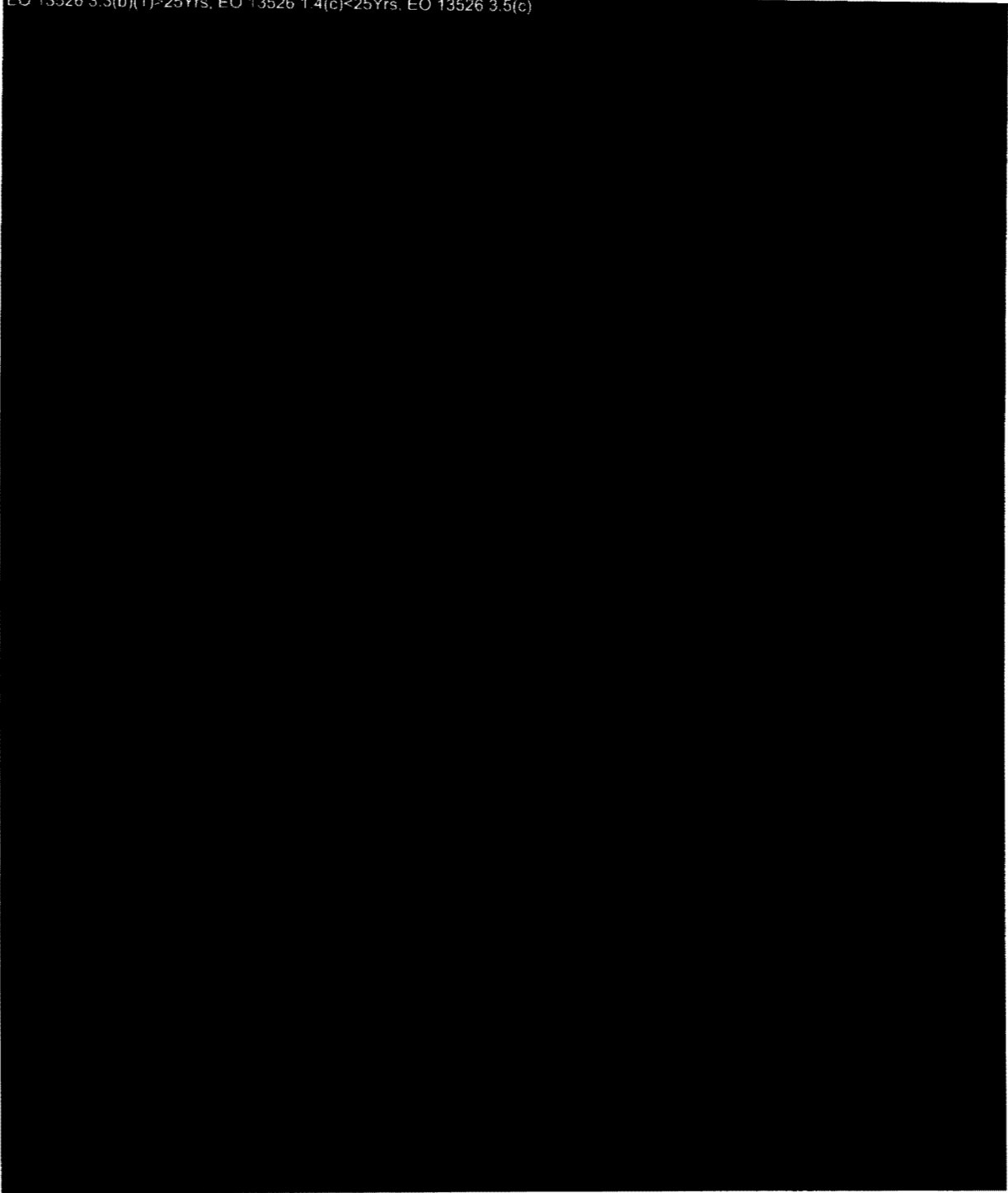


~~Top Secret~~  
Handle via ~~BYEMSA TALENT KEYHOLE~~  
~~COMINT Control Channels Janits~~  
~~BYF 010 02~~

~~Top Secret~~  
~~NOFORN/NOFORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

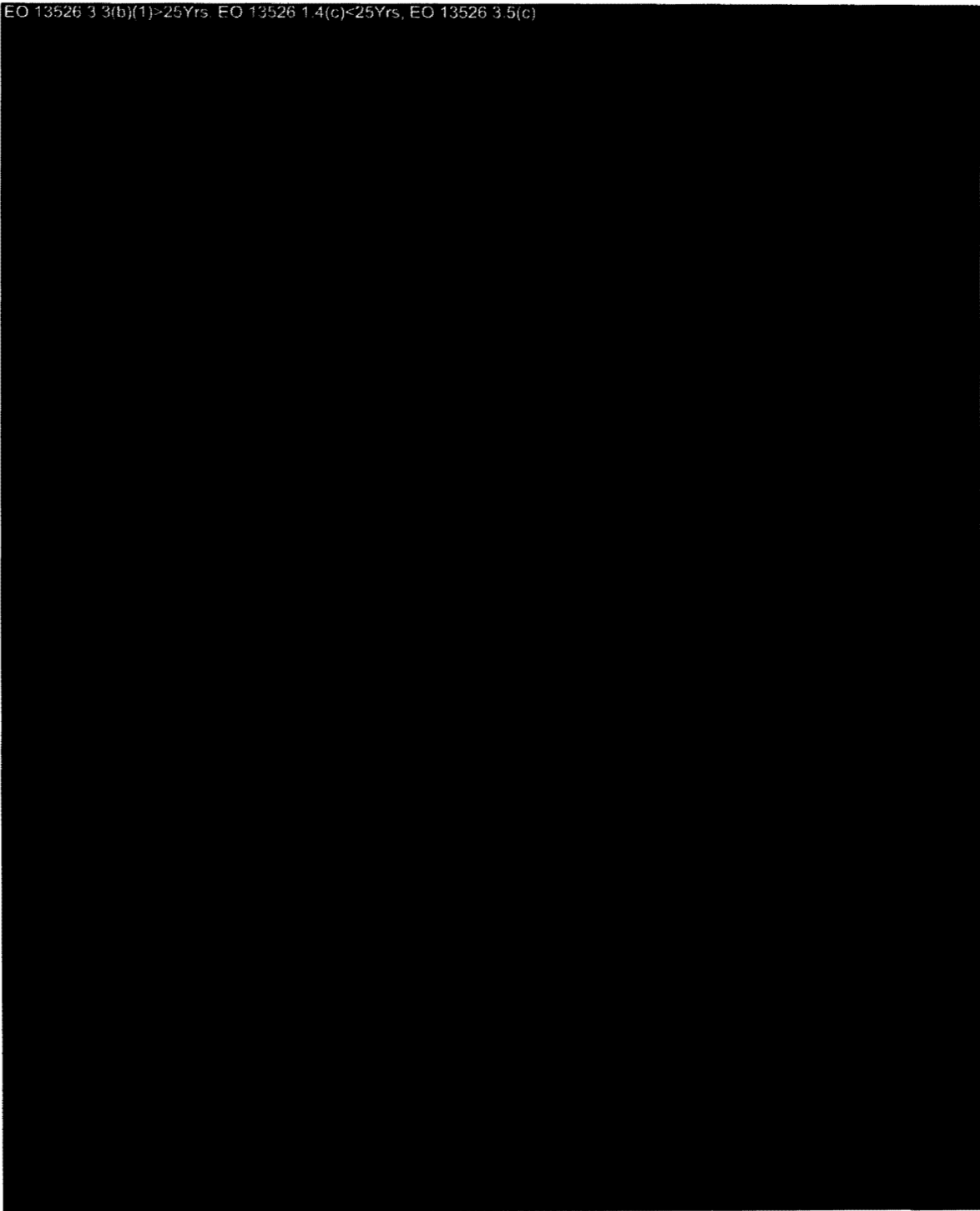


~~Top Secret~~  
Handle via BYE/BN-TALENT-KEYHOLE-  
COMINT Control Channels family  
2VF 010 010

~~Top Secret~~  
~~NOFORN ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3 3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



36/50 USC 3605

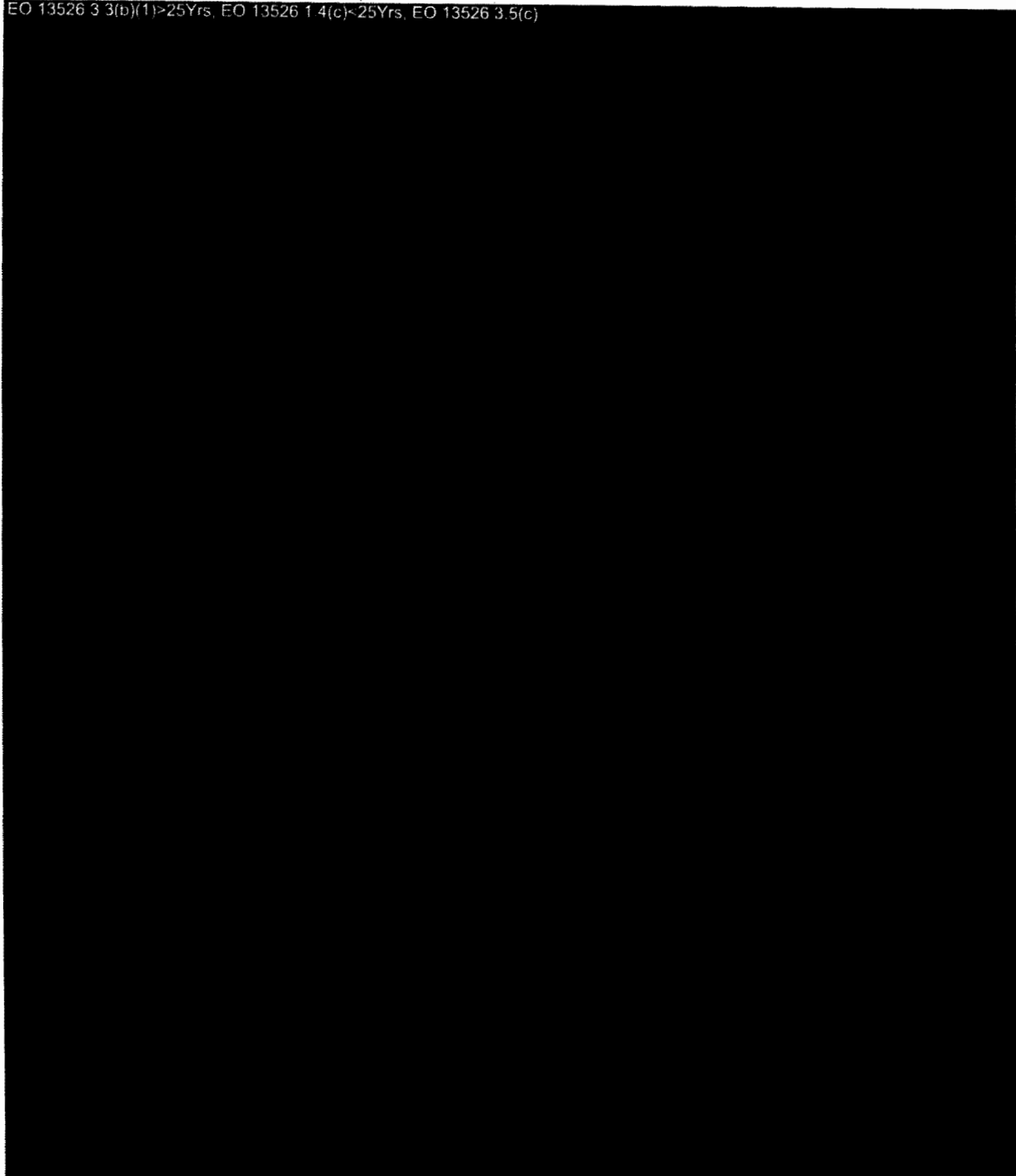
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COMINT Control Channels Jointly  
~~BYE-419744~~

~~Top Secret  
NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

PL 86-36/50 USC 3605

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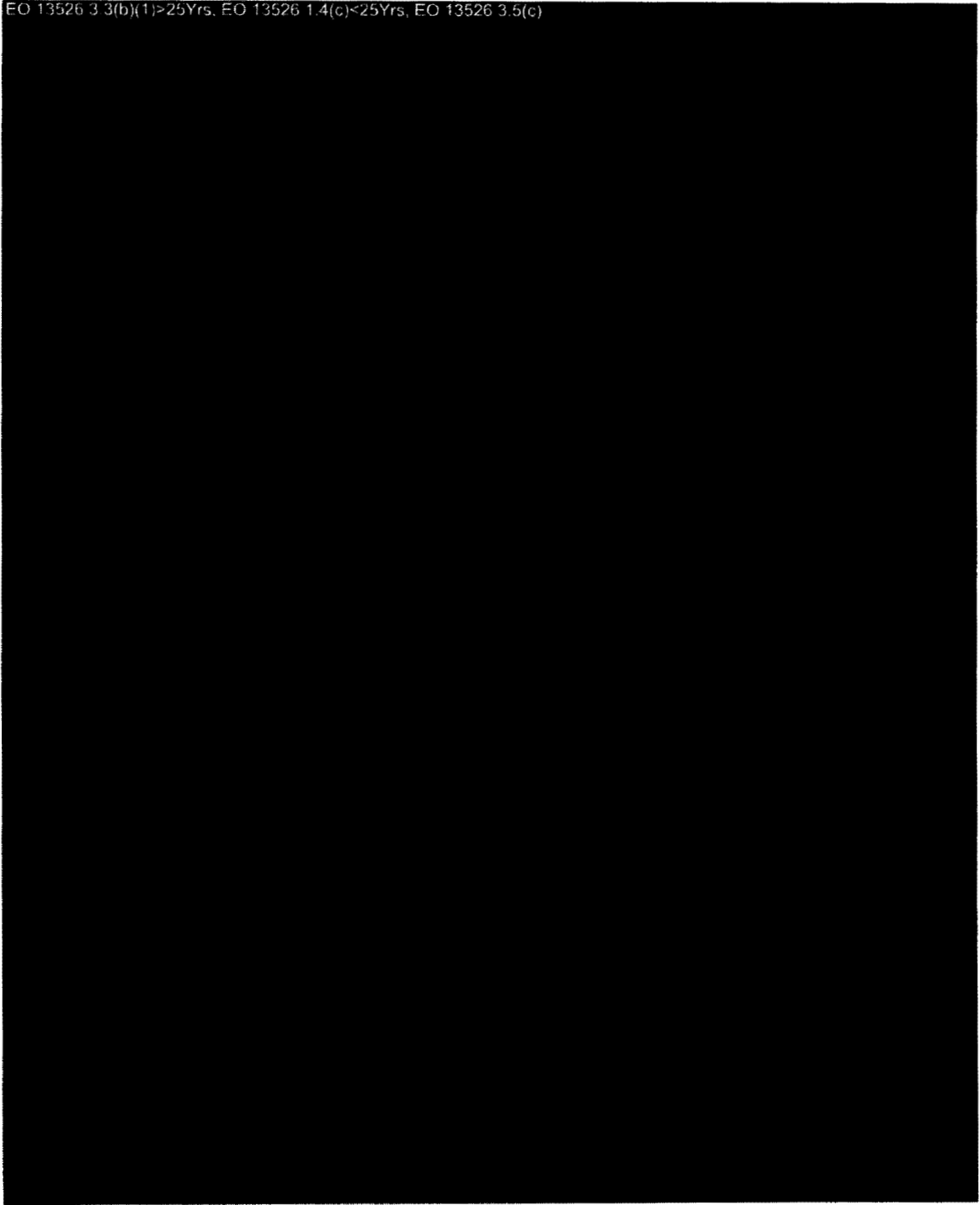
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COMINT Control Channels jointly  
RVE-010702~~

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels Jointly~~  
~~BYE 919794~~

~~Top Secret~~  
~~NOFORN-ORCON~~

PL 86-36/50 USC 3605

### Chapter 5 References

1. NSA-BYE-20850-65 and EO 13526 3.5(c)
2. *NSA in Space*, April 1975, BYE-19385-75, pp. 13-14.
3. EO 13526 3.3(b)(1)>25Yrs, E *Final Report*, 1 May 1968, BYE-19347-68.  
EO 13526 3.5(c), EO 13526 3.3(b)(1)>25Yrs
5. *NSA in Space*, pp. 14-15.
6. EO 13526 3.5(c)
7. [REDACTED]
8. *NSA in Space*.
9. Reports AM41, 17 June 1970, and AM78, 30 October 1970, TK/WC-W205/47-71  
EO 13526 3.5(c)
10. *NSA in Space*, p. 29.  
EO 13526 3.5(c), EO 13526 3.3(b)(1)>25Yrs
11. [REDACTED]
12. [REDACTED]
13. [REDACTED]
14. [REDACTED]
15. [REDACTED]
16. [REDACTED]
17. [REDACTED]
18. [REDACTED]
19. [REDACTED]
20. [REDACTED]
21. [REDACTED]
22. [REDACTED]
23. [REDACTED]
24. [REDACTED]
25. Report 004, 16 January 1970.
26. TCS 58527-71, 13 October 1971; Report AM63, 28 September 1970; Report AM81, 24 November 1970; Report AM07, 23 February 1971; Report AM16, 15 April 1971; Report AM29, 5 August 1970; Report AM09, 28 January 1972.
27. Report 29, 1 and 12 May 1970; Report 32, 15 May 1970; Report 25, 29 June 1971; Report 27, 2 August 1971; Report 51, 4 November and 8 December 1971; Report 43, 7 October 1971; Report 28, 5 May 1972 EO 13526 3.5(c)
28. EO 13526 3.5(c)
29. [REDACTED]

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COMINT Control Channels jointly  
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30. [REDACTED] EO 13526 3.5(c)
31. [REDACTED]
32. Raymond Potts' personal notes (hereafter Potts' notes).
33. TK/WC-W205/47-71 (TS/B/TK).
34. Potts' notes.
35. TK/WC-W205/47-71.
36. TK/WC-W205/47-71.
37. [REDACTED] EO 13526 3.5(c)
38. [REDACTED]
39. Report # R19, 21 March 1969.
40. Photo of the K4SP Status Board, 20 December 1970.
41. [REDACTED] EO 13526 3.5(c)
42. TK/WC-W205/43-71.
43. K4SP Status Board photo.
44. [REDACTED] EO 13526 3.5(c)
45. [REDACTED] EO 13526 3.5(c) interview, 11 August 1992.
46. [REDACTED] EO 13526 3.5(c)
47. K4SP Status Board photo.
48. Report 72, 20 October 1970.
49. [REDACTED] EO 13526 3.5(c) TK/WC-E205/008-72.
50. Report 45, 8 October 1971.
51. Report 61, 29 December 1971.
52. [REDACTED] EO 13526 3.5(c) TK/WC-E205/008-72.
53. QR, 31 March 1971.
54. Interviews with [REDACTED] EO 13526 3.5(c) 26 June 1992.
55. [REDACTED] EO 13526 3.5(c)
56. [REDACTED]
57. NSA in Space, p. 30.
58. QR, 31 March 1974.
59. [REDACTED] EO 13526 3.5(c) interview, 25 July 1990.
60. [REDACTED] interview, 27 February 1991.
61. NSA in Space.
62. Interviews with [REDACTED] EO 13526 3.5(c) 27 February 1991 [REDACTED] EO 13526 3.5(c) 24 June 1992;  
and [REDACTED] EO 13526 3.5(c) 24 June 1992.
63. [REDACTED] EO 13526 3.5(c) interview, 24 June 1992.

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EO 1.4.(c)

## Mission Requirements

During the late 1950s, the Intelligence Community's weapons system analysts began to realize that overhead photography alone could not do a complete job of assessing the Soviet missile threat. Though crucial for strategic indications and warning (I&W), photography was essentially static; it showed the number and kind of launching pads but revealed little about the missiles themselves in terms of actual in-flight performance. The information of greatest value to US missile intelligence analysts was that used by the Soviet missile designers themselves. Like their US counterparts, Soviet missile designers put instruments on board their vehicles to monitor various internal functions during the missile development and test phase. These data were transmitted to Earth in coded-signal format, called telemetry, for engineering evaluation and assessment. Because of the design and function of telemetry, US intelligence agencies made special efforts to collect this information, along with beaconry and other electronic emissions from rocket test vehicles, all of which came to be called foreign instrumentation signals, or FIS. The collection and analysis of such signals for intelligence purposes is called TELINT.

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EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

EO 13526 3.3(b)(1)>25Yrs

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The SIGINT Satellite Story

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COMINT/Comint Channels Only  
Date 01/17/03

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turned beneath it, the equatorial geosynchronous satellite appears to an observer on the ground to remain motionless in the sky. This is a perfect orbit for a satellite designed for relaying information from one place on the Earth to another—ideal for a communications satellite or a COMINT satellite. SynCom II marked the birth of the era of communications satellites and it also set in motion the idea for a project that was to play center stage at the CIA and the National Reconnaissance Office (NRO).



Albert D. Wheelon

Albert D. "Bud" Wheelon was one of the original bright young engineers hired by Simon Ramo at the Ramo-Wooldridge Corporation, the technical manager of the US Air Force ballistic missile program, in November 1953. By the late 1950s Wheelon was involved in Ramo-Wooldridge's analysis work on the capabilities of Soviet missiles. He became acquainted with Presidential Science Advisors Jerome Wiesner, James Killian, and Edwin A. "Din" Land. In June 1962, at the invitation of Herbert "Pete" Scoville, Jr., he joined the CIA.

### The Project Story

On 27 July 1963, the Hughes Aircraft Company's SynCom II became the world's first successful equatorial geosynchronous satellite. Located 22,000 miles above the Earth's equator and orbiting around the Earth once each day at the same peripheral velocity that the Earth's equator

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Then, at the request of Ray Cline, Deputy Director for Intelligence (DDI), and over Scoville's objections, Wheelon was assigned as Assistant Director for Scientific Intelligence and head of the Office of Scientific Intelligence (OSI), reporting to Cline, and Chairman of the Guided Missiles and Astronautics Intelligence Committee (GMAIC) of the US Intelligence Board (USIB). These were the dark days of the Cuban Missile Crisis. CIA's reputation for innovative excellence, built on the reconnaissance successes with the U-2 aircraft and CORONA photo satellites, was now being overtaken by the failures of the Bay of Pigs. At the highest levels of government, CIA's reputation and influence were declining. In August 1963 Wheelon was appointed Deputy Director for Science and Technology (DDS&T) of the CIA by Director of Central Intelligence (DCI) John McCone. Wheelon was given McCone's mandate to put the CIA back into the reconnaissance business in a strong way.

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526

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~~BYE-9197704~~

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**Brockway McMillan**

EO 13526 3.3(b)(1)>25Yrs



**Lloyd Lauderdale**

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.



**John McMahon**

EO 13526 3.3(b)(1)>25Yrs

EO 1.4(c)

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COMINT Control Channels Identity  
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EO 1.4.(c)

PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



Alexander H. Flax



LGen Marshall S. Carter

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



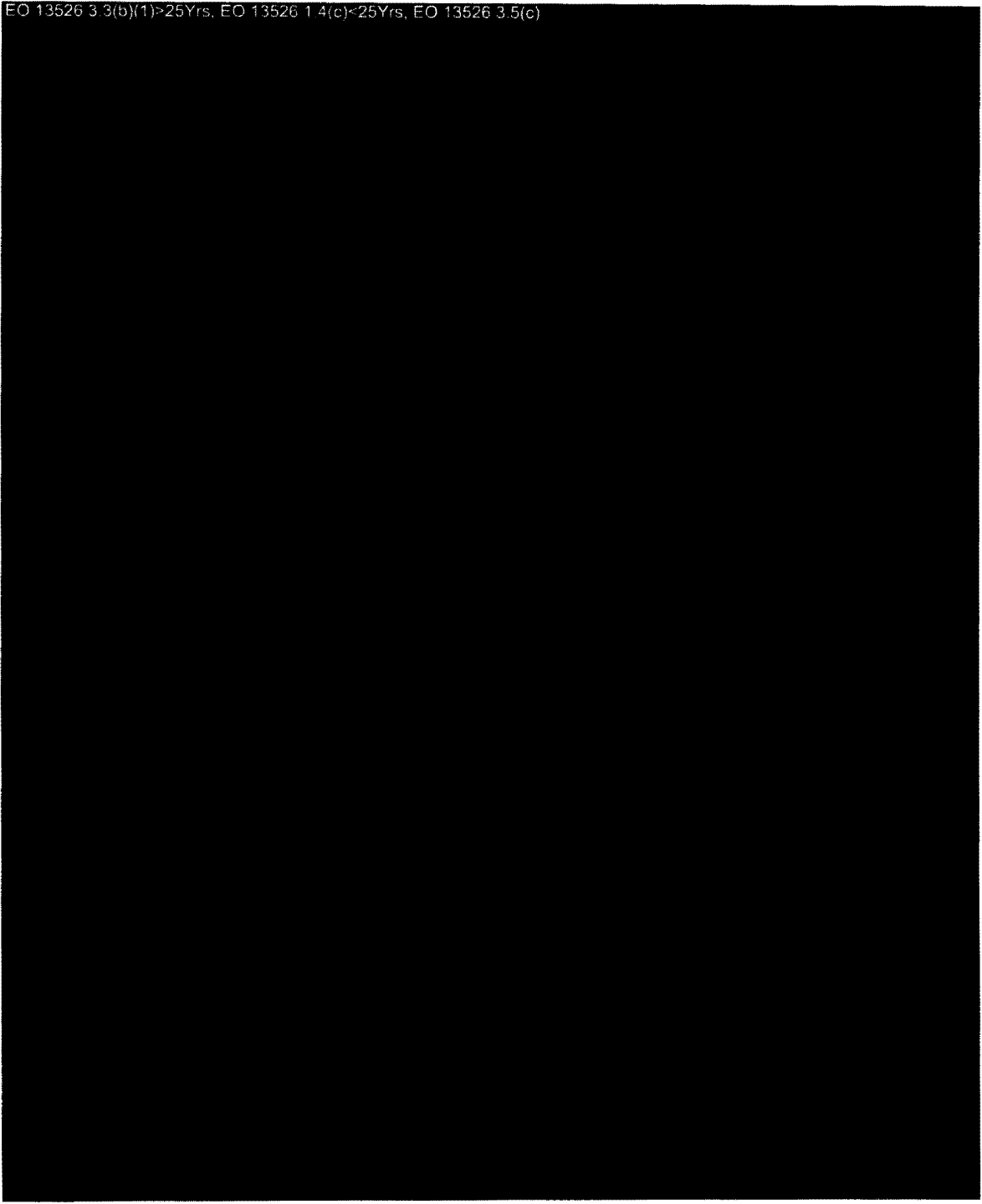
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EO 1.4.(c)

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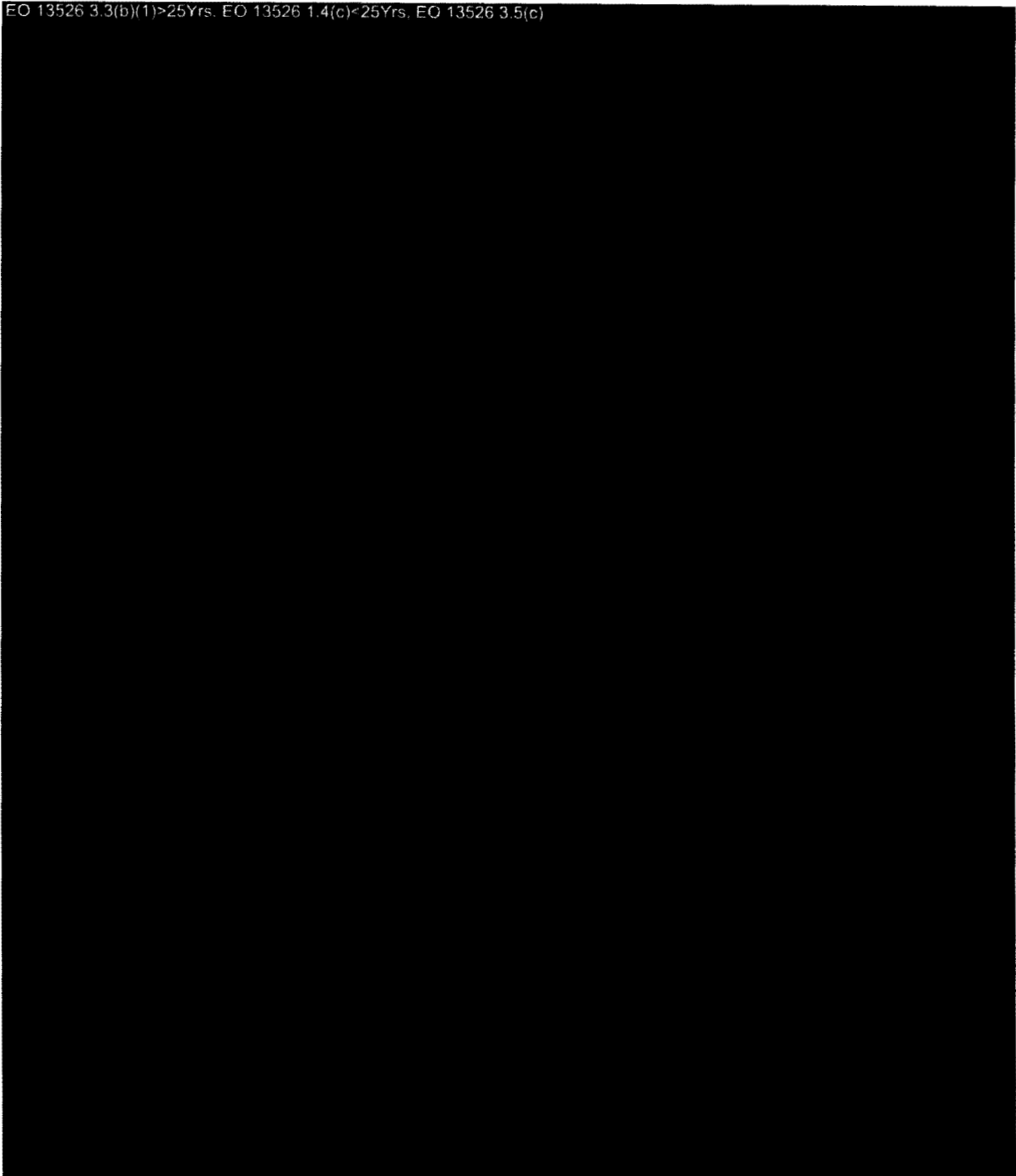


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EO 1.4.(c)

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PL 86-36/50 USC 3605  
EO 1.4.(c)



Charles C. Tevis

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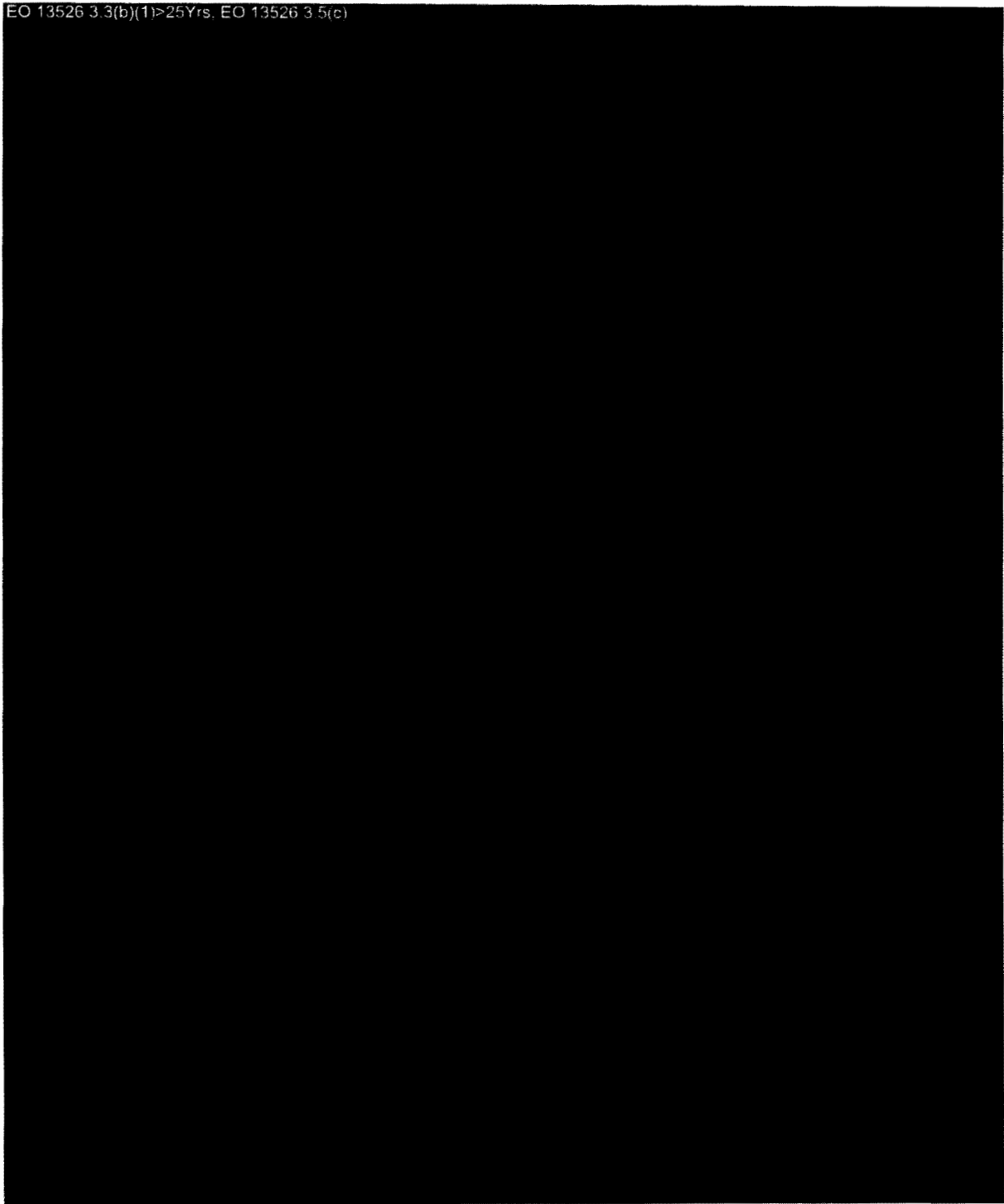
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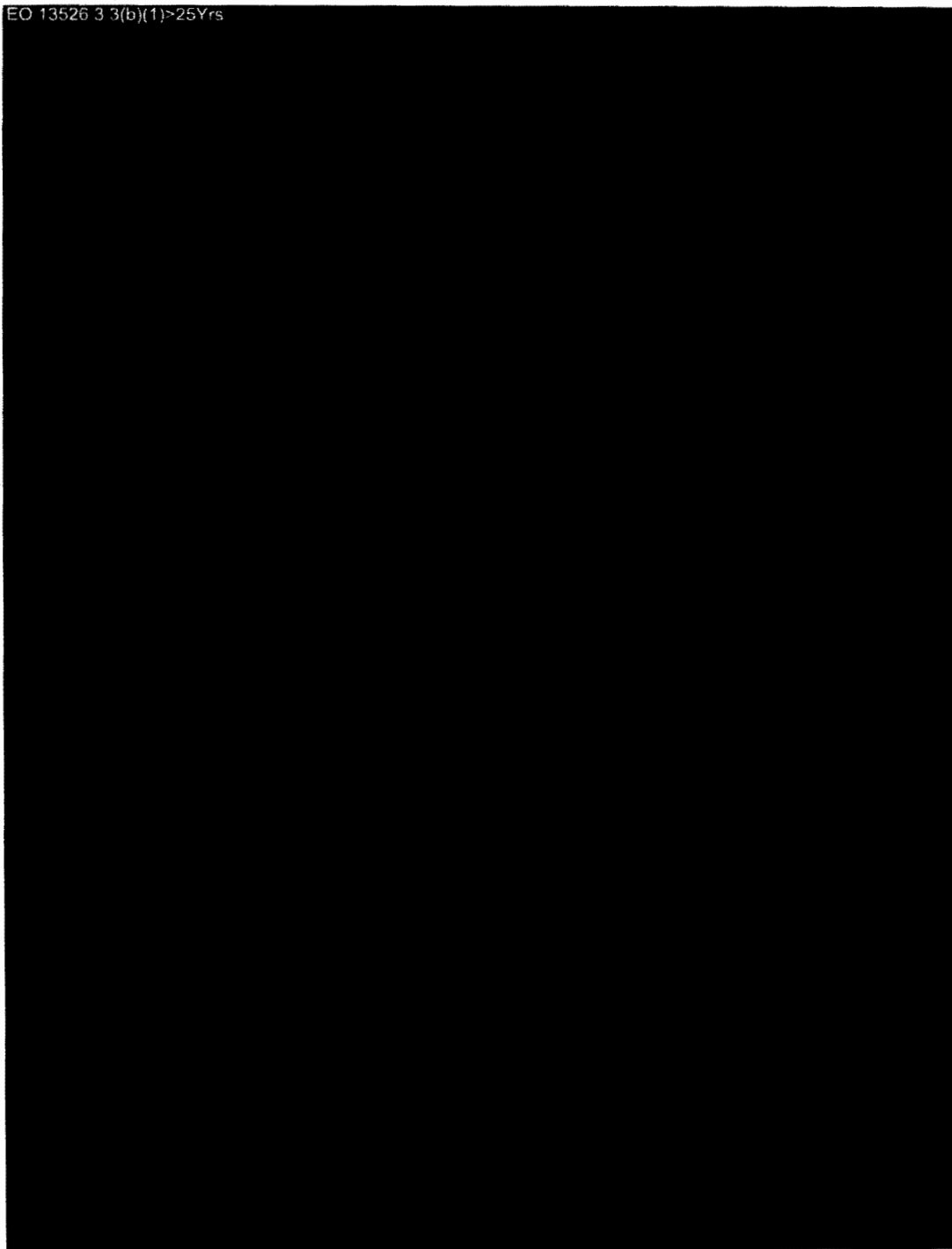
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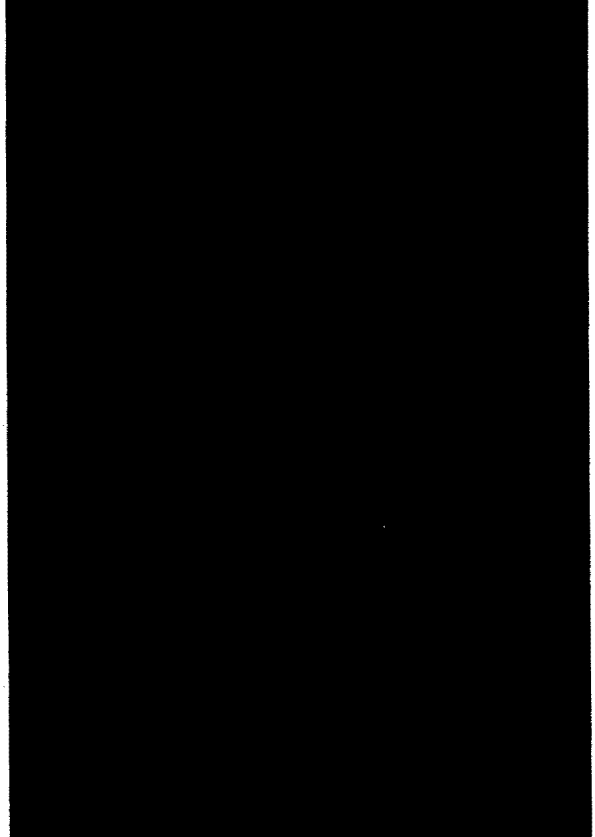
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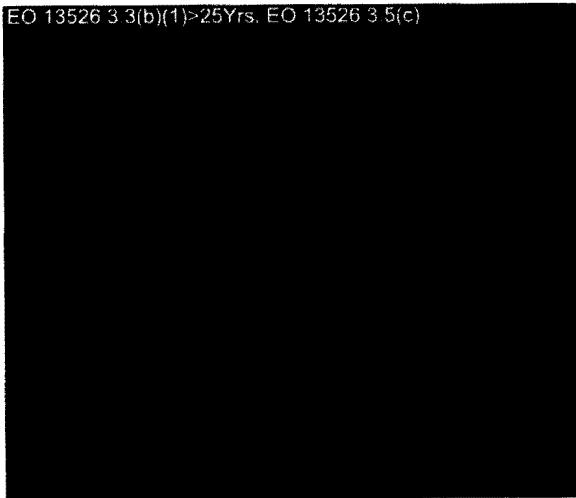


**Julian Caballero**

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EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.5(c)



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BYE 019794~~

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EO 1.4.(c)



**John L. McLucas**

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)-25Yrs. EO 13526

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)-25Yrs. EO 13526 3

96-36/50 USC 3605  
EO 1.4.(c)

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Robert F. Naka

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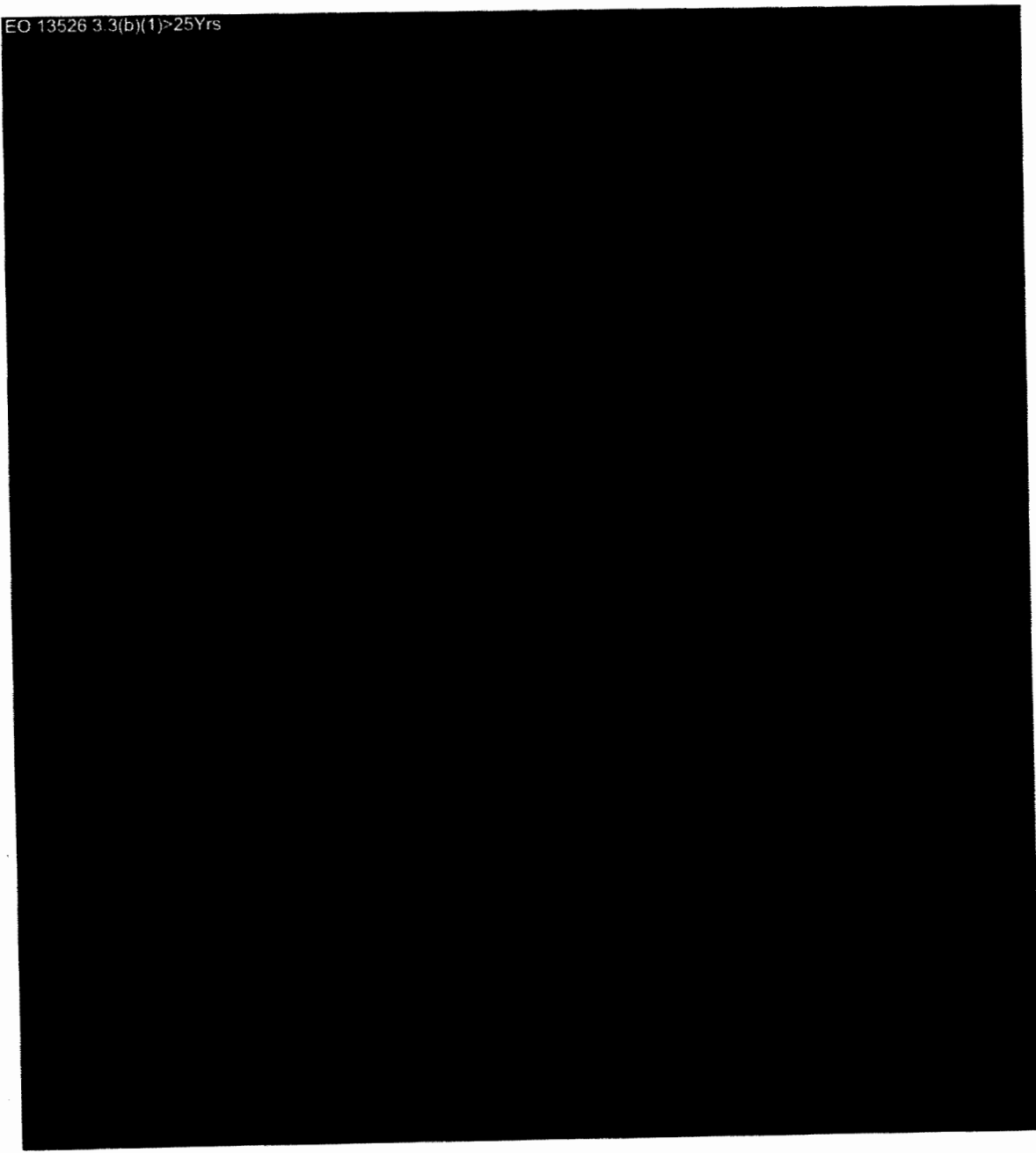
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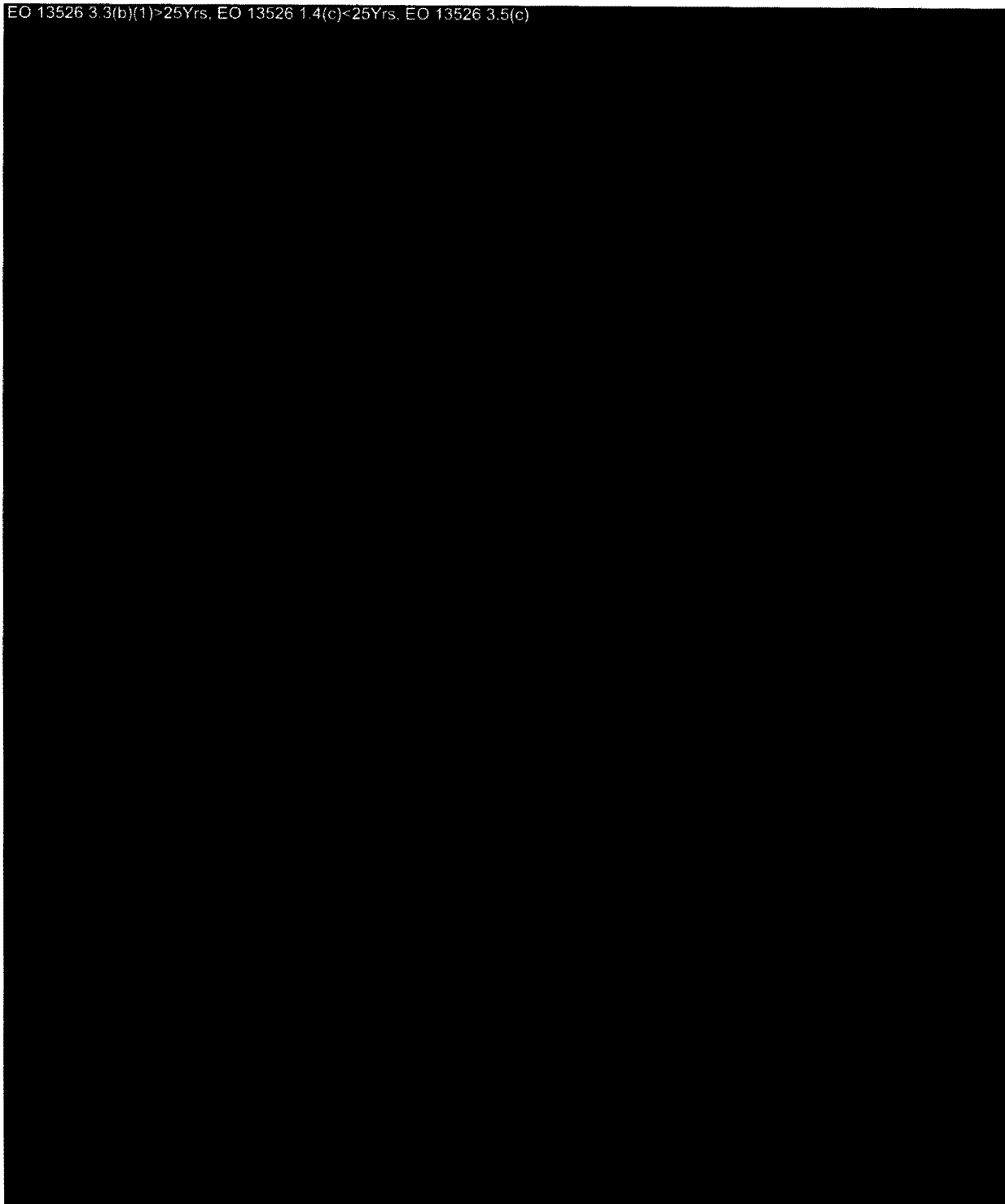
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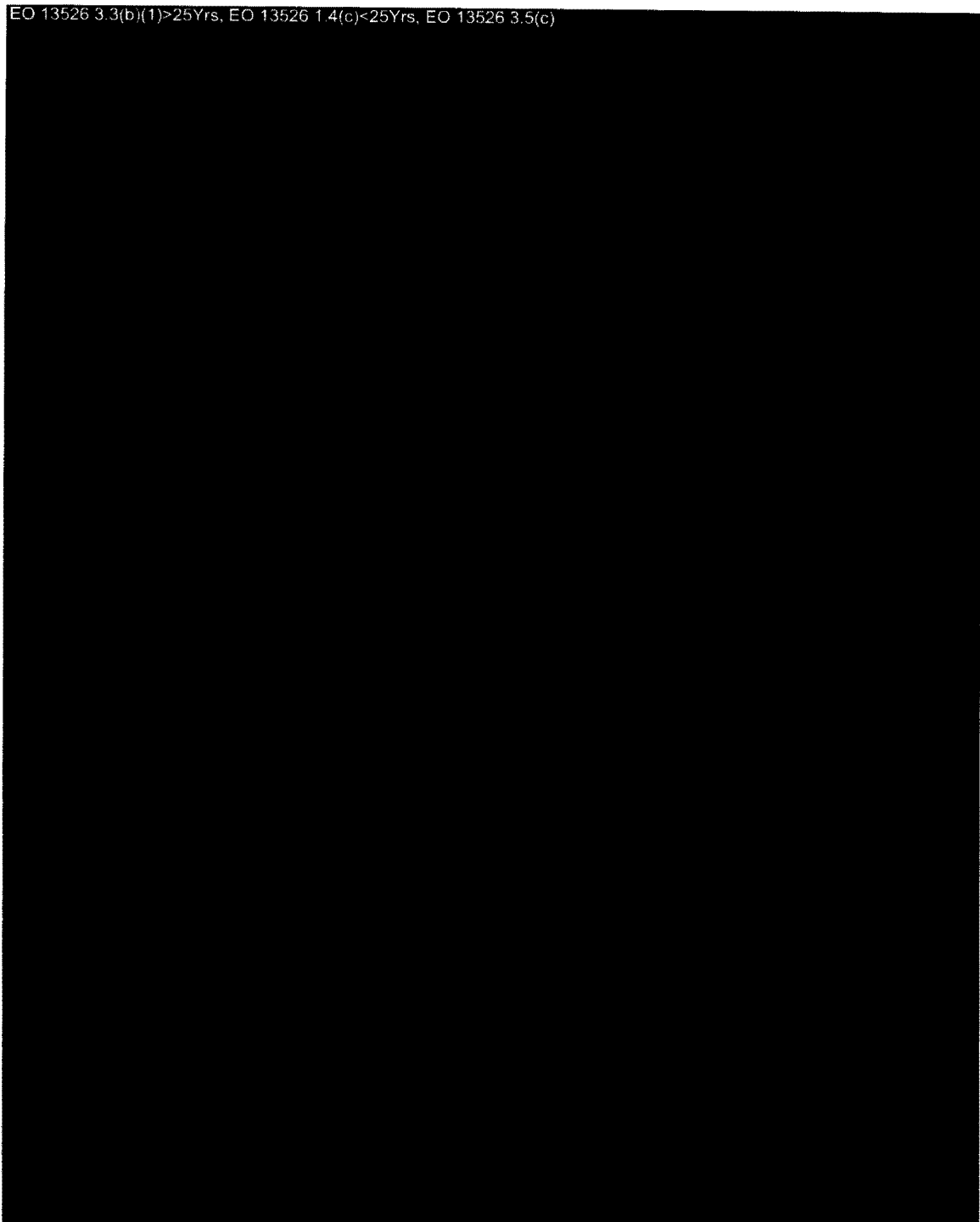
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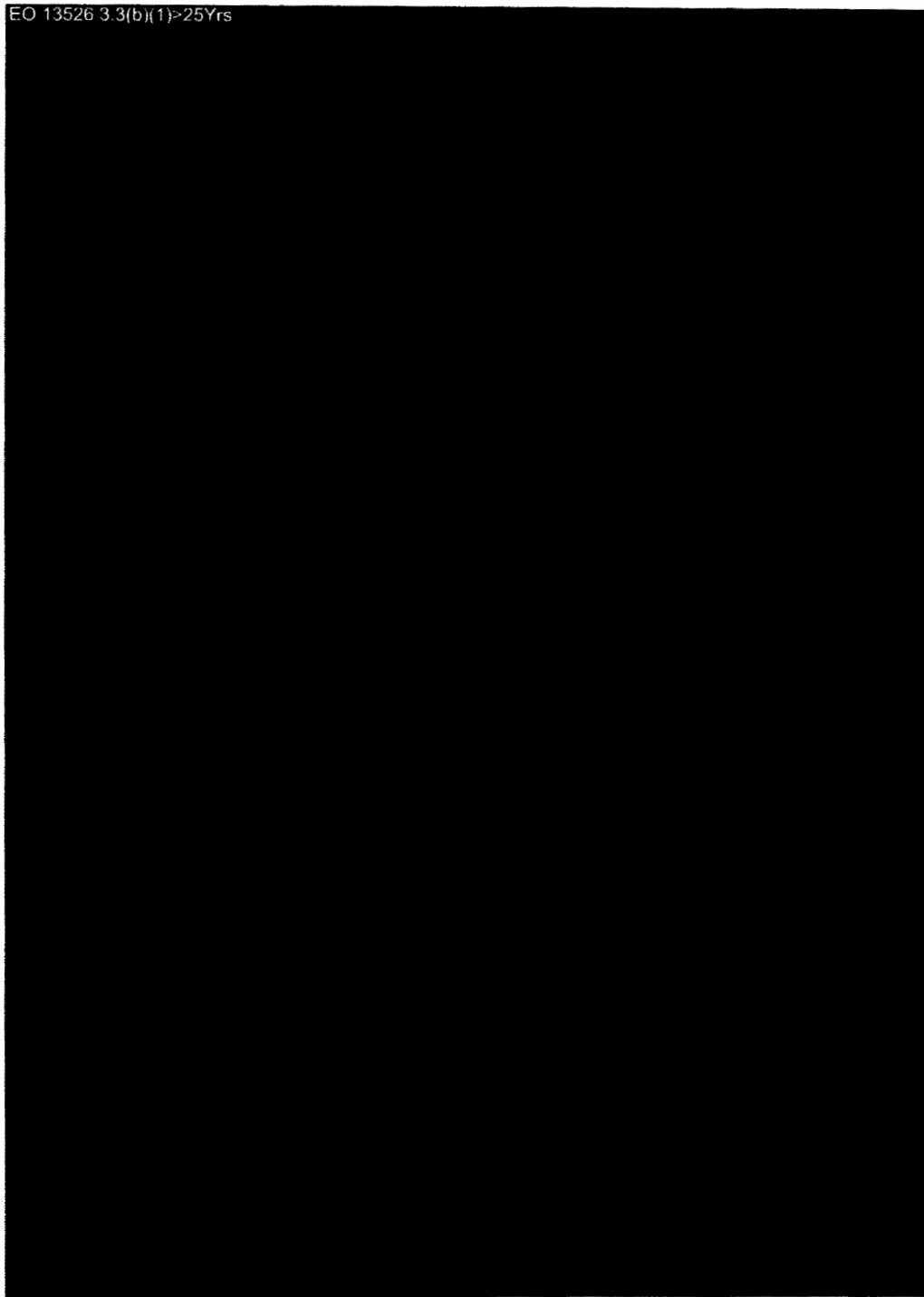
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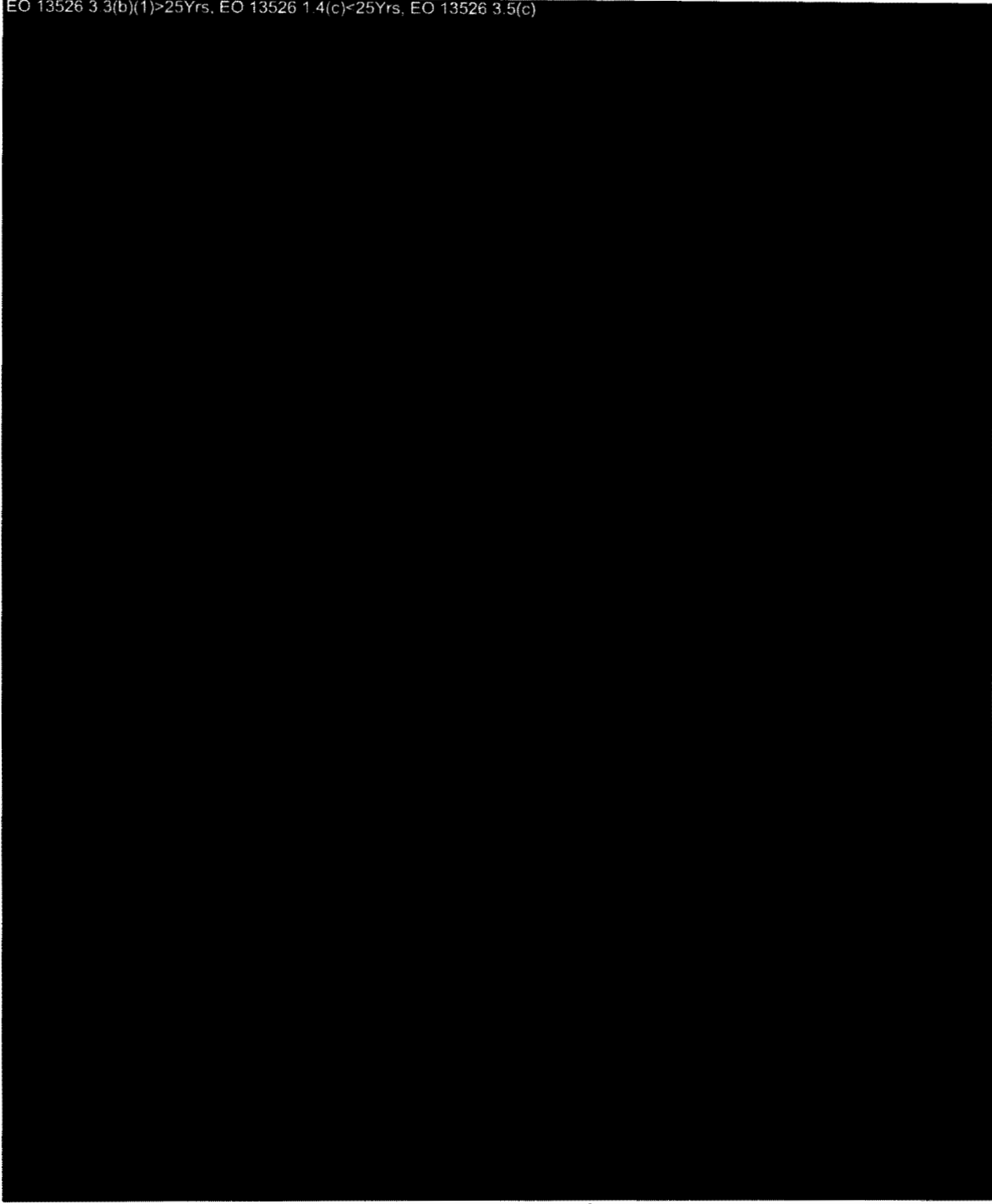


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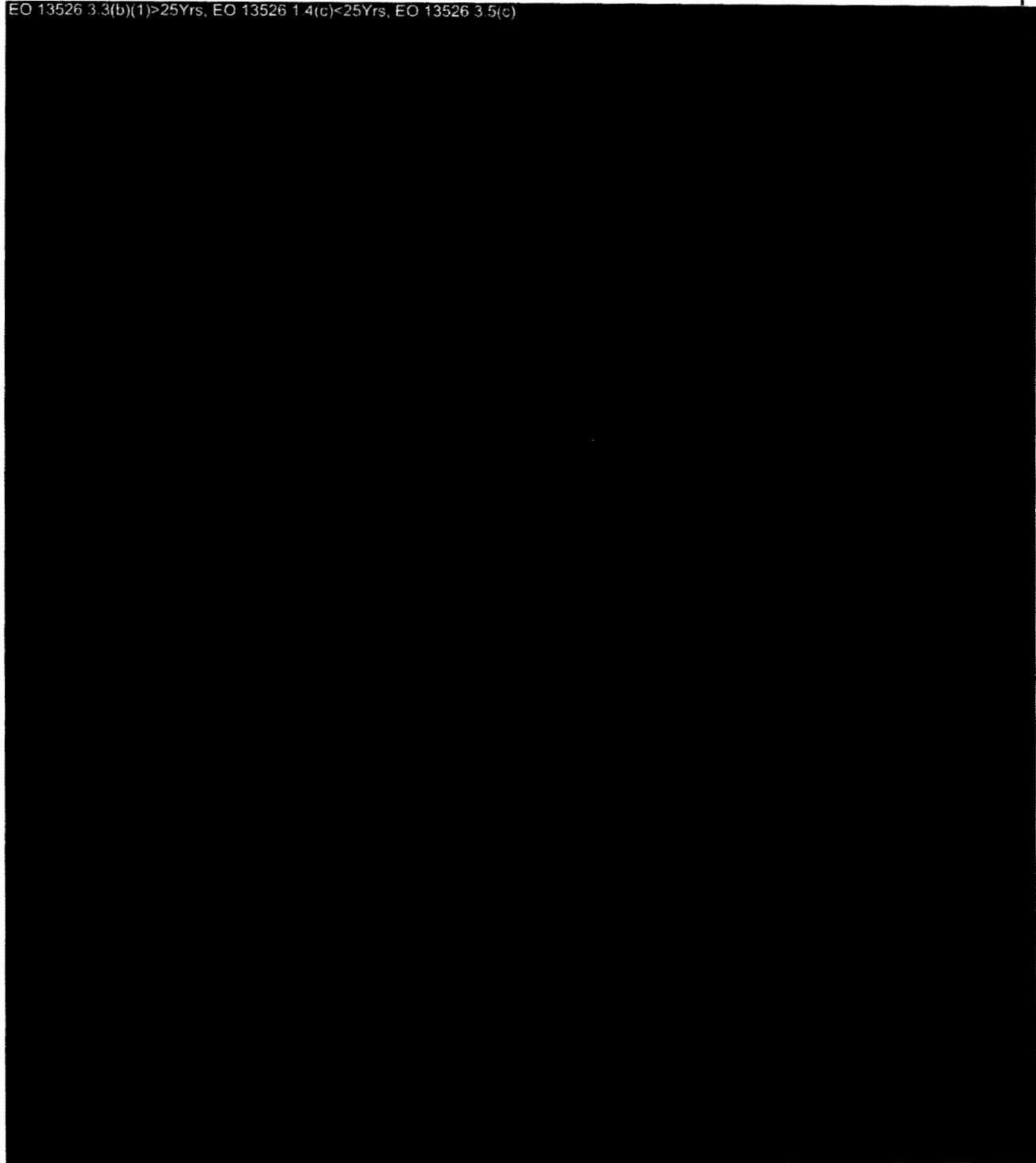


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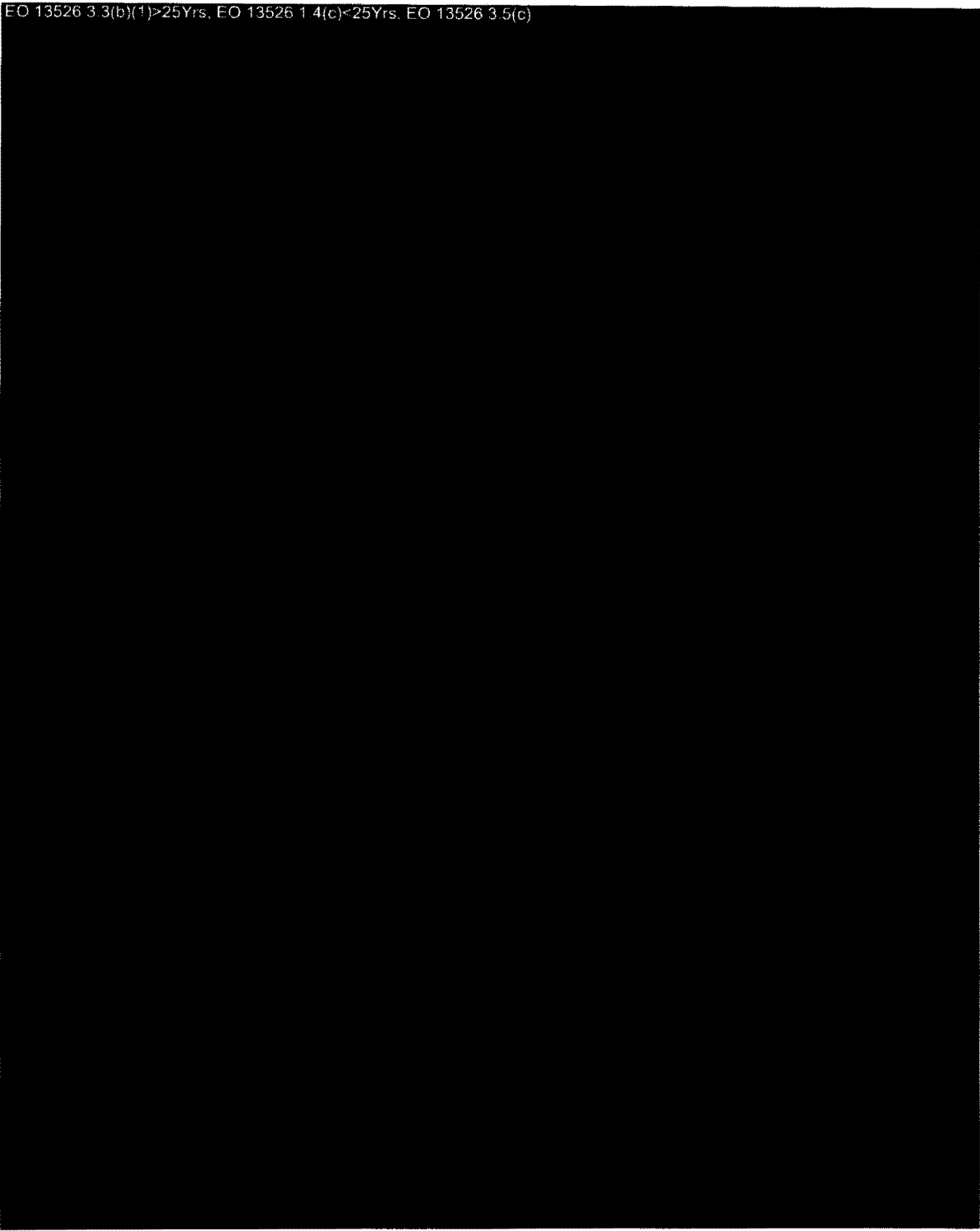


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PL 86-36/50 USC 3605

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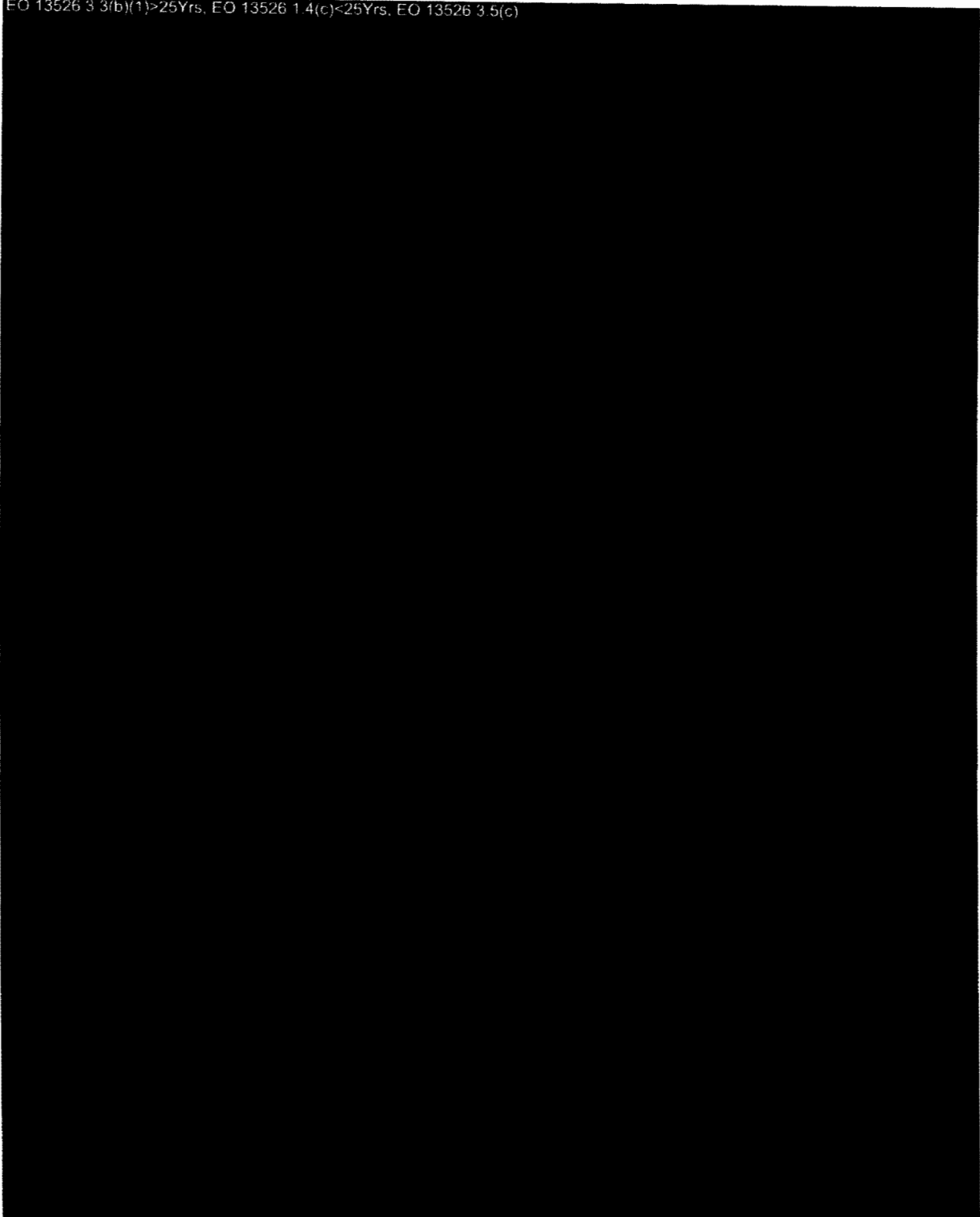
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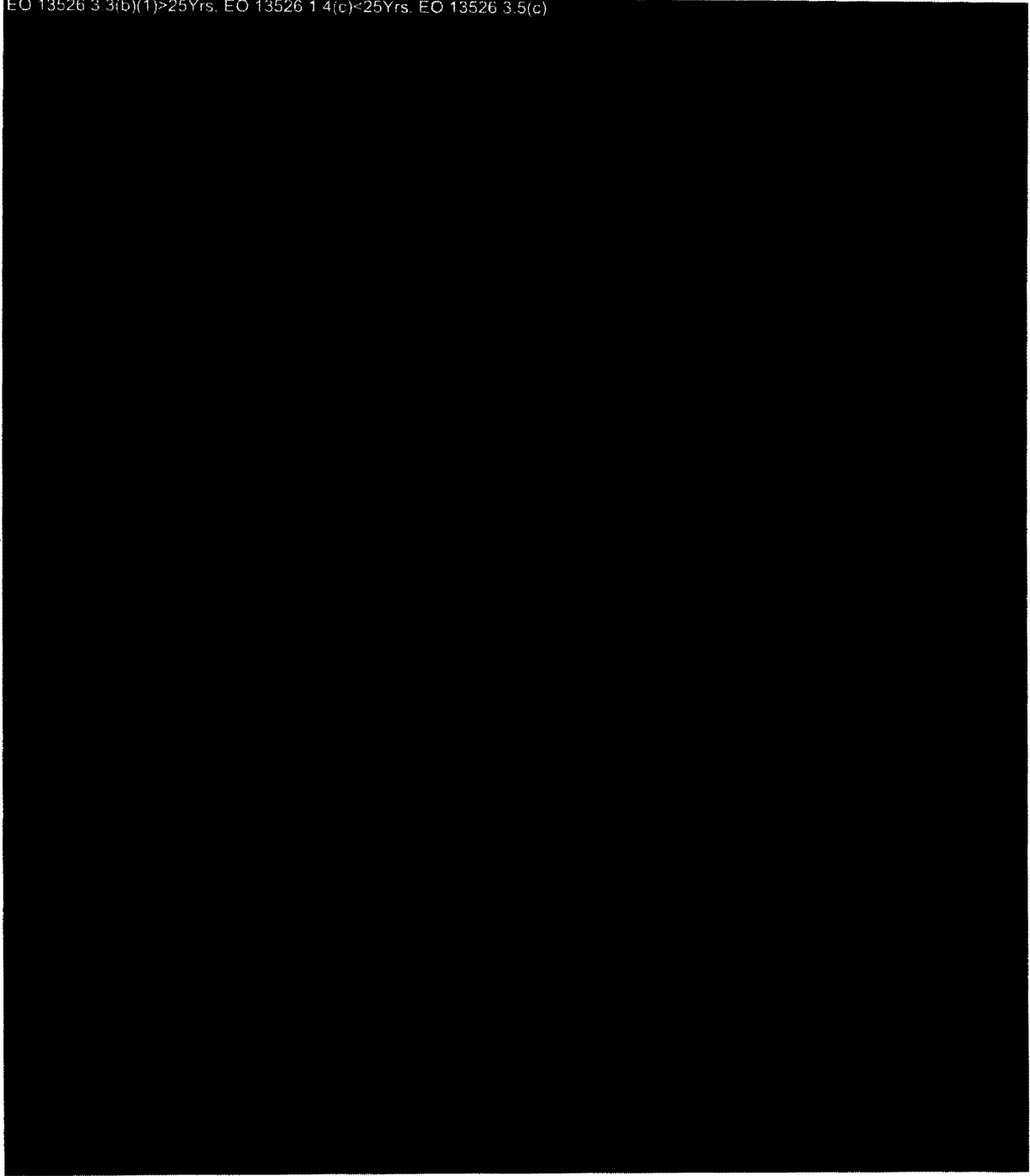
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EO 13526 3 3(b)(1)>25Yrs. EO 13526 1 4(c)<25Yrs. EO 13526 3 5(c)



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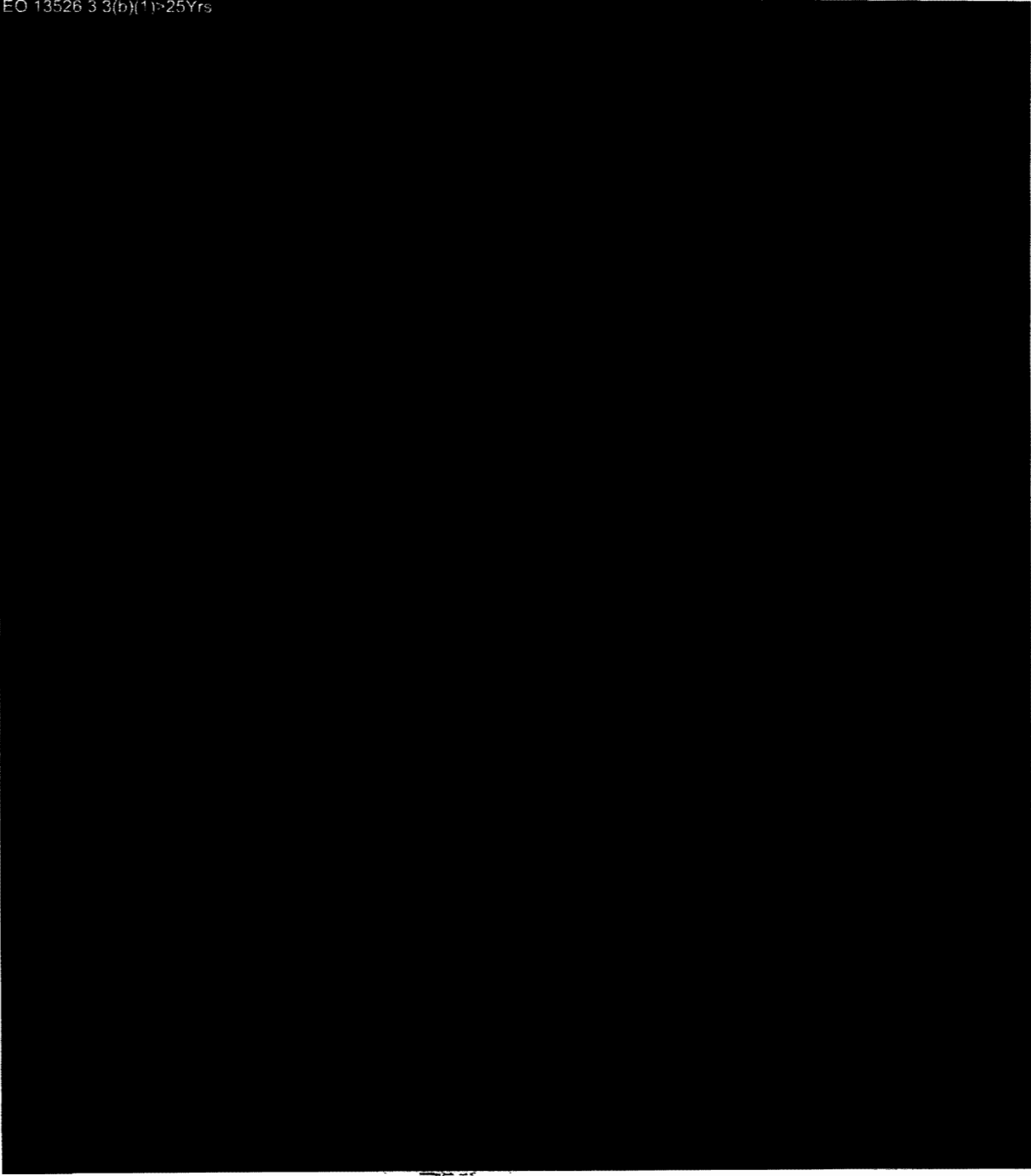
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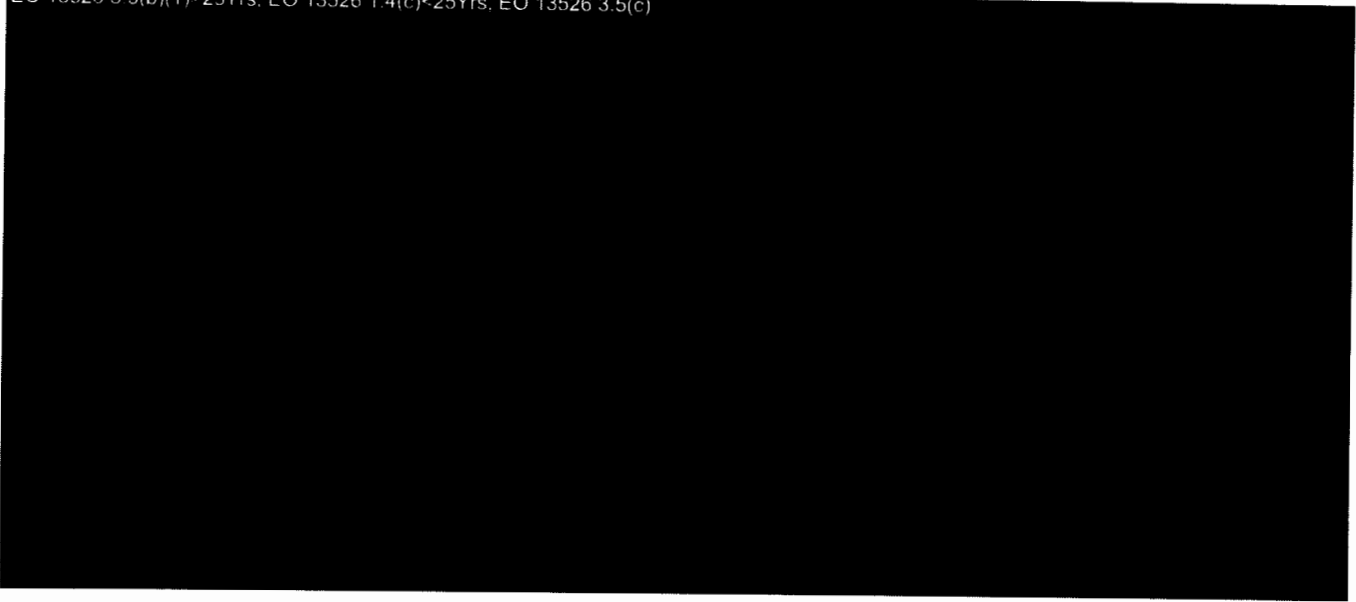
## Chapter 6 References

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COMINT Control Channels Janille  
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EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



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EO 1.4.(c)

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PL 86-36/50 USC 3605

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~~BYE-919794~~

EO 13526 3 3(b)(1)>25Yrs

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The SIGINT Satellite Story

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EXCLUDED FROM AUTOMATIC  
DOWNGRADING AND  
DECLASSIFICATION

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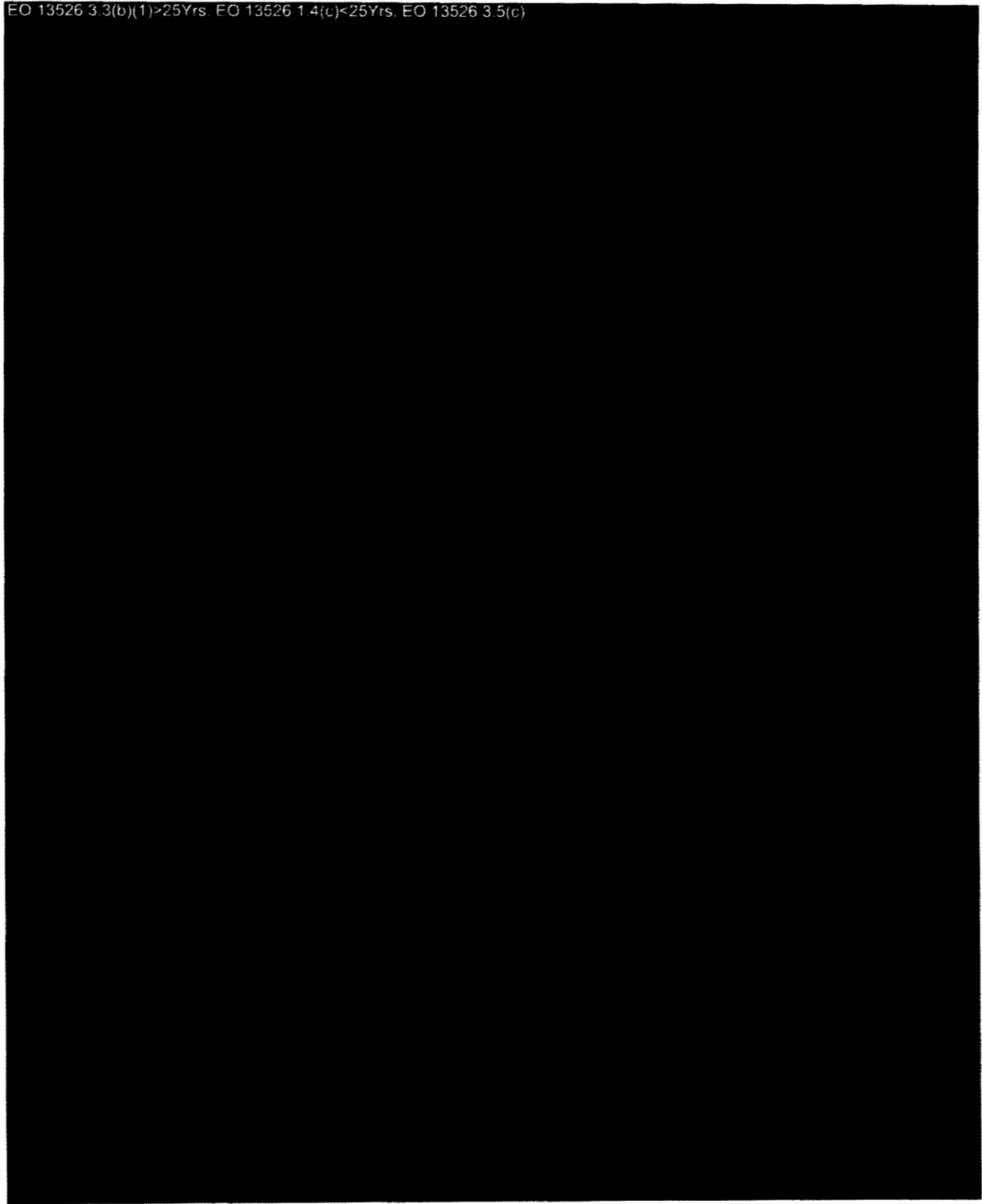
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PL 86-36/50 USC 3605

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EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 1352



Col David D. Bradburn

EO 13526 3.3(b)(1)>25Yrs

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EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.5(c)



**Robert J. Hermann**

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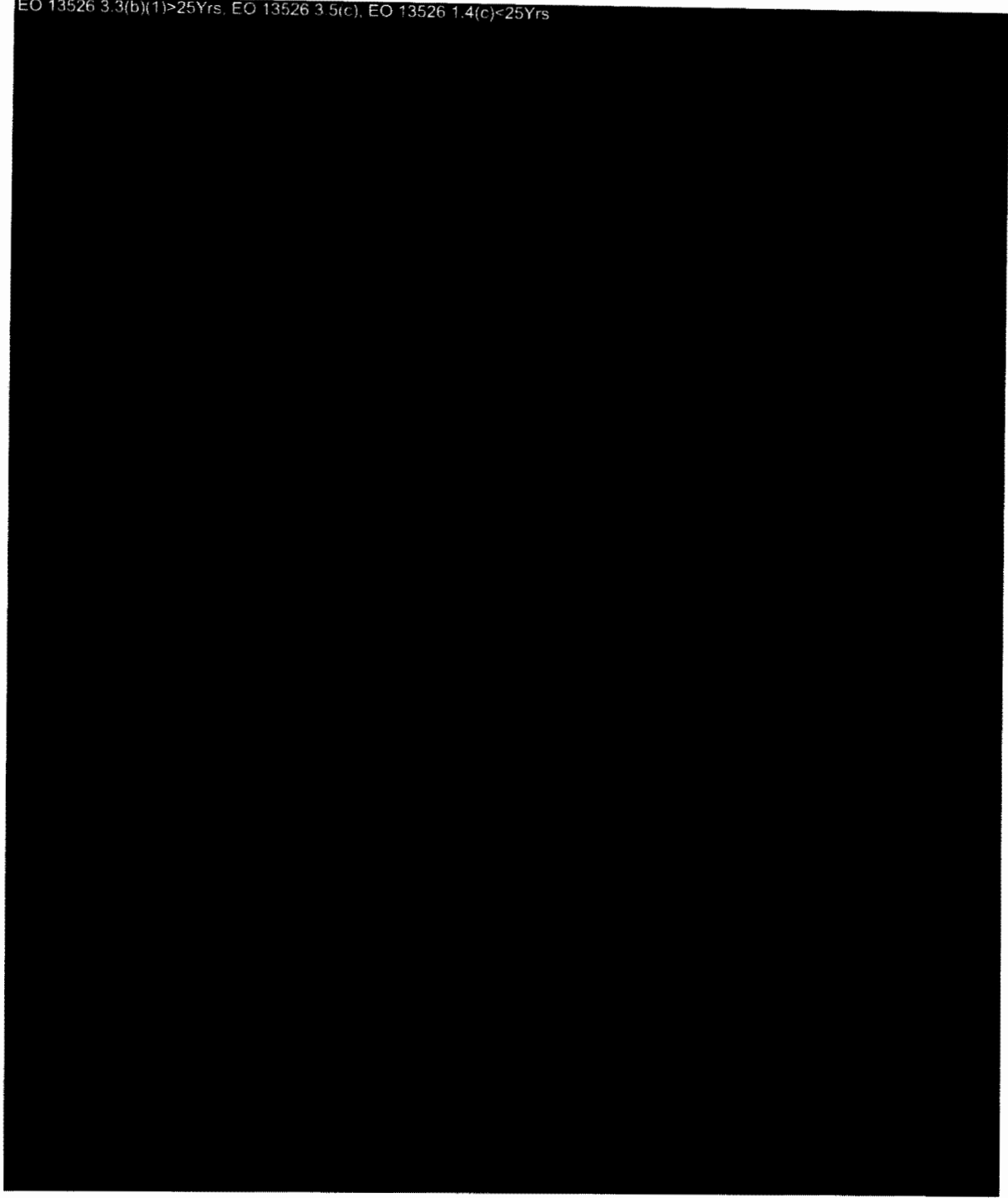
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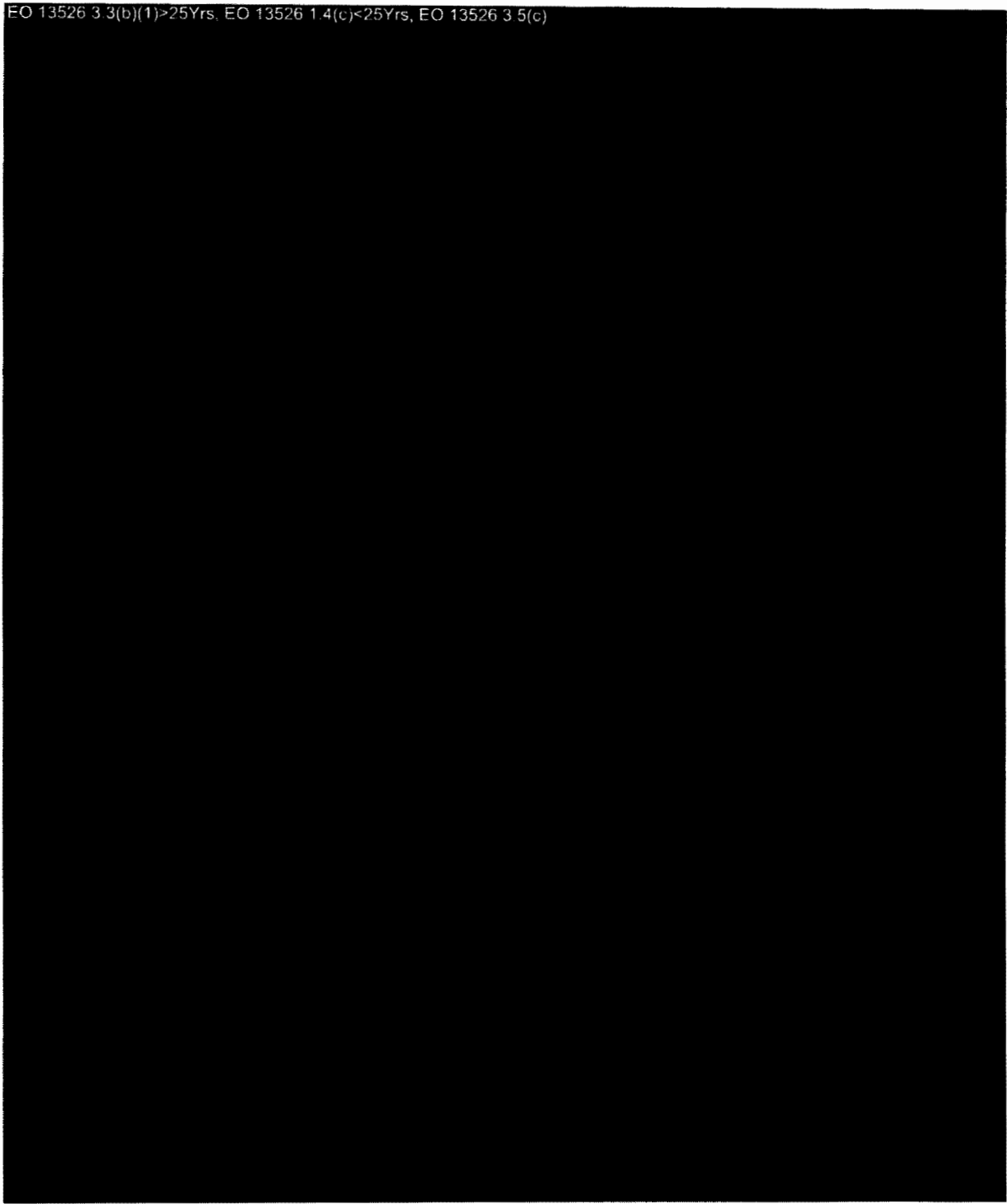
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~~COMINT Control Channels~~ ~~Intiv~~  
BYE-919794

~~Top Secret~~  
~~SI/ORN/DRCON~~

PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

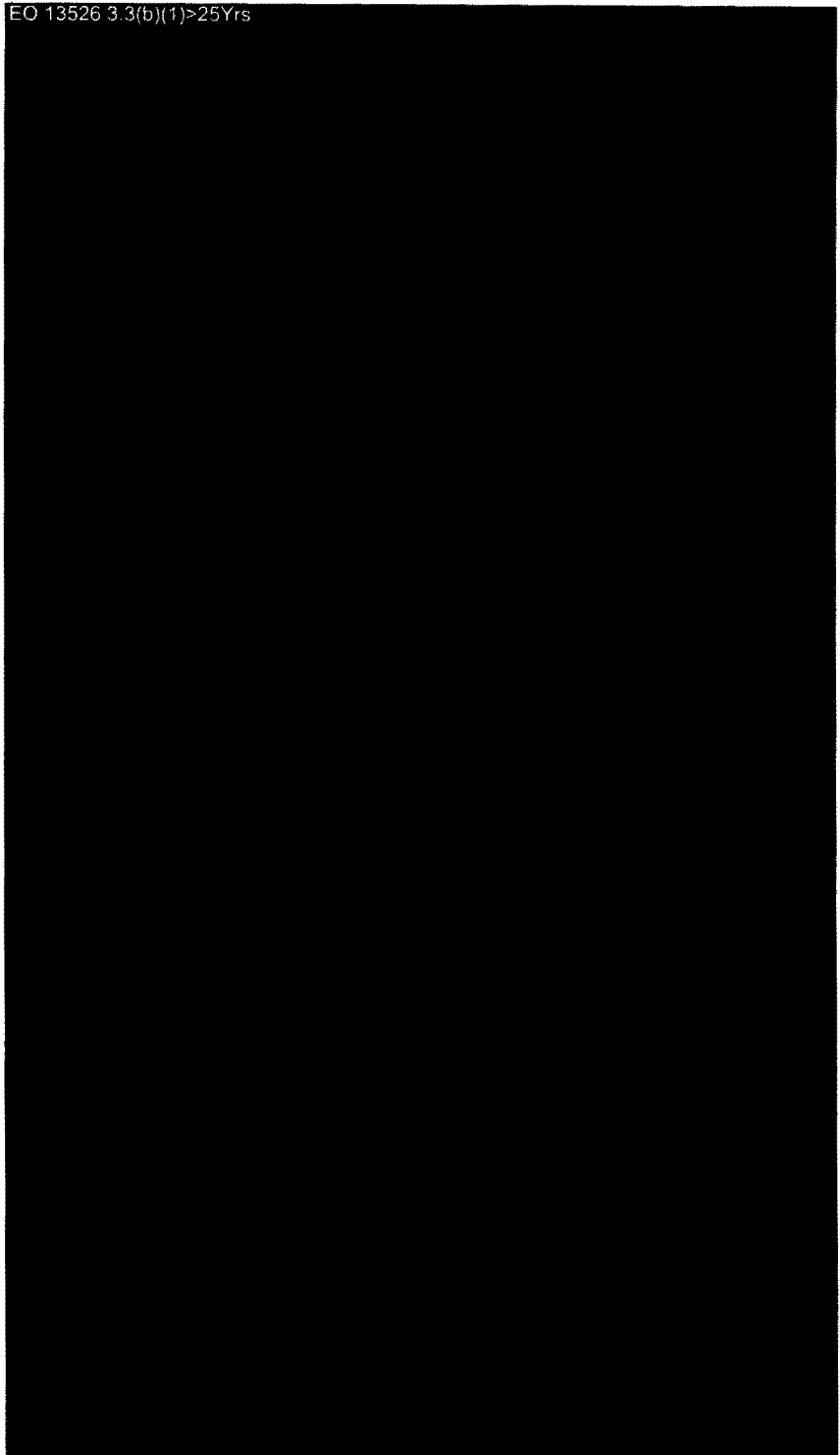


EO 1.4.(c)  
PL 86-36/50 USC 3605

~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE-919794

~~Top Secret~~  
~~NOFORN/NOCON~~

EO 13526 3.3(b)(1)>25Yrs



~~Top Secret~~  
~~Handle via BYEMAN-FALENT-KEYHOLE-~~  
~~COMINT Control Channels Intlv~~  
~~BVE 010794~~

~~Top Secret  
NOFORN ORCON~~

EO 1.4(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



PL 86-36/50 USC 3605

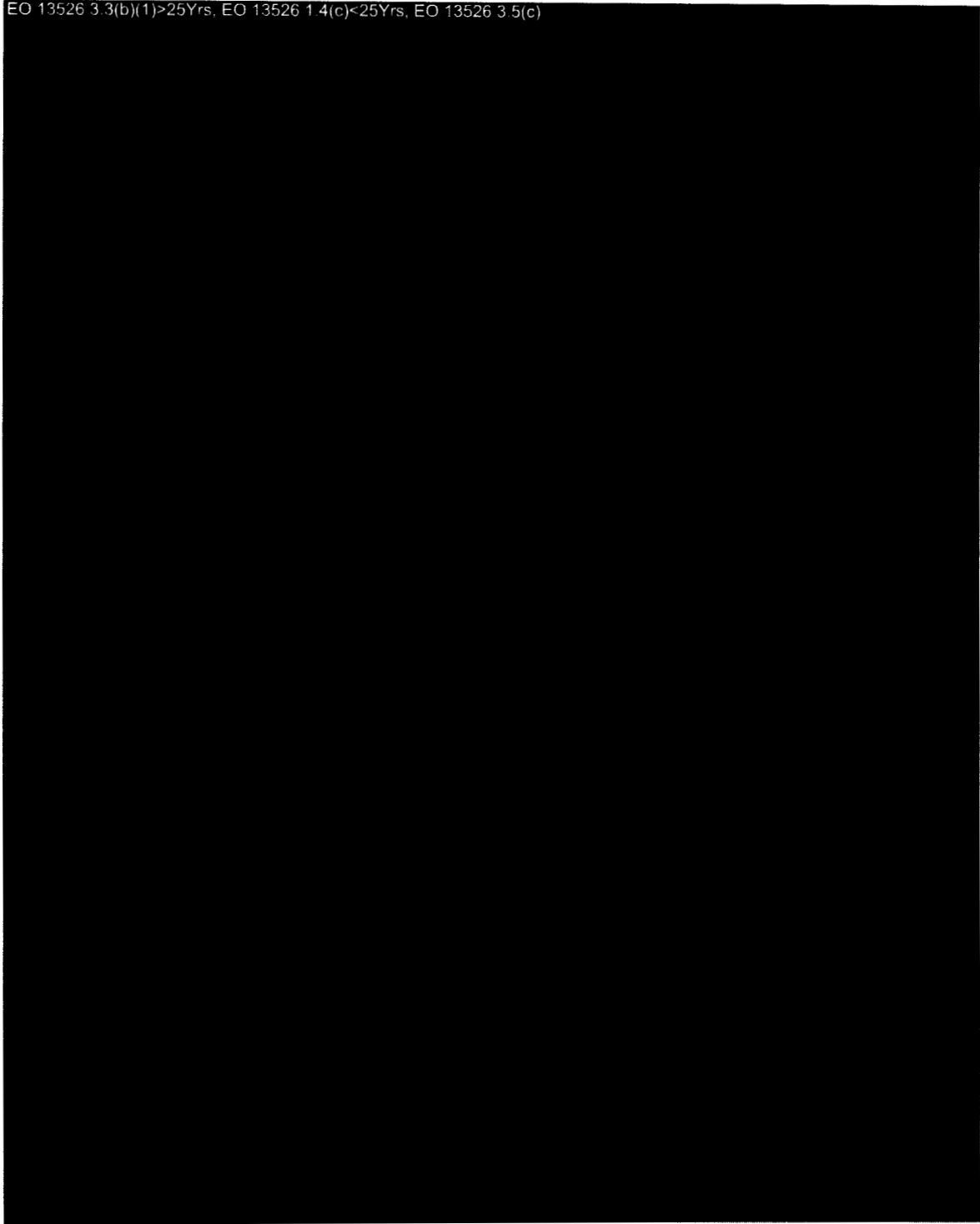
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COMINT Control Channels Inuitly  
BYF.0107N4~~



~~Top Secret~~  
~~NOFORN-ORCON~~

PL 86-36/50 USC 3243  
EO 1.4.150

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



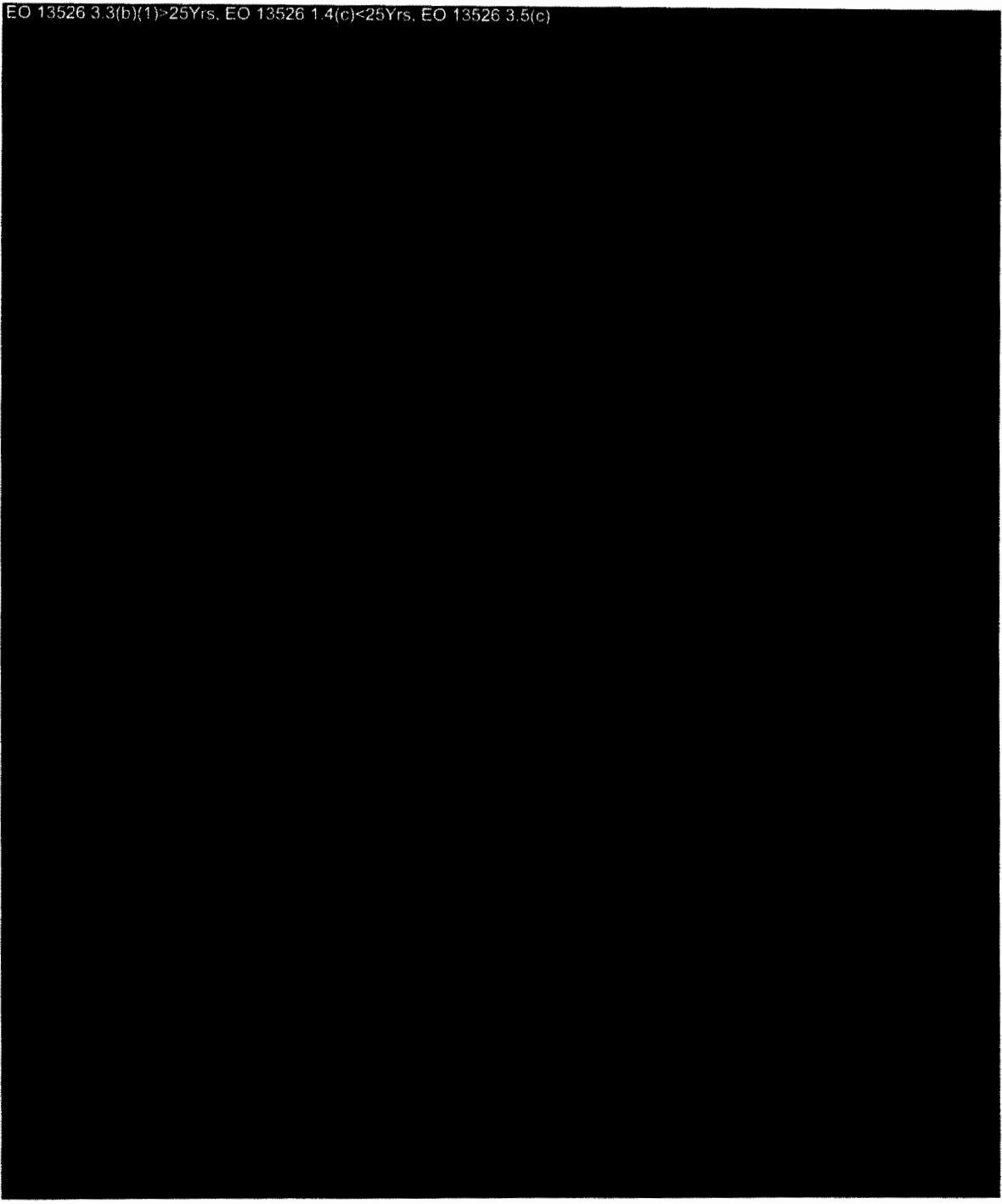
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COMINT Control Channels Jointly  
BYE-9197/94

~~Top Secret  
NOFORN-ORCON~~

PL 86-36/50 USC 3605

EO 1.4.1.1  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret  
Handle via BYEMAN-TALENT-KEYMOLE-  
COMINT Control Channels jointly  
OTE-919794~~

~~Top Secret  
NOFORN-ORCON~~

EO 1.4.2  
PL 86-36/50 USC 3605



EO 13526 3.3(b)(1)-25Yrs, EO 13526 1.4(c)-25Yrs, EO 13526 3.5(c)



VAdm Noel Gayler

EO 13526 3.3(b)(1)-25Yrs, EO 13526 1.4(c)-25Yrs, EO 13526 3.5(c)



~~Top Secret  
Handle via BYEMAN-FALENT-KEYHOLE-  
COMINT Critical Channels, Kaitix  
05/07/07 a1~~

~~Top Secret  
NOFORN-ORCON~~

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526

USC 3605



EO planning meeting, El Segundo, California, April 1970

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526

PL 80-30/50 USC 3605  
EO 1.4.(c)

~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
NY 014734~~

~~Top Secret~~  
~~NOFORN/ORCON~~



**Col John W. Browning**

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 135

EO 1.4.(c)  
PL 86-36/50 USC 3605

PL 86-36/50 USC 3605

~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels Innlv  
BYE-9197/04

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c), EO 13526 1.4(d)<25Yrs

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 1.4(d)<25Yrs



LtGen Lew Allen, Jr.

EO 13526 3.3(b)(1)>25Yrs

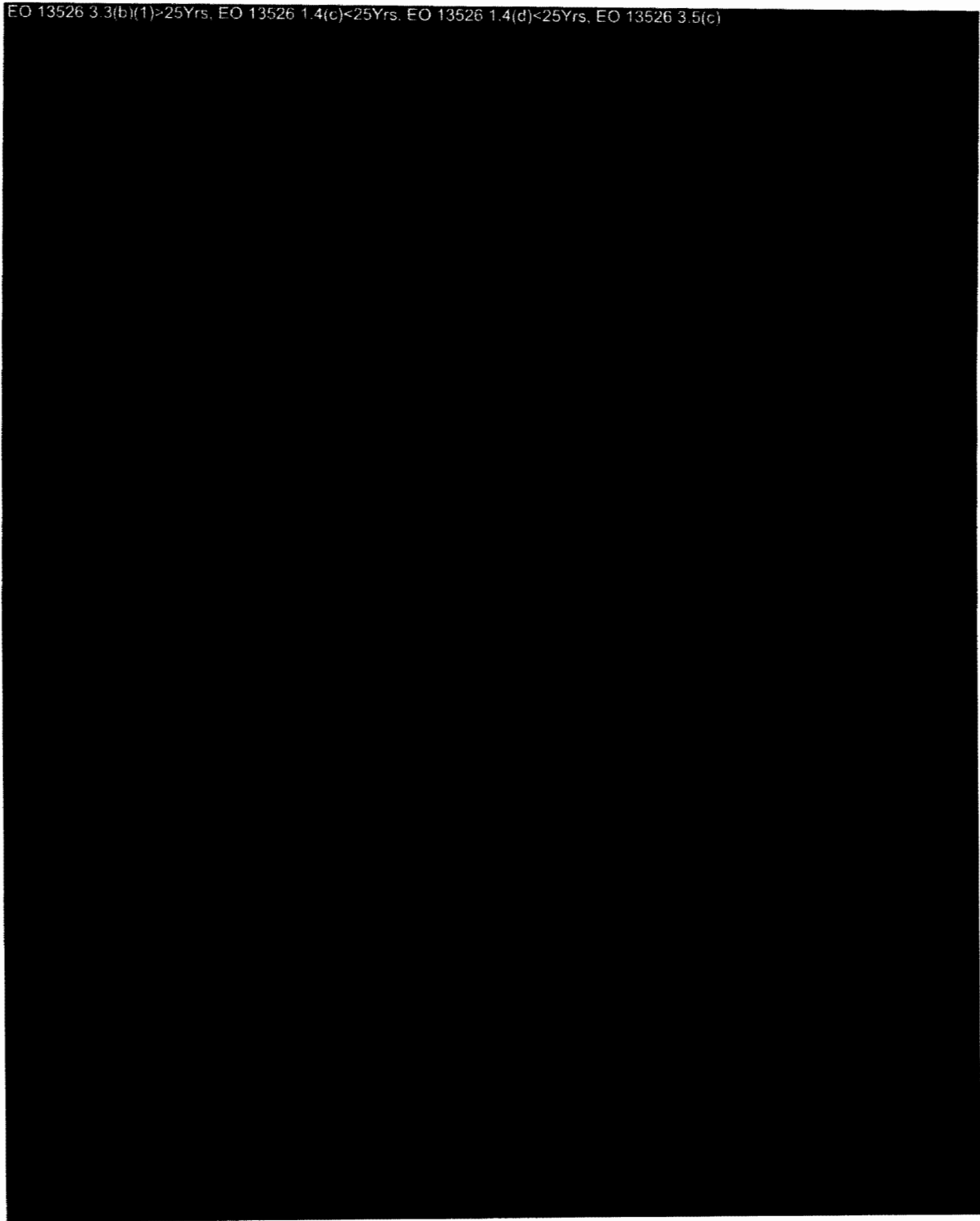
EO 1.4.(c)  
EO 1.4.(d)  
PL 86-36/50 USC 3605

~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels Jointly~~  
BYE-919794

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
EO 1.4.(d)  
PL 86-36/50 USC 3035

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~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
RYE-019794

~~Top Secret  
NOFORN-ORCON~~

PL 86-36/50 USC 3605

EO 1.4.(c)  
PL 86-36/50 USC 3605

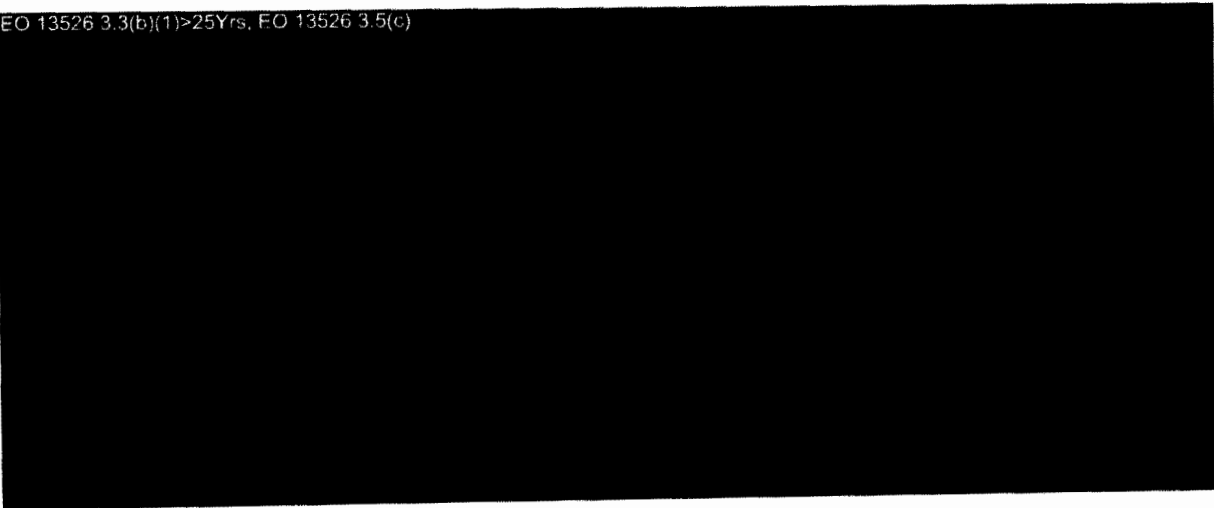
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~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels Identity  
REF. 4197-04~~



EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.5(c)



~~TOP SECRET~~  
HANDLE VIA BRYAN, CLIENT ATTORNEY,  
CONSIST (S) WITH CURRENT BIRTH  
BY 01/07/94

~~TOP SECRET~~  
NO DISSEMINATION



~~Top Secret  
NOFORN/DIRCON~~

EO 1.4.(b)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



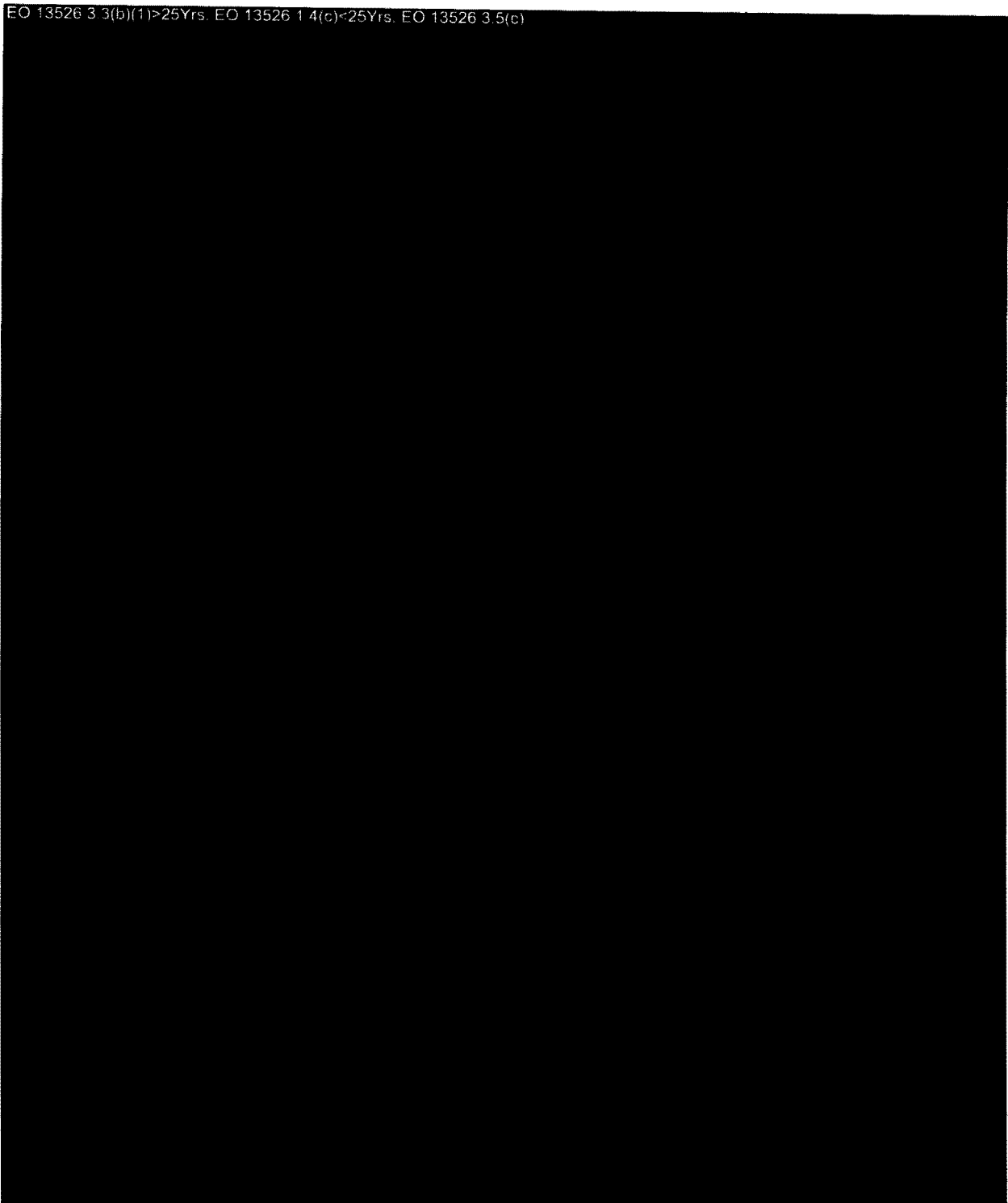
PL 86-36/50 USC 3605

~~Top Secret  
Handle via RYEMAN TALENT-KEYHOLE-  
COMINT Control Channels Jointly  
BY 0111/01~~

~~Top Secret~~  
~~NOFORN/NOFORN~~

EO 1.4.707  
PL RC-30700 000 3607

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)

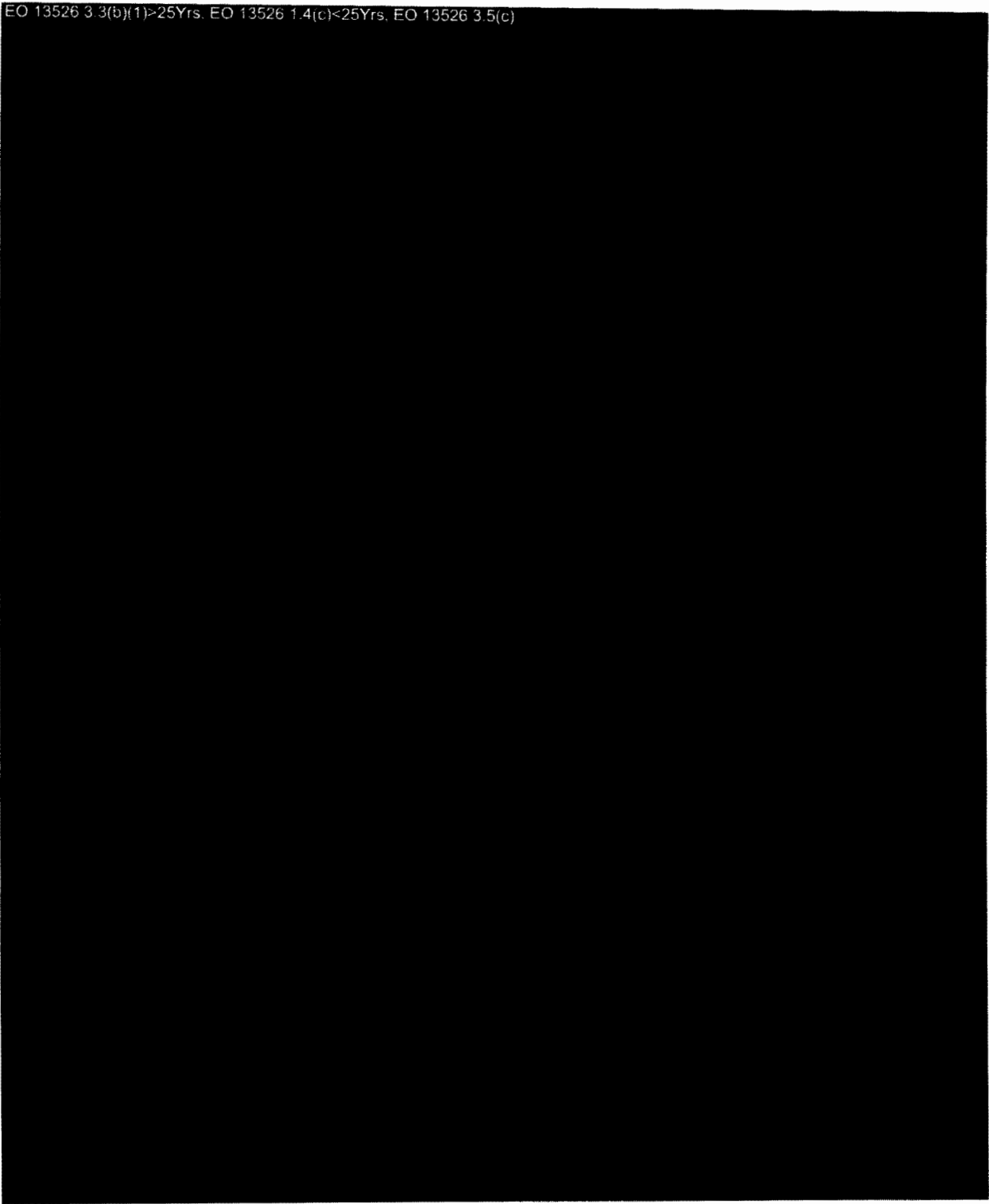


~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels jointly~~  
BYE-919794

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
EL 36-30/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT Control Channels Jointly~~  
~~BYE-9197/94~~

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526



86-36/50 USC 3605

Outstanding high-school graduates with a demonstrated aptitude for foreign language were hired and trained because the military services could not recruit enough

EO 13526 3.5(c)



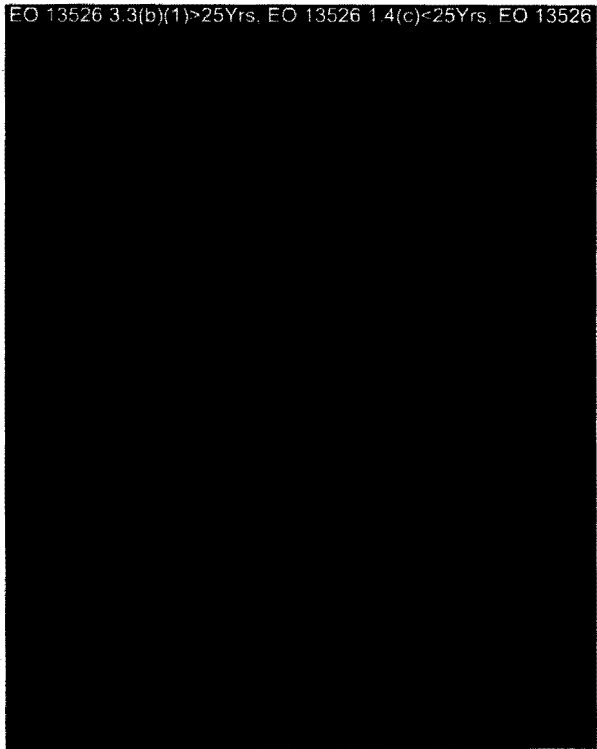
school graduates who qualified for the program were hired as GS-3s, promoted to GS-4s upon successful completion of the first six months of the program, and promoted to GS-5s upon completion of the intensive one-year program. Many went on to get a college degree in language from a local college or university while continuing to work for NSA.

Congressional committees have oversight of NSA and NRP operations, and approve NSA and NRP budgets and activities. The six committees are the House Armed Services Committee (HASC), the Senate Armed Services Committee (SASC), the House Appropriations Committee (HAC), the Senate Appropriations Committee (SAC), the House Permanent Select Committee on Intelligence (HPSCI), and the Senate Select Committee on Intelligence (SSCI).

~~Top Secret  
NOFORN/NOCON~~

EO 1.4  
EL 1.4-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526



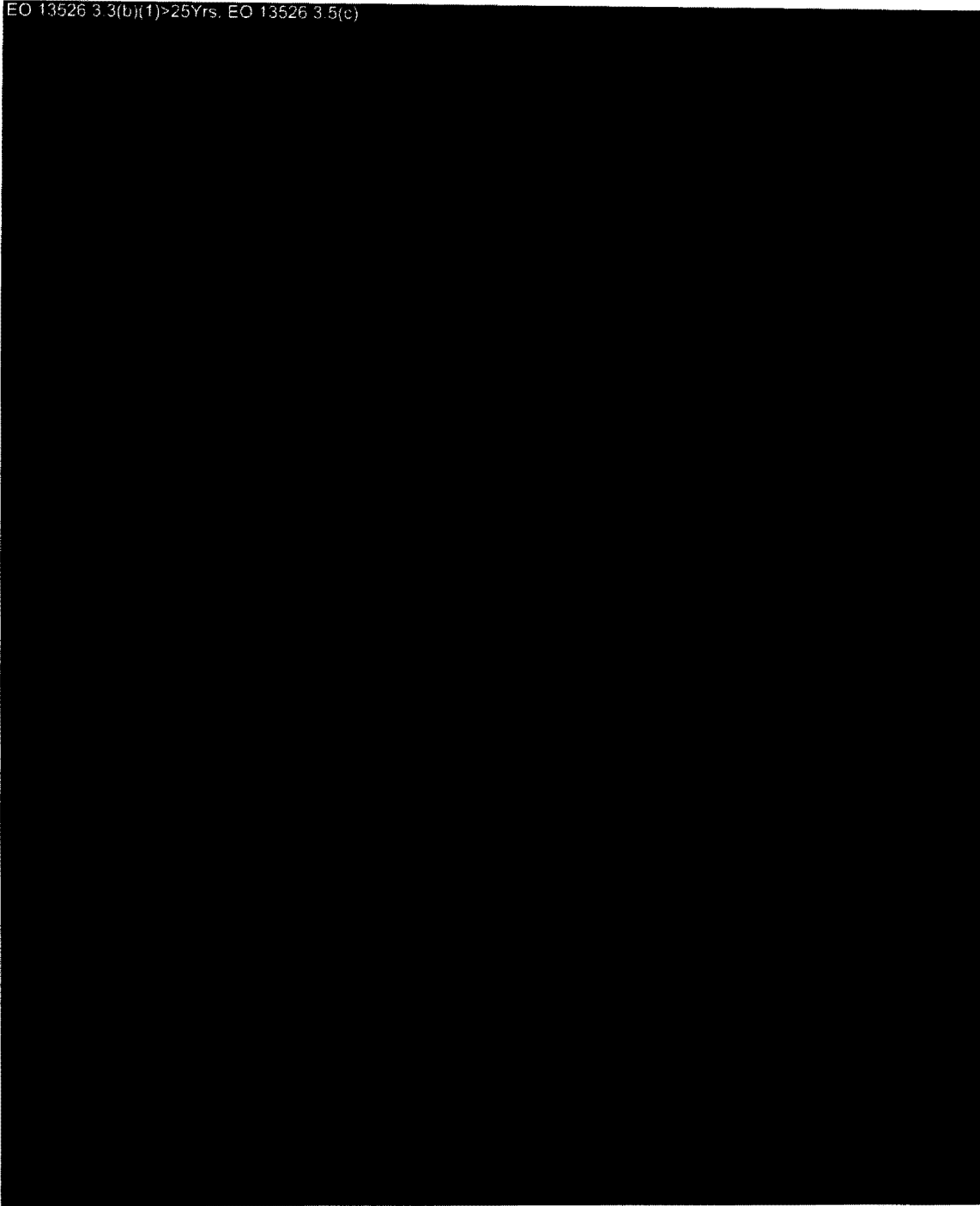
~~Top Secret  
Handle via BYEMANTALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE-9197/96~~

~~Top Secret~~  
~~NOFORN/NOCON~~



## Chapter 7 References

EO 13526 3.3(b)(1)>25Yrs. EO 13526 3.5(c)



U80 3445

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~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
~~COMINT Control Channels limits~~  
~~REF ID: A11714~~

~~Top Secret~~  
~~NOFORN-ORCON~~

88

[REDACTED]

EO 1.4.1  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

[REDACTED]

EO 86-36/50 USC 3605

~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE 4192 94



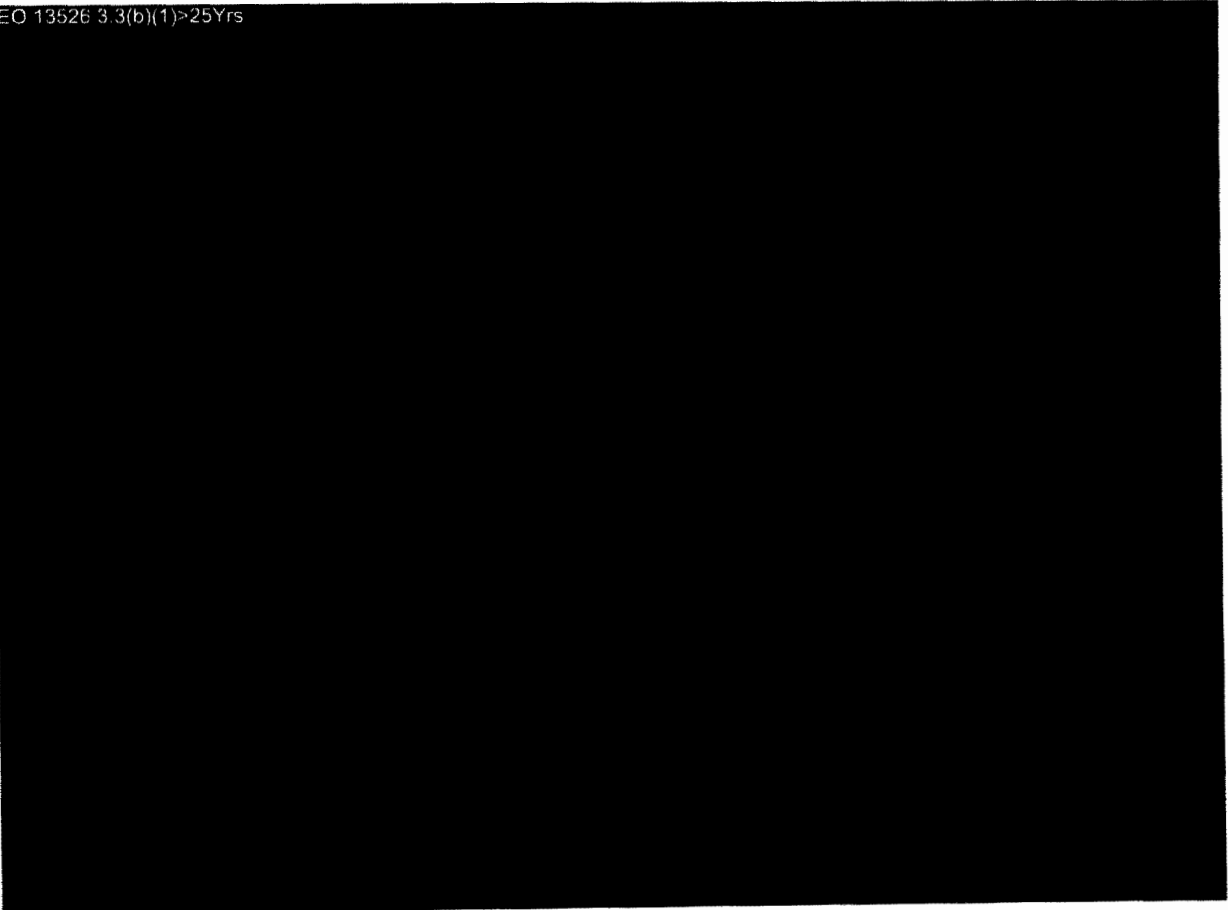
NRO APPROVED FOR RELEASE  
12 JUNE 2015

EO 13526 3.3(b)(1)>25Yrs

224

THE SIGINT SATELLITE STORM

~~TOP SECRET~~  
Handle as BYE/NOFORN  
COMINT/CI/INT/CT/INTEL/OPS  
NYT 8182 02



~~TOP SECRET~~  
NOFORN/CI/INT/CT/INTEL/OPS

~~Top Secret~~  
~~NOFORN/ORCON~~

EO 1.4.10  
PL 86-36/50 USC 3605

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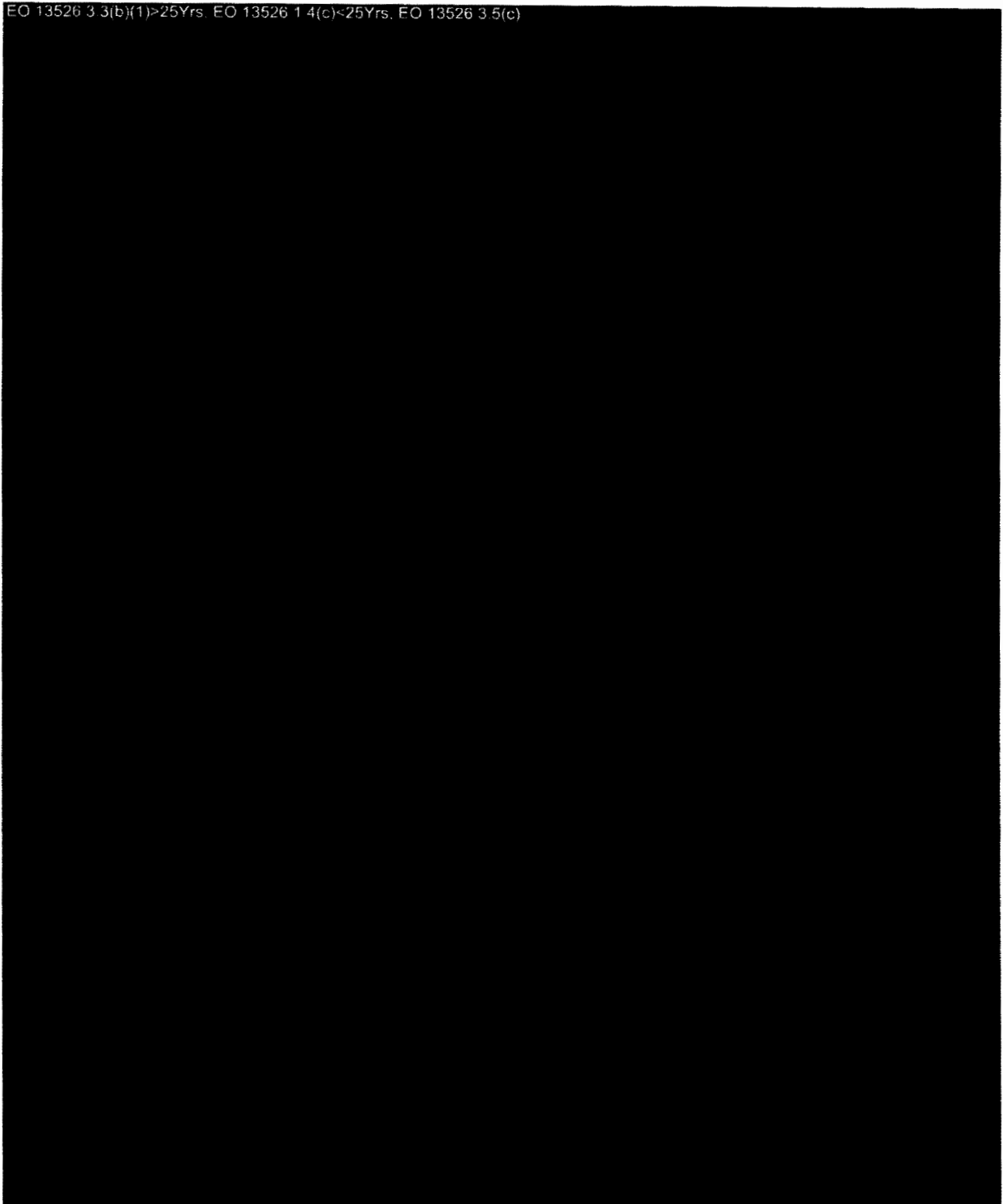
PL 86-36/50 USC 3605

~~Top Secret~~  
Handle via ~~BYEMAN-TALEST-KEYHOLE~~  
~~COMINT~~ Control Channels Initially  
BYE-019702

~~Top Secret~~  
~~SXORN ORCON~~

EO 1.4.1.001  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



~~Top Secret~~  
Handle via BYEMSA-FALENT-KEYHOLE-  
COMINT Control Channels both.

~~Top Secret  
NOFORN ORCON~~

PL 86-36/50 USC 3605

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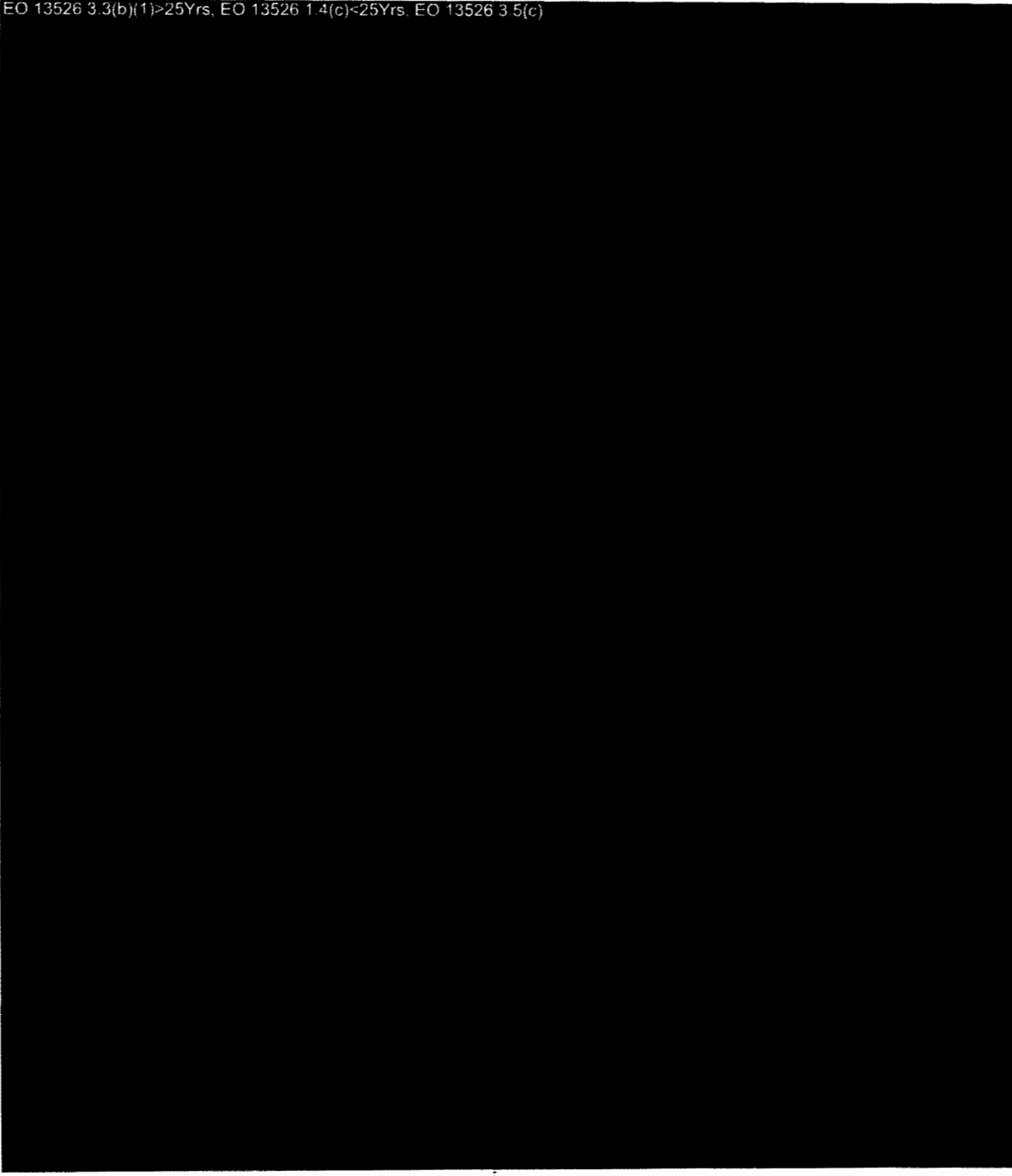
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EO 13526

~~Top Secret  
Handle via BYEMAN TALENT KEYHOLE  
COMINT Control Channels jointly  
BYE 019794~~

~~Top Secret  
NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

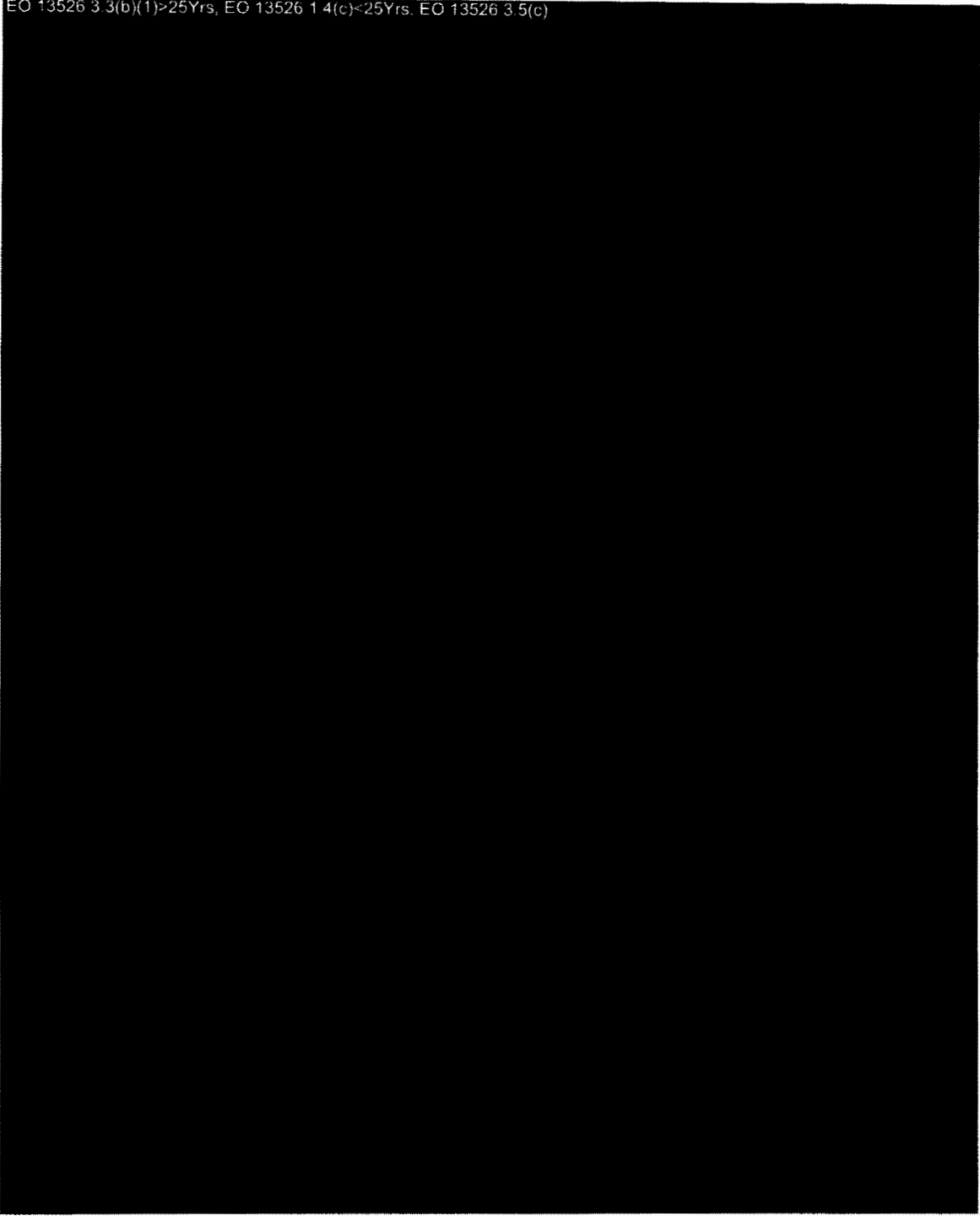
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE-9197/94~~



EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

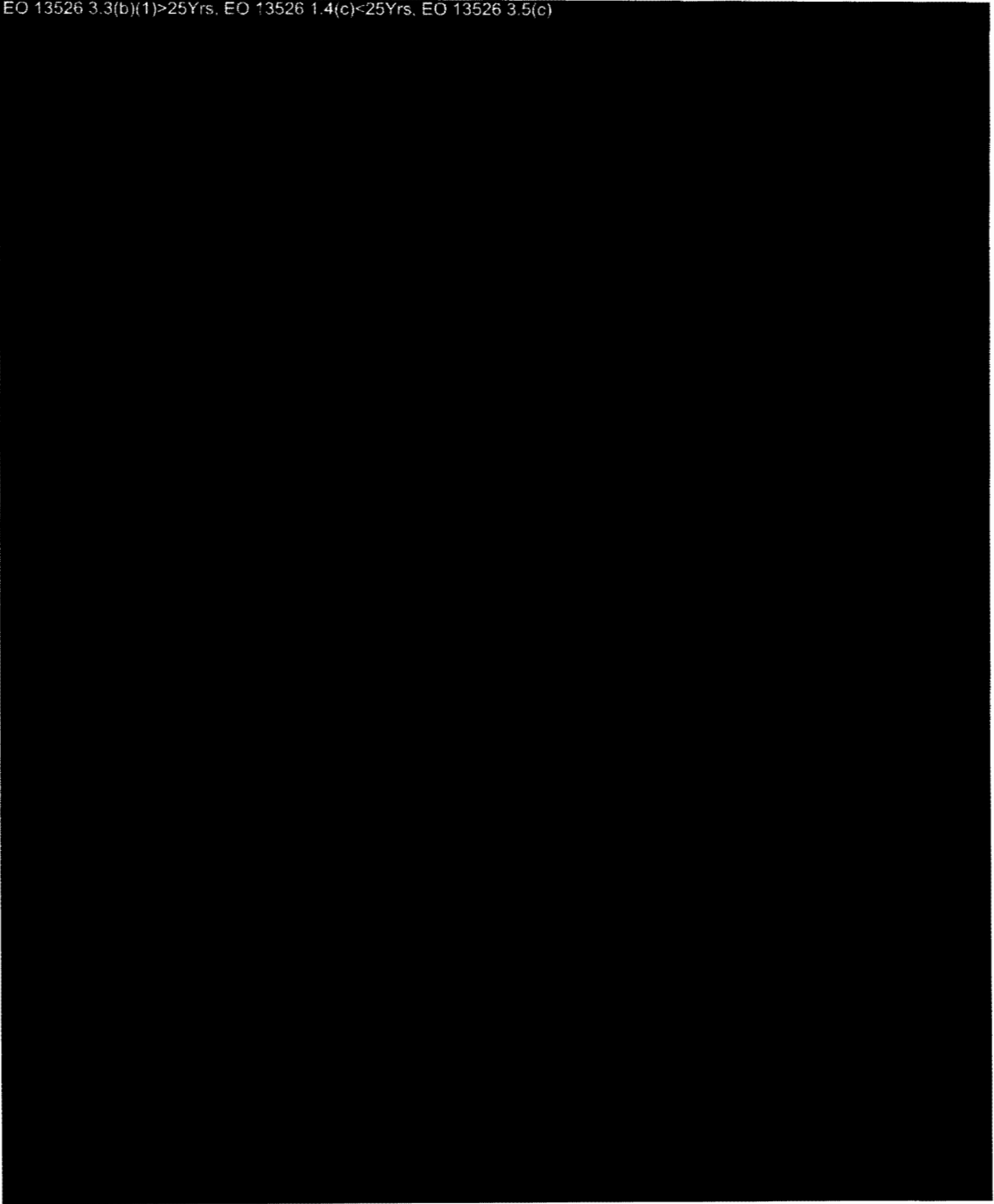


~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
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BYE-91979J

~~Top Secret~~  
~~NOFORN/NOFORN~~

EO 1.4.100  
EL 30-30/50 USC 3005

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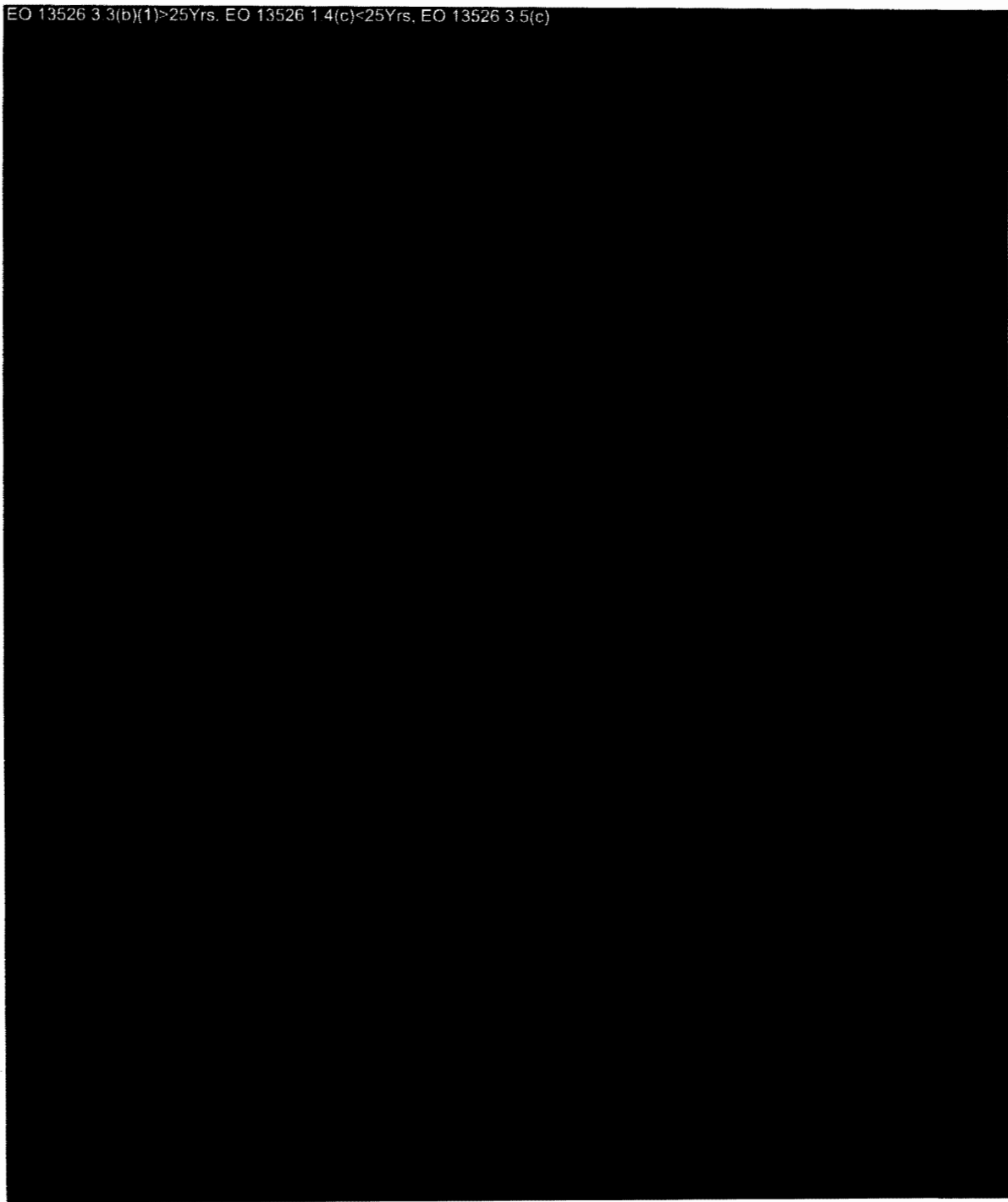


EL 30-30/50 USC 3005

~~Top Secret~~  
~~NOFORN ORCON~~

PL 86 36750 USC 3605

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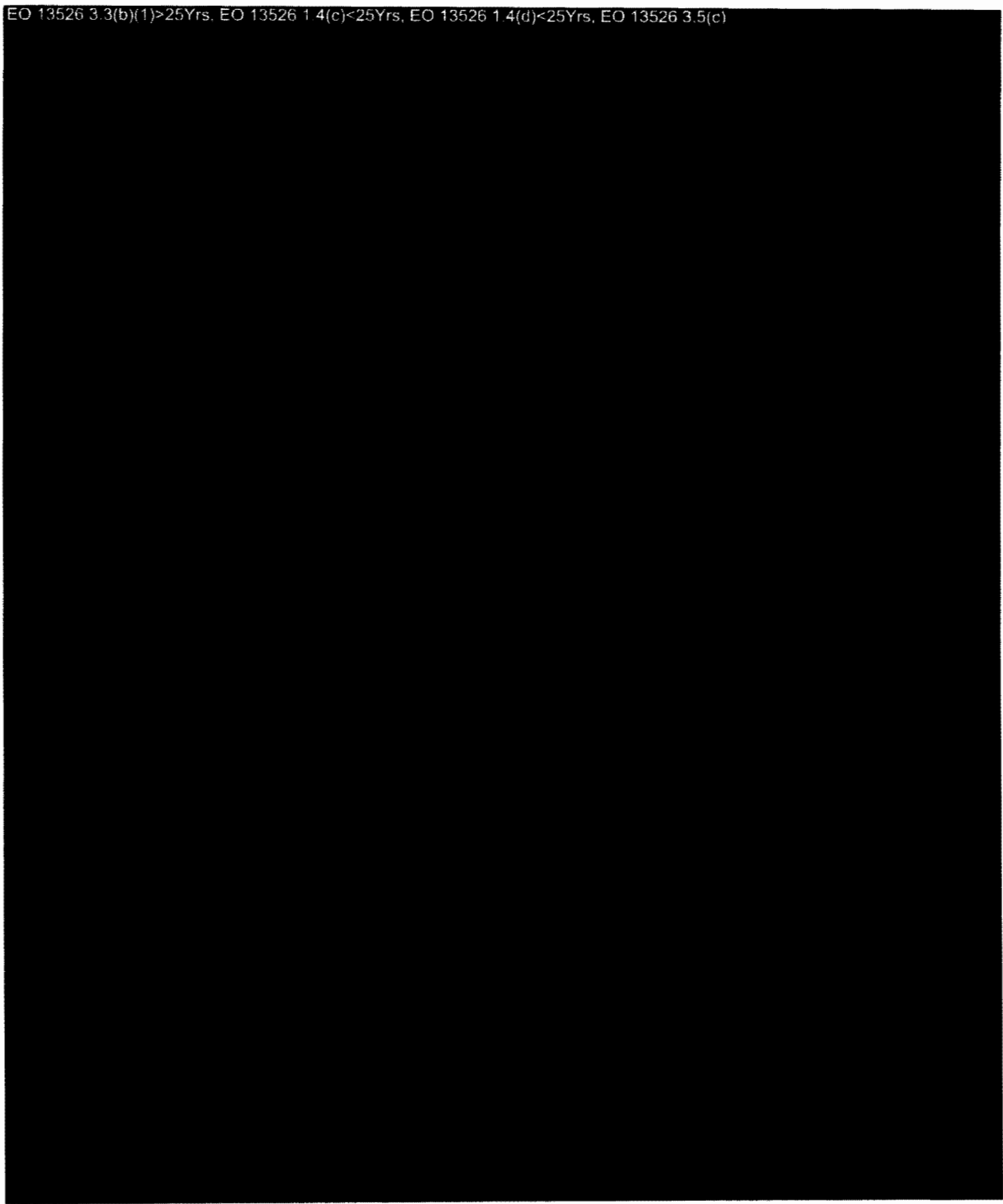
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COMINT Control Channel Jointly  
ByE-919794



~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(b)  
EO 1.4.(c)  
PL 86-36/50 USC 3605

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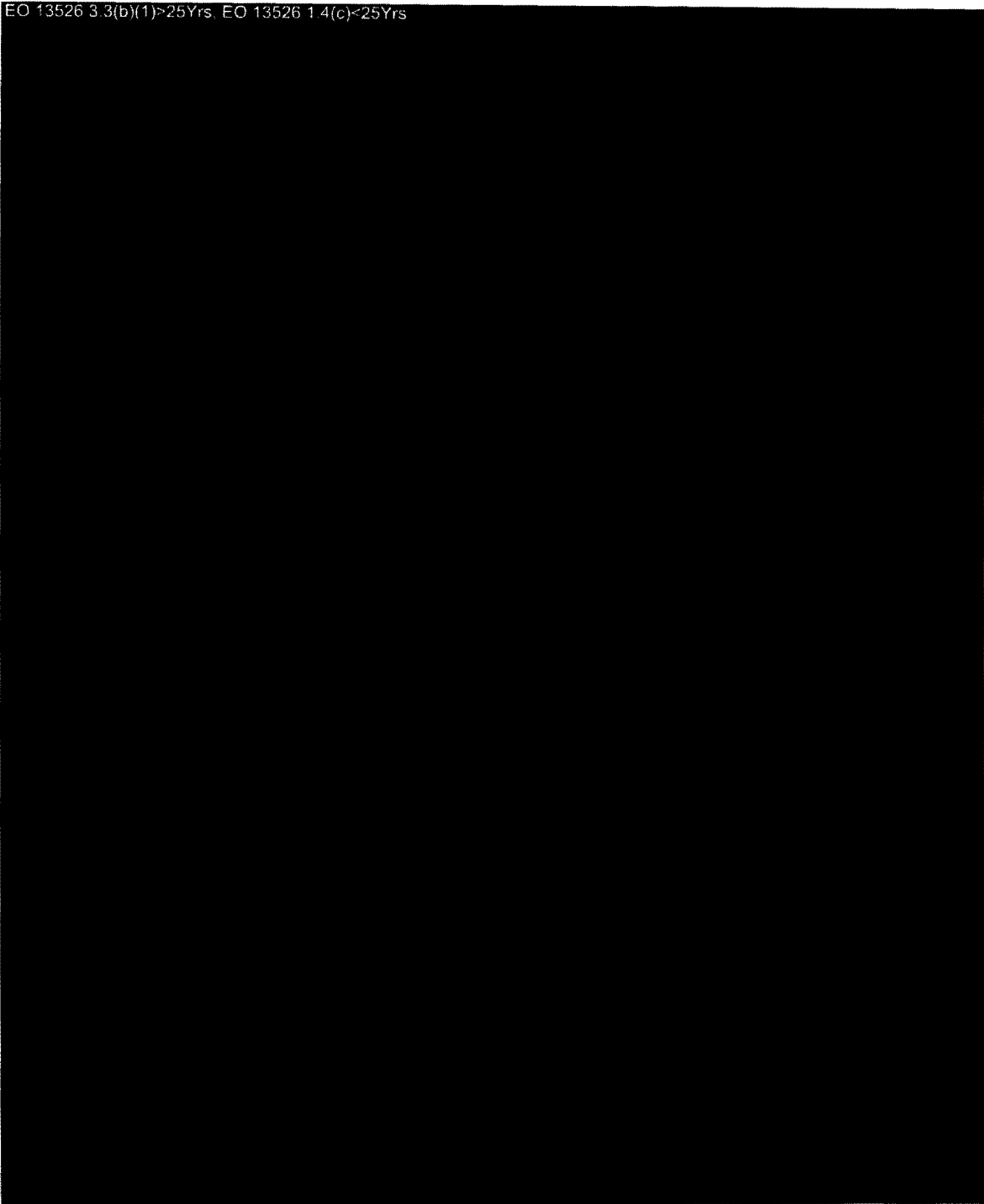


PL 86-36/50 USC 3605

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~~BYE-010\*01~~

~~Top Secret~~  
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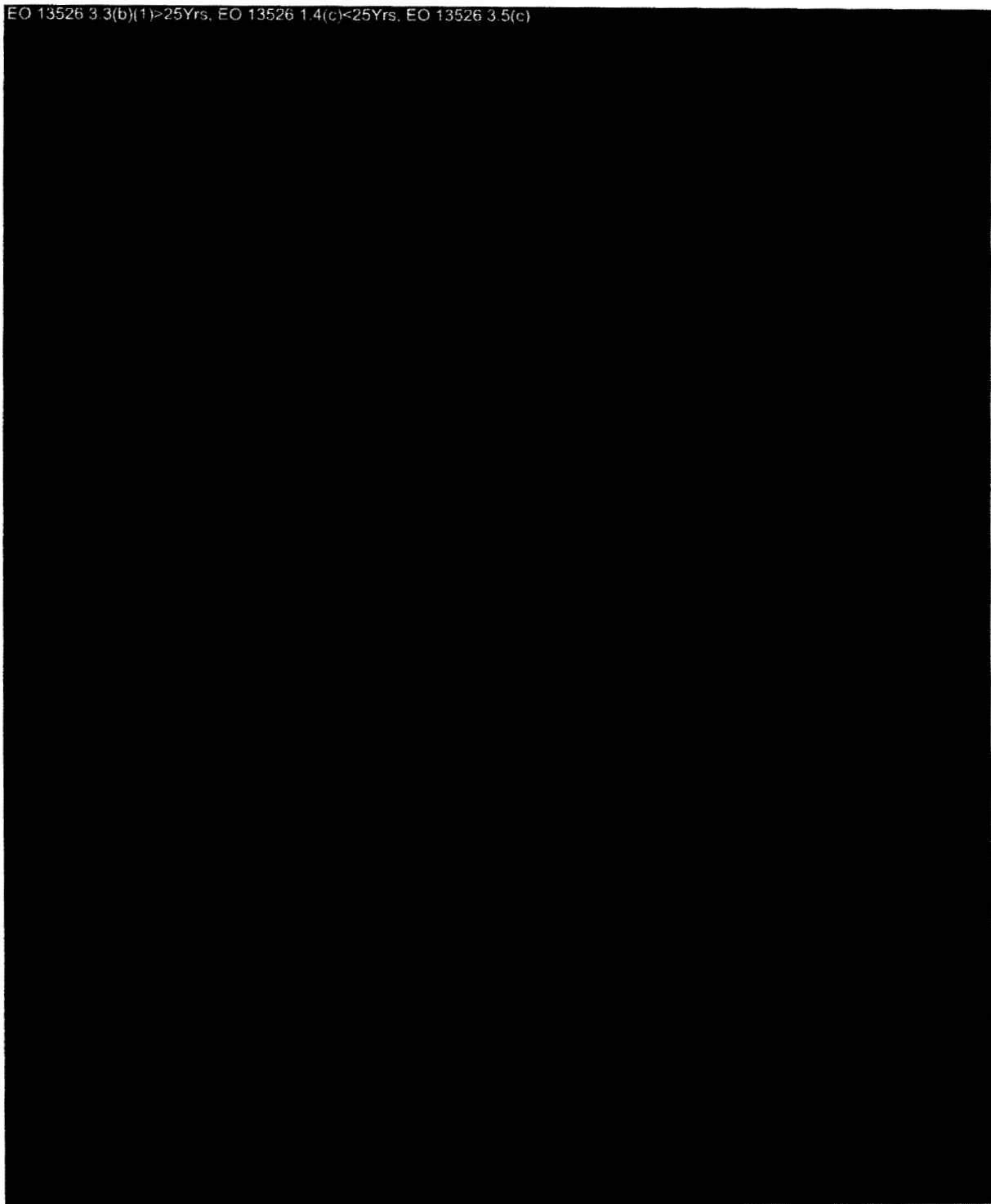
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~~Top Secret~~  
Handle via BYFAKX-TALENT-KEYHOLE-  
~~COMINT~~ Control Channels jointly  
BYE-919794

~~Top Secret~~  
~~COMINT-ORCON~~

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



EO 1.4.(c)  
PL 86-36/50 USC 3605

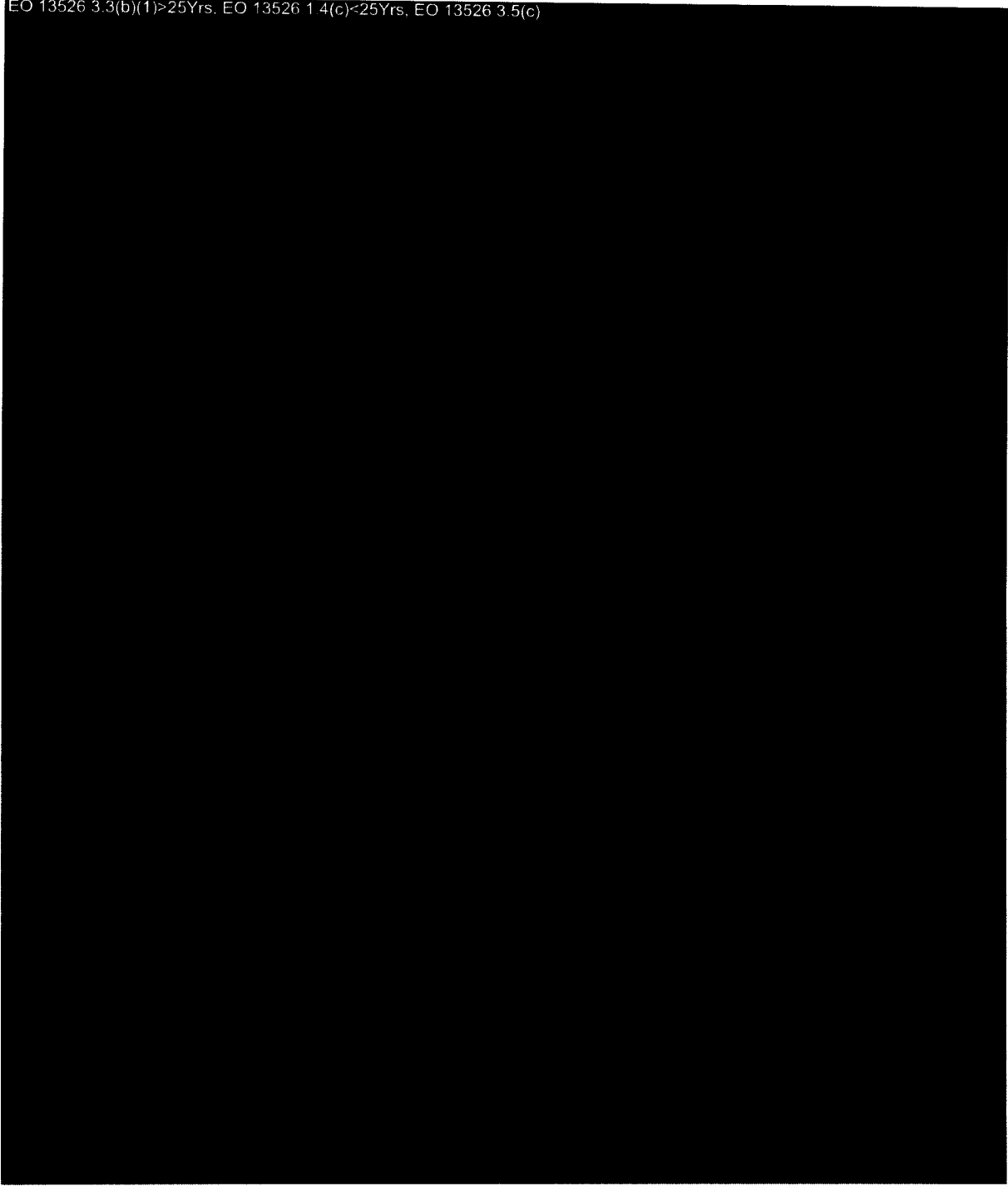
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COMINT Control Channels Inintlv  
BYE 419794

~~Top Secret~~  
~~NOFORN-ORCON~~

PL 86-36/50 USC 3605

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



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~~COMINT Control Channels (unth~~  
~~847-0117-04~~

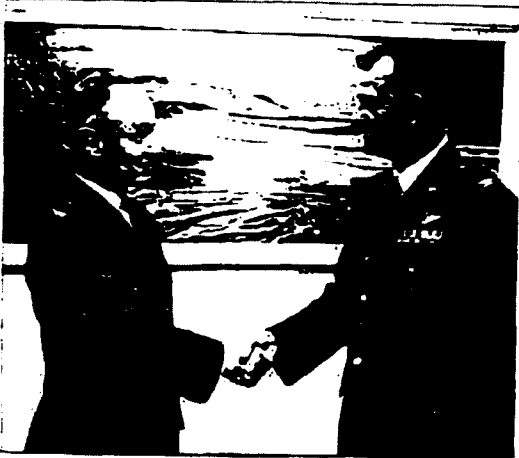
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NOFORN/NOCON~~

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~~Top Secret~~  
Handle via BYEMAN TALENT-KEYHOLE-  
COMINT Control Channels jointly  
REF. 014 702

~~Top Secret~~  
~~NOFORN ORCON~~



Col David D. Bradburn (left) congratulates Col Henry B. Stelling, Jr., as Stelling takes charge of **EO 13526** in May 1971



Col Jack Simonton

EO 13526 3.3(b)(1)>25Yrs

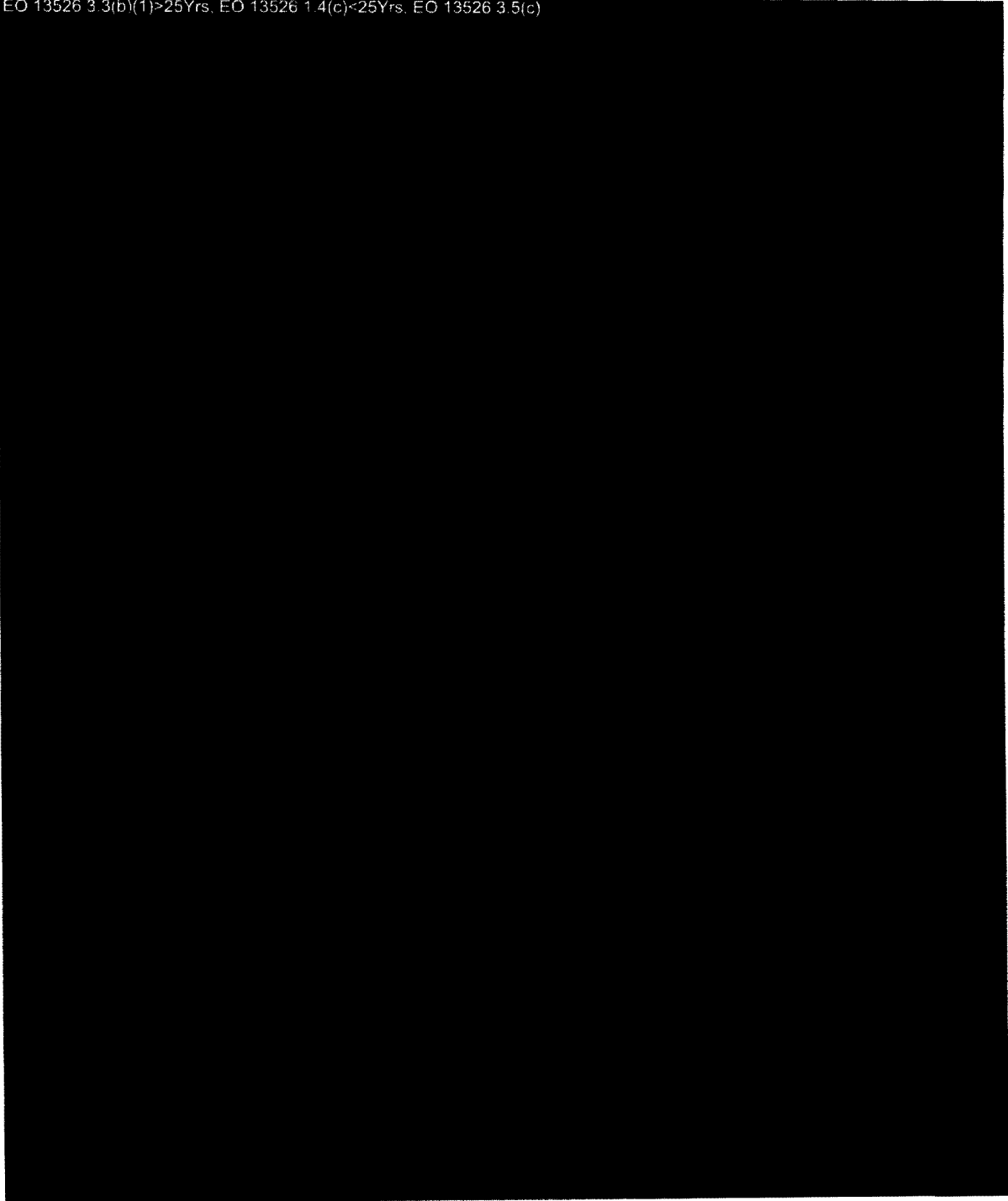
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~~Top Secret~~  
~~NOFORN-CIRCON~~

EO 1.4.001  
PL 86-36/50 USC 3605

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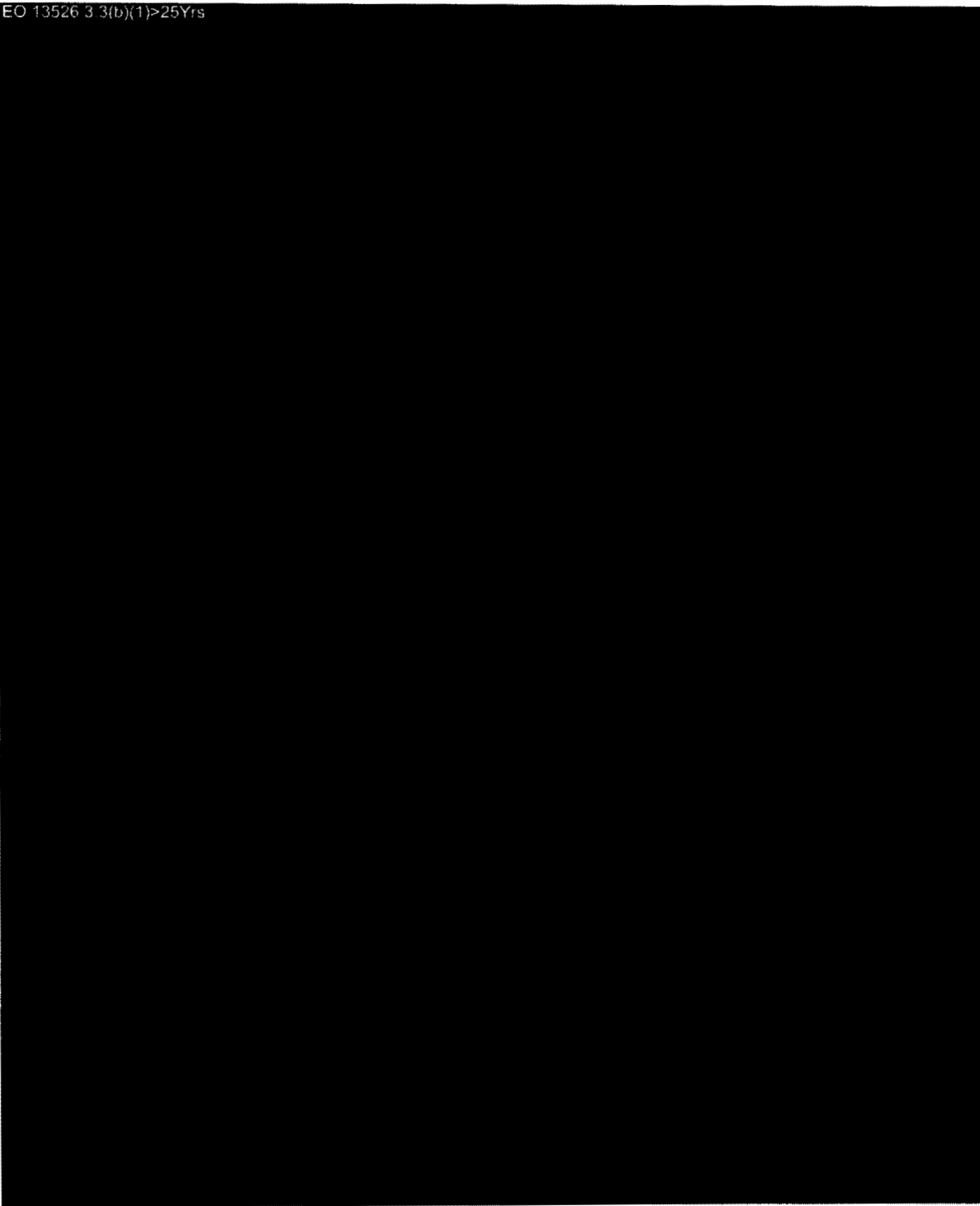


PL 86-36/50 USC 3605

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BYE 414793

~~Top Secret  
NOFORN ORCON~~

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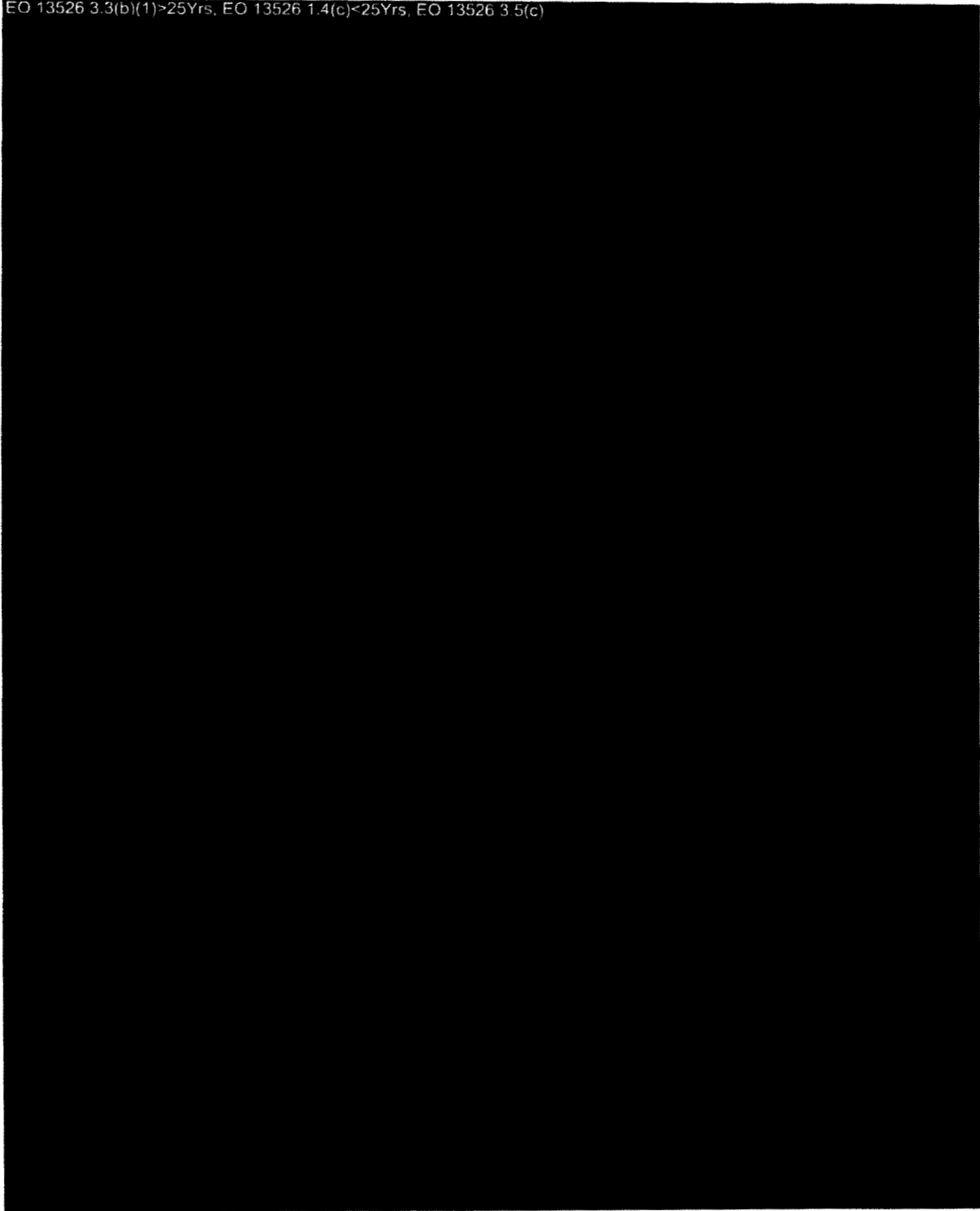


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BYE 4107 9d~~



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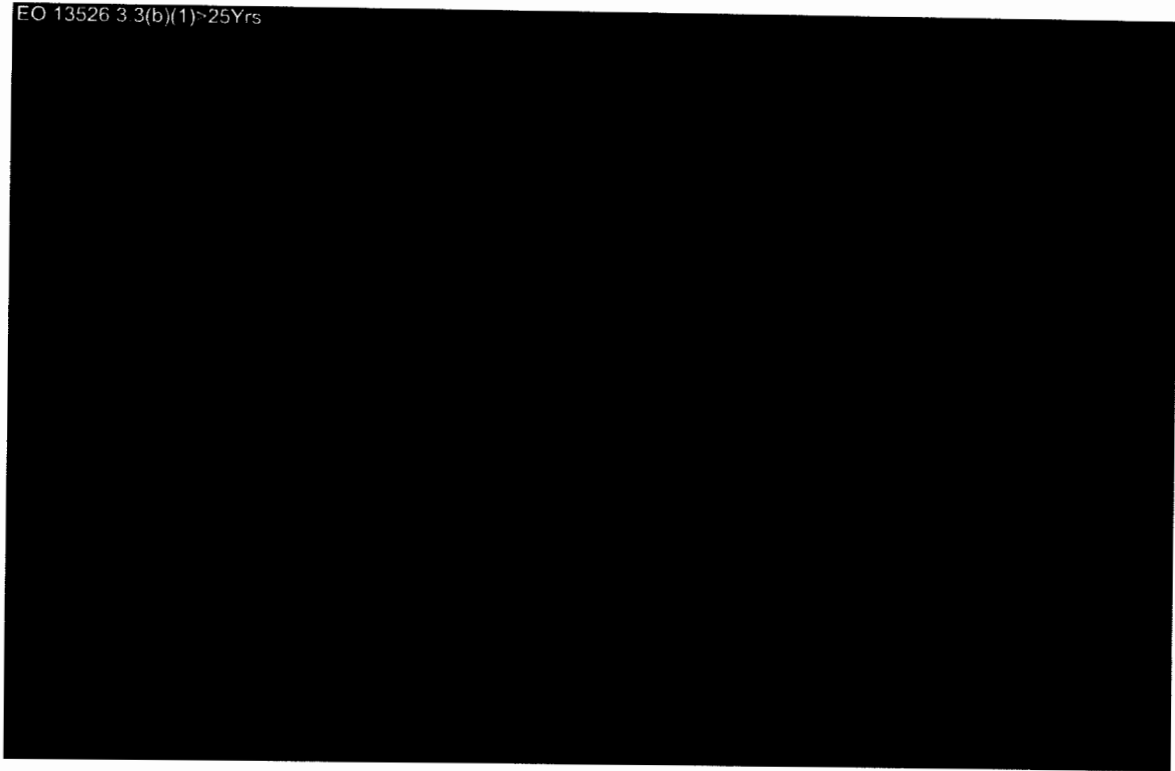
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~~Top Secret~~  
Handle via BYEMAC TALENT-KEYHOLE-  
COMINT Control Channels initially  
BYE-919704

EO 1.4.(c)  
PL 86-36/50 USC 3605

EO 13526 3.3(b)(1)-25Yrs



~~TOP SECRET~~  
CONFIDENTIAL  
NOFORN



~~Top Secret  
NOFORN/ORCON~~

EO 13526 3.3(b)(1)-25Yrs. EO 13526 1.4(c)-25Yrs. EO 13526 3.5(c)



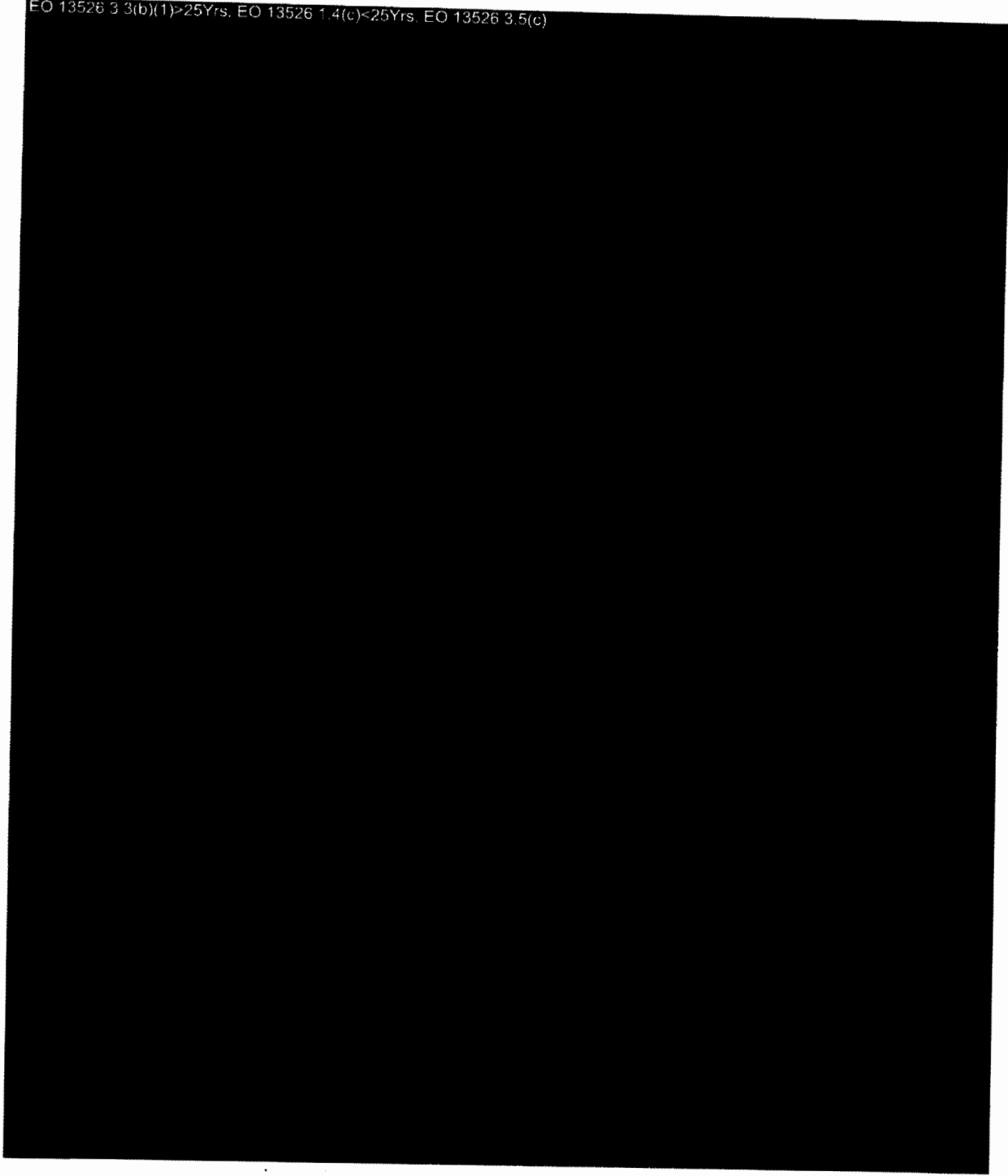
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COMINT Control Channels jointly  
RYF 910-93~~

~~Top Secret~~  
~~NOFORN ORCON~~

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PL 86-36/50 USC 3605

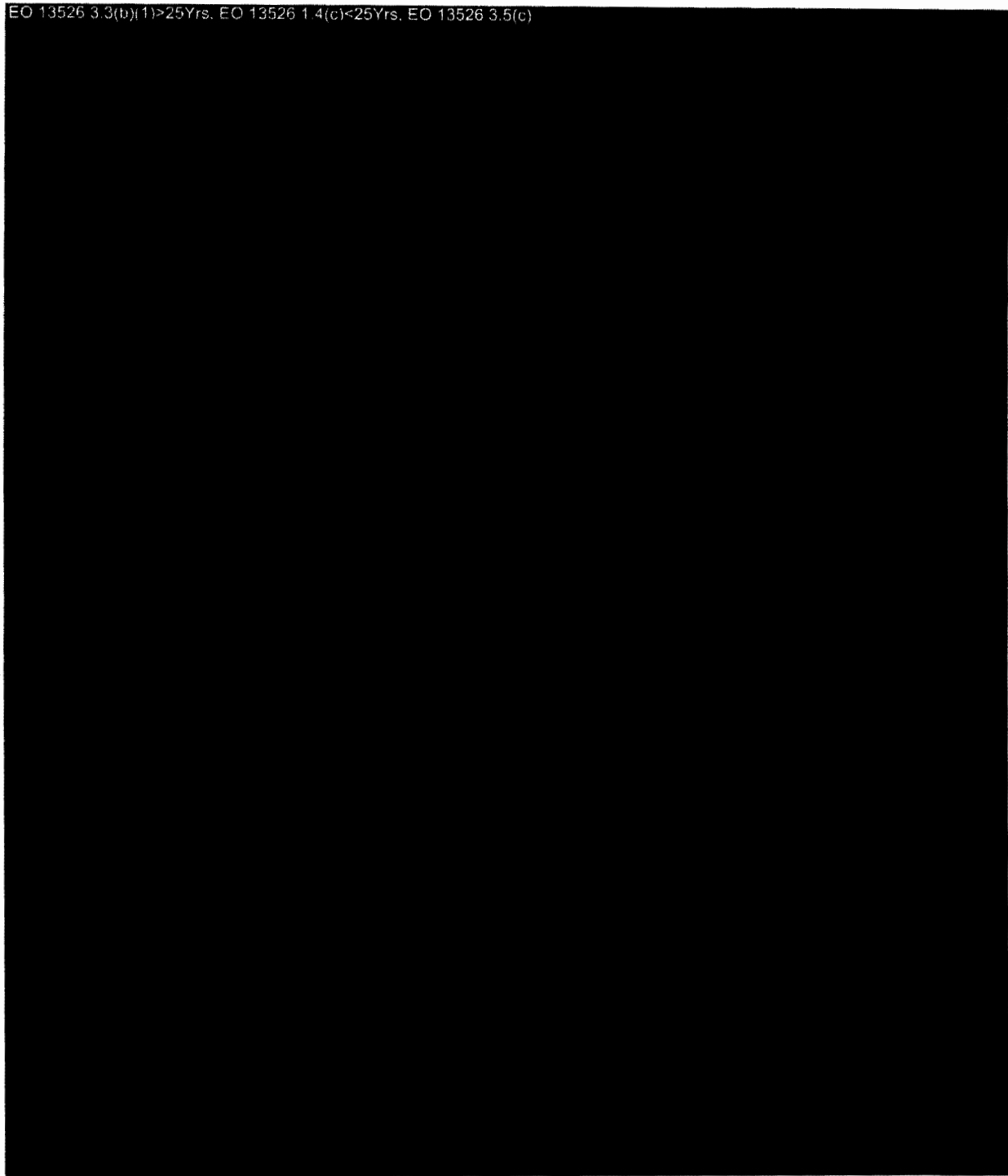
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~~COMINT Control Channels jointly~~  
~~BYE-9197-94~~

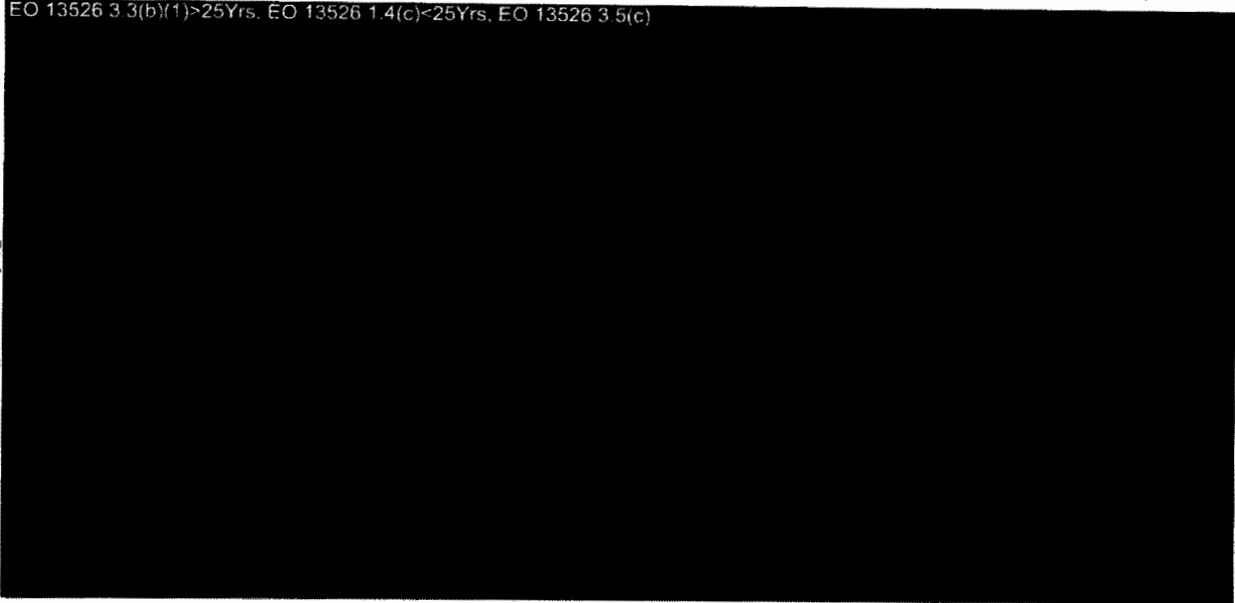
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NOFORN-ORCON~~

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~~Top Secret  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE 914704~~

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EO 13526 3.5(c)



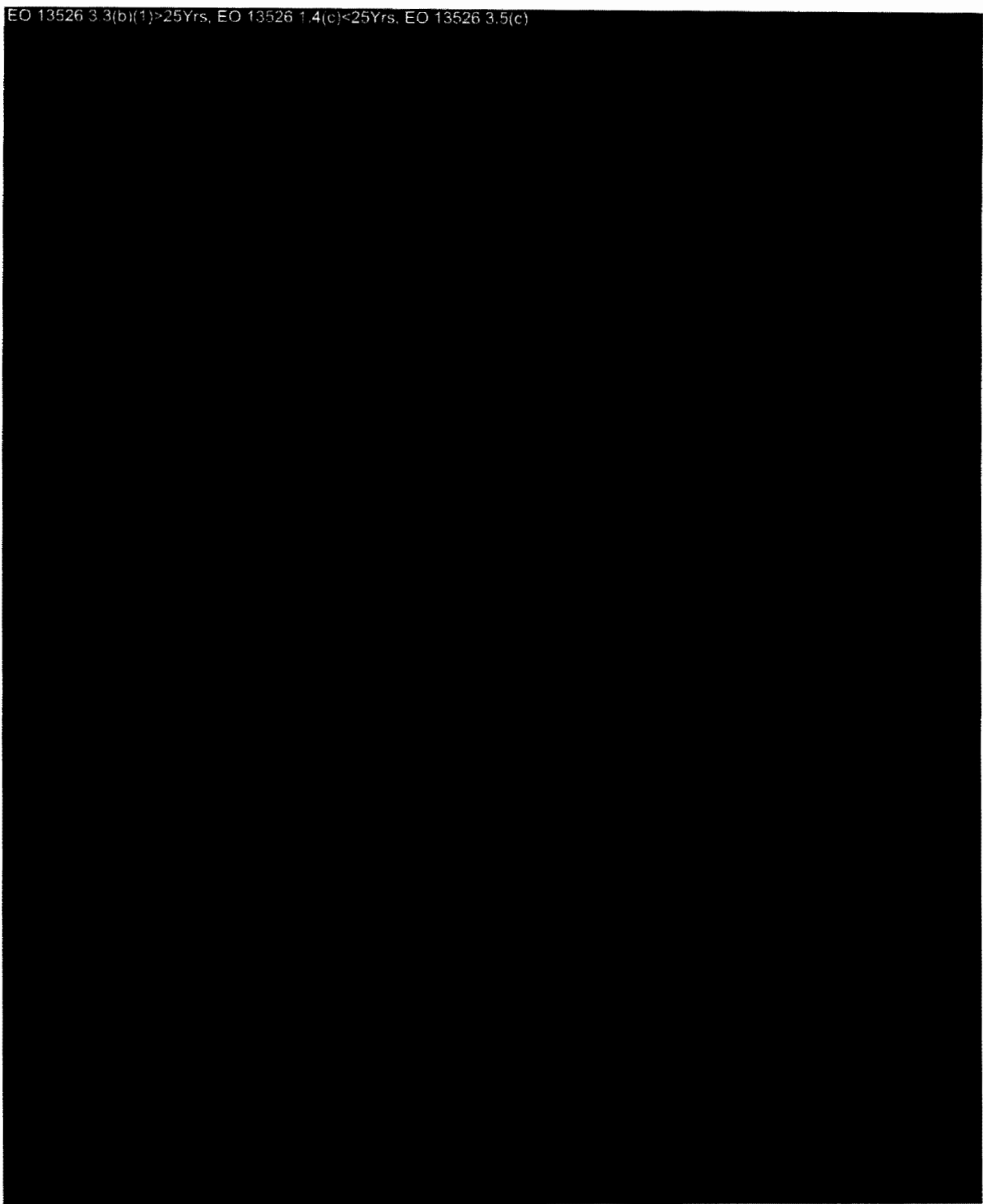
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COMINT (Special) (Enhanced) (S) (U)  
REF: 11/9/92

~~Top Secret~~  
MAY ATENT KTYHONL

~~Top Secret~~  
~~SIGFORN/DIRCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3405

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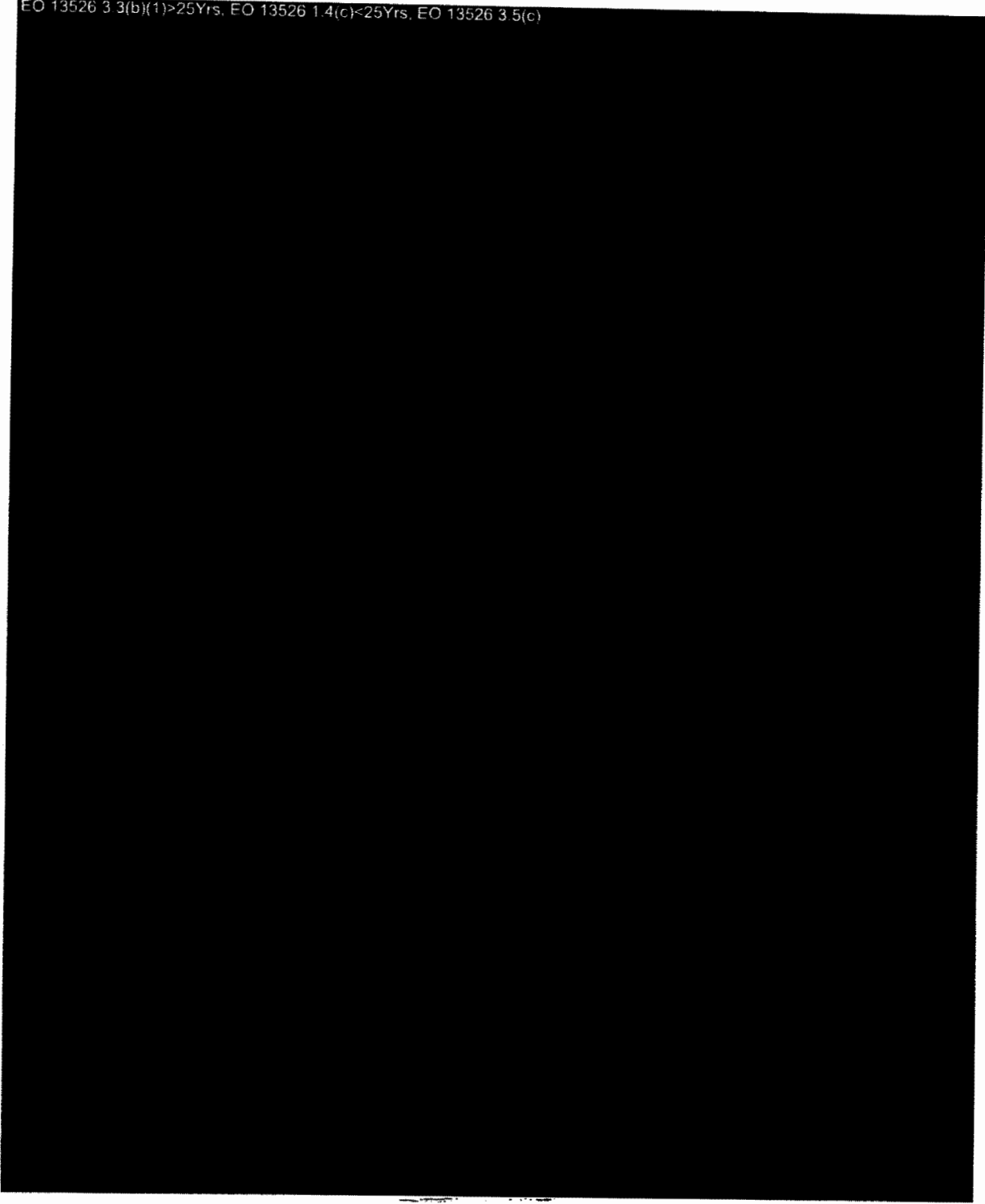


~~Top Secret~~  
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~~COMINT Control Channels jointly~~  
~~BYE-914714~~

~~Top Secret~~  
~~NOFORN-ORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3705

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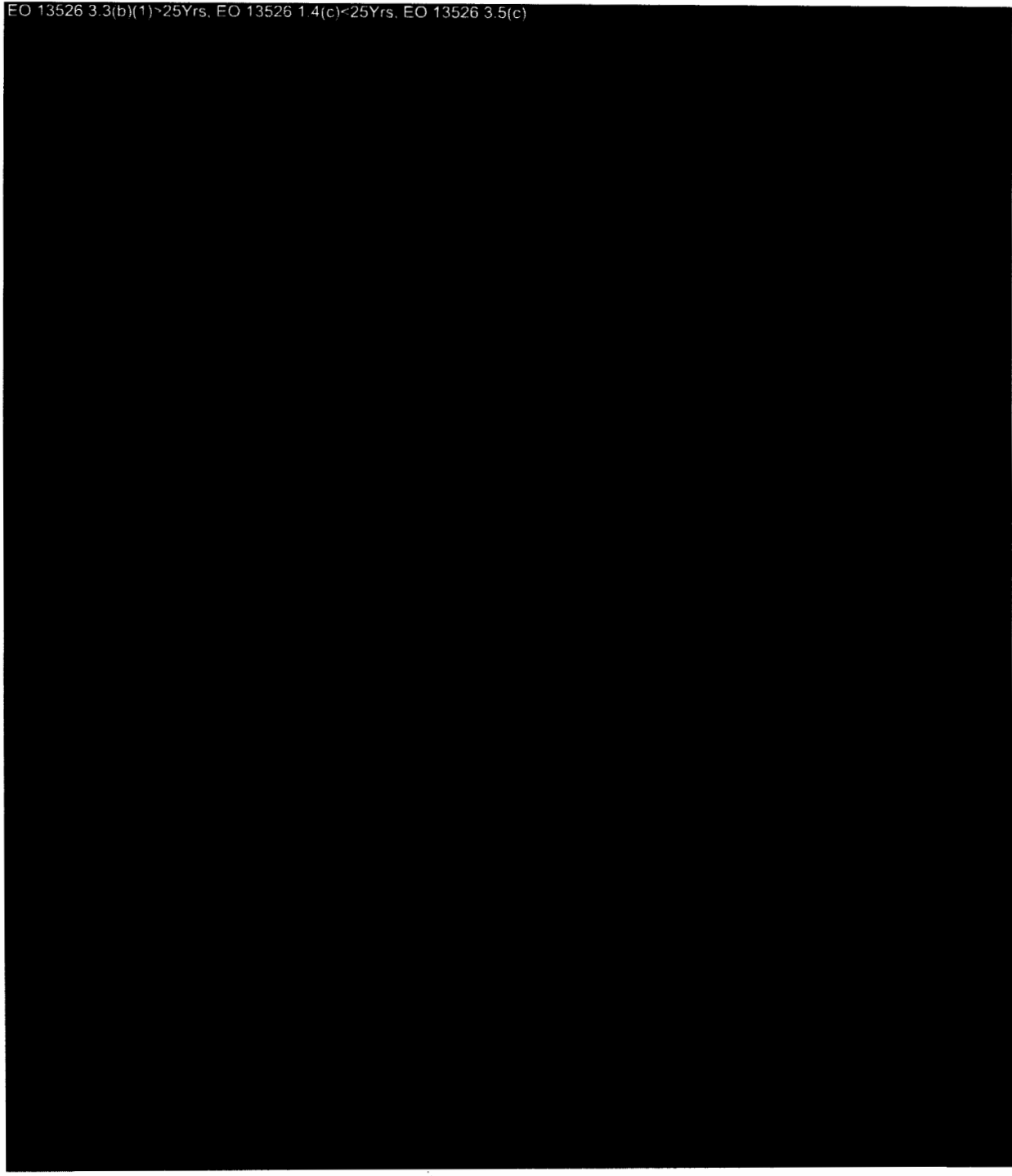
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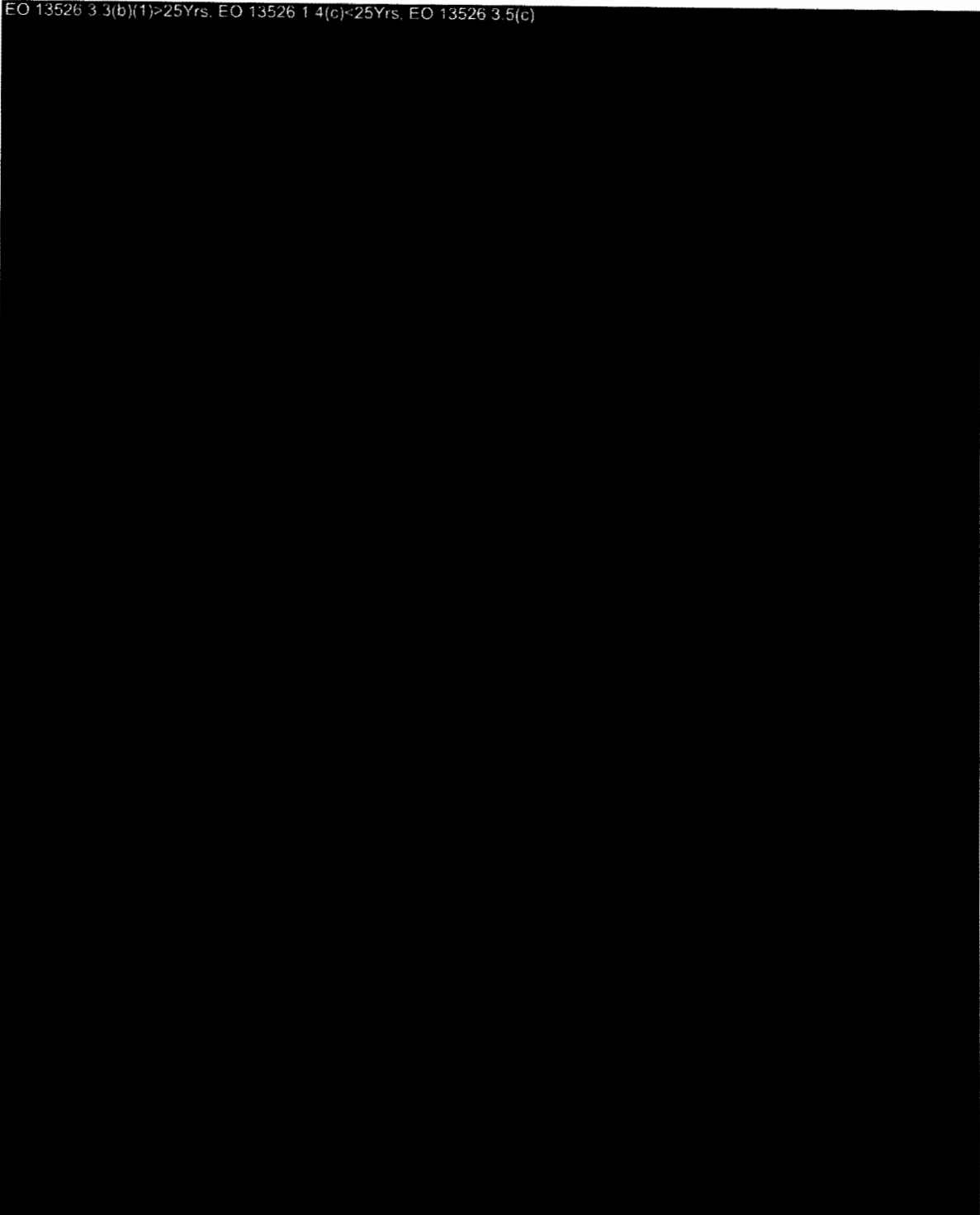


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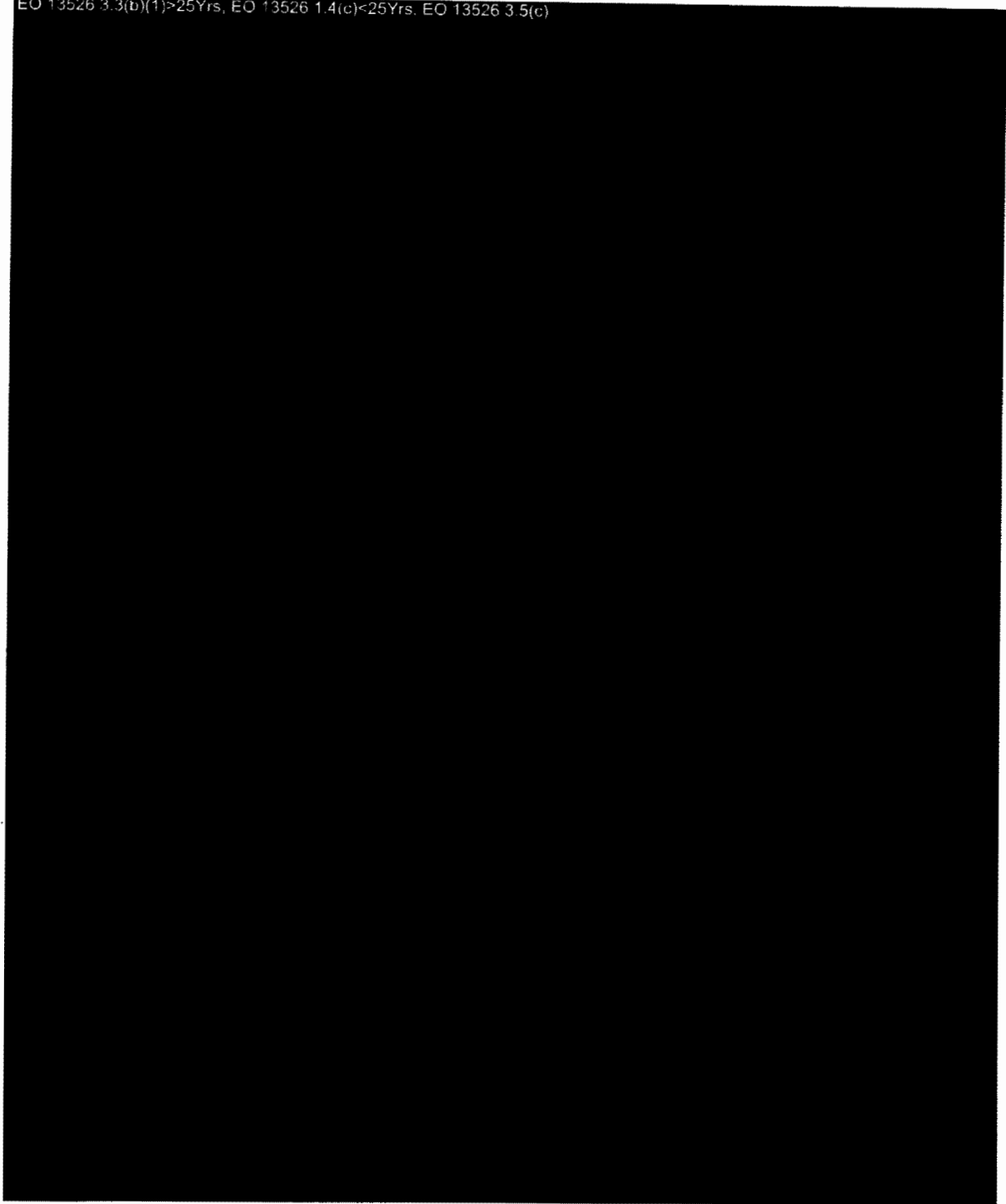


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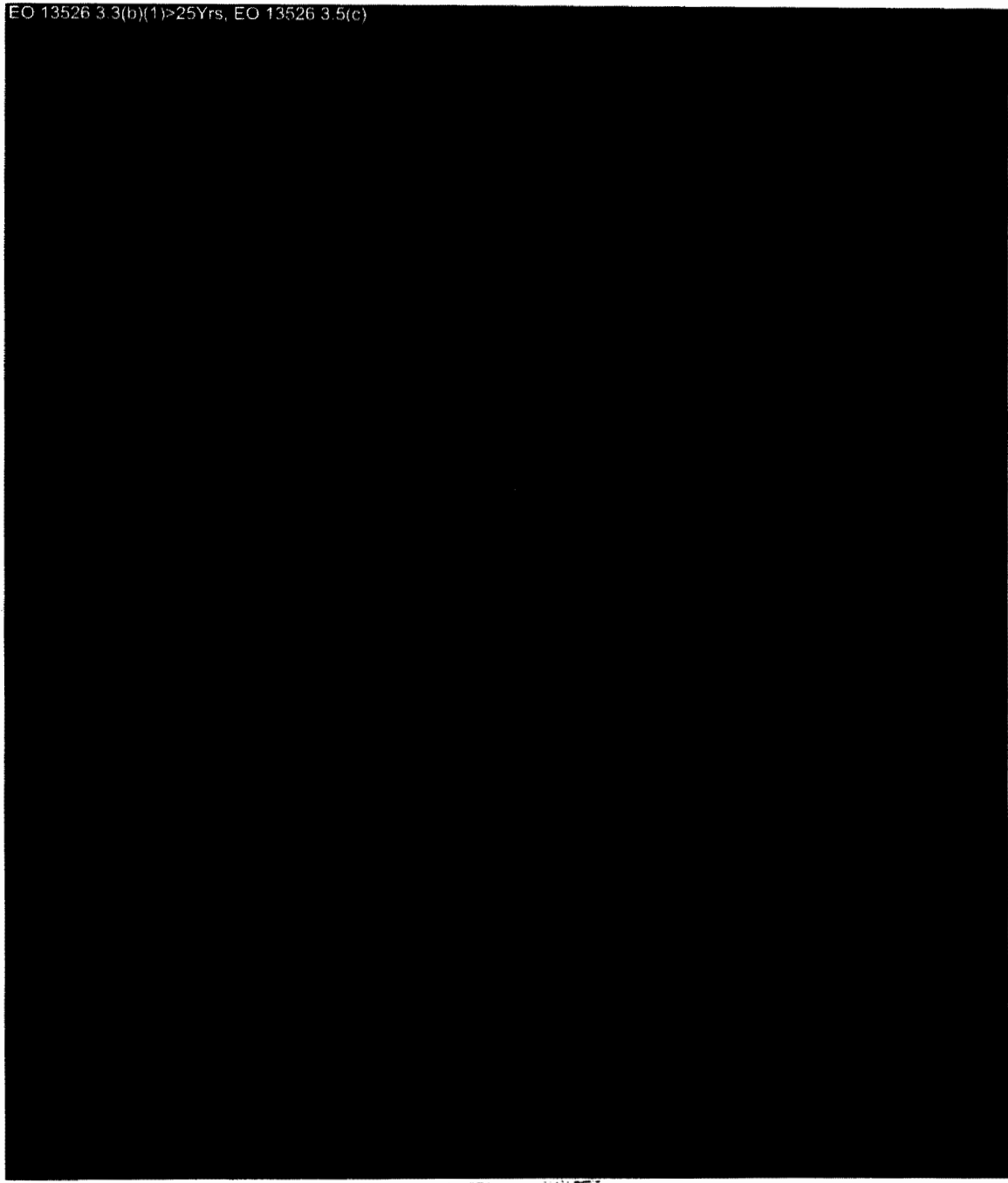
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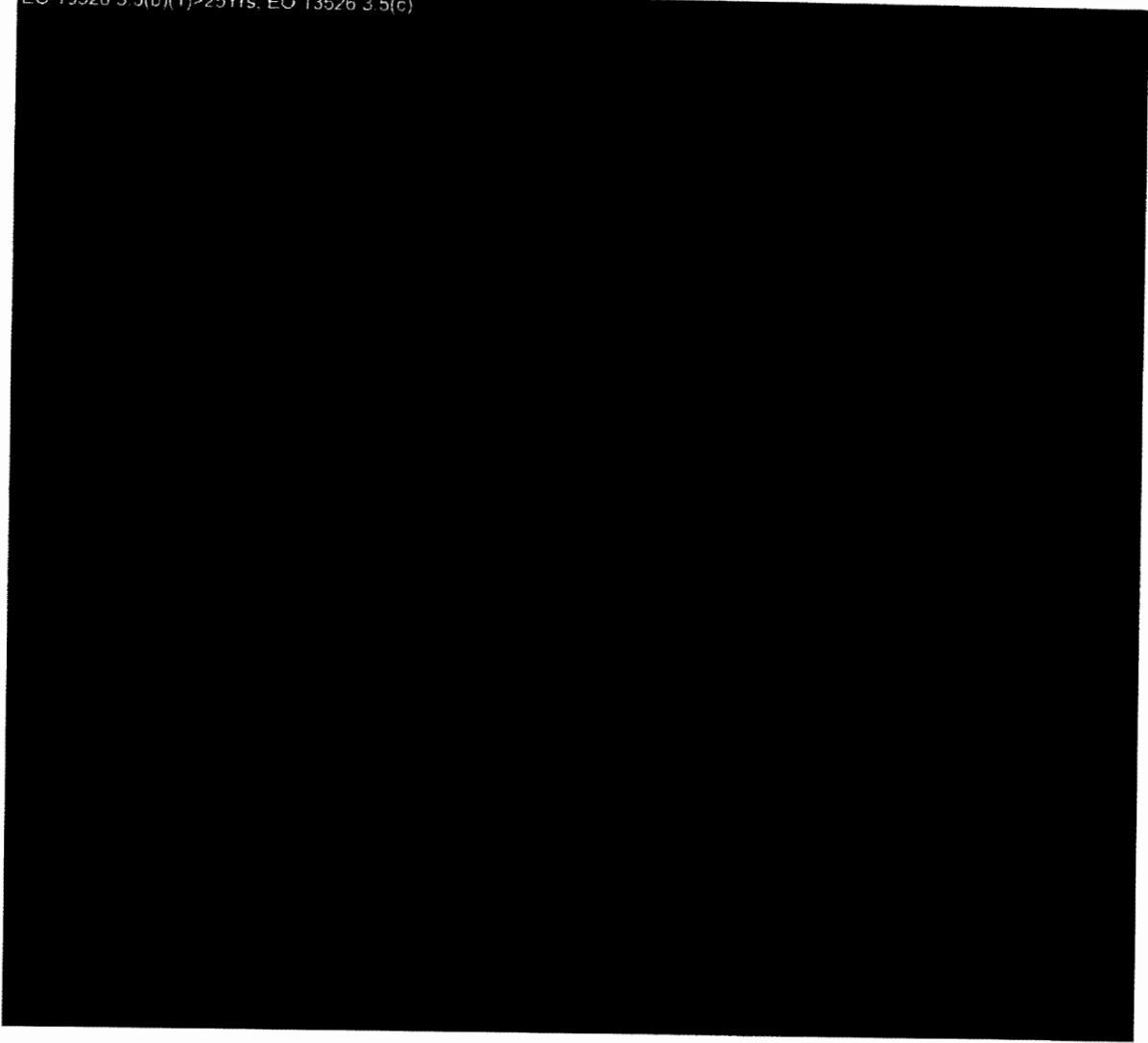
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## Chapter 8 References

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# 9 Conclusions and Accomplishments

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EO 1.4.1.1

## The SIGINT Satellite System Mix as of 1975 and Why It Was Effective

By 1975 the National Reconnaissance Office (NRO) SIGINT satellite world consisted of an effective set of complementary space vehicles. The low-orbiting POPPYs were busy searching for new signals and using their elegant relay techniques to provide the Navy, especially, with up-to-date locations of radar-equipped ships anywhere on the surface of the Earth. Going through a constant evolution from launch to launch, POPPY proved to be the best system for intercepting ship-based radars, which were sometimes only on for a few fleeting moments as the commanders used special tactics to avoid detection. This same main-beam intercept capability was immensely powerful in determining the power and scan properties of any ground-based radar that happened to illuminate the POPPY satellites. As a main-beam collector POPPY was the best and, [EO 13526 3.3(b)(1)>25Yrs] was assured of an important continuing role.

EO 13526 3.3(b)(1)>25Yrs

Along the way, the original WS 117L low-orbiters helped pave the way, but had been retired by the early 1970s. They were replaced by a new ensemble that could bring back signals faster, locate them more accurately, and make reports almost as the events were happening.

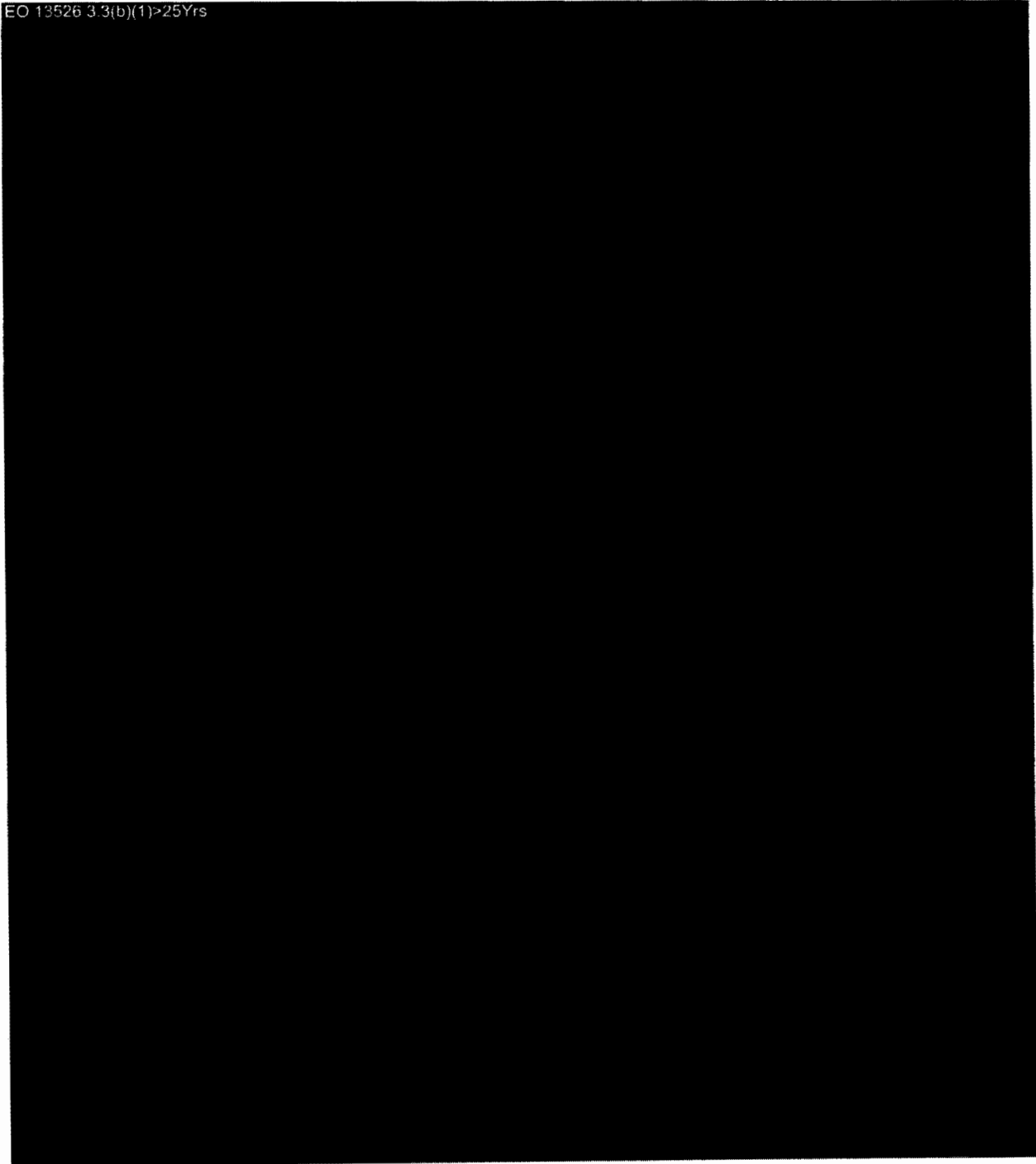
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## The NRO Program Offices as Managers of Satellite Projects

The NRO SIGINT Program Offices shared a short chain of command, high motivation, a sense of team spirit, and a sense of urgency. They also worked in total secrecy. It was a management environment that the participants say was unusually rewarding and unlikely ever to be repeated.

In SIGINT satellite development, the Office of the Secretary of Defense staffs and the Army and Air Force staffs (but not the Navy, initially) were removed from the management chain by the establishment of the SAMOS Project Office (later the Director of Special Projects, SAFSP), reporting to the Secretary of the Air Force, in late 1960. This Presidential decision effectively froze out all other participants and provided for a short chain of command and quick decisions, first for the Air Force's SAMOS Project. This organizational precursor became the NRO, established formally in 1962. From 1962 on, all SIGINT satellites, including Air Force, Navy, and CIA satellites, would be developed and operated by the NRO.

The creation of the NRO, and in particular, the office of the Director of the NRO (DNRO), harnessed the creative technical energies of the nation. The DNRO was empowered to work on the whole problem of providing satellite reconnaissance for the country. That job, being covert, did not in itself, require the DNRO to do anything except work on the problems of developing and operating the nation's reconnaissance satellite fleet. The tying of

By 1975, the NRO had a strong capability in **EO 1** basic SIGINT satellite systems. The mix of orbits and capabilities proved an important quality. **EO 13526 3.3(b)(1)>25Yrs**

**EO 13526 3.3(b)(1)>25Yrs**

**EO 13526 3.3(b)(1)>25Yrs**

They covered the frequencies of interest and each of them carried out missions that were easy and natural to do from each orbit. This ensemble, developed thoughtfully over time in response to various perceived problems was actually a good set of architectural pieces, efficient and technically clever, that met real intelligence needs.\*<sup>1</sup> Budget pressures prompted efforts at consolidation, using fewer basic satellite systems. But no such effort at consolidation was to be successful because, despite some mutually reinforcing overlaps in capability, each of the **EO 1** systems possessed a unique basic function that the others could not perform at all—a testimony to the ingenuity and insight that put them there.

\* DNRO Alexander H. Flax said, "There was a plan, although like all long-range planning it evolved over time (particularly in COMINT collection), but in many respects the architecture was envisioned in crude outline from the beginning."

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research and development (R&D) with operations, all under the DNRO, became the key to the whole plan. The genius was in defining the job in this way. It provided a single forum to focus on how systems would work together. Consideration of engineering principles, along with cost and the desires of the individual participants, was possible. This approach allowed system-level and architectural decisions to be made cleanly. It saved valuable time in putting new designs into orbit and it ensured that the reconnaissance satellites of the United States would be technically superior.

DNRO Alexander H. Flax said, "In my mind, tying R&D to operations under the DNRO was essential. The NRO never had a pure R&D launch; all had some operational objective. Feedback from operations to R&D was almost instantaneous. Given the rapid pace of the technologies involved, these characteristics were invaluable."<sup>2</sup> Eugene Fubini reinforced this view: "The NRO was designed to relieve stresses; the fact that it has survived so long is a testimony to the wisdom of those who set it up."<sup>3</sup>

This management approach made possible the creative work by the Directors of Programs A, B, and C, who similarly had both operational and R&D work blended under their operating charters. Within the NRO, then, the work came to support the primary missions of the organizational elements that were to carry it out.

The covert Air Force (SAFSP) elements, Program A, based in Los Angeles, California, developed the WS-117L-derived

low-altitude systems (SAMOS F-1) EO 13526 3  
EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(d)(1)>25Yrs These projects all originated in Air Force needs and interests. They were mostly carried out within the SAFSP offices in Los Angeles, with support easily arranged from the non-covert, or "white," Air Force organizations for launch services, tracking, and communications. The DNRO was also the Under Secretary of the Air Force\* and this was the key to a simple and effective management arrangement for Director, Program A. He was working on projects of interest to the Air Force and he reported to the top of the Air Force's statutory chain of command. Since the DNRO occupied an overt position—usually Under Secretary of the Air Force—he had the obvious authority to provide the necessary direction to elements outside the NRO. This arrangement worked well but at a price. The Air Force people in Program A came to view themselves, and to be viewed by the rest of the Air Force, as "outside the system."<sup>7</sup> The DNRO was also in a difficult position, having to exclude from the management chain senior Air Force officers and others throughout

\* DNROs Joseph V. Charyk (1962-63), Brockway McMillan (1963-65), and John L. McLucas, Jr. (1969-70), served as Under Secretary of the Air Force. McLucas later served as Secretary of the Air Force (1973-75). DNRO Flax (1965-69) was Assistant Secretary of the Air Force for Research and Development, and arranged for special authorities to carry out his job. Other DNROs have served as either Secretary, Under Secretary, or Assistant Secretary of the Air Force.

<sup>7</sup> All Directors of Program A, except one, retired in the rank held (brigadier general or major general) as Director of Special Projects (SAFSP). Lew Allen, Jr., was the exception: after serving as Director of Special Projects (major general, 1971-72), he served as Director, NSA (lieutenant general, 1973-77), and Chief of Staff, United States Air Force (general, 1978-82).

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the Department of Defense who would normally be able to offer good counsel but who were excluded and knew it.<sup>4</sup>

At the CIA, the Director of Program B had a different set of problems and motivations. EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b) It was a major organizational and conceptual victory within the NRO.

But the CIA Director of Program B, with EO 13526 3.3(b)(1)>25Yrs also lived in a complicated world, alienated from the larger CIA because of his affiliation with the NRO. He, too, had his own problems of reporting to a line boss, the Deputy Director for Science and Technology in the CIA, and by dotted line to the DNRO, an official of the Defense Department. His management chain was not as clean as for Director, Program A, but he had an advantage: Director, Program B, was in the CIA and therefore was closer to the requirements side of the Intelligence Community than were the other program managers. EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

The Navy's POPPY, originally designed to collect against land-based emitters, came under NRO control in 1962, and the role of ocean surveillance, late in 1970, fit in well with the interests of Navy sponsors outside the Program C offices. Still, the Director of Program C also had the problem of dual allegiance: he reported to the Chief of Naval Operations, either through the Director of Naval Intelligence or, later, through the Chief of Naval Materiel.<sup>6</sup> His reporting line to the DNRO was a dotted line to an office that was really in the Air Force. So the Director of Program C had a slightly more complicated life than Director of Program A. But the POPPY project proved of interest and value to the Navy and generally was well supported by both NRO Navy leaders.<sup>7</sup>

These charters, arrived at through historical experience and by executive decisions of the DNRO, turned out to be very practical and productive. The POPPY EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

effective set of SIGINT satellites in an engineering and analytic sense and also matched the interests of their sponsoring development and acquisition agencies. Altogether, the NRO management team consisted of highly mission-oriented project offices, with extremely short lines of control to the decision makers.

NSA, while not a builder of satellites, played a central role in the decision process for new SIGINT systems. Gen Lew Allen described it this way: "If the DNRO wants to make a major decision in the SIGINT world, he should have NSA on his

<sup>4</sup>The DNRO collaterally reported to the senior Air Force management, but for most NRO matters, reporting was to the Secretary or Deputy Secretary of Defense.

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side and the CIA not opposed." From 1960 to 1975, that set of conditions was always present. The DNRO had NSA working with him, supporting the recommended plan. EO 13526 3.3(b)(1)>25Yrs  
EO 13526 3.3 the CIA got into the planning discussions too and did not question DNRO decisions after they were made.<sup>8</sup> So long as the DNRO did his homework, he could make his decisions stick.

With the NRO jobs assigned and the organizational relationship established, the actual design and building of satellites in Program A and Program B were carried out by industrial contractors. The Navy's Program C POPPY satellites were built by the Naval Research Laboratory (NRL); EO 13526 3.3(b)(1)>25Yrs were first built by NRL and subsequently manufactured by industrial contractor teams. In Program A, the SAFSP SIGINT project offices in EO 13526 3.3(b)(1)>25Yrs used a few people in the office for each project. In a matrix form of organization, each project team was supported by an SAFSP procurement team EO 13526 3.3(b) a budget team EO 13526 3.3(b)(1) and an operations team EO 13526 3.3(b) that worked with the tracking and communications network of the Air Force Satellite Control Facility (AFSCF) sites. Launch vehicles—the Atlas, Thor, and Titan derivatives—were procured by sending money to the "white" Air Force project offices in Los Angeles. This arrangement allowed EO 13526 3.3(b) project managers to concentrate on the SIGINT mission part of the job, which, because it revealed that reconnaissance was being carried out, was bought with covert or "black" contracts.

The black contracts were administered so as to comply with all procurement rules contained in Federal Statutes—the law—but with waivers from any of the implementing or reporting instructions of the US Department of Defense or the US Air Force that would have required disclosure of the existence of the contracts to persons who were not working on them. The Director of SAFSP, as head of a contracting agency, held his own warrant as a contracting officer and signed in that capacity on large procurements. These arrangements gave him effective control over every aspect of the reconnaissance side of his job and a way of getting support for all the other space-related needs through the "white" Air Force, which operated the tracking network and the launch bases at Cape Canaveral and Vandenberg Air Force Base.

The Air Force EO 13526 3.3(b) project manager viewed himself as the head of a task force, with his main job being the leading of a team made up mostly of industrial contractors. To motivate that team he used performance incentive contracting, developed for the photo satellites by BGen John L. Martin, Jr., (the "Martin Incentive") and then first applied to SIGINT satellites by BGen David D. Bradburn with Martin's close supervision. Under this approach, good performance by the contractor was linked to successful mission performance. If the project succeeded, the fee would be high. If the project failed, the fee would be low. This direct coupling of the project goals turned the contract into an important instrument of delegation. The contractor team became an extension of the EO 13526 3.3(b) project office.

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Under the Martin Incentive, objective measures of performance, such as total days of successful operation and the percentage of usable information, were worked out in advance. With this system, if the satellite needed more testing on the ground to ensure it would work right in orbit, the contractor would do the testing on his own initiative. When all were confident, the launch would proceed.

The Air Force, through ~~EO 135~~, became responsible for operating each Program A satellite as it went into orbit. From that time on, the incentive provisions were especially useful, because contractor team members, experts on the mission, were on duty at the mission ground stations, pursuing the same goals in the contract originally laid out by the government project manager. If the Air Force manager decided to operate the satellite in a way that would place the vehicle at risk, the contractors affected by the planned action could choose either to accept the risk and leave their incentive fees riding or to select the "no-fault" option, with fees lower than for a full success (but not zero) for the remainder of the flight.

This Performance Incentive contracting method made for simple, short contracts. Air Force managers spent much of their time negotiating and administering these incentive provisions. Senior managers of the contractors also spent their time on the incentive provisions, before and during the life of the contract. This was time well spent because it constituted the heart of the delegation process. When all had agreed on the incentives, there was then no need for detailed government contract

specifications, and contract changes could be made without fear by the government that some important performance goal might be lost. Government offices to administer the black projects were much smaller than equivalent offices administering similar white programs because the more detailed specification process (called "configuration management" on the white side) was not applied on the black side.

To reiterate: The Program A SIGINT projects used a team approach, incentives, motivation, and simple contracts to delegate the work to the contractor teams. In this way they made the contractors part of a task force, with the same priorities as the government managers.

A set of special circumstances not usually found in the Air Force, in the opinion of MGen John Martin, Jr., helped make this management structure successful:

1. The effect of the increased responsibility which such limited and compartmented management places on each of the participants. SAFSP captains typically had more responsibility than many colonels.
2. The extent of continuity realized within the system. There were changes of station and specific jobs, while maintaining essential continuity for both individual development as well as the organization's effectiveness.
3. The extremely beneficial effect of many key people being in place long enough for the 'chickens to come home to roost'—to see the direct

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results produced by the decisions which they made or in which they participated.

4. The unique benefit of working in a closed-loop enterprise, where the end results are evident to all—where, although it's nice to be told that one's work is good, it's not necessary in order to know, for the entire results tell all there is to be told: technically, operationally, financially; the ultimate in work incentive and job satisfaction.<sup>9</sup>

Secrecy was probably a help, on balance, especially during the formative days of the NRO, between 1958 and 1962, when steps were taken to exclude the military services and the Office of the Secretary of Defense staff from the management chain. The freedom not to be involved in routine R&D administration, more a question of short decision-making channels than of secrecy as such, motivated those on the inside. The disadvantage was the ill will engendered among those on the outside, who were not taken into confidence, and whose cooperation was sometimes difficult to arrange. This was a continuing problem, particularly in the Air Force, because the SAFSP organization did not report through the Air Force Systems Command or the Air Force Staff in the Pentagon; to those on the outside, it often appeared that the SAFSP people and their CIA friends were using secrecy to keep others away for personal convenience rather than for any legitimate purpose. This difficulty—there were outsiders who knew generally what was going on and wanted more access and less secrecy—was a manageable problem

at the time but, with the passing of the Cold War, will lead to new looks at security policy.

In this history, the real argument for short management channels was the urgency of the SIGINT satellite mission. The real argument for secrecy was the fear of Soviet diplomatic intervention or attempts to interfere with the satellites; there was also the concern for compromise of intelligence sources and methods—the possible drying up of a SIGINT source when the Soviets became aware of our ability to use the radio frequency (RF) signal. Secrecy made the job easier in most cases and helped to ensure the privacy of the short management channels. Both factors were probably important to the results that were achieved.

The NRO project teams, charged with building and operating SIGINT satellites, brought these new spacecraft into existence in a short time and brought them to bear on the intelligence problems of the nation quickly and effectively. POPPY typically achieved new models within one or two years. EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs

These short times from concept to operation were remarkable and a testimony to the dedication and skill of their government and contractor teams. These records were achieved in unique circumstances—a one-time blending of threats to our national survival and technological

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opportunity—and were made possible by an astute decision about how to organize for the job.\*<sup>10</sup>

## NRO and NSA Working Together

In 1958, National Security Council (NSC) Directive No. 6 (NSCID No. 6) placed NSA in charge of coordinating all US ELINT activity. This decision put NSA in a business it had not been in before: up to that time NSA people were really COMINT specialists, not ELINTers. This new assignment for NSA was resisted by many of the rank and file in the CIA and in the military services, who were the traditional ELINT collectors, users, and operators. By the 1960s, NSCID No. 6 also led to a conflict between NSA and the NRO over roles and missions: with the NRO in charge of satellite reconnaissance and NSA in charge of ELINT, who would be in charge of ELINT satellites? This question came up again, and with more importance, when COMINT satellites became a reality. The answer was usually worked out by NRO/NSA teaming arrangements and agreements on a project-by-project basis, along the lines suggested by Gene Fubini in 1961: typically, the NRO would build and operate the satellites, and NSA would be the resident SIGINT expert and process the satellite data for analysis by the Intelligence Community customers.

At the end of the 1950s, NSA was recognized as the processor of satellite-collected SIGINT and that, too, was not

\* There were no dedicated R&D flights and no formal test and evaluation flight programs. This alone distinguished NRO programs from almost all other R&D programs.

seriously questioned thereafter, although  
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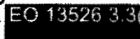
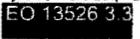
tasking—that is, giving detailed commands to the satellites to direct their collection operations—on the other hand, was more painfully sorted out. Eventually, tasking was defined in phases, authority ultimately resided in the US Intelligence Board (USIB), which delegated the detailed work of target selection and priorities to its committees. The committees discussed and wrote the official requirements and set priorities which, in some cases, became extremely detailed, even awkward, and, at least in the early 1960s, inefficient. The NRO acquiesced to what many felt was an intrusion and, in 1962, set up the Satellite Operations Center (SOC) in the Pentagon. NSA, in turn, saw the SOC as usurping a traditional NSA role in managing the tasking of SIGINT collectors. Later in 1962, NSA personnel were integrated into the NRO, both on the collection side (satellite planning and budgeting) in the Office of the Secretary of the Air Force, Space Systems (SAFSS), and on the operational side, in the SOC. Then, in an evolutionary step, in 1968 the SIGINT part of the SOC provided a representative to NSA offices at Fort Meade, Maryland. An amicable arrangement evolved: USIB was in titular control,<sup>†</sup> NRO was in control of the satellite vehicles, and NSA orchestrated target collection and, of course, did or arranged for all the SIGINT processing.

<sup>†</sup> Actually, when one reviews the voluminous detail in the more recent USIB files on SIGINT satellites, particularly their "Guidance on the NRP" published annually and then for five and then 10 years in advance, one could conclude that USIB, if not in control, certainly spent a lot of time and resources attempting control of SIGINT satellites.

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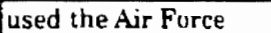
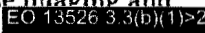
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The mission ground stations (MGSs) were important to the collaboration between the NRO and NSA. The GRAB/POPPY mission ground stations were primarily at the Navy  stations 

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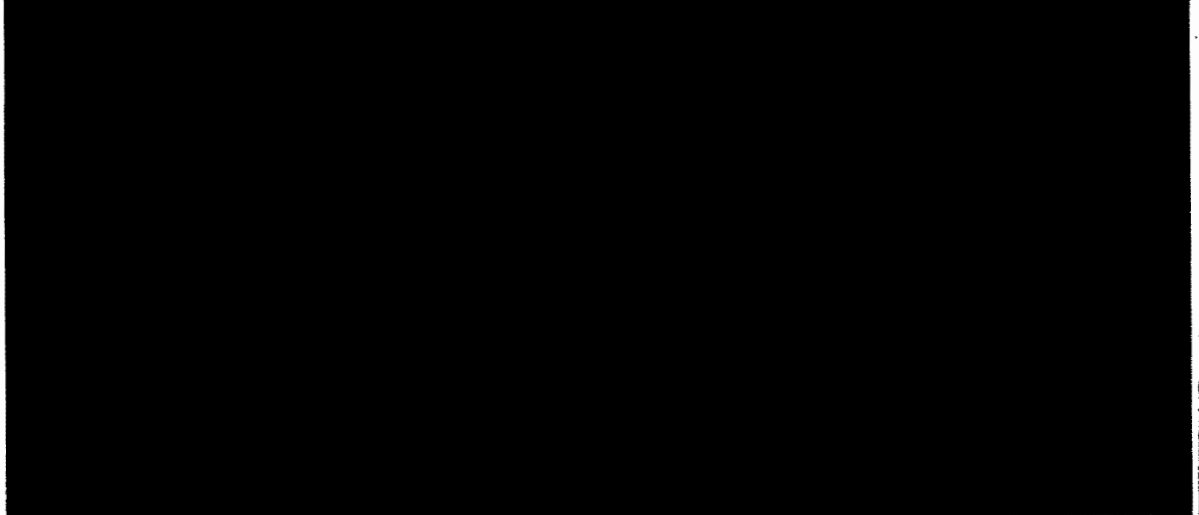
 used the Air Force Satellite Control Facility (AFSCF) sites built by the Air Force for the imaging and SIGINT satellites. In 1966 

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became the first collaboratively manned operational site at which NSA people carried out processing of SIGINT data with the support of the NRO  satellite

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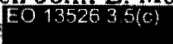
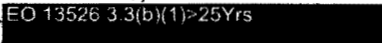
With the advent of the high-altitude, and also realtime, SIGINT satellites, NSA did in fact make a determined and successful effort to get back into the business of SIGINT operational control. On 10 February 1968 the Director of NSA, LGen Marshall S. "Pat" Carter, approved the establishment of the SIGINT Satellite Support Center (SSSC) at NSA Headquarters, Fort Meade, Maryland.<sup>14</sup> This was a specialized tasking center to focus and centralize all tasking for EO 13526 3.3 conceived by Charlie Tevis and headed by EO 13526 3.5(c) who had developed much of the software himself. The SSSC was originally manned by approximately eight people to handle COMINT, ELINT, and TELINT. In January 1972 two representatives from the NRO/SOC were integrated into the SSSC to operate certain phases of NRO tasking at NSA. By the summer of 1972

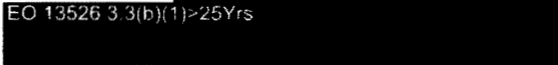
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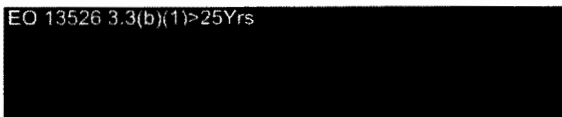
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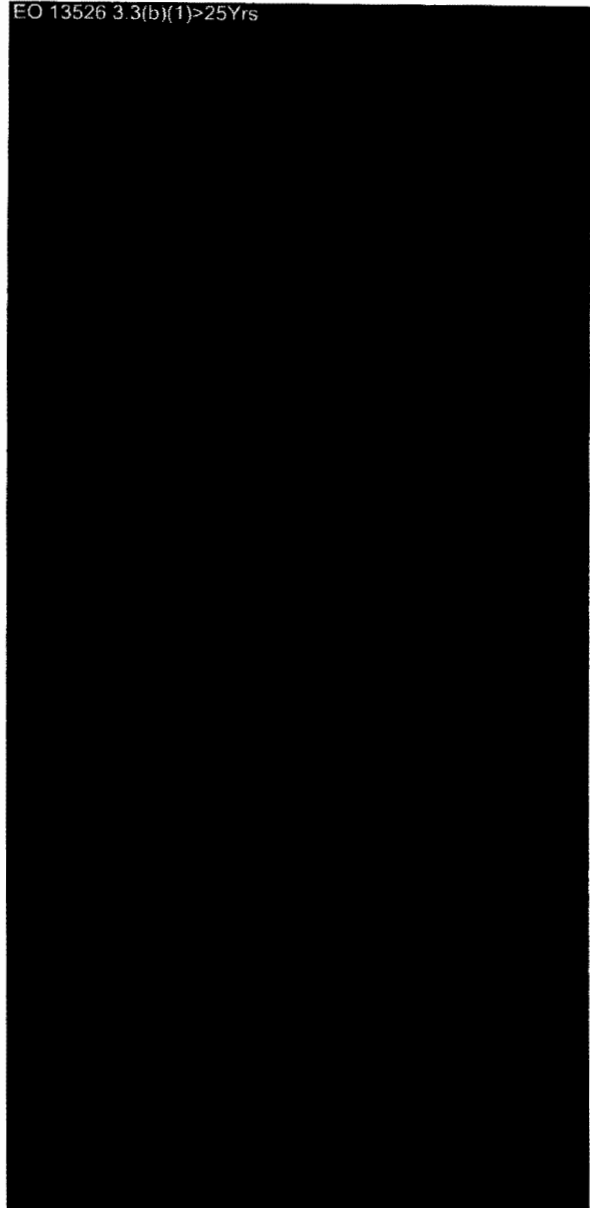
there were at least four NRO/SOC representatives, mostly Air Force personnel, working jointly with NSA personnel in the SSSC.\*<sup>15</sup>

The timing and personnel were just right for the SSSC to go into operation. The spirit of cooperation between NSA and the NRO was high under Carter and his Directors of Operations, Oliver Kirby and later MGen John E. Morrison, Jr., US Air Force. As  NSA assistant to the Director of SSSC, remarked, NSA could not unilaterally have developed and begun operating its SSSC as part of the NRO satellite control and tasking system either before or after the late 1960s: earlier, the NSA wasn't capable; later, the NRO was better organized and probably wouldn't have relinquished control of SIGINT satellite operations.<sup>16</sup> Later, much of the task planning for 

  
EO 13526 3.3(b)(1)-25Yrs

The SSSC was ahead of its time, but it was not politically acceptable in the Intelligence Community. The US Intelligence Board (USIB) hierarchy—its SIGINT Requirements Subcommittee, especially—did not like the SSSC, even though it was intended to provide a mechanism for consolidating NSA recommendations on the SIGINT satellite collection requirements. As a part of an internal NSA reorganization, the SSSC was formally disestablished on 18 September 1974. The 24-hour watch operations in SSSC were assimilated into

  
EO 13526 3.3(b)(1)-25Yrs



\* The Operations Center for Mission Control (OCMC) was established at NSA by a memo signed by John McMahon, Deputy Director of Central Intelligence, in 1984

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The good times were when the lime-light was shared—when each participant respected the other.

- This sharing started in the early years, from 1958, between the Air Force and NSA, as John Copley and [redacted] EO 13526 3.5(c) remember so well.
- Charlie Tevis and Raymond Potts remember that the good times overwhelmingly outnumbered the bad, and both cite the enthusiastic support of Deputy Director of NSA Louis Tordella as crucial throughout all those years, until Tordella's retirement in 1974. He set up direct access/short-chain management.
- NSA Director LGen Pat Carter, 1965 to 1969, of course, encouraged team play.
- DNROs Joseph V. Charyk (1962 to 1963), Brockway McMillan (1963 to 1965), Alexander H. Flax (1965 to 1969), and John L. McLucas (1969 to 1973) also added to the cooperative spirit.
- SAFSP key team leaders in the 1960s and 1970s were BGen Bill King, Col Bob Yundt, LtCol Jack Sides, and MGen Dave Bradburn. Bradburn was among the first in SAFSP senior management to establish a close collaborative working relationship between SAFSP and NSA.

- LMSC leaders such as Bill Troetschel, Bill Harris, George Price, and [redacted] EO 13526 3.3(b) were team players who often acted as extensions to the SAFSP project offices.
- Bob Hermann, as NSA Chief, (high altitude) Satellite Programs in the 1970s, then as Director of all NSA R&D, from mid-1973 to 1975, advised NSA not to try to take over. He was instrumental in resolving NSA/Air Force and NSA/CIA problems.
- NSA Directors VAdm Laurence H. Frost (1960 to 1962), and VAdm Noel Gayler (1969 to 1972) tried to get control, while the Air Force and Army Directors of NSA, LGen Gordon Blake, US Air Force (1962 to 1965), Pat Carter, US Army (1965 to 1969), Samuel C. Phillips, US Air Force (1972), and Lew Allen, US Air Force (1973 to 1977), felt comfortable without getting complete control.

So there was an ebb and flow of NSA/NRO/CIA cooperation. George Cotter says he will always consider SIGINT satellites as the only SIGINT program where NSA was not master. [redacted] EO 13526 and Potts believe that some Air Force and Navy airborne military SIGINT [redacted] EO 13526 3.3(b)(1)>25Yrs also belong in the same (NSA not driving) category.

The CIA, from the early days of Bud Wheelon's arrival from the academic community and industry, was a technical tiger. As Wheelon said, "Killian and Land got to President Kennedy after the Bay of Pigs

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when Allen Dulles was fired in November 1961; so CIA was not gutted; instead, its technical capability was preserved and expanded." The Air Force and NSA then had real competition. So, tensions were bound to develop; they were resolved only when personalities allowed for cooperation or when the excitement of the job overwhelmed the spirit of competition. In the interviews conducted for this history, an opinion frequently proffered was that in the late 1970s and later years, interagency relations became more formal and difficult.

This point of view (actually in EO 13526 words) could be summarized this way: "There are too many middlemen and we won't ever get back to the simple days; the systems are so large we can't do some very important jobs the way we used to do with small systems—we have lost that skill; and organizations have become so large, it is easier not to do at all what, in the old days, was accomplished with a short discussion."

### Concluding Thoughts

The story of the SIGINT satellites is first the story of decisions by national leaders: The creation of a Department of Defense, a Director of Central Intelligence, and a National Security Agency by President Truman; the arrangement to have the Director of Central Intelligence take full charge of setting priorities for military and civil intelligence operations by President Eisenhower; Eisenhower's creation of the US Intelligence Board (USIB), the

\* Wheelon was the first CIA Deputy Director for Science and Technology (DDS&T); preceding Wheelon were Herb Pete Scoville and Don Chamberlain, who were the first and second CIA Deputy Directors for Research.

President's Scientific Advisory Committee, and the President's Foreign Intelligence Advisory Board; and Eisenhower's initiation of what became the National Reconnaissance Office (NRO), which brought creative minds to assist the President in his stewardship over these crucial national security activities of the country. These decisions can now be seen as legacies of the very first importance—actions that shaped the manner in which the Cold War would unfold.

The objectives of President Eisenhower's "Open Skies" proposal were actually achieved at greater altitudes above national airspace by the US space reconnaissance systems. Even though the Soviets never agreed to permit US reconnaissance aircraft to overfly their airspace, they did permit US reconnaissance satellites to overfly the Soviet Union and benefited by the same access for their satellites over the United States. This tacit cooperation was made possible by Eisenhower's three-track approach to organizing and carrying out the US space effort. Assigning the manned and scientific space work to NASA, the standard military projects to the military services, and all space reconnaissance under a separate and covert organization was a brilliant organizational plan. By hiding the US reconnaissance effort under the NRO, the United States kept the diplomatic pressure off. Neither the Soviet Union nor the United States had to admit publicly that it was overflying the territory of the other or that the sovereignty of its own territory might be "violated." The tacit agreement served well. These initiatives and activities would have been hard to negotiate and even harder for leaders to

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agree to in public. So the plan was good, it worked, and it suited the special circumstances of the Cold War perfectly.

The SIGINT satellites that were built were good, too. They made a complementary set and provided our leaders with the information they needed to make crucial defense decisions. Especially on the Soviet ABM—the big question as to whether the Soviets could actually defend themselves against incoming US missiles (they couldn't!)—the answers were vital and they were provided in time to preserve the confidence of US leaders in the deterrent power of their forces.

These results meant that the leaders of the United States could wait and not be led by uncertainty into the disaster of a nuclear exchange. For the United States, this made possible the successful outcome of the Cold War.

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## Chapter 9 References

1. Alexander H. Flax comments, SIGINT Satellite History peer review, March 1994.
2. Flax comments, SIGINT Satellite History peer review, March 1991.
3. Eugene Fubini interview, 20 May 1991.
4. Flax comments, SIGINT Satellite History peer review, March 1994.
5. Flax comments, SIGINT Satellite History peer review, March 1994.
6. RAdm Robert K. Geiger comments, SIGINT Satellite History peer review, March 1994.
7. Flax comments, SIGINT Satellite History peer review, March 1994.
8. Flax comments, SIGINT Satellite History peer review, March 1994.
9. MGen John L. Martin, Jr., comments, SIGINT Satellite History peer review, March 1994.
10. Flax comments, SIGINT Satellite History peer review, March 1994.
11. Julian Caballero interview, 29 October 1990.
12. James V. Boone interview, 19 September 1971.
13. George Cotter interview, 23 May 1991.
14. NSA-BYE-19016-68, 9 February 1968.
15. *NSA in Space*, April 1975, BYE-19385-75, pp. 84-85.
16. EO 13526 3.5(c) interview, 1 October 1991.

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# Appendix

## Role of Digital Computing in SIGINT Satellite Collection Systems

The role of digital computers in the development of SIGINT satellite collection systems can be appreciated through a review of digital computer development and the application of this development to processing of SIGINT data collected by the various overhead satellite systems.

The timeline in this appendix presents a brief outline of computer development from 1935 to 1975.

Chart 1 depicts the improvement in processing capacity at the National Security Agency (NSA) from 1960 through 1971 as more powerful computers were developed and applied to the processing of SIGINT data from the first mostly experimental programs of the early 1960s to the more sophisticated programs of the 1970s.

Chart 2 demonstrates a similar trend in the processing capability developed by

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13

Chart 3 is a measure of the increasing data produced by the POPPY Program as its collection progressed from a single

satellite with a single frequency band to multiple satellites with as many as

EO 13526 3.3(b)(1)>25Yrs

Chart 4 shows the total number of radar locations produced per year as the number of collection systems increased and became more sophisticated. Advanced techniques

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13

EO 13526 3.3(b)(1)>25Yrs made these increases possible.

Chart 5 is a comparison of emitter location accuracy for the various SIGINT systems as they were developed.

EO 13526 3.3(b)(1)>25Yrs

is a far cry from the 400- to 8,000-mile locations of the first POPPIES

EO 13526 3.3(b)(1)>25Yrs

Chart 6 reminds us that in addition to the digital processing applied to identification and location of SIGINT emitters, there was a parallel development in using digital techniques to glean the technical information from the narrow and wide bandwidth analog tapes produced in the same timeframe.

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## Digital Computer Evolution

- | Date | Event  |
|------|--|
| 1935 | IBM 601 Multiplying Card Punch was developed. <sup>1</sup> These punched-card machines were the backbone of the machine support for processing by NSA's predecessor organizations, the Navy's Communications Supplementary Activities, Washington (CSAW), and the Army Security Agency (ASA).  |
| 1944 | Mark 1 relay computer was developed at Harvard under direction of Howard Aiken. <sup>2</sup>   |
| 1946 | ENIAC, the first large, general-purpose electronic computer, which had 18,000 vacuum tubes, stored only 20 numbers, and was programmed by plugging large cables between registers, was developed by J. Presper Eckert and John Mauchly at the Moore School of Electrical Engineering, University of Pennsylvania. <sup>3</sup>   |
| 1950 | Engineering Research Associates, Inc. (ERA), delivered the first ATLAS computer (started in 1948) to CSAW in December 1950. The ATLAS digital computer was a large, vacuum-tube machine that used magnetic-drum storage with a capacity of 16,384 words of 24 bits (binary digits) each and had an access time of 17 milliseconds. <sup>4</sup> ATLAS I was the first parallel electronic computer in the US with drum memory.   |
| 1952 | ABNER I, developed by ASA engineers, became operational in 1952. ABNER I used mercury delay lines developed by Technitrol for ASA for memory, digital tape drives developed by Raytheon, and a unique instruction set developed by ASA programmers and engineers, the first of which emphasized upon nonarithmetic operations. ABNER was a serial computer similar in logic to SEAC and EDVAC. It was the most sophisticated computer of its time and was the first computer to perform computations simultaneously with input-output operations. ABNER had the most complete complement of input-output capabilities of its time, including punched cards, punched paper tape, magnetic tape, parallel printer, typewriter, and console. ABNER II, built for NSA by Technitrol Corporation, became operational in June 1955. <sup>5</sup> |
| 1953 | The first ATLAS II computer was delivered to NSA (established on 4 November 1952) in October 1953 by UNIVAC (ERA had been acquired by Remington Rand, Inc., in 1952, and UNIVAC was formed). The first ATLAS II computer used electrostatic tubes for high-speed memory.   |

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- 1954** The second ATLAS II computer delivered to NSA in November 1954 is believed to be the first magnetic-core-memory computer delivered. ATLAS II was 1,000 times faster than ATLAS I, with the new magnetic-core memory.<sup>7</sup>
- 1956** IBM 703 and UNIVAC 1103 are the first commercial digital computers to use magnetic-core storage.<sup>8</sup> The UNIVAC Scientific 1103 was the commercial version of the ATLAS II.<sup>9</sup>
- 1957** The first of five BOGART computers, built by Sperry Rand (Remington Rand and Sperry Corporation combined in 1955 to form Sperry Rand.), St. Paul, Minnesota, to specifications provided by NSA to provide data conversion, formatting, and other special functions, was delivered to NSA, Fort Meade, in July 1957. Work started on BOGART in July 1954. The BOGART computer used diode and magnetic-core logic with a 24-bit word size and had the capability to select any of three 8-bit portions of the word. The cycle time of the magnetic core memory was 20 microseconds. IBM 727 magnetic tape drives, which were becoming the industry standard, were also used. BOGART was probably the first US computer that was built using "design automation" techniques. Many features of BOGART were carried over into the family of Navy Tactical Data System computers.<sup>10</sup> The BOGART computer was the first computer used by NSA in 1961 to process ELINT data collected by the Navy program (see Chapter 3).
- 1958** SOLO, the first operational digital computer using transistors, was delivered to NSA in March 1958. NSA recognized in January 1955 the potential for transistors to replace vacuum tubes and formed a small group of engineers (including EO 13526 3.5(c) and Raymond Potts) to lead efforts using transistors and to form the nucleus of what became the transistor generation. In June 1955 Philco Corporation was awarded a contract to build a transistor machine using surface-barrier transistors (a technology that was superseded by junction transistors) to duplicate the design of the ATLAS II computer. The SOLO transistor version of the ATLAS II computer operated with a clock speed of 1 megacycle and was contained in a desk, compared to the 400 square feet of space required for ATLAS II. Philco marketed a commercial version of SOLO as the TRANSAC 1000. A larger, improved computer, the TRANSAC S-2000, based on the Navy CXPQ computer and later called Philco S-2000, was marketed with more success.<sup>11</sup>
- 1960** The first Control Data Corporation (CDC) 1604A computer was delivered. CDC was formed by William Norris and a small group of engineers from Remington Rand in 1957. These engineers included Seymour Cray as the chief computer designer. Cray later formed Cray Research where he designed, built, and delivered the very large scientific CRAY computers.

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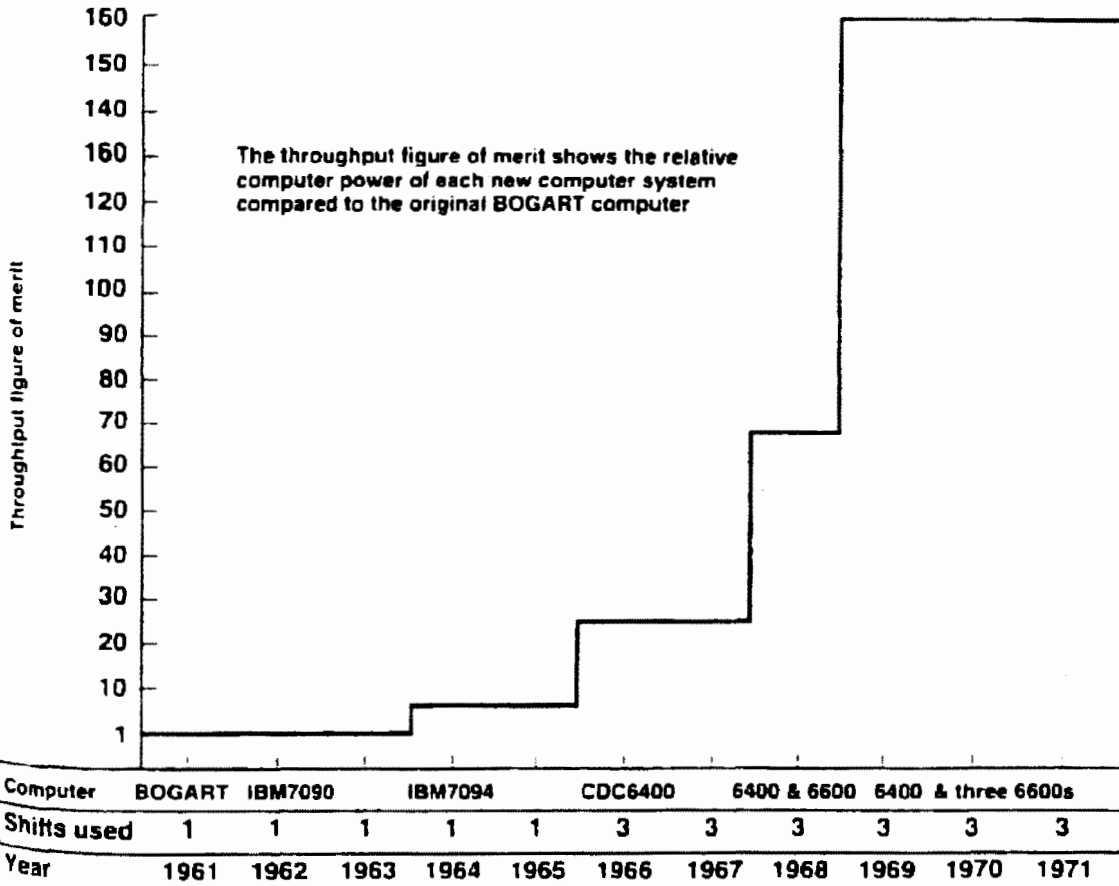
**1962** HARVEST, the most sophisticated model of the STRETCH series of computers built by IBM, was delivered to NSA in February 1962.<sup>12</sup> Construction of the IBM STRETCH series of computers started in 1955 with the design for the more capable HARVEST version to meet NSA requirements submitted in May 1957. The proposed HARVEST system was estimated to be 100 to 200 times faster than current equipment. The HARVEST system for NSA was basically the same as other STRETCH systems, with the following major additions: two additional banks of high-speed memory, with a 0.9-microsecond access time; a high-speed streaming unit to perform special statistical calculations; and the TRACTOR automatic, high-speed, high-capacity data storage system. TRACTOR consisted of three automatic tape-cartridge handling units, each capable of automatically seeking and extracting data under program control. The 160 tape cartridges, each using 1.75-inch-wide tape with 3,000 bits per inch, could store 88-billion characters, with an instantaneous information-transfer rate of 1,280,000 characters per second. The TRACTOR tape system was the first completely automated tape library. The system also pioneered the use of error-correcting codes and deskewing buffers.

The logic technology used in IBM's 7000-series and subsequent models followed the STRETCH and HARVEST foundation. The 2-microsecond magnetic-core memory technology was used in IBM's 7090 and other computers.<sup>13</sup>

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### Chart 1

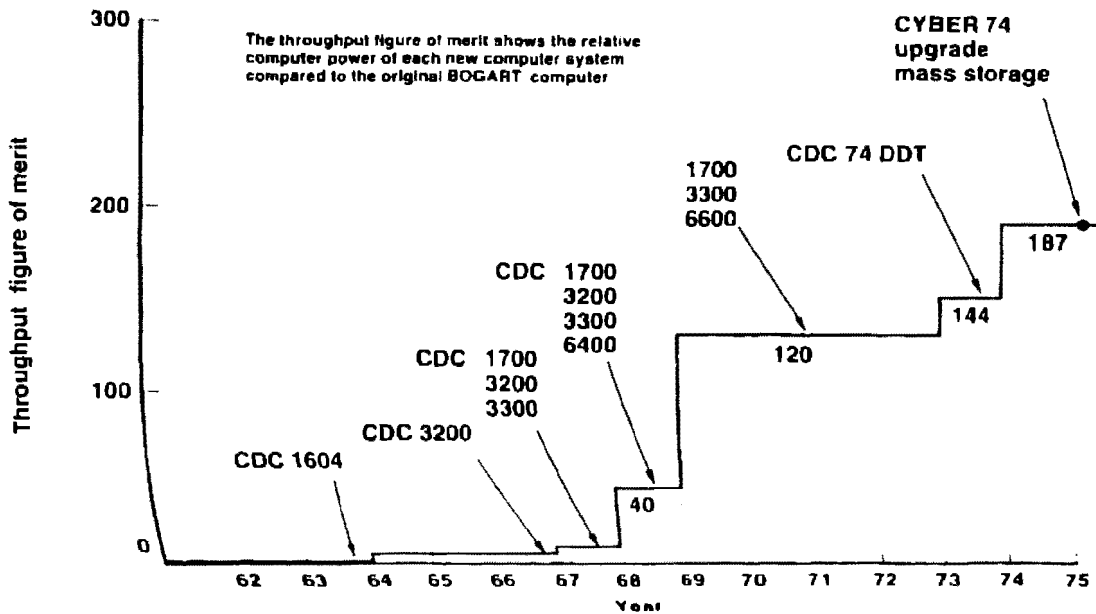
Processing capacity increases applied to satellite ELINT data at NSA, Fort Meade, Maryland.



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### Chart 2

Processing capacity increases applied to satellite SIGINT data  
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4

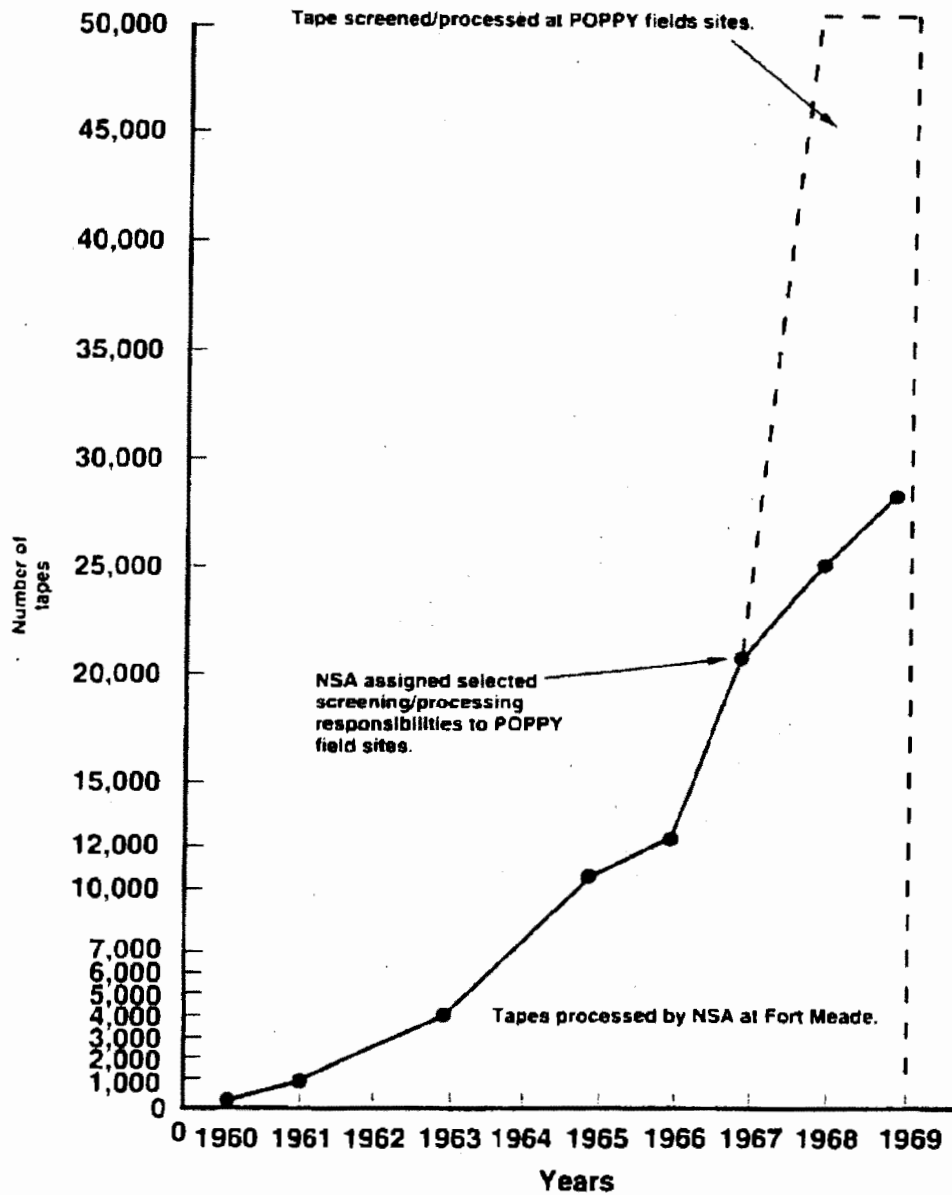


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### Chart 3

POPPY tapes processing.

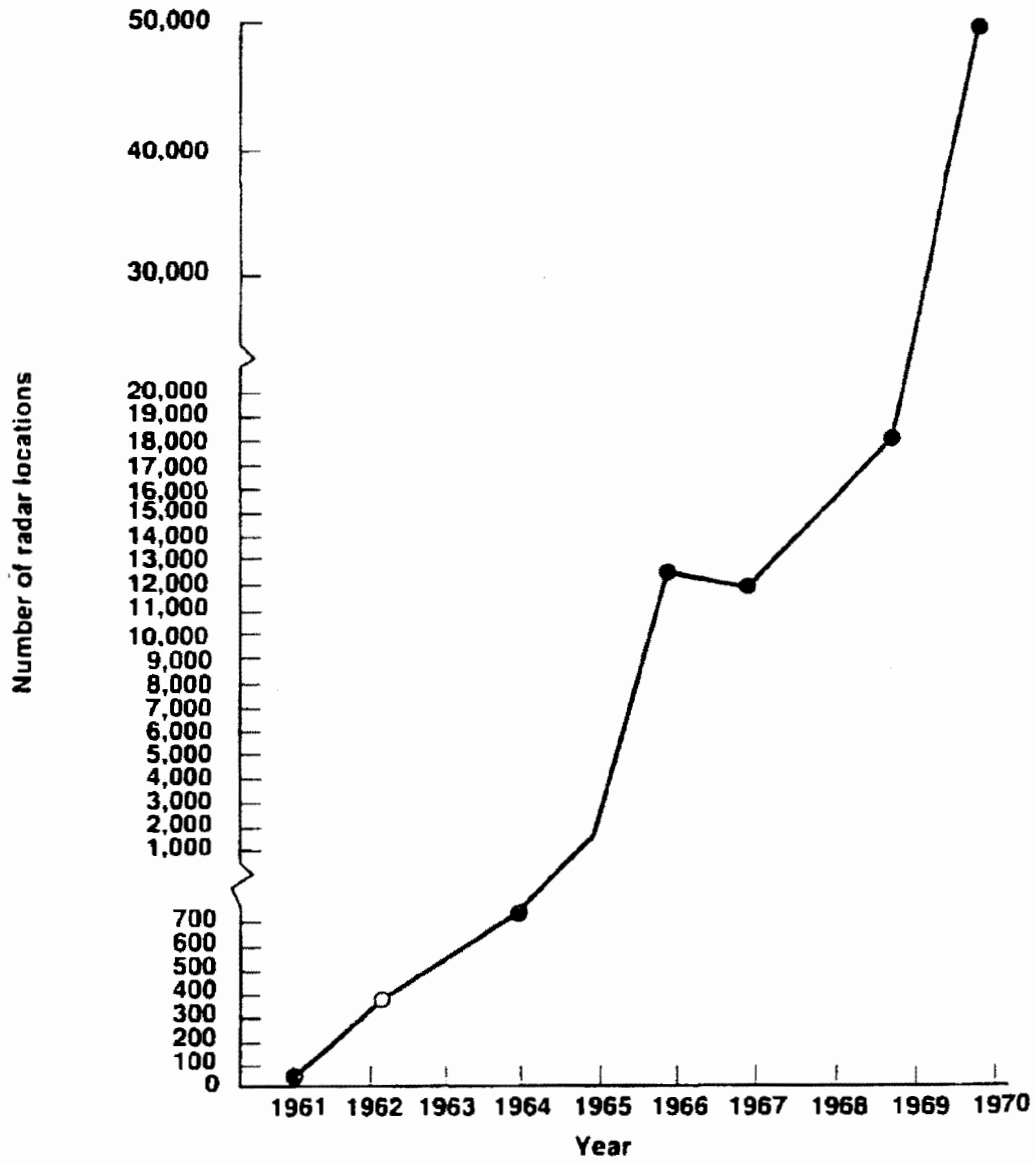


No accurate tape volume data available after 1969

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### Chart 4

Number of radar locations produced per year.

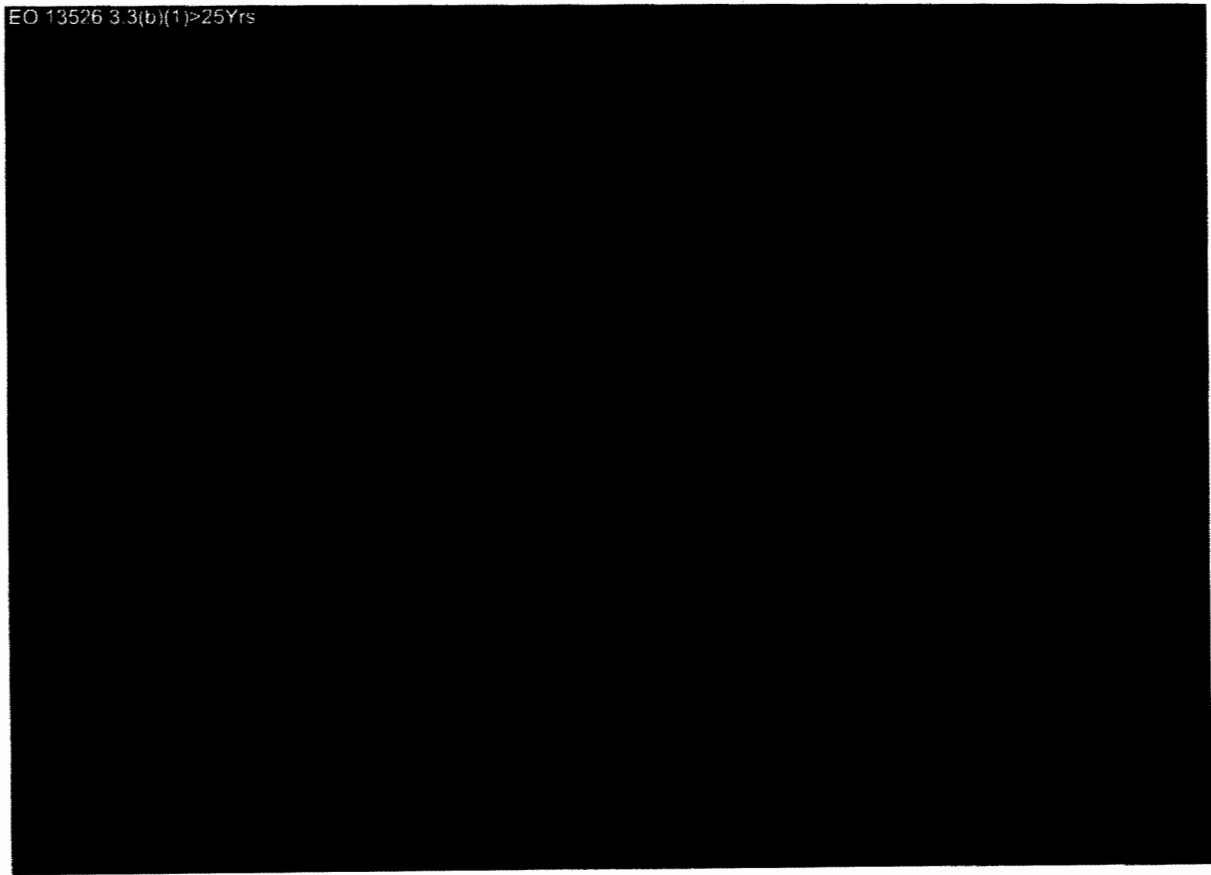


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Appendix A

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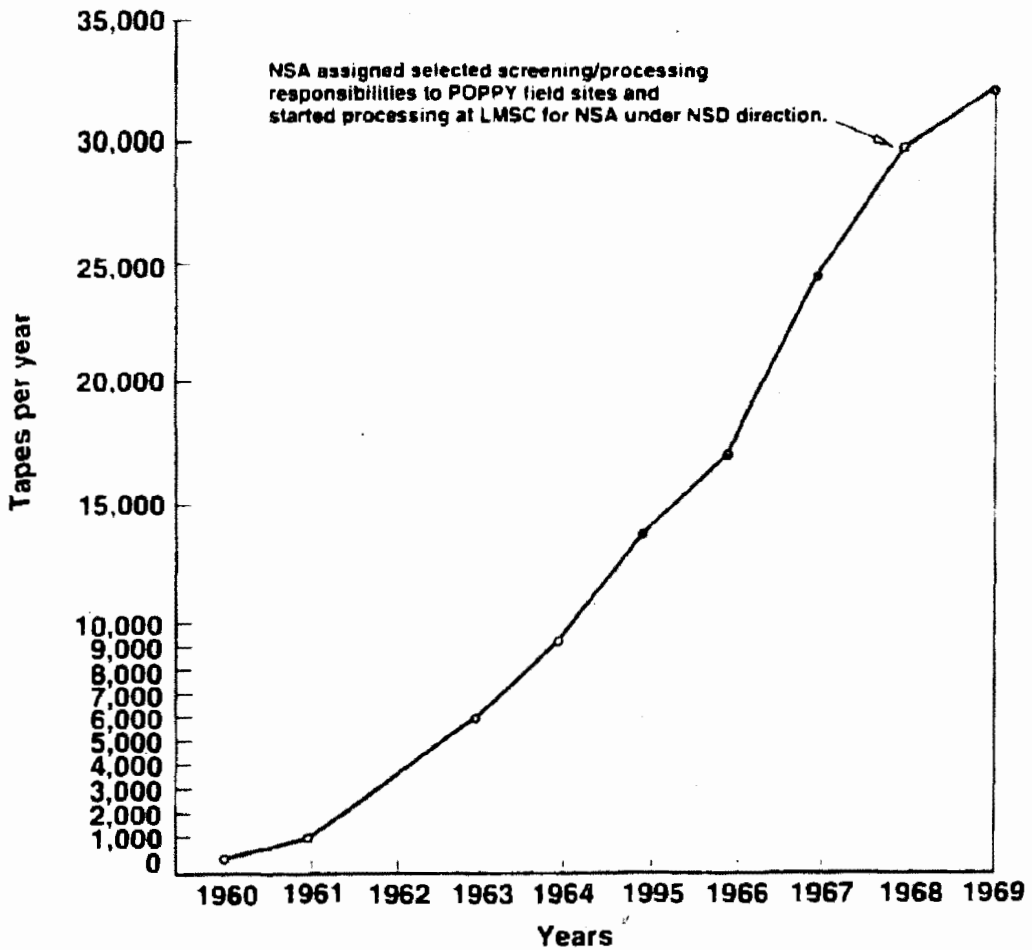
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### Chart 6

**Volume of ELINT analog tapes processed by NSA at Fort Meade, Maryland.**  
EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



In addition to the ELINT analog tapes there were large quantities of digital data processed. There are NO complete records of the digital volume. The analog tapes include 10 kHz, detected data up to 10 MHz, and pre-detected data.

No accurate tape volume data available after 1969

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## Appendix A References

1. *Encyclopedia of Computer Science*, 3rd Edition. Van Norstrand Reinhold. NY, 1993. p. 1488.
2. *Encyclopedia of Computer Science*, p. 1488.
3. Snyder, Samuel S. *Influence of U.S. Cryptologic Organizations On The Digital Computer Industry*. National Security Agency, Fort George G. Meade, MD, May 1977. p. 3.
4. Snyder, pp. 5, 7, and 8.
5. Snyder, p. 10.
6. Snyder, p. 8.
7. Snyder, p. 8.
8. *Encyclopedia of Computer Science*, p. 1488.
9. Snyder, p. 8.
10. Snyder, pp. 17-18.
11. Snyder, pp. 18-19.
12. Snyder, p. 29.
13. Snyder, pp. 19-22.

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# B Appendix

## SIGINT Satellite Contributions to Understanding Soviet Antiballistic Missile/ Anti-Earth Satellite (ABM/AES) Radar System Capabilities

Date	Mission	ABM/AES Information Developed
Apr 60	U-2 photography	Two HEN ROOST radars, one HEN HOUSE radar, a HEN NEST radar, and two HEN EGG radars, all thought to be tracking radars, were photographed at the research and development complex under construction at Sary Shagan. <sup>1</sup>
1961	Satellite photo	BIG SCREEN construction detected. <sup>2</sup>
7 Aug 61	GRAB/DYNO 2	"On the 7th of August 1961, the first signals believed to emanate EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)
28 Oct 62	EO 13526 3.3(b)(1)>25Yrs	
26 Jun 63	EO 13526 3.3(b)(1)>25Yrs POPPY 4. EO 13526 3.3(b)(1)>25Yrs	
27 Nov 63	EO 13526 3.3(b)(1)>25Yrs	
11 Jan 64	POPPY 5. EO 13526 3.3(b)(1)>25Yrs	Using a series of intercepts in the EO 13526 1.4(c)<25Yrs band made during POPPY 5 operations, National Security Agency (NSA) analysts EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)
27 Jan 64	MOON BOUNCE EO 13526 program	Satellites provided the only signal collection of Soviet ABM radars until the MOON BOUNCE intercept arranged by NSA and the Naval Research Laboratory (NRL).
25 Dec 64	POPPY 5. EO 13526 3.3(b)(1)>25Yrs	EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)


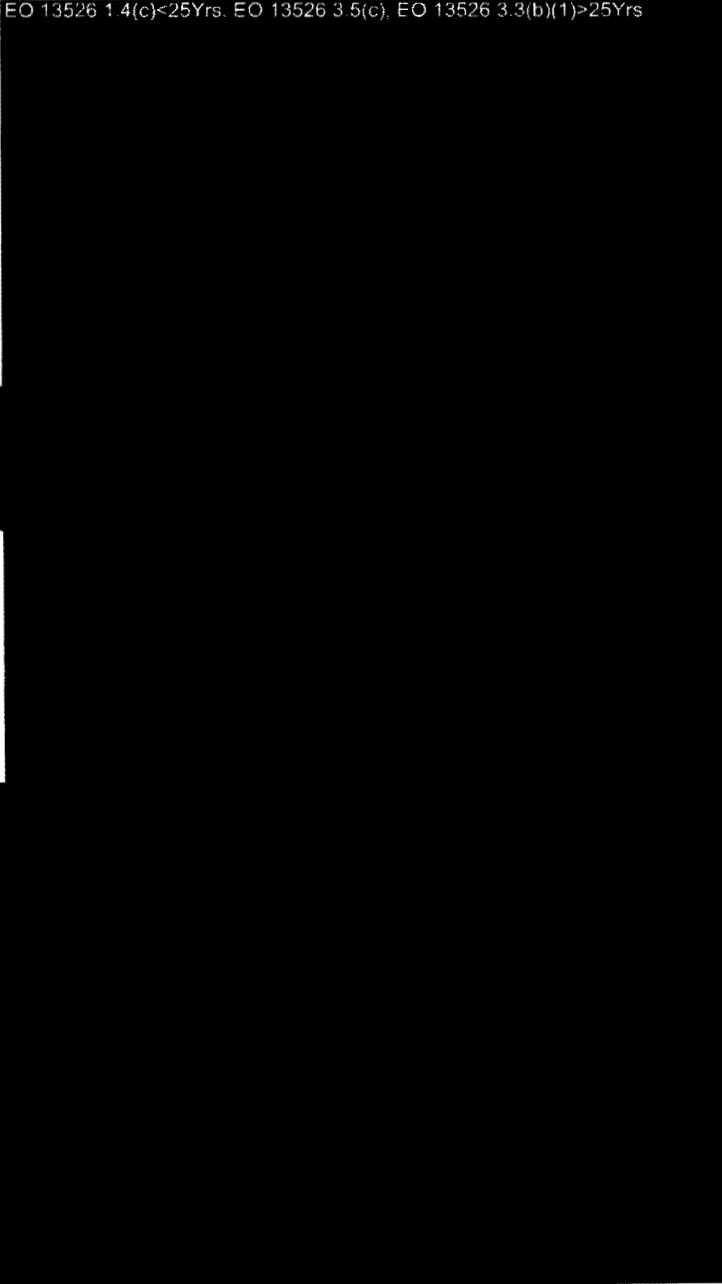
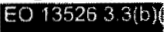
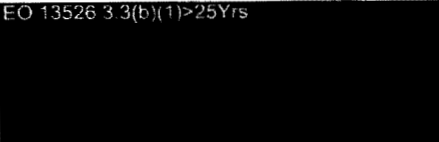
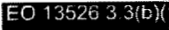
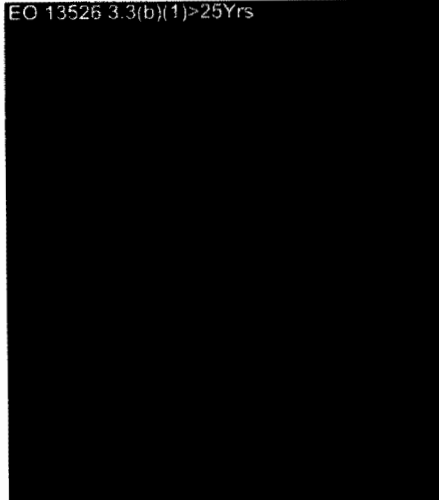
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**SIGINT Satellite Contributions to Understanding Soviet Antiballistic Missile/  
Anti-Earth Satellite (ABM/AES) Radar System Capabilities**

Date	Mission	ABM/AES Information Developed
2 Feb 65	POPPY 5, 	
9 Mar 65	POPPY 6, 	
 EO 13526 3.3(b)(1)>25Yrs		
25 Jun 65, 1 Sep 66, and 21 Dec 66	POPPY 6, 	
 EO 13526 3.3(b)(1)>25Yrs		

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**SIGINT Satellite Contributions to Understanding Soviet Antiballistic Missile/  
Anti-Earth Satellite (ABM/AES) Radar System Capabilities**

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Date	Mission	ABM/AES Information Developed
31 May 67	POPPY 7,	EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)
EO 13526 3.3(b)(1)>25Yrs		
19 Dec 67	POPPY 7,	
EO 13526 3.3(b)(1)>25Yrs		

*(Table continues)*

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~~COMINT Control Channels Jointly~~  
~~BYE-9197/94~~

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EO 1.4.(c)  
PL 86-36/50 USC 3605

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**SIGINT Satellite Contributions to Understanding Soviet Antiballistic Missile/  
Anti-Earth Satellite (ABM/AES) Radar System Capabilities**

---

**Date                      Mission                      ABM/AES Information Developed**

EO 13526 3 3(b)(1)-25Yrs, EO 13526 1.4(c)-25Yrs, EO 13526 3.5(c)



*(Table continues)*

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COMINT Control Channels jointly  
81E-919794

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EO 1.4.(c)  
PL 86-36/50 USC 3605

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**SIGINT Satellite Contributions to Understanding Soviet Antibalistic Missile/  
Anti-Earth Satellite (ABM/AES) Radar System Capabilities**

---

**Date                      Mission                      ABM/AES Information Developed**

---

EO 13526 3.3(b)(1)-25Yrs. EO 13526 1.4(c)-25Yrs. EO 13526 3.5(c)



~~Top Secret~~  
Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT~~ Control Channels Jointly  
BYE-919794

### Appendix B References

1. Thompson, Fred C., Emory Richardson, Thomas F. Kenly, and Leo W. Lemley. *Synthesis of the* [redacted] *Radar System*, HRB Singer Inc. Report, [redacted] 5 June 1964, p. 9. (S)
2. *A Study of the* [redacted] *Radar Signal*, by the Special Signal Analysis Team of Lockheed Missile [redacted] Company, under the direction of the National Security Agency, [redacted]
3. [redacted] *Signal Characteristics, Summary of Antimissile/Antisatellite System Type Signals*, 27 January 1966, TCS-650001-66, p. 9, para 7.
4. *History of the POPPY Satellite System*, BYE-56105-78, p. 45 (hereafter cited as *POPPY History*).
5. *Summary of Antimissile/Antisatellite System Type Signals*, 27 January 1966, TCS-650001-66, pp. 10-11.
6. *Summary of Antimissile/Antisatellite System Type Signals*, p. 13.
7. *NSA in Space*, April 1975, BYE-19385-75, p. 13.
8. *POPPY History*, p. 46.
9. *A Study of the* [redacted] *Radar Signal*, p. 3.
10. *Summary of Antimissile/Antisatellite System Type Signals*, p. 21, and *Radar Signal Similar to* [redacted] *Intercepted by Satellite* [redacted]
11. *POPPY History*, p. 47.
12. *History of* [redacted] *Intercepts by Mission 7312* [redacted] TCS-650070-66, 9 May 66.
13. *A Study of the* [redacted] *Radar Signal*, pp. 3-4.
14. [redacted]
15. [redacted]
16. [redacted]
- [redacted]
18. *Summary of SLEWTO, Mission 7318, Intercept Analysis*, [redacted] TCS-40117-68, 20 March 68.
19. *POPPY History*, pp. 47-48.
20. [redacted]
21. [redacted]
22. *A Study of the* [redacted] *Radar Signal*, p. 4.
23. [redacted]
24. *POPPY History*, p. 48.

EO 1.4.(c)  
PL 86-36/50 USC 3605

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COMINT Control Channels Janitly  
BYE-919774

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NOFORN/ORCON~~

PL 86-36/50 USC 3605

25. [REDACTED] EO 13526 3.5(c)
26. *A Study of the* [REDACTED] EO 13526 1.4(c) < *Radar Signal*, p. 5.
27. [REDACTED] EO 13526 3.5(c)
28. [REDACTED]
29. [REDACTED]
30. [REDACTED]
31. TK/WC-W205/47-71 and TK/WC-W205/08-72.
32. Report AM019, 17 April 1970 and 22 July 1970.
33. Report AM 103, 8 December 1989.
34. Report AM007, 20 February 1970.
35. Report AM73, 21 October 1970.
36. Report 004, 16 January 1970.
37. *Performance Characteristics Based on Wave Form Analysis of* [REDACTED] EO 13526 *Signals*, by the Special Signal Analysis Team of Lockheed Missiles and Space Company, under the direction of the National Security Agency, 13 October 1971, TCS 58527-71.
38. Reports: 06, 18 February 1971; AM10, 12 March 1971; 15, 6 April 1971; and AM24, 15 June 1971.
39. [REDACTED] EO 13526 3.5(c)
40. [REDACTED]
41. [REDACTED]
42. *NSA in Space*, April 1975, BYE-19385-75, Appendix H, p. 1.

PL 86-36/50 USC 3605  
EO 1.4.1.100

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COMINT Control Channels jointly  
BYE 9197 9J

Appendix B

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PL 86-36/50 USC 3605

# C Appendix

## Soviet and Chinese Radar and Communications Signals

### Radars

US/NATO Name	Function
<del>EO 135</del> (HEN HOUSE I)	Soviet ABM, target acquisition and tracking
<del>EO 135</del> (HEN HOUSE II)	Soviet ABM, target acquisition and tracking
BACK NET	Soviet acquisition radar for the SA-5 GAMMON surface-to-air-missile (SAM) system
BALL GUN	Soviet shipborne surface search
BAR LOCK	Soviet early warning
BEER CAN	Soviet early warning, ground-controlled intercept
BIG BAR	Soviet early warning
BIG MESH	Soviet early warning
BIG NET	Soviet shipborne early warning
BIG SCREEN	Soviet ABM target warning
BUEB (HEN HOUSE)	Soviet ABM, target acquisition and tracking
BUGH	Soviet ABM
<del>EO 13526</del> (HEN HOUSE)	Soviet ABM, target acquisition and tracking
<del>EO 13526</del> (HEN HOUSE)	Soviet ABM, target acquisition and tracking
CAT HOUSE	Soviet target tracking for the GALOSH antiballistic missile (ABM) system
CROSS OUT	Soviet early warning
DOG HOUSE	Soviet target acquisition for the GALOSH ABM system
DRUM TILT	Soviet antiaircraft fire control
EGG HEAD	Soviet, believed slewable phased array
FAN SONG, C-band	Soviet target tracking and missile guidance for SA-2 GUIDELINE SAMs also used in the People's Republic of China (PRC)
FAN SONG, S-band	Soviet target tracking and missile guidance for SA-2 SAMs
FIRE CAN	Soviet antiaircraft fire control
FLAT FACE	Soviet early warning for antiaircraft fire control
FLAT TWIN	Soviet target tracking with coherent radio frequency, believed to emit from a slewable phased array
FULL TIME	Soviet early warning
GIN SLING	PRC target-tracking radar associated with the CSA-1 SAM system

(Table continues)

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Handle via BYEMAN-TALENT-KEYMOLE-  
COMINT Control Channels jointly  
BEE-41979-2

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**Radars**

US/NATO Name	Function
GUN DISH	Soviet shipborne anti-aircraft
HEAD LIGHTS	Soviet shipborne target tracking and missile guidance for the SA-N-3 missile
HEAD NET	Soviet shipborne air search and early warning for the SA-N-1
HEN EGG	Soviet ABM
HEN HOUSE I	Soviet ABM target-tracking; B357Z, formerly BUEB and BV01
HEN HOUSE II	Soviet ABM target-tracking; B375Z, formerly BVFW and T5136
HIGH SIEVE	Soviet shipborne surface search
LONG TRACK	Soviet target acquisition radar associated with SA-4 GANEF, SA-6 GAINFUL, and SA-8 GECKO SAM systems
LOW BLOW	Soviet target-tracking radar associated with the SA-3 COA SAM
MOON MAT	Early warning copy US SCR-270
MUFF COB	Soviet shipborne anti-aircraft fire control
NYSA-C	Polish early warning
PART TIME	Soviet early warning
PAT HAND	Soviet target-tracking for the GANEF SA-4 SAM system
POP GROLP	Soviet shipborne SA-N-4 missile guidance, target tracking
ROCK CAKE	Soviet height finder
SHEET BEND	Soviet coastal surveillance radar associated with the SS-2B surface-to-surface missile system
SHIP WHEEL	Soviet missile beacon-tracking/instrumentation
SHOCK SING	PRC early warning associated with the SA-3
SLIM NET	Soviet shipborne surface search/target acquisition
SNOOP SLAB	Soviet submarine-borne navigation
SNOOP TRAY	Soviet submarine-borne navigational radar
SQUARE PAIR	T8856 Soviet target-tracking radar for the SA-5 missile system
STRAIGHT FLUSH	Soviet target-tracking radar associated with the SA-6 missile system
STRIKE OUT	Soviet early warning
STONE CAKE	Soviet height finder
TALL KING	Soviet early warning
THIN SKIN	Soviet height finder associated with the SA-4, SA-6, and SA-8
TOKEN	Soviet early warning
TOP ROOST	Soviet ABM target-tracking, can track multiple targets
TOP SAIL	Soviet shipborne for SA-N-3
TOP TROUGH	Soviet shipborne early warning
TRY ADD	Soviet target-tracking, missile tracking, and guidance for the GALOSH ABM system
YO YO	Soviet target tracking for GUILD SA-1 SAM

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NOFORN-CORCON~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

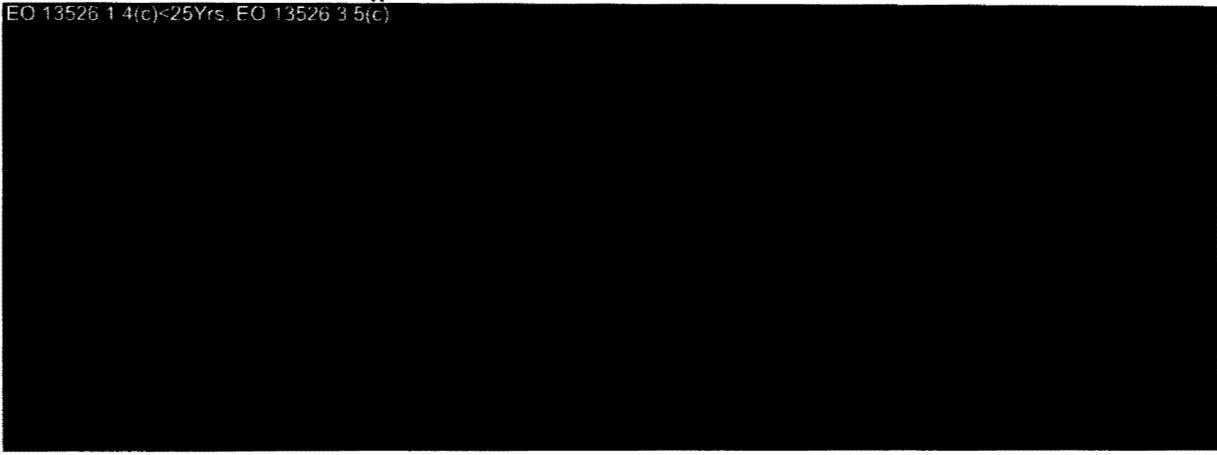
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### Communications Signals

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US/Soviet Name	Soviet Designator	Function	Frequency*
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EO 13526 1 4(c)-25Yrs. EO 13526 3 5(c)



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### Radio Frequency Ranges

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pe	Range	Wavelength
HF (high frequency)	3-30 MHz	100-10 meters
VHF (very high frequency)	30-300 MHz	10-1 meter
UHF (ultra high frequency)	300-3,000 MHz	1 m to 10 cm
S-band	2,000-4,000 MHz	10 cm
C-band	4,000-6,000 MHz	5 cm
X-band	8,000-10,000 MHz	3 cm
SHF (superhigh frequency)	3-30 GHz	10-1 cm

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Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE-919-704~~

**SIGINT Satellite Mission Summary**



Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
					EO 13526 1.4(c)		
<b>1960</b>							
6/22/60	XXXX	GRAB/ DYNC-1	Transit IIIA Thor/Able-Star	NRI		90 days	First SIGINT (ELINT) satellite
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)							
10/11/60	XXXX	SAMCOS 1	Atlas-Agena E-1/F-1	AIL		-	Failed to orbit
11/30/60	XXXX	GRAB/ DYNC	Transit IIIA Thor/Able-Star	NRI		-	Failed to orbit
<b>1961</b>							
01/31/61	XXXX	SAMCOS 2 E-1/F-1	Atlas-Agena	AIL		21 orbits	First on-orbit digital processing (ELINT)
EO 13526 3.3(b)(1)>25Yrs							

Top Secret  
NRO Approved for Release  
EO 1.4  
12 June 2015

Top Secret  
NRO Approved for Release  
EO 1.4  
12 June 2015

(Table continues)

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The SIGINT Satellite System

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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EO 13526 3 3(b)(1)>25Yrs

06/29/01	XXXX	GRAV/DYNO 2	Transit III Thor Able-Star	NR1		6 months	Failed to separate Limited U-band EINT.
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EO 13526 3 3(b)(1)>25Yrs

[REDACTED]

(Table continues)

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NOFORN

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
1962 (cont)							
01/24/62	xxxx	POPPY 1	Thor/Able-Star	NRI	EO 13526 3.3(b)(1)>25Y		Failed to orbit DYNCO plus four payloads
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)							
06/24/62	xxxx	POPPY 2	Scout	NRI			Failed to orbit
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)							

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NRI  
NOFORN

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NRI  
NOFORN

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The SIGINT Satellite Story

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)							
12/12/62	7101	POPPY 1A/B (2 satellites)	Thor Agena B Vehicle 2351	NRL	EO 13526 3.3(b)(1)>25Yrs		UHFNT GS located FWC/CG Library Band orbit (124 by 1,500 miles)
EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)							

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Controlled Information (CMI) -  
SECRET

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CONTROLLED INFORMATION

(Table continues)

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
<b>1963 (cont)</b>							
EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)							
06/15/63	EO 1	POPPY 4 (3 satellites)	Thor Agena D Vehicle 2353	NRI	EO 13526 3.3(b)(1)>25Y		Rad orbit (96 by 495 miles) - LUNGS Confirmed HENHOUSE intercept
EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)							

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COMINT/COMINT/COMINT/COMINT  
BY 9/15/04

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**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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**1963 (cont)**

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

**1964**

01/11/64

EO 1

POPPY 5  
(3 satellites)

EO 13526 3.3(b)(1)>25Yrs  
IAI Agena D  
Vehicle 2154

NRL

EO 13526 3.3(b)(1)>25Yrs

First 500-mile circular orbit  
EUMS CS/EOB

EO 13526 1.4(c)<25Yrs, EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.5(c)

300

The SIGINT Satellite Story

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Approved for Release  
COMINT Section, Chatham Annex  
01/12/2015

Tag Secret  
Approved for Release  
01/12/2015

*Table continues*

EO 1.4 (c)  
PL 86-36/50 USC 3605

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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1964 (cont)

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



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COMINT Control Channel/Intell  
M/I direct

Appendix D

301

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NOFORN/COMINT

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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1964 (cont)

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)

1965

01/09/65

EO 13

KOPPY

EO 135

FAT Agena D Vehicle 2701

NKL

EO 13526 3.3(b)(1)>25Y

FIRST U.S. First SIGINT launch under BRYAN system  
EO 13526 3.3

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)

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302 The SIGINT Satellite Store

Top Secret  
Handle via BRASS/FAULT/KEYHOLE/  
COMINT/Control Channel/Interv

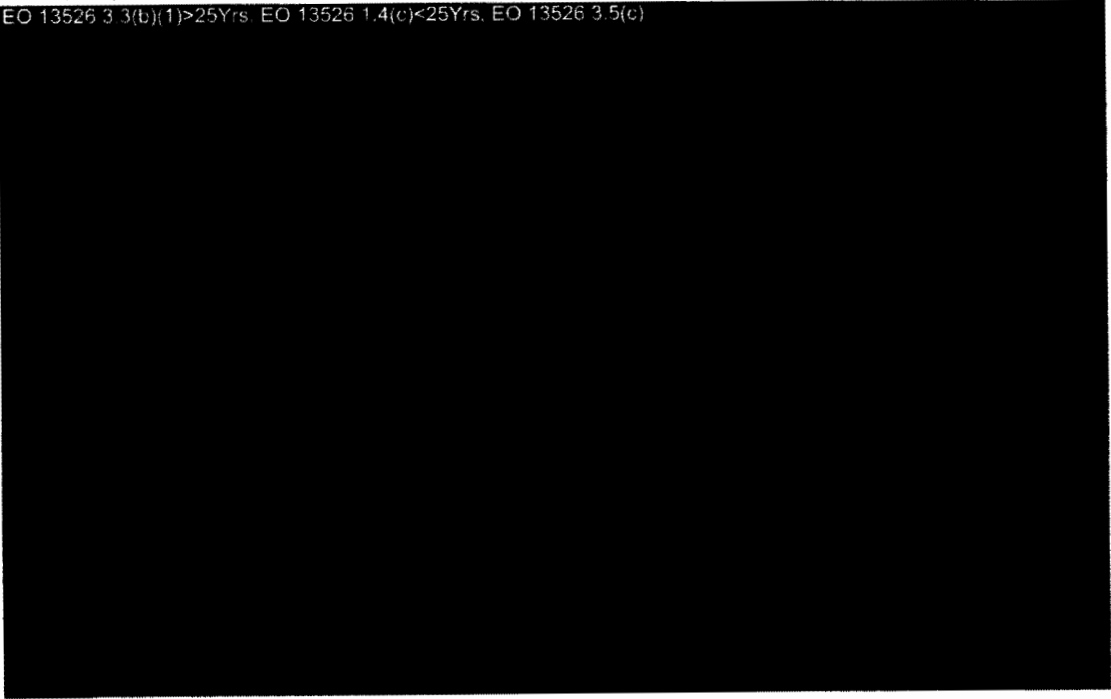
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**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor (GHz)	Frequency Range	Life	Features, Mission, Accomplishments
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1965 (cont)

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



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Handle in Briefing Room  
COMINT Control Channel (unclassified)  
REF: NIN 1000

Appendix D 303

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NOFORN, NOCON

304 The SIGINT Satellite Store

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NRO Approved for Release  
EO 1.4

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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1966 (cont)

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



05/11/67	EO 13	POPPY EO 13	Thor Agena D Vehicle 2701	NRI	EO 13526 3.3(b)(1)>25Yrs		TUNICUS ABM radars Shipboard radars
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(Table continues)

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NRO Approved for Release  
EO 1.4

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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1967 (cont)

EO 13526 3.3(b)(1)>25Yrs EO 13526 1.4(c)~25Yrs EO 13526 3.5(c)



*Table continues*

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Handle via BYEM/KA/FA/TA/PROLIF-  
CONINT/COMINT/CHAMBER/SENTRY  
ATTENTION

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NOFORN/NOCON

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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1969 (cont)

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)



(Table continues)

308 The SIGINT Satellite Mission

Top Secret  
NOFORN  
COMINT  
Controlled  
Export  
Category  
1  
PL 86-36/504

Top Secret  
NOFORN  
COMINT

**SIGINT Satellite Mission Summary**


Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
<b>1970 (cont)</b>							
EO 13526 3.3(b)(1) >25Yrs, EO 13526 1.4(c) <25Yrs, EO 13526 3.5(c)							
							

Table continues

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Handle via BR/TK/AL/CP/AF/PA/CI  
FOUO/NOFORN/NOFORN/NOFORN  
BT 11/19/14

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~~NOFORN~~



J10 The SIGINT Satellite Store

**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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1971 (cont)

EO 13526 3.3(b)(1)>25Yrs

1972

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)

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COMINT/COMINT Channel Smith  
BYEIN/NSA

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NRO/NSA/AFSS

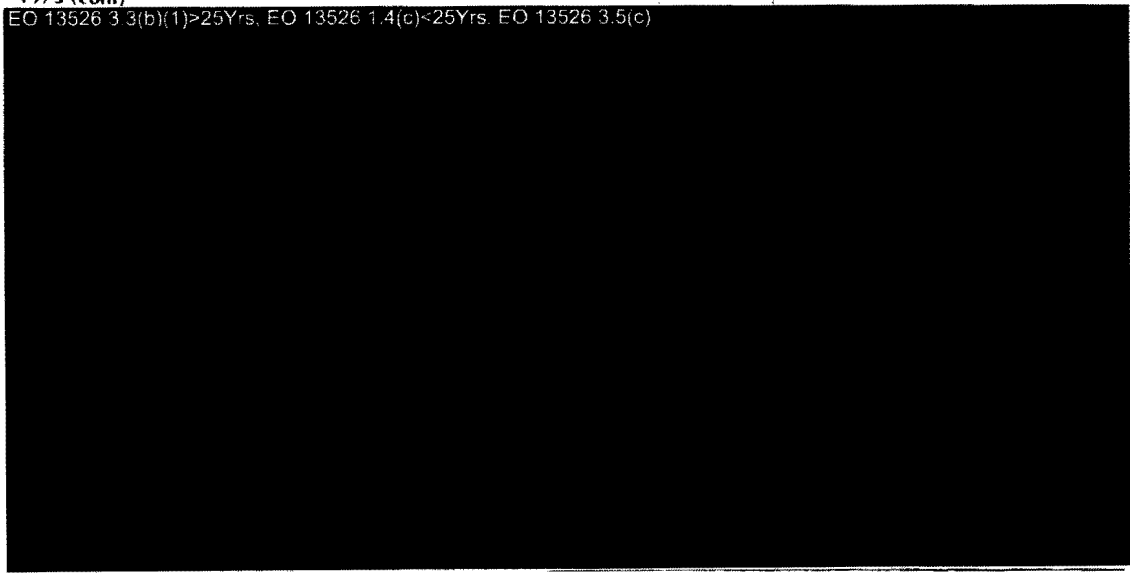
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**SIGINT Satellite Mission Summary**

Date	Mission	Payload	Launch Vehicle	Contractor	Frequency Range (GHz)	Life	Features, Mission, Accomplishments
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1973 (cont)

EO 13526 3 3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13526 3.5(c)



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HUNTER-KILLER NETWORKS  
COMINT CODE/CHANGES/CONF

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COMINT CODE/CHANGES/CONF

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~~NOFORN-CORCON~~

# Appendix

## Full-Text References

Explanatory note to full-text documents: National Security Council Intelligence Directive 6 (NSCID 6), dated 15 September 1958, delegated to NSA the authority to organize and control all US electronic intelligence (ELINT) intercept and processing. The 1958 version of this NSCID added ELINT to NSA's responsibilities, and since this directive was written before SIGINT began to use space vehicles, references to "satellites" are neither specifically included nor excluded. As a result of a Presidential reorganization in 1971, NSCID 6 was rewritten; the 1972 revision of the directive delineates NSA's responsibilities on control of the intercept payload and processing of data collected by SIGINT satellites. This appendix contains both an extract from the original NSCID 6 on the mission, administration, and specific responsibilities of NSA and its director and a copy of the 17 February 1972 directive. (Ref: Page 60, *NSA in Space*.)

The following documents are reproduced here in full text:

Extract from National Security Council Intelligence Directive 6, dated 15 September 1958, paragraphs 6 and 7. (Ref: Appendix N, *NSA in Space*.)

Full text of National Security Council Directive 6, dated 17 February 1972. (Ref: Appendix N, *NSA in Space*.)

Memorandum signed by Secretary of Defense Robert S. McNamara, dated 6 September 1961, attaching letter from Deputy Secretary of Defense Roswell L. Gilpatric to Director of Central Intelligence Allen W. Dulles, dated 6 September 1961, subject: Management of the National Reconnaissance Program. (Ref: Appendix P, *NSA in Space*.)

Memorandum from the Secretary of Defense, subject: Space Vehicle Electronics Intelligence Program, dated 20 October 1961. (Ref: Appendix Q, *NSA in Space*.)

Tordella-Scoville-Charyk agreement, dated 25 May 1962. (Ref: Appendix R, *NSA in Space*.)

Agreement for Reorganization of the National Reconnaissance Program, dated 11 August 1965, signed by Deputy Secretary of Defense Cyrus Vance and Director of Central Intelligence W. F. Raborn. (Ref: Appendix S, *NSA in Space*.)

Memorandum from Chief of Naval Operations, subject: System POPPY, reassignment of responsibilities for, dated 21 January 1963. (Ref: Appendix T, *NSA in Space*.)

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Handle via BYEASIN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
BYE 9197/94

~~Top Secret~~  
~~NOFORN ORCON~~

NRO/NSA/CIA/USN Management  
Agreement for the POPPY System, dated 5  
November 1971. (Ref: Appendix U, *NSA  
in Space.*)

EO 13526 3.3(b)(1)>25Yrs

EO 13526 3.3(b)(1)>25Yrs. EO 13526 1.4(c)<25Yrs. EO 13

PL 86-36/50 USC 3605  
EO 1.4.(c)

~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYHOLE-  
COMINT Control Channels jointly  
REF. 9197.94

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EXTRACT FROM NSCID 6, DATED 15 SEPTEMBER 1958

"6. The National Security Agency

a. The COMINT and ELINT missions of the National Security Agency (NSA) shall be to provide an effective, unified organization and control of the (1) COMINT and (2) ELINT intercept and processing activities of the United States, to provide for integrated operational policies and procedures pertaining thereto and to produce COMINT information and ELINT information in accordance with objectives, requirements and priorities established by the U.S. Intelligence Board.

b. NSA shall be administered by a Director, designated by the Secretary of Defense after consultation with the Joint Chiefs of Staff, whose appointment shall be for a term of four years. The Director shall be a career commissioned officer of the armed services on active or reactivated status, and shall enjoy at least 3-star rank during the period of his incumbency. The Director shall have a civilian Deputy.

7. The Director, National Security Agency.

a. The Director of NSA shall be responsible for accomplishing the mission of NSA. For this purpose all COMINT and ELINT intercept and processing activities of the United States are placed under his operational and technical control. When action by the Chiefs of the operating agencies of the Services or civilian departments or agencies is required, the Director shall normally issue instructions pertaining to COMINT and ELINT operations through them. However, because of the unique technical character of COMINT and ELINT operations, the Director is authorized to issue direct to any operating elements under his operational control task assignments and pertinent instructions which are within the capacity of such elements to accomplish. He shall also have direct access to, and direct communications with, any elements of the Service or civilian COMINT or ELINT agencies on any other matters of operational and technical control as may be necessary, and he is authorized to obtain such information and intelligence...

HANDLE VIA BYEMAN/TALENT KEYHOLE  
COMINT CONTROL SYSTEMS JOINTLY

Page 1

~~TOP SECRET~~

~~TOP SECRET~~

NATIONAL SECURITY COUNCIL  
Washington, D.C. 20505

February 17, 1972

MEMORANDUM FOR

The Secretary of State  
The Secretary of the Treasury  
The Secretary of Defense  
The Attorney General  
The Director of Central Intelligence  
The Director, Office of Science and Technology  
The Chairman, President's Foreign Intelligence Advisory  
Board  
The Chairman, U.S. Atomic Energy Commission

SUBJECT: Issuance of Revised NSCID's

In accordance with the President's memorandum of November 5, 1971, directing a reorganization of the intelligence community, the staffs of the NSC, DCI, and OMB, in consultation and coordination with the President's Foreign Intelligence Advisory Board, have prepared revisions of National Security Council Intelligence Directives 1-8. These revisions have been approved, and the revised NSCID-6 is attached. This supersedes all previous versions of this NSCID.

The revised NSCID's 1-5 and 7-8 have been distributed separately.

/S/

Henry A. Kissinger

Attachment

cc: The Director, Office of Management  
and Budget

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NATIONAL SECURITY COUNCIL INTELLIGENCE  
DIRECTIVE NO. 6<sup>1</sup>

SIGNALS INTELLIGENCE  
(Effective 17 February 1972)

Signals Intelligence (SIGINT), which comprises Communications Intelligence (COMINT) and Electronics Intelligence (ELINT) and the activities pertaining thereto are national responsibilities and must be so organized and managed as to exploit to the maximum the available resources of the Government, to satisfy the intelligence needs of the National Security Council and the departments and agencies of the Government, and to provide for efficiency and economy in the use of technical resources. Therefore, pursuant to the National Security Act of 1947, as amended, the National Security Council authorizes and directs that SIGINT activities shall be conducted as prescribed herein.

1. Definitions

For the purpose of this directive, the terms "Communications Intelligence" or "COMINT" shall be construed to mean technical and intelligence information derived from foreign communications by other than the intended recipients.

COMINT activities shall be construed to mean those activities that produce COMINT by the collection and processing of foreign communications passed by radio, wire or other electromagnetic means, with specific exceptions stated below, and by the processing of foreign encrypted communications, however transmitted. Collection comprises search, intercept and direction finding. Processing comprises range estimation, transmitter/operator identification, signal analysis, traffic analysis, cryptanalysis, decryption, study of plain text, the fusion of these processes, and the reporting of results.

COMINT and COMINT activities as defined herein shall not include (a) any intercept and processing of unencrypted written communications, press and propaganda broadcasts, or (b) censorship.

<sup>1</sup> This Directive supersedes NSCID No. 6 dated 15 September 1958, revised 18 January 1961.

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ELINT activities are defined as the collection (observation and recording), and the processing for subsequent intelligence purposes, of information derived from foreign, non-communications, electromagnetic radiations emanating from other than atomic detonation or radioactive sources. ELINT is the technical and intelligence information product of ELINT activities.

2. The Director of Central Intelligence

Consistent with his responsibilities as set forth in NSCID Nos. 1, 2 and 3, the Director of Central Intelligence shall:

a. Establish with the advice of the United States Intelligence Board and issue appropriate intelligence objectives, requirements and priorities to guide the conduct of all United States SIGINT activities.

b. Review the needs and performance of United States SIGINT activities as a basis for preparing a consolidated intelligence program budget.

c. Establish policies and procedures for the conduct of SIGINT arrangements with foreign governments with the advice of the United States Intelligence Board.

d. Develop and establish policies and procedures for the protection of SIGINT including the degree and type of security protection to be given SIGINT activities through the protection of information about them or derived from them.

3. The Secretary of Defense

a. The Secretary of Defense is designated as Executive Agent of the Government for the conduct of SIGINT activities in accordance with the provisions of this directive and for the direction, supervision, funding, maintenance and operation of the National Security Agency. The Director of the National Security Agency shall report to the Secretary of Defense and shall be the principal SIGINT advisor to the Secretary of Defense, the Director of Central Intelligence, and the Joint Chiefs of Staff. The Secretary of Defense may delegate in whole or part authority over the Director of the National Security Agency within the Office of the Secretary of Defense.

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b. The Secretary of Defense may determine, after consultation with the Secretary of State and the Director of Central Intelligence, that a SIGINT matter forwarded by the Director of Central Intelligence to the National Security Council for decision presents a problem of an emergency nature and requires immediate action. His action will be implemented and will govern, pending a decision by the National Security Council.

4. The National Security Agency

a. There is established under the Secretary of Defense and subject to his authority and control a National Security Agency with a Director who shall be head thereof and a Deputy Director who shall act for, and exercise the powers of, the Director during his absence or disability. The Director and Deputy Director shall be designated by the Secretary of Defense subject to the approval of the President. The duration of their appointments shall be at the pleasure of the President. The Director shall be a commissioned officer of the armed services, on active or reactivated status and shall enjoy not less than three star rank during the period of his incumbency. The Director shall have a Deputy who shall be a career civilian with SIGINT experience.

b. It shall be the duty of the Director of the National Security Agency to provide for the SIGINT mission of the United States, to establish an effective unified organization and control of all SIGINT collection and processing activities of the United States, and to produce SIGINT in accordance with objectives, requirements and priorities established by the Director of Central Intelligence with the advice of the United States Intelligence Board. No other organization shall engage in SIGINT activities except as provided for in this directive.

c. Except as provided in paragraphs 5 and 6 of this directive, the Director of the National Security Agency shall exercise full control over all SIGINT collection and processing activities, except the operation of mobile SIGINT platforms which will normally be exercised through appropriate elements of the military command structure. The Director of the National Security Agency is authorized to issue direct to any

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operating elements engaged in SIGINT operations such instructions issued by the Director under the authority provided in this paragraph shall be mandatory, subject only to appeal to the Secretary of Defense.

d. In consonance with the aims of maximum overall efficiency, economy and effectiveness, and to the extent he deems necessary and desirable, the Director shall centralize and consolidate the performance of SIGINT functions for which he is responsible. To this end, there is established a Central Security Service under the Director of the National Security Agency, which shall be organized in accordance with a plan approved by the Secretary of Defense. It shall be principally collection oriented and shall include SIGINT functions previously performed by various Military Department and other United States governmental elements engaged in SIGINT activities. The Director of the National Security Agency shall determine the appropriate division of responsibilities among the elements under his direction.

e. The Armed Forces and other departments and agencies often require timely and effective SIGINT. The Director of the National Security Agency shall provide information requested taking all necessary measures to facilitate its maximum utility. As determined by the Director of the National Security Agency or as directed by the Secretary of Defense, the Director of the National Security Agency shall provide such SIGINT either through the direction of activities under his control or through the delegation to an appropriate agent of specified SIGINT facilities and resources from among the elements under his direction for such periods and for such tasks as appropriate.

f. Specific responsibilities of the Director of the National Security Agency include the following:

- (1) Formulating necessary operational plans, policies and procedures to provide for integrated operations.
- (2) Managing SIGINT resources, personnel and programs.
- (3) Conducting research and development to meet the needs of the United States for SIGINT.

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(4) Determining and submitting to the authorities responsible for logistic support for activities under his control requirements together with specific recommendations as to what each of the responsible departments and agencies of the Government should supply.

(5) Prescribing within his field of authorized operations requisite security regulations covering operating practices, including the transmission, handling and distribution of SIGINT material within and among the elements under his control; and exercising the necessary monitoring and supervisory control to ensure compliance with the regulations.

(6) Providing the Director of Central Intelligence with such information as he may require on the past, current and proposed plans, programs and costs of the SIGINT activities under the control of the Director of the National Security Agency.

g. The intelligence components of individual departments and agencies may continue to conduct direct liaison with the National Security Agency in the interpretation and amplification of requirements and priorities within the framework of objectives, requirements and priorities established by the Director of Central Intelligence.

h. It is the intent of this directive that the National Security Agency not engage in the production and dissemination of finished intelligence, but be limited to the production and dissemination of COMINT and ELINT.

#### 5. Relationship to other SIGINT Activities

a. The Director of Central Intelligence with the advice of the United States Intelligence Board shall determine the requirements and priorities for collection by SIGINT satellites that shall be developed, launched and maintained in operation by the National Reconnaissance Office. The Director of the National Security Agency, with respect to his technical and operational control of the intercept payload, and the Director of the National Reconnaissance Office, with respect to his control of spacecraft operations, shall provide for the tasking of these satellites based on guidance provided

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by the Director of Central Intelligence. The National Security Agency shall process the collected data.

b. Nothing in this directive shall be construed to encroach upon or interfere with the unique requirements for clandestine operations covered under NSCID No. 5. Those SIGINT collection and processing activities (other than cryptanalysis) that are specifically designated by the Director of Central Intelligence to be essential and integral to the operation of clandestine espionage and counterintelligence activities abroad, including arrangements with foreign clandestine services, shall be conducted under the provisions of that directive. To the extent practicable, however, information pertaining to the activities and derived therefrom shall be handled so as to give suitable protection to related SIGINT activities. Material collected under these circumstances that would have been considered COMINT or ELINT will be passed to the National Security Agency to the extent desired by the Director of the National Security Agency as soon as special requirements of the collector have been satisfied.

c. The Director of the National Security Agency shall conduct such COMINT and ELINT activities as are required to support electronic warfare activities. The conduct of such search, intercept, direction-finding, range-estimation, and signal analysis of non-communications electromagnetics radiation as must be undertaken to permit immediate operational use of the information in support of electronic measures and countermeasures and rescue operations, if delegated by the Director of the National Security Agency, shall be the responsibility of the Military Departments or Commands, as appropriate. The responsibility for such activities with respect to electromagnetic radiations of COMINT interest shall normally not be delegated and shall remain the responsibility of the Director of the National Security Agency.

6. The Federal Bureau of Investigation

Nothing in this directive shall be construed to encroach upon or interfere with the unique responsibilities of the Federal Bureau of Investigation in the field of internal security, including such intercept and processing activities as may be undertaken by the Federal Bureau of Investigation in connection with its functions.

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THE SECRETARY OF DEFENSE

Washington

6 September 1961

MEMORANDUM FOR THE SECRETARY OF THE ARMY  
THE SECRETARY OF THE NAVY  
THE SECRETARY OF THE AIR FORCE  
THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING  
THE CHAIRMAN OF THE JOINT CHIEFS OF STAFF  
THE GENERAL COUNSEL

SUBJECT: (TS) Assistant for Reconnaissance

Reference the attached Agreement between the Secretary of Defense and the Director of the Central Intelligence Agency entitled Management of the National Reconnaissance Program.

The Under Secretary of the Air Force is hereby designated my Assistant for Reconnaissance, and is delegated full authority for management of this program. In this regard, he will act as my direct representative both within and outside the Department of Defense. He will be given any support that he requires from normal staff elements, although these staff elements will not participate in program matters except as he specifically requests. He will, however, keep pertinent key officials informed on a regular basis on the status of these programs.

Because of the extreme sensitivity of the projects involved in the National Reconnaissance Program, particular care must be taken to protect the Security of the arrangements described herein. The existence of the referenced Agreement, its contents and the organizational implementation employed for its execution are all classified TOP SECRET. This information will not be disclosed to anyone to whom such disclosure is not mandatory in order to carry out actions required by the terms of the referenced Agreement or by my Assistant for Reconnaissance in carrying out his responsibilities in the National Reconnaissance Program.

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All Department of Defense satellite or overflight photographic reconnaissance, mapping, geodesy, and electronic signal collection programs will be handled in accordance with the referenced Agreement, and existing project assignments will be brought into conformity and present directives will be revised at the earliest date that such action can be taken with plausible overt appearance.

A new public relations policy for satellite launches will be announced as a separate action to minimize political vulnerability of these programs.

Robert S. McNamara

1 Att.  
Agreement

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THE SECRETARY OF DEFENSE  
Washington

6 September 61

The Honorable Allen W. Dulles  
Director of Central Intelligence  
Washington, D.C.

Re: Management of the National Reconnaissance Program

Dear Mr. Dulles:

This letter confirms our agreement with respect to the setting up of a National Reconnaissance Program (NRP), and the arrangements for dealing both with the management and operation of this program and the handling of the intelligence product of the program on a covert basis.

1. The NRP will consist of all satellite and overflight reconnaissance projects whether overt or covert. It will include all photographic projects for intelligence, geodesy and mapping purposes, and electronic signal collection projects for electronic signal intelligence and communications intelligence resulting therefrom.

2. There will be established on a covert basis a National Reconnaissance Office to manage this program. This office will be under the direction of the Under Secretary of the Air Force and the Deputy Director (Plans) of the Central Intelligence Agency acting jointly. It will include a small special staff whose personnel will be drawn from the Department of Defense and the Central Intelligence Agency. This office will have direct control over all elements of the total program.

3. Decisions of the National Reconnaissance Office will be implemented and its management of the National Reconnaissance Program made effective: within the Department of Defense, by the exercise of the authority delegated to the Under Secretary of the Air Force; within the Central Intelligence Agency, by the Deputy Director (Plans) in the performance of his presently assigned duties. The Under Secretary of the Air Force will be designated Special Assistant For Reconnaissance to the Secretary of Defense and delegated full authority by me in this area.

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4. Within the Department of Defense, the Department of the Air Force will be the operational agency for management and conduct of the NRP, and will conduct this program through use of streamlined special management procedures involving direct control from the office of the Secretary of the Air Force to Reconnaissance System Project Directors in the field, without intervening reviews or approvals. The management and conduct of individual projects or elements thereof requiring special covert arrangements may be assigned to the Central Intelligence Agency as the operational agency.

5. A Technical Advisory Group for the National Reconnaissance Office will be established.

6. A uniform security control system will be established for the total program by the National Reconnaissance Office. Products from the various programs will be available to all users as designated by the United States Intelligence Board.

7. The National Reconnaissance Office will be directly responsive to, and only to, the photographic and electronic signal collection requirements and priorities as established by the United States Intelligence Board.

8. The National Reconnaissance Office will develop suitable cover plans and public information plans, in conjunction with the Assistant Secretary of Defense, Public Affairs, to reduce potential political vulnerability of these programs. In regard to satellite systems, it will be necessary to apply the revised public information policy to other non-sensitive satellite projects in order to insure maximum protection.

9. The Directors of the National Reconnaissance Office will establish detailed working procedures to insure that the particular talents, experience and capabilities within the Department of Defense and the Central Intelligence Agency are fully and most effectively utilized in this program.

10. Management control of the field operations of various elements of the program will be exercised directly, in the case of the Department of Defense, from the Under Secretary of the Air Force to the designated project officers for each program and, in the case of the Central Intelligence Agency, from the Deputy Director (Plans) to appropriate elements of the Central Intelligence Agency. Major program elements and operations of the National Reconnaissance Office will be

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reviewed on a regular basis and as special circumstances require by the Special Group under NSC 5412.

If the foregoing is in accord with your understanding of our agreement, I would appreciate it if you would kindly sign and return the enclosed copy of this letter.

/S/

Roswell L. Gilpatric  
Deputy Secretary of Defense

1 Atch:  
Chart "Single Mgmt for  
National Reconnaissance  
Programs (TS)

CONCUR:

C. P. Cabell, General, USAF  
Acting Director  
Central Intelligence Agency

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THE SECRETARY OF DEFENSE  
WASHINGTON

October 20, 1961

MEMORANDUM FOR SECRETARY OF THE ARMY  
SECRETARY OF THE NAVY  
SECRETARY OF THE AIR FORCE  
DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING  
CHAIRMAN, JOINT CHIEFS OF STAFF  
GENERAL COUNSEL  
DIRECTOR, NATIONAL SECURITY AGENCY  
SPECIAL ASSISTANT FOR RECONNAISSANCE TO THE SECRETARY  
OF DEFENSE

SUBJECT: Space Vehicle Electronics Intelligence Program

The attached document entitled "Space Vehicle Electronic Signal Collection Responsibilities and Resources" is approved and will be implemented within the Department of Defense by all departments, agencies, and special activities.

This documentation is provided as an additional basis for understanding the relationships, responsibilities and working arrangements applicable to space vehicle electronic signal collection and data processing that is in consonance with the responsibilities set forth in my memorandum of 6 September 1961, subject: "Assistant for Reconnaissance". As used within this document, the term "Department of the Air Force (SAFMS)" specifically refers to that activity for which the Under Secretary of the Air Force has been designated as my Assistant for Reconnaissance.

1 Attachment

As stated, w/tabs A and B

cc: OSD/DDR&E, Dr. Eugene G. Fubini  
OSD/OSO, Mr. Clyde W. Elliott  
ACSI, D/A, Maj Abram V. Rinearson, III, USA  
ONI, D/N, Capt D. M. Showers, USN  
SAFMS, D/AF, Lt Col Edwin J. Istvan, USAF  
USA, Mr. Herbert L. Conley  
CIA, Mr. Harold Willis

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SPACE VEHICLE ELECTRONIC SIGNAL COLLECTION  
RESPONSIBILITIES AND RESOURCES

- References:
- (a) National Security Council Intelligence Directive No. 6
  - (b) National Security Council Memo, dated 1 Sep 60, Subject: Reconnaissance Satellite Program
  - (c) DOD Directive 5160.32, Development of Space Systems
  - (d) DOD Directive 5160.34, Reconnaissance and Geodetic Programs
  - (e) Secretary of Defense Memo, dated 6 Sep 61, with Inclosures

1. The utilization of space vehicles as a means for collection of electronic signal information is a special augmentation to other signal intelligence resources of the U.S. Government. In order that the present and future intelligence collection capabilities of earth satellites and other space vehicles can be vigorously explored and developed to add to the total U.S. intelligence posture, the procedures used for management, direction, and technical supervision of this intelligence collection medium will:

a. Assure that appropriate planning takes place for both collection and processing systems in a well-coordinated fashion.

b. Provide a means whereby immediate advantage is taken of break throughs in either the collection or processing state-of-the-art.

2. Present approved collection and processing programs, through CY 1962 are essentially complementary and will not be modified, except as supplementary programs are developed in accordance with the responsibilities and procedures contained herein.

3. Security considerations affecting this medium will provide that the sensitivity of the projects can be protected, and that full dissemination is made of extracted intelligence information to elements having a genuine need.

4. To provide for accomplishment of management, direction, and technical supervision in accordance with the above, the following responsibilities and arrangements are defined.

a. The Department of the Air Force (SAFMS) will be solely responsible for the research, development, planning, and operations for electronic signal collection by space vehicles, taking into consideration

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the effective utilization of all resources available to the U.S. Government. This responsibility will be implemented in accordance with Tab A hereto.

b. The Department of the Air Force (SAFMS) will develop the over-all collection effort to satisfy electronic signal collection requirements established by the U.S. Intelligence Board. The National Security Agency will review USIB electronic signal (COMINT and ELINT) requirements and will recommend to the Department of the Air Force (SAFMS) those which, in NSA's opinion, can best be fulfilled by means of overhead reconnaissance. The over-all collection program prepared by the Department of the Air Force (SAFMS) will be subject to approval by the USIB.

c. The National Security Agency will be solely responsible for the research, development, planning, and operations for processing of electronic signal data (COMINT and ELINT) collected from space vehicle sources, taking into consideration the effective utilization of all processing resources available to the U.S. Government. The processing will include technical feedback to the Department of the Air Force (SAFMS) as well as extraction of intelligence data, but technical feedback from other sources may be provided. This responsibility will be implemented in accordance with Tab B hereto.

d. The Department of the Air Force (SAFMS) will determine the data format for the electronic signal collection products in close consultation with the National Security Agency so as to optimize the match between collection and processing.

5. All applicable resources of the Department of Defense will be used in fulfillment of the above responsibilities. The resources of all other components of the U.S. Government engaged in electronic signal intelligence activity will be utilized as feasible.

2 Incls:

1. Tab A - Implementation of Collection Responsibilities
2. Tab B - Implementation of Processing Responsibilities

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TAB A

IMPLEMENTATION OF COLLECTION RESPONSIBILITIES

1. The Department of the Air Force (SAFMS) collection responsibilities include all aspects of the research, development, planning and operation of electronic signal collection by earth satellites or other space craft. These responsibilities encompass all aspects of the collection systems and include necessary ground support functions and equipment incident to the proper operation of the space craft and/or payload and as may be required to recover, transmit, convert, reformat and technically correct or reconstruct the collected data in order to yield a usable collection product for exploitation by the processor.
2. The Department of the Air Force (SAFMS) will utilize all resources within the U.S. Government in the accomplishment of its collection responsibilities.
3. The Department of the Air Force (SAFMS) will establish, organize and manage the electronic signal collection effort in accordance with USIB approved requirements and priorities, and will exercise technical direction, program planning, funding, security, and operational control of the collection programs.
4. The Department of the Air Force (SAFMS) will accomplish payload configuration control and mission planning. In accomplishing these functions, the Department of the Air Force (SAFMS) may utilize the services of a technical advisory group.
5. The collection products of this effort will be placed under a single unified security control system.
6. All original (record) copies of the collection product will be maintained in a repository designated by the Department of the Air Force (SAFMS).
7. The collection product of this effort will be made available by the Department of the Air Force (SAFMS) to the NSA for fulfillment of processing responsibilities, and to such other activities designated by NSA or specifically authorized by USIB.
8. No basic changes to existing collection programs scheduled through calendar year 1962 will be made. Augmentations to the collection effort will be in accordance with the procedures and responsibilities outlined herein.

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9. The Department of the Air Force (SAFMS) will consult with the National Security Agency, in a timely manner, concerning the anticipated product and format from each electronic collection effort to facilitate planning for the exploitation processing in accordance with the responsibilities assigned to the National Security Agency, and will provide technical assistance to facilitate accomplishment of the exploitation processing.

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TAB B

IMPLEMENTATION OF PROCESSING RESPONSIBILITIES

1. The National Security Agency processing responsibilities include all aspects of the research, development, planning, and operation of the processing effort for electronic signal collection products provided by the Department of the Air Force (SAFMS). These responsibilities encompass all aspects of the processing of collection product, including the distribution of end product information reports as authorized by USIB.

2. The National Security Agency will establish, organize, and supervise the electronic signal processing effort in accordance with the requirements and priorities established by the USIB and will exercise technical direction, program planning, security control, and supervision of the processing program.

3. The National Security Agency will take cognizance of all resources within the U.S. Government in accomplishment of its processing responsibilities. To achieve maximum effectiveness, the National Security Agency will be responsible for specifying those U.S. resources to be applied to the processing of space vehicle collection products. In accomplishing its responsibility, the Director, National Security Agency may utilize the services of a technical advisory group.

4. No basic changes to presently existing approved processing programs scheduled through calendar year 1962 will be made. Additions or augmentations to the processing effort will be in accordance with the procedures and responsibilities outlined herein.

5. The National Security Agency will place the end product information reports of the processing effort under a security control system to safeguard the source of the material. Such a system will be subject to USIB approval.

6. The National Security Agency will provide specified technical or other feedback as required by the Department of the Air Force (SAFMS).

7. In the exercise of the responsibility for processing the collection product, the National Security Agency shall assign tasks to appropriate organizations of the United States Government. An organization within the Department of Defense may not refuse to apply available resources for the accomplishment of a particular task on the basis that it will require the diversion of such resources from the accomplishment of other missions, unless such refusal is approved by the Secretary of the Military Department or the Commander of the Unified or Specified Command concerned. Assignment of tasks to organizations outside the Department of Defense will be subject to the approval of the head of the particular organization concerned.

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8. In those cases where NSA delegates processing responsibility, the NSA will:

a. Provide appropriate planning support, and will furnish required operational and technical instructions.

b. Assure that specified feedback as required by the Department of the Air Force (SAFMS) is provided.

c. Arrange for each processing element to provide results to NSA, in one of two forms, either (1) as data to be integrated with other information into NSA distributed reports, or (2) as a finished report to be provided to all authorized customers. In either case, distribution will be made as authorized by USIB. The reports of type (2) above will be distributed in an NSA reporting series but will contain a designator showing the organization of origin.

d. As authorized by USIB, provide appropriate processing units with instructions for "sanitization" in order that information produced can be provided under appropriate classification to all intelligence users, including the unified and specified commands and their operating elements.

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MEMORANDUM OF AGREEMENT CONCERNING  
NSA PARTICIPATION IN THE  
~~(S)~~ NATIONAL RECONNAISSANCE OFFICE

1. In the course of discussions between Dr. Charyk, Dr. Scoville, Admiral Frost and Dr. Tordella on 25 May 1962, it was made known that the ~~(S)~~ National Reconnaissance Office in its SIGINT program will respond only to requirements levied by the United States Intelligence Board. Further, that the NRO will request the USIB to determine which subordinate committee on the Board (COMOR or SIGINT Committee) will be responsible for applicable SIGINT requirements.

2. During these discussions, it was agreed that:

a. NSA will provide advice and consultation to the NRO on how best to meet requirements which are levied by the Board.

b. NSA will nominate one of its personnel to become a full-time member of the NRO.

c. After discussion with the NSA the NRO may assign primary responsibility for development of certain aspects of the SIGINT collection program to NSA.

d. NSA will be responsible for advising the NRO on desired format of the SIGINT material to be collected. NSA will also be responsible for accomplishing or supervising analysis and reporting of collected SIGINT materials.

e. Security safeguards required for the handling of NRO collected SIGINT materials can be provided as described in memorandum from Director, NRO, to Chairman USIB; dated 31 May 1962; Subject: Security Handling of SIGINT Collected by Reconnaissance Satellites.

/s/

LOUIS W. TORDELLA  
Acting Director

Concur. /s/ Herbert Scoville, Jr.

Concur. /s/ Joseph V. Charyk

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AGREEMENT FOR REORGANIZATION OF THE  
NATIONAL RECONNAISSANCE PROGRAM

A. The National Reconnaissance Program

1. The NRP is a single program, national in character, to meet the intelligence needs of the Government under a strong national leadership, for the development, management, control and operation of all projects, both current and long range for the collection of intelligence and of mapping and geodetic information obtained through overflights (excluding peripheral reconnaissance operations). The potentialities of U.S. technology and all operational resources and facilities must be aggressively and imaginatively exploited to develop and operate systems for the collection of intelligence which are fully responsive to the Government's intelligence needs and objectives.

2. The National Reconnaissance Program shall be responsive directly and solely to the intelligence collection requirements and priorities established by the United States Intelligence Board. Targeting requirements and priorities and desired frequency of coverage of both satellite and manned aircraft missions over denied areas shall continue to be the responsibility of USIB, subject to the operational approval of the 303 Committee.

B. The Secretary of Defense will:

1. Establish the NRO as a separate agency of the DoD and will have the ultimate responsibility for the management and operation of the NRO and the NRP;

2. Choose a Director of the NRO who will report to him and be responsive to his instructions;

3. Concur in the choice of the Deputy Director of the NRO who will report to the DNRO and be responsive to his instructions;

4. Review and have the final power to approve the NRP budget;

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5. Sit with members of the Executive Committee, when necessary, to reach decisions on issues on which committee agreement could not be reached.

C. The Director of Central Intelligence will:

1. Establish the collection priorities and requirements for the targeting of NRP operations and the establishment of their frequency of coverage;

2. Review the results obtained by the NRP and recommend, if appropriate, steps for improving such results;

3. Sit as a member of the Executive Committee;

4. Review and approve the NRP budget each year;

5. Provide security policy guidance to maintain a uniform system in the whole NRP area.

D. National Reconnaissance Program Executive Committee

1. An NRP Executive Committee, consisting of the Deputy Secretary of Defense, the Director of Central Intelligence, and the Special Assistant to the President for Science and Technology, is hereby established to guide and participate in the formulation of the NRP through the DNRO. (The DNRO will sit with the Executive Committee but will not be a voting member.) If the Executive Committee can not agree on an issue the Secretary of Defense will be requested to sit with the Committee in discussing this issue and will arrive at a decision. The NRP Executive Committee will:

a. Recommend to the Secretary of Defense an appropriate level of effort for the NRP in response to reconnaissance requirements provided by USIB and in the light of technical capabilities and fiscal limitations.

b. Approve or modify the consolidated National Reconnaissance Program and its budget.

c. Approve the allocation of responsibility and the corresponding funds for research and exploratory development for new systems. Funds shall be adequate to ensure that a vigorous research and exploratory development effort is achieved and maintained by the Department of Defense and CIA to design and construct new sensors to meet intelligence requirements aimed at the acquisition of intelligence data. This effort shall be carried out by both CIA and DoD.

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d. Approve the allocation of development responsibilities and the corresponding funds for specific reconnaissance programs with a view to ensuring that the development, testing and production of new system is accomplished with maximum efficiency by the component of the Government best equipped with facilities, experience and technical competence to undertake the assignment. It will also establish guidelines for collaboration between departments and for mutual support where appropriate. Assignment of responsibility for engineering development of sensor subsystems will be made to either the CIA or DoD components in accordance with the above criteria. The engineering development of all other subsystems, including spacecraft, reentry vehicles, boosters and booster interface subsystems shall in general be assigned to an Air Force component, recognizing, however, that sensors, spacecraft and reentry vehicles are integral components of a system, the development of which must proceed on a fully coordinated basis, with a view to ensuring optimum system development in support of intelligence requirements for overhead reconnaissance. To optimize the primary objective of systems development, design requirement of the sensors will be given priority in their integration within the spacecraft and reentry vehicles.

e. Assign operational responsibility for various types of manned overflight missions to CIA or DoD subject to the concurrence of the 303 Committee.

f. Periodically review the essential features of the major program elements of the NRP.

2. The Executive Committee shall meet on the call of either the Deputy Secretary of Defense or the Director of Central Intelligence. All meetings will be attended by the DNRO and such staff advisors as the Deputy Secretary of Defense or the Director of Central Intelligence consider desirable.

E. National Reconnaissance Office

1. To implement the NRP, the Secretary of Defense will establish the NRO as a separate operating agency of the DoD. It shall include the SOC which shall be jointly manned.

2. The Director of the NRO shall be appointed by the Secretary of Defense. The Director NRO will:

a. Subject to direction and control of the Secretary of Defense and the guidance of the Executive Committee as set forth in Section D above, have the responsibility for managing the NRO and executing the NRP.

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b. Subject to review by the Executive Committee, and the provisions of Section D above, have authority to initiate, approve, modify, redirect or terminate all research and development programs in the NRP. Ensure, through appropriate recommendations to the Executive Committee for the assignment of research and development responsibilities and the allocation of funds, that the full potentialities of agencies of the Government concerned with reconnaissance are realized for the invention, improvement and development of reconnaissance systems to meet USIB requirements.

c. Have authority to require that he be kept fully and completely informed by all Agencies and Departments of the Government of all programs and activities undertaken as part of the NRP.

d. Maintain and provide to the members of the Executive Committee records of the status of all projects, programs and activities of the NRP in the research, development, production and/or operational phases.

e. Prepare a comprehensive budget for all aspects of the National Reconnaissance Program.

f. Establish a fiscal control and accounting procedure to ensure that all funds expended in support of the National Reconnaissance Program are fully accounted for and appropriately utilized by the agencies concerned. In particular, the budget shall show separately those funds to be applied to research and exploratory design development, systems development, procurement, and operational activities. Funds expended or obligated under the authority of the Director of Central Intelligence under Public Law 110 shall be administered and accounted for by CIA and will be reported to DNRO in accordance with agreed upon procedures.

g. Sit with the USIB for the matters affecting the NRP.

3. The Deputy Director NRO shall be appointed by the DCI with the concurrence of the Deputy Secretary of Defense and shall serve full time in a line position directly under the Director NRO. The Deputy Director shall act for and exercise the powers of the Director, NRO during his absence or disability.

4. The NRO shall be jointly staffed in such a fashion as to reflect the best talent appropriately available from the CIA, the three military departments and other Government agencies. The NRO staff will report to the DNRO and DDNRO and will maintain no allegiance to the originating agency or Department.

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F. Initial Allocation of Program Responsibilities

1. Responsibility for existing programs of the NRP shall be allocated as indicated in Annex A attached hereto.

(signed) Cyrus Vance  
Deputy Secretary of Defense

(signed) W. F. Raborn  
Director of Central Intelligence

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ANNEX A

The following assignments for the development of new optical sensor subsystems are made to take full advantage of technical capability and experience of the agencies involved.

1. The CIA will develop the improvements in the CORONA general search optical sensor subsystems.
2. Following the selection of a concept, and a contractor, for full-scale development, in the area of advanced general search, the CIA will develop the optical sensor subsystem for that system.
3. The Air Force (SAFSP) will develop the G-3 optical sensor subsystem for the advanced high-resolution pointing system.
4. SAFSP will develop the optical sensor subsystems (manned and unmanned) for the MOL program.

The Director, NRO will, in managing the corresponding overall systems developments, ensure that:

1. The management of an contracting for the sensors is arranged so that the design and engineering capabilities in the various contractors are most efficiently utilized.
2. The sensor packages and other subsystems are integrated in an overall system engineering design for each system, with DNRO having responsibility for systems integration of each overall system.

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DEPARTMENT OF THE NAVY  
OFFICE OF THE CHIEF OF NAVAL OPERATIONS  
WASHINGTON 25, D.C.

From: Director of Naval Intelligence  
To : Director, National Reconnaissance Office(s)  
Subj: System POPPY, reassignment of responsibilities for (TS)  
Ref: (a) Missions operations Directive **EO 13526** (BYE-4337-62) of 6 Nov 62  
(b) Your memo subj: "Organization and Functions of NRO (S)" of  
23 July 62  
(c) DNI ltr subj: "Project POPPY; assignment of responsibilities  
for (TS)" of 10 September 62

1. The responsibilities delineated by reference (a) necessitate a realignment of the organizational information requested by reference (b) and supplied by reference (c). Accordingly, reference (c) is hereby cancelled and superseded.

2. System POPPY of Project **EO 13526** is currently the only NRP assignment within Program C.

3. One formal agreement has been made between the Director of Naval Intelligence and the Director, National Security Agency regarding interrogation of POPPY satellites. This agreement authorizes the NSA to direct POPPY satellite interrogation and collection when "quick-reaction", resulting from short tip-off of Soviet space or missile activity, is required. Although this is the only formal agreement entered into an additional informal understanding has been made with the National Security Agency. This understanding permits the allocation of U.S. Army, U.S. Air Force and U.S. Navy cryptologic personnel to man and operate Navy furnished electronic equipment at regularly established collection stations along the periphery of the **EO 13526** Soviet Bloc. **EO 13526 3.3(b)(1)>25Yrs**

**EO 13526 3.3(b)(1)>25Yrs**

**EO 13526 3.3(b)(1)>25Yrs**

**EO 13526 3.3(b)(1)>25Yrs** in accordance with these understandings the respective services/agency man the equipment with their regularly assigned personnel when the POPPY satellites are transmitting and when the stations are tape recorded and couriered to the NSA for analysis. Operations resulting from these informal understandings have proven entirely satisfactory.

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4. The specific responsibilities of the organization/individuals associated with the project are as follows:

a. The Program Director's Staff (Technical Operations Group):

(1) This group of specialists provides the Program Director, through the Project Director, the necessary technical information and guidance. This includes advising the Director of Intelligence requirements, satellite instrumentation, missile rocketry, orbital requirements, field station operations, and signal processing. In addition, this group insures that overt research and development programs, approved by the Director, Program C, are conducted in a proper manner to support System POPPY.

(2) Designated members of the Program Director's Staff (TOG) shall meet with the Deputy Director for Operations, NRO, as required, to prepare routine tasking schedules for the operational control of the POPPY satellite after it has achieved orbit. Activation of the satellite and appropriate collection facilities will be accomplished by this staff as directed by the Satellite Operations Center (SOC), NRO. The non-routine interrogation required in the event of indications requiring quick reaction will be accomplished as set forth in paragraph 3 above.

(3) The Staff will report, as occurring, any significant changes in the technical capability of the satellites to the Director, Program C.

b. The Director of Naval Intelligence is responsible for:

(1) Providing the Project Director

(a) The Project Director's responsibilities are to supervise and administer all aspects of the project subject to the approval of the Program Director.

(2) Providing the Product Control Representative

(a) The Product Control Representative is normally attached to the Scientific and Technical Intelligence Center of ONI and is responsible for informing the Project Director of intelligence requirements. Additionally, he is responsible for disseminating quality control technical data to the field stations, for monitoring the signal analysis program, and for supervision of in-house signal analysis support where required.

c. The Director, Naval Research Laboratory is responsible for:

(1) Providing the Project Technical Representative.

(a) The Project Technical Representative is responsible for establishing such liaison with the Naval Research Laboratory as will provide the following:

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1. Overall Instrumentation concepts, including the satellite.

2. Provision of all equipments required for collection and interrogation, including but not limited to, the shipment and supply of technical expendables and spare parts to the field stations.

3. Coordination of vehicle and mission payload integration, and the preparation including the monitoring of the launch thereof.

4. The training of all personnel involved in collection and interrogation.

5. Operational control of the satellite prior to its launch.

d. The Director, Naval Security Group is responsible for:

(1) Providing the Project Operational Representative whose responsibilities are:

(a) The direction and coordination of field station operations. These responsibilities include insuing project planning and operational-directives to the field stations and keeping each of these stations advised of the tasking requirements necessary to perform the project mission.

(2) Acting as the focal point for all electrical communications associated with the project. This includes all operational, technical and logistical traffic.

(3) Providing operating personnel at the Navy collection sites.

e. The Director, National Security Agency is responsible for:

(1) Providing a representative who shall act as an advisor to the Project Director's staff.

(2) Processing all collected data and developing an ELINT product therefrom.

(3) Disseminating, through specified security channels, any intelligence information derived from the data as initially agreed upon by the Project Director and Director, National Security Agency.

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(4) Interpreting National Intelligence Requirements into technical ELINT requirements and making recommendations to the staff for operational tasking of the satellite.

(5) Providing magnetic tapes to field collection sites on a continuing basis.

f. The Chief, Bureau of Naval Weapons is responsible for:

(1) Providing the Project Fiscal Representative whose responsibilities are:

(a) Budget preparation and submission. He is responsible for the disbursement of project funds to the U.S. Naval Research Laboratory and, further, for the submission of expenditure statements to the Program Director.

g. The Air Force Security Service is responsible for:

(1) Providing sites and the support facilities at these sites for a collection hut. This includes physical security and utilities.

(2) Providing operating personnel at the Air Force collection sites.

(3) Providing one qualified individual who may act with authority and may coordinate Air Force operations in coordination with the Project Director.

h. The Army Security Service is responsible for:

(1) Providing sites and the support facilities at these sites for a collection hut. This includes physical security and utilities.

(2) Providing operating personnel at the Army collection sites.

(3) Providing one qualified individual who may act with authority and may coordinate Army operations in coordination with the Project Director.

EO 13526 3.3(b)(1)>25Yrs

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NRO/NSA/CIA/USN  
MANAGEMENT AGREEMENT FOR THE POPPY SYSTEM

I. PURPOSE:

The purpose of this agreement is to define the organizational responsibilities and the lines of authority associated with the management of the POPPY System Project.

II. BACKGROUND:

The Navy Space Project (PM-16) was established by the Chief of Naval Operations under the Chief of Naval Material. The Manager, Navy Space Project, is also the Director of NRO, Program C. As the Director, Program C, he is supported by elements of the National Security Agency, the Central Intelligence Agency, and the United States Navy in fulfilling his responsibilities under the National Reconnaissance Program.

III. RESPONSIBILITIES:

The Director, Program C, is responsible to the Director, National Reconnaissance Office, for the overall management of the POPPY Project. The Director, National Security Agency, is responsible for the processing, analysis, and reporting of POPPY collected data. EO 13526 3.3(b)(1)>25Yrs

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EO 13526 3.3(b)(1)>25Yrs

The Director, Naval Research Laboratory, is responsible to the Director, Program C, for the engineering and technical support in the design, development, fabrication, test, and on-orbit operation of the system. The Commander, Naval Security Group Command, while functioning in support of the NRO, exercises for the Director, Program C, in flight operational control of the

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POPPY system, executing the tasking directions of the NRO and processing priorities of NSA.

/S/  
John L. McLucas  
Director  
National Reconnaissance Office  
  
5 November 1971

/S/  
Noel Gayler  
Vice Admiral, USN  
Director  
National Security Agency  
27 October 1971

/S/  
Carl E. Duckett  
Deputy Director for  
Science and Technology  
16 July 1971

/S/  
Robert A. Frosch  
Assistant Secretary of the Navy  
(Research and Development)  
25 June 1971

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SPECIFIC RESPONSIBILITIES IN SUPPORT OF THE POPPY SYSTEM

1. The Director, Program C, is responsible to the Director of the National Reconnaissance Office (DNRO) for overall management of the POPPY Project. Included in his responsibilities are the following:

- a. Establishes the policy for the management of the POPPY Project.
- b. Coordinates all aspects of the project to ensure optimum effective employment of the system.
- c. Develops requirements for POPPY mission concepts, personnel, ground support equipment, facilities, etc., and submits proposals to the DNRO for approval.
- d. Prepares a coordinated plan for the design, development, construction, and implementation of approved concepts.
- e. Coordinates, prepares, and submits the POPPY budget.
- f. Allocates NRO funds as required for the design, development, and support of the project in accordance with DNRO Program and fund approvals.
- g. Monitors the technical development, test, production, quality assurance, maintenance, training, and other logistic support matters to meet system objectives.
- h. Provides guidance to COMNAVSECGRU for his responsibilities in the execution of POPPY operations.
- i. Keeps the DNRO advised of the status, trends, accomplishments, problems, and any other important aspects of the project.
- j. Furnishes requirements information and basic planning data to elements of the POPPY Project.
- k. Performs continuous evaluation of progress against plans, cost against funds available, and capability against design objectives. Initiates corrective actions whenever necessary.
- l. Ensures efficient utilization of manpower, materials, and funds pertaining to the project.
- m. Provides guidance and review of security controls within the POPPY Project.

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2. The Director, Naval Research Laboratory, is responsible to the Director, Program C, for the engineering and technical support in the design, development, fabrication, test, and on-orbit operation of the POPPY system. His responsibilities include the following:

- a. Prepares mission concepts for submission to the Director, Program C.
- b. Initiates system engineering design to support approved concepts in the space and ground systems.
- c. Designs, develops, and fabricates satellite vehicles and provides on-board equipment required to implement approved concepts.
- d. Provides ground support equipment and repair parts required in the collection and interrogation functions of POPPY ground sites, ensuring appropriate interface between collection and processing functions.
- e. Assures complete engineering coordination between spacecraft and launch vehicle.
- f. Provides pre-launch technical coordination and monitoring of the POPPY launch.
- g. Monitors satellite telemetry to assess on-orbit spacecraft systems and reports as required.
- h. Prepares funding data as required by the Director, Program C.

3. The Commander, Naval Security Group Command, while functioning in support of the NRO, exercises for the Director, Program C, in-flight operational control of the POPPY system, executing the tasking directions of the NRO and processing priorities of NSA. His responsibilities include the following:

- a. Exercises management authority over POPPY field stations.
- b. Develops, plans, programs, and coordinates as required for current and future requirements for equipment, materials, supplies, facilities, maintenance, and administrative support services (other than that directly involved in collection and processing functions), housing, barracks, and messing needed for the POPPY operational mission.
- c. Plans and programs for manpower requirements at POPPY field stations.

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d. Develops procedures for executing the tasking directives of the NRO Satellite Operations Center and initiates guidance to field stations in response to NSA policy on processing priorities and other matters concerning field processing functions.

e. Monitors the operations of POPPY field activities to ensure the maintenance of high standards of performance.

f. Coordinates with NRL and NSA regarding all collection and processing equipment for POPPY field stations and monitors all installation plans and schedules for its impact on station facilities and service requirements.

g. Provides for routine repair and upkeep of POPPY operations equipment and interfaces with NRL regarding non-routine maintenance and repair.

h. Plans and programs for communications facilities to support POPPY operations.

i. Provides for the physical security facilities and services required to maintain authorized SI, TK, and BYEMAN control centers at the POPPY field stations.

j. Develops and administers, in coordination with Chief of Naval Personnel, the requisite training programs for officer and enlisted personnel assigned to POPPY field stations. Administers the personnel security program for these personnel.

4. The Director, National Security Agency, has overall responsibility for the processing, analysis, and reporting of POPPY collected data. Included in his responsibilities are the following:

a. Provides SIGINT technical guidance and feedback to the POPPY Processing System to ensure its effectiveness in conjunction with other satellite and non-satellite SIGINT operations.

b. Plans the technical and fiscal management of the processing and analysis functions of the POPPY system to include the manpower resources of the POPPY field sites. As such, he determines processing equipment requirements at the sites and coordinates with NRO, NRL, and NSG in the procurement, installation, and operational use of the equipment.

c. Budgets for the procurement and repair parts for POPPY processing and analysis equipment.

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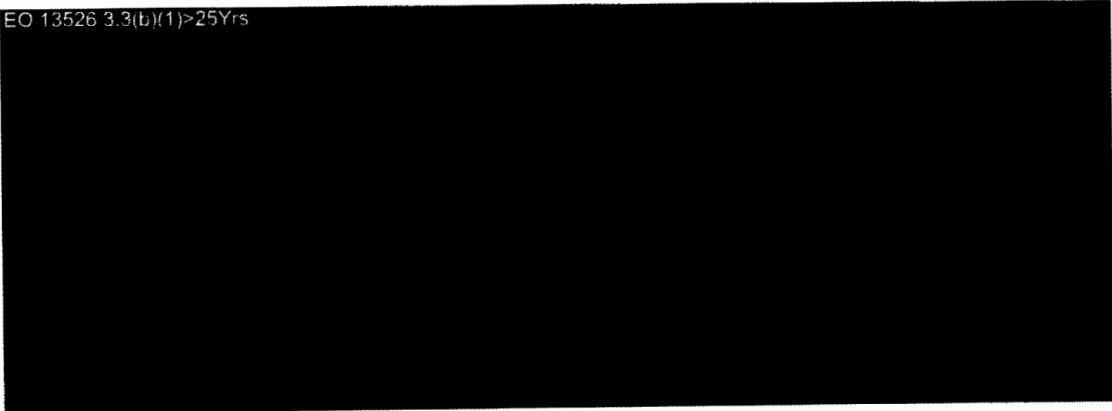


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d. Interfaces with the NRO; Director, Program C; NRL; and NSG in the development of future POPPY concepts as they relate to processing and analysis functions.

e. Processes, analyzes, and publishes data collected from the POPPY system.

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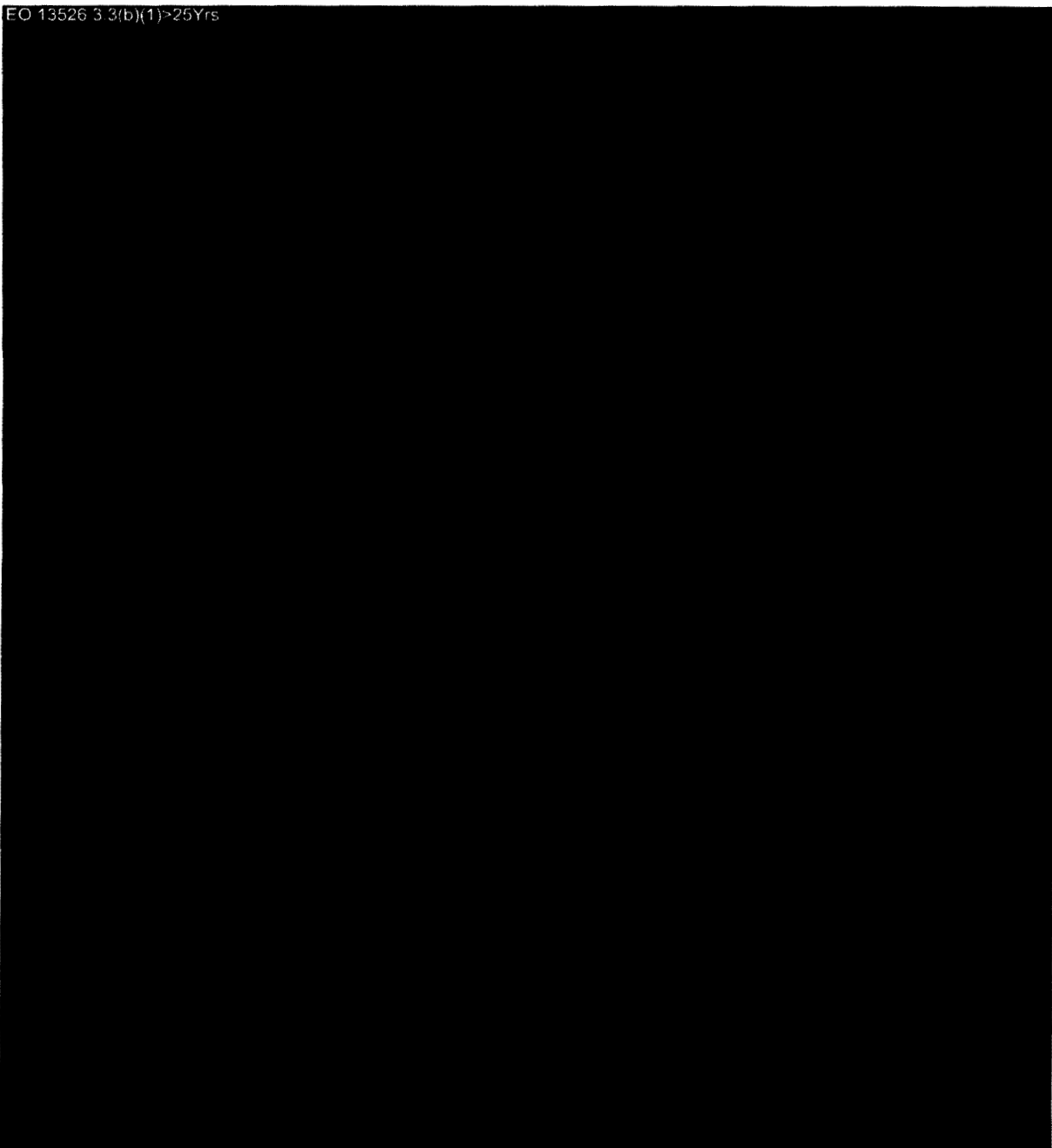
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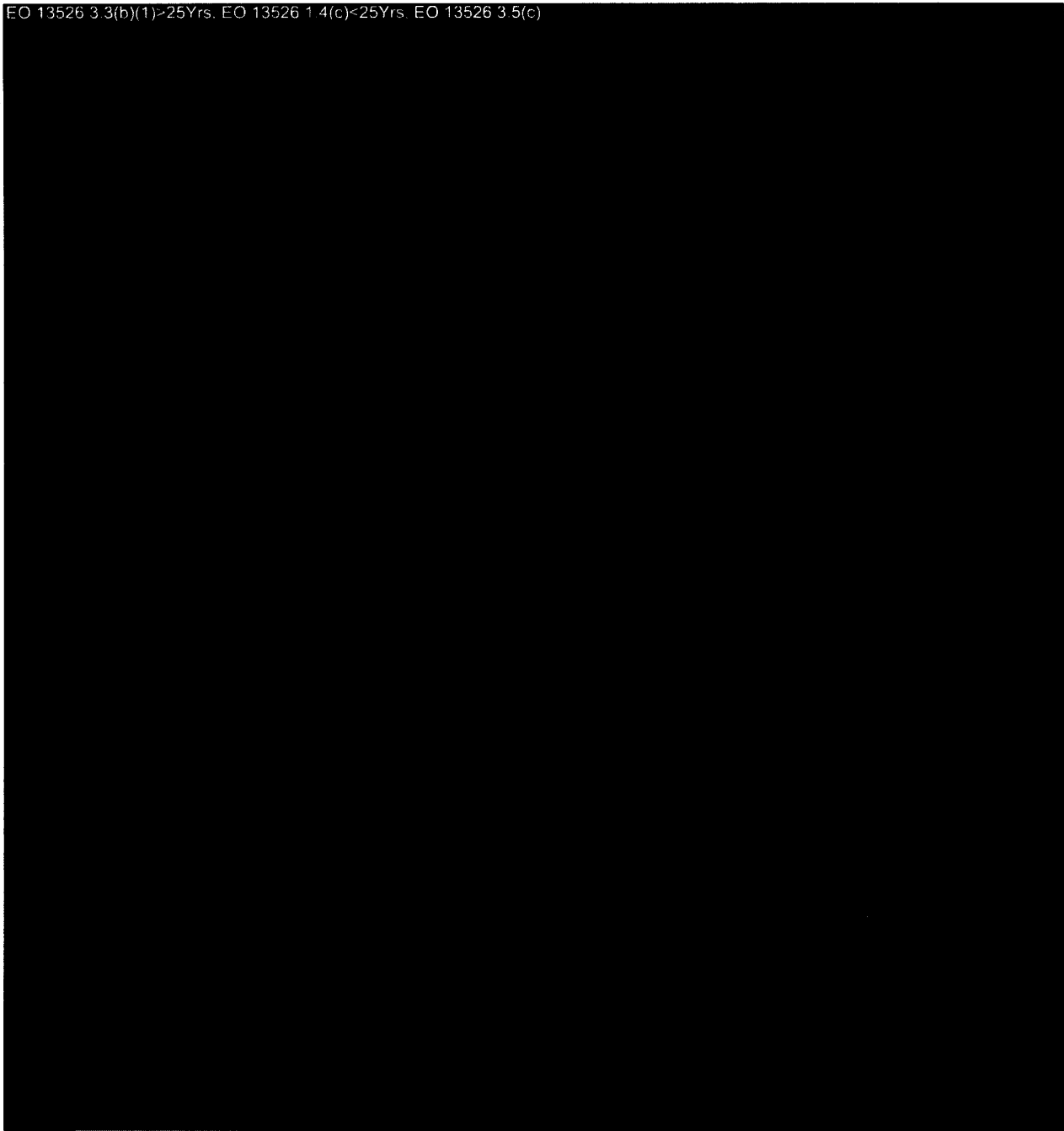
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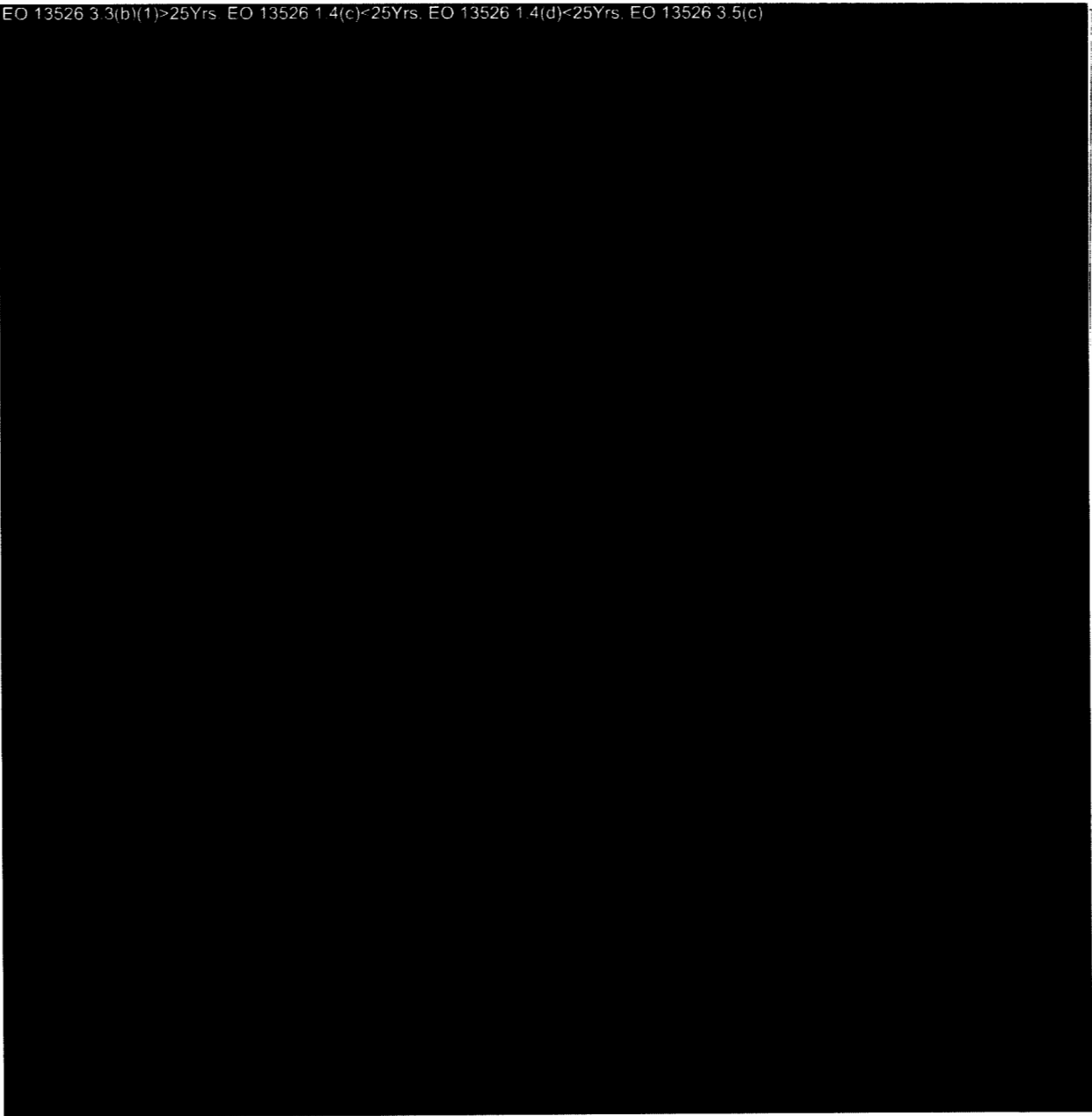
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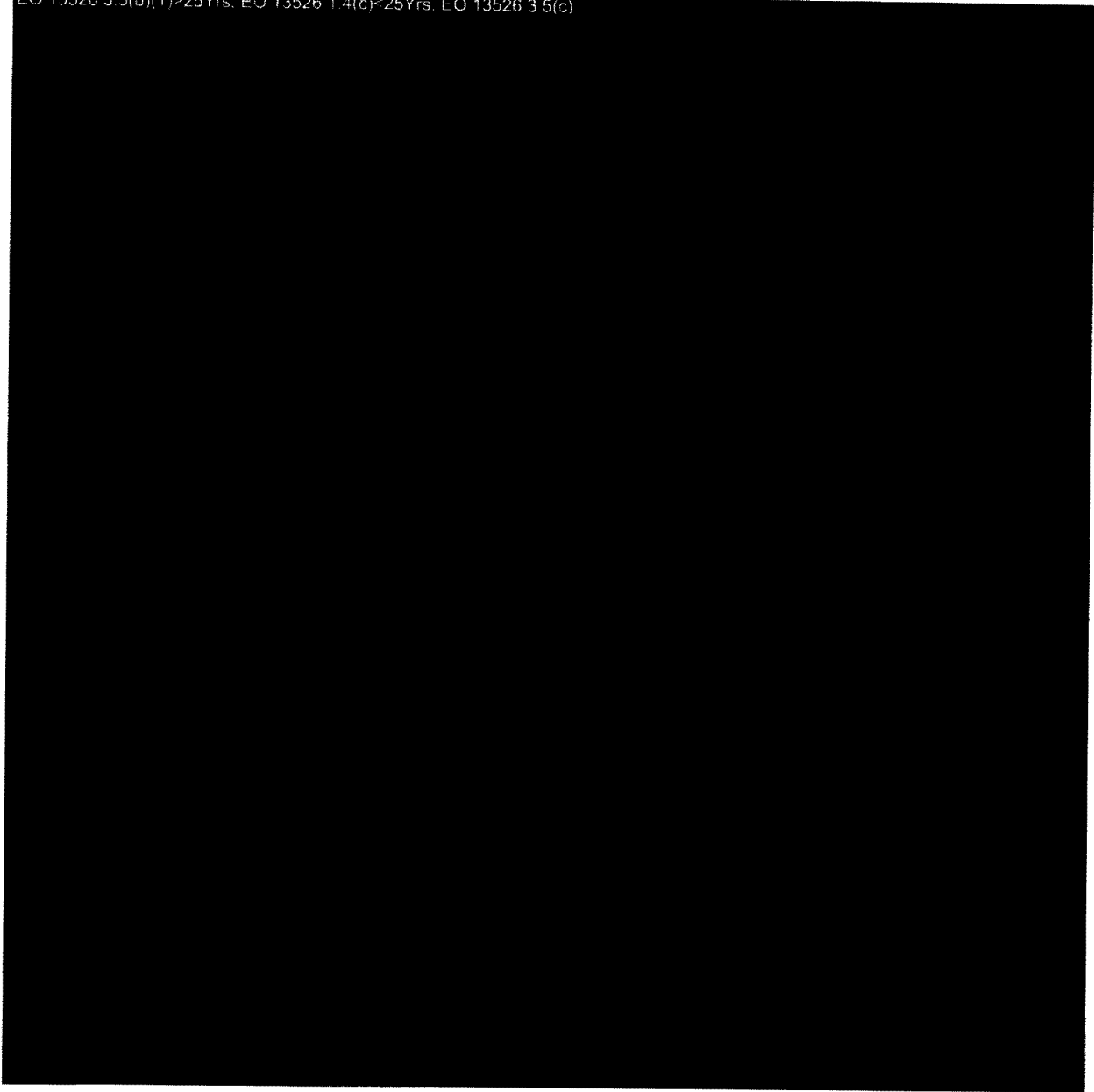
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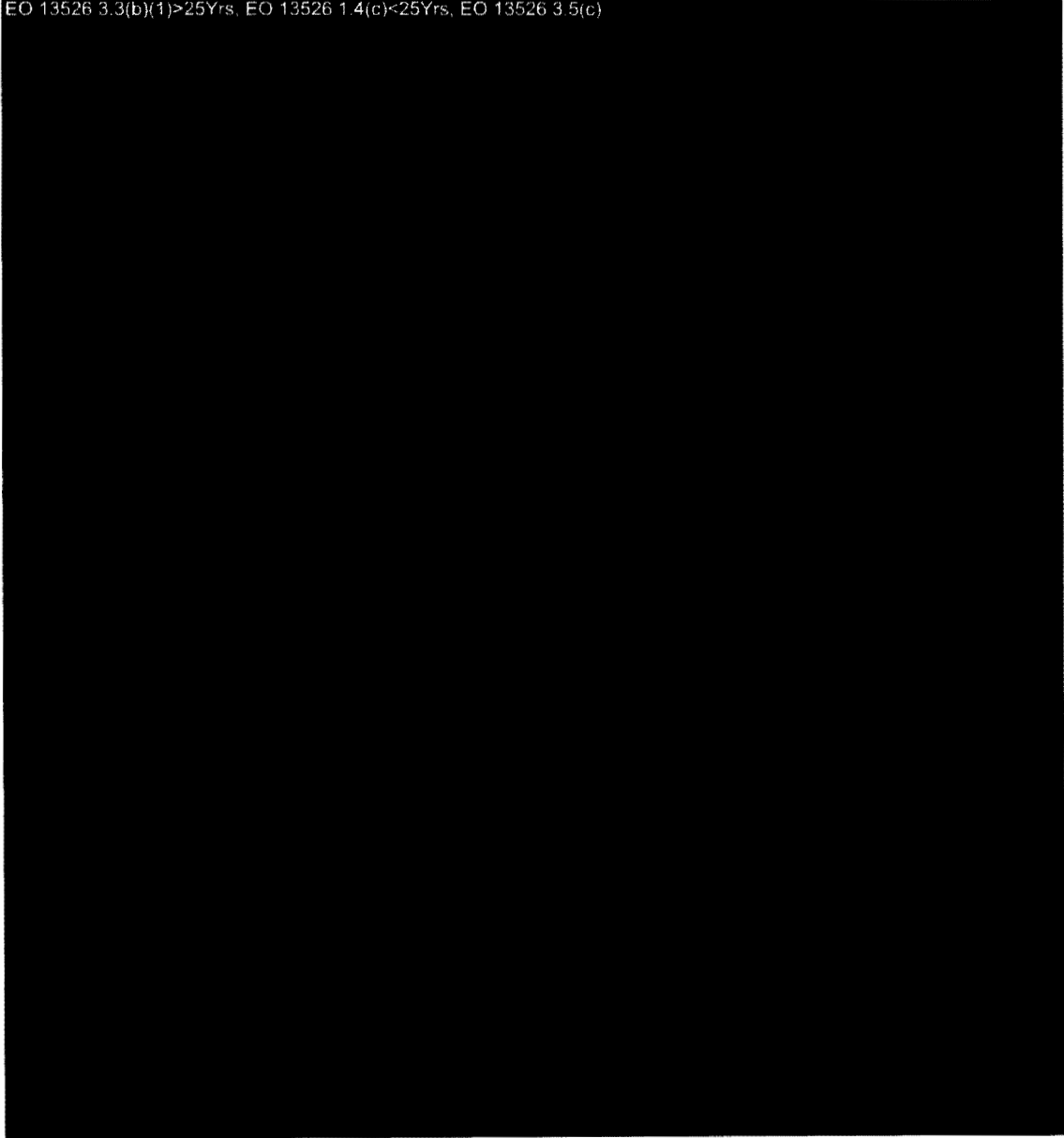
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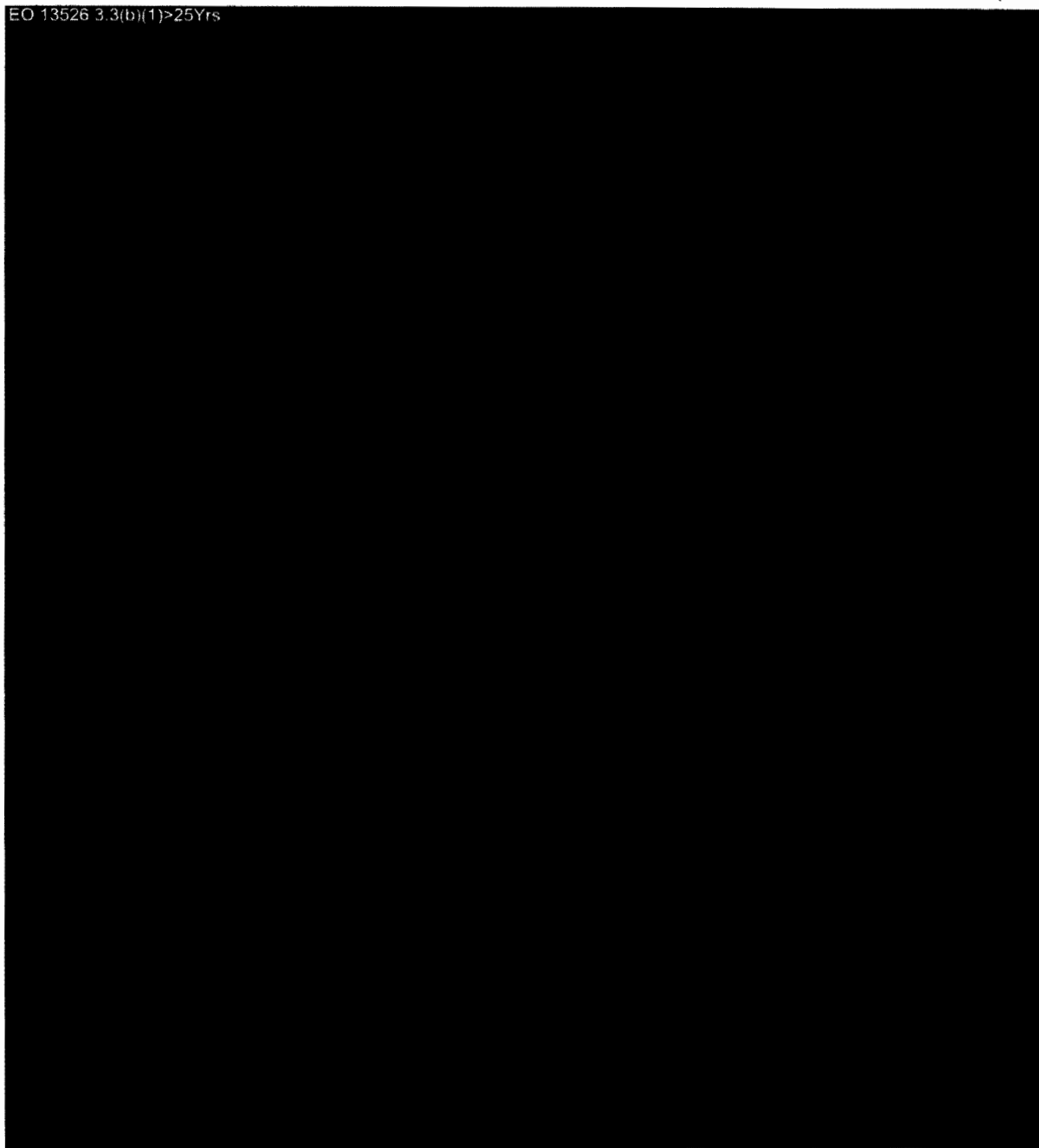
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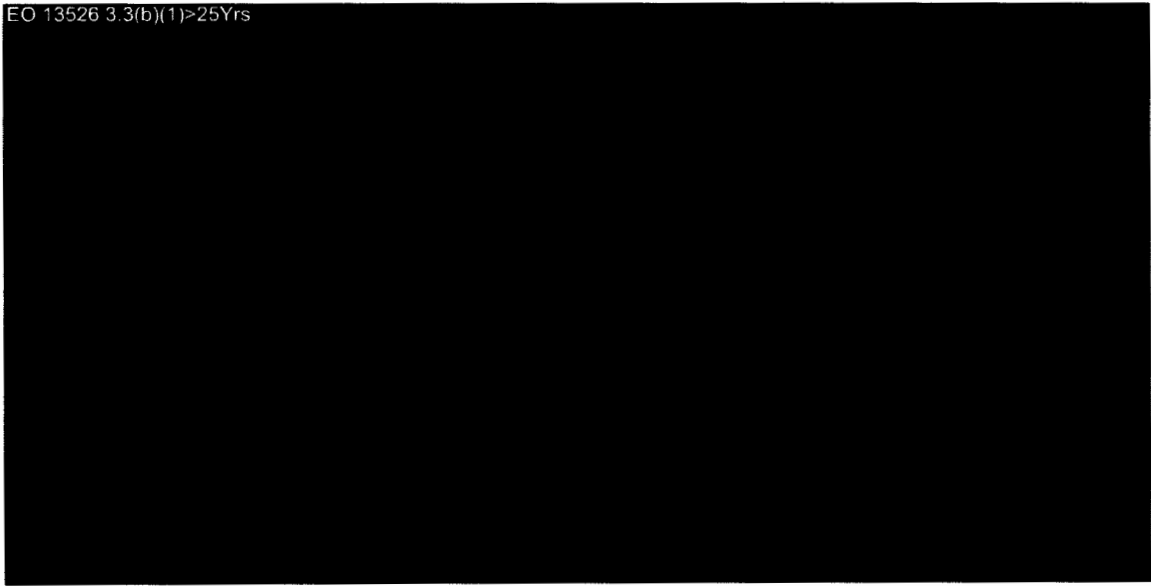
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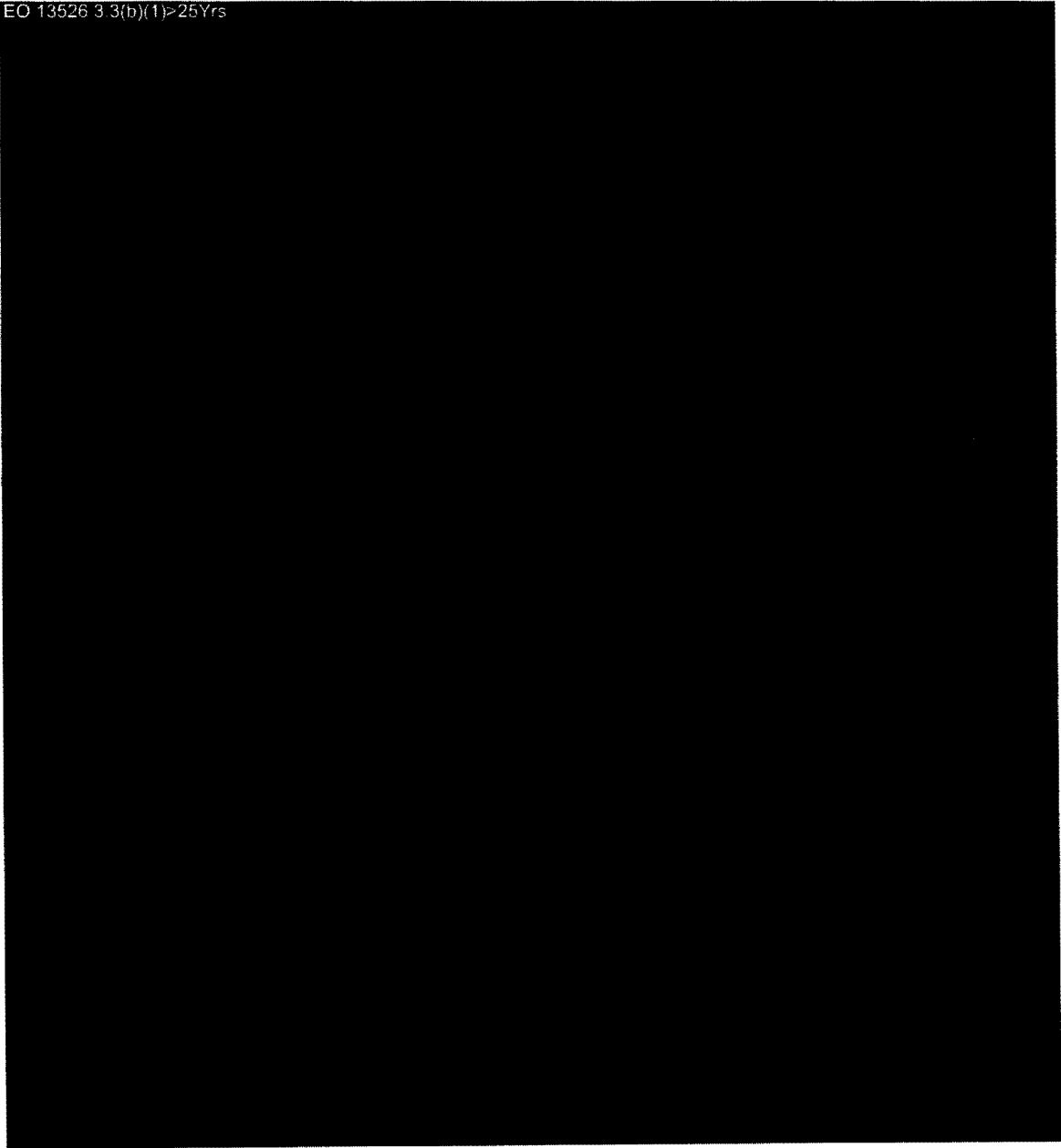
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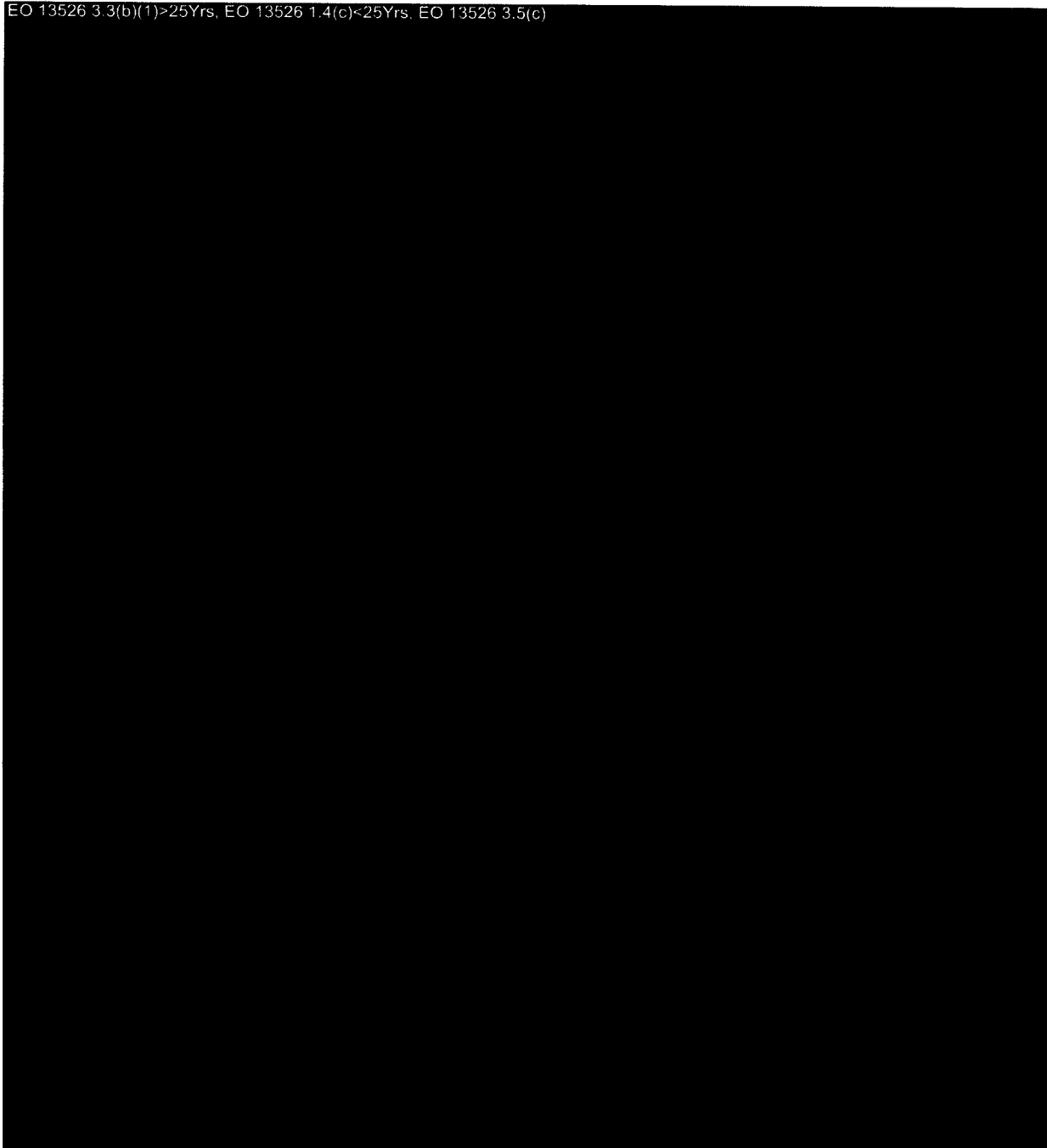
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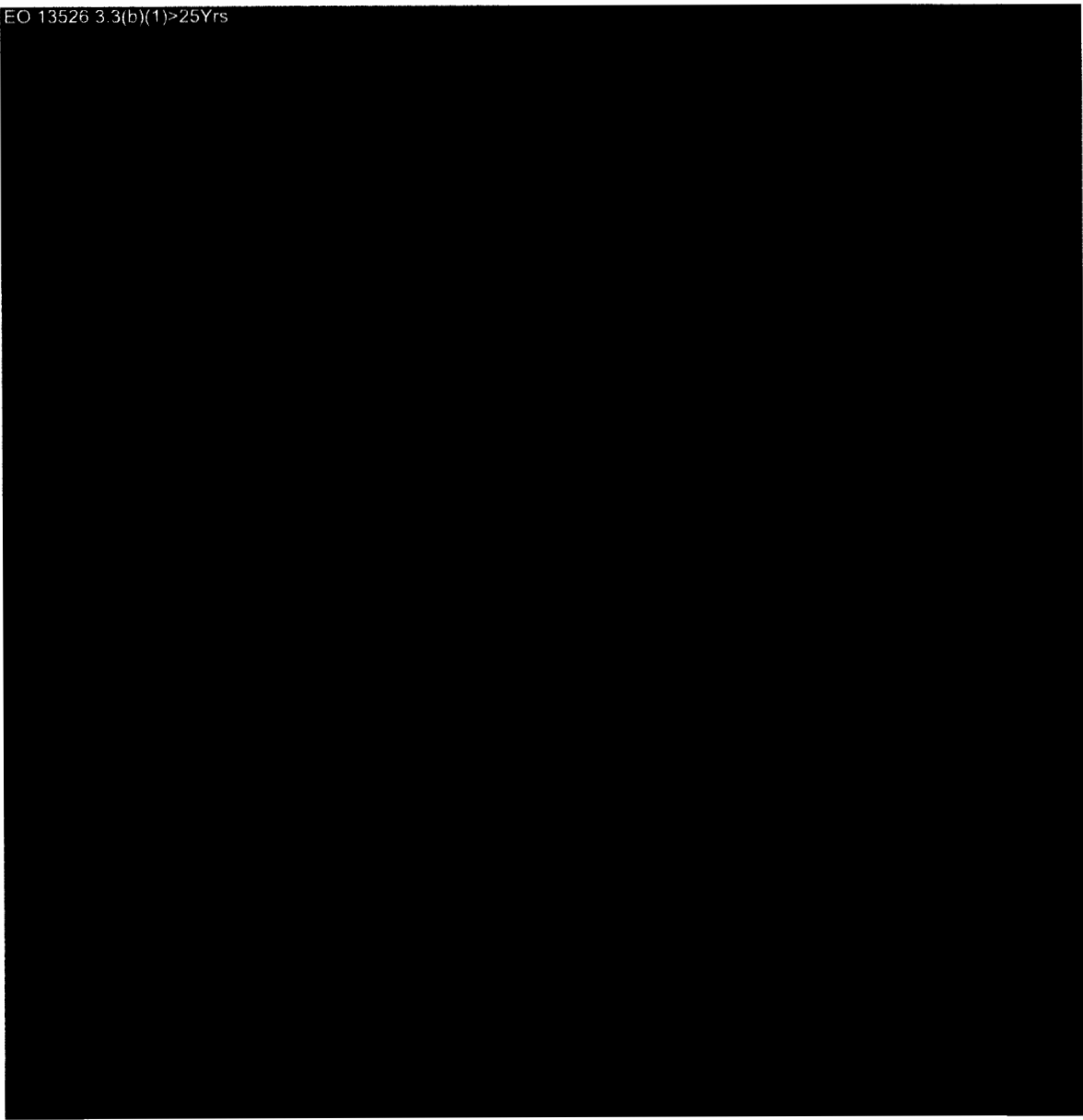
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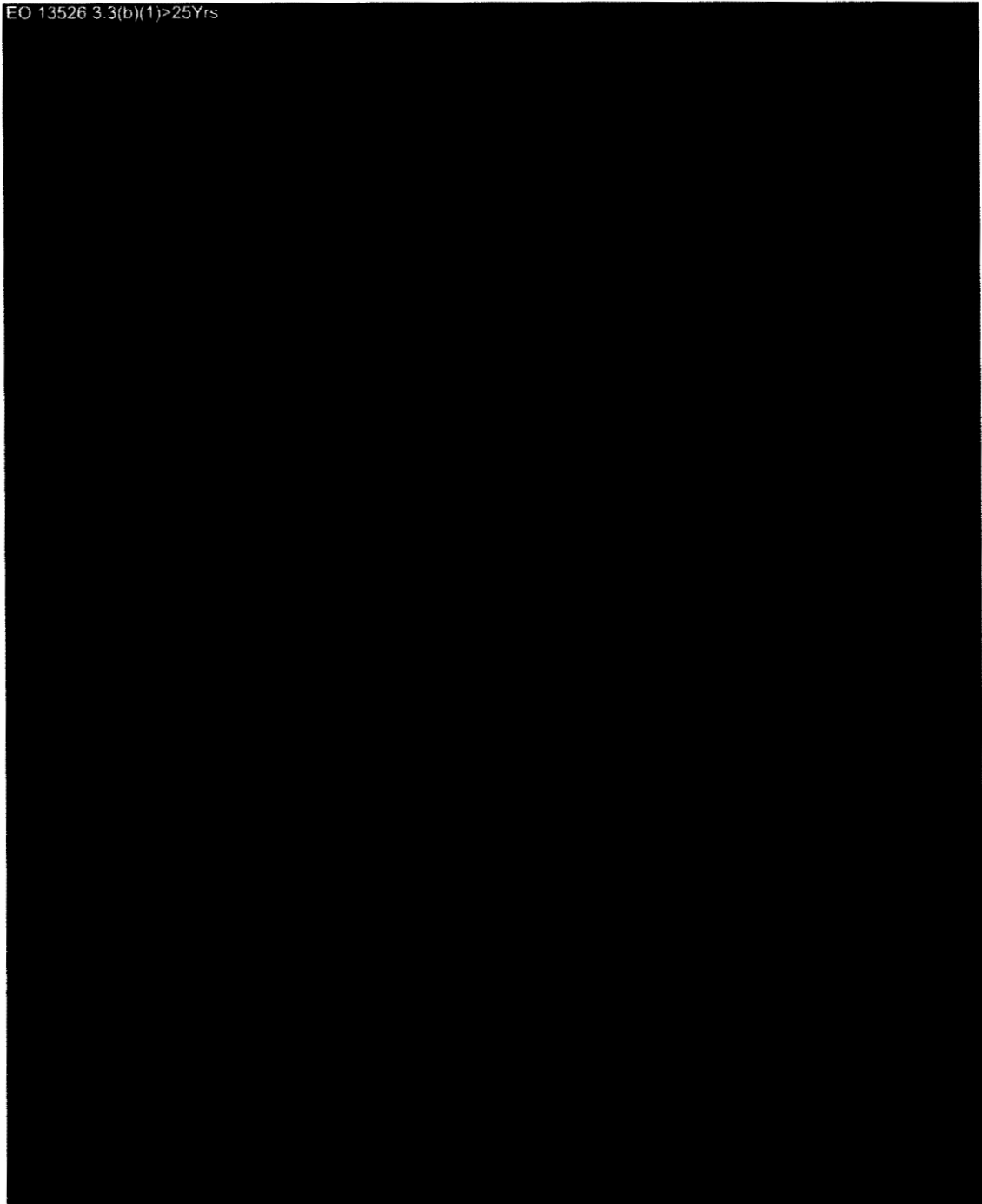
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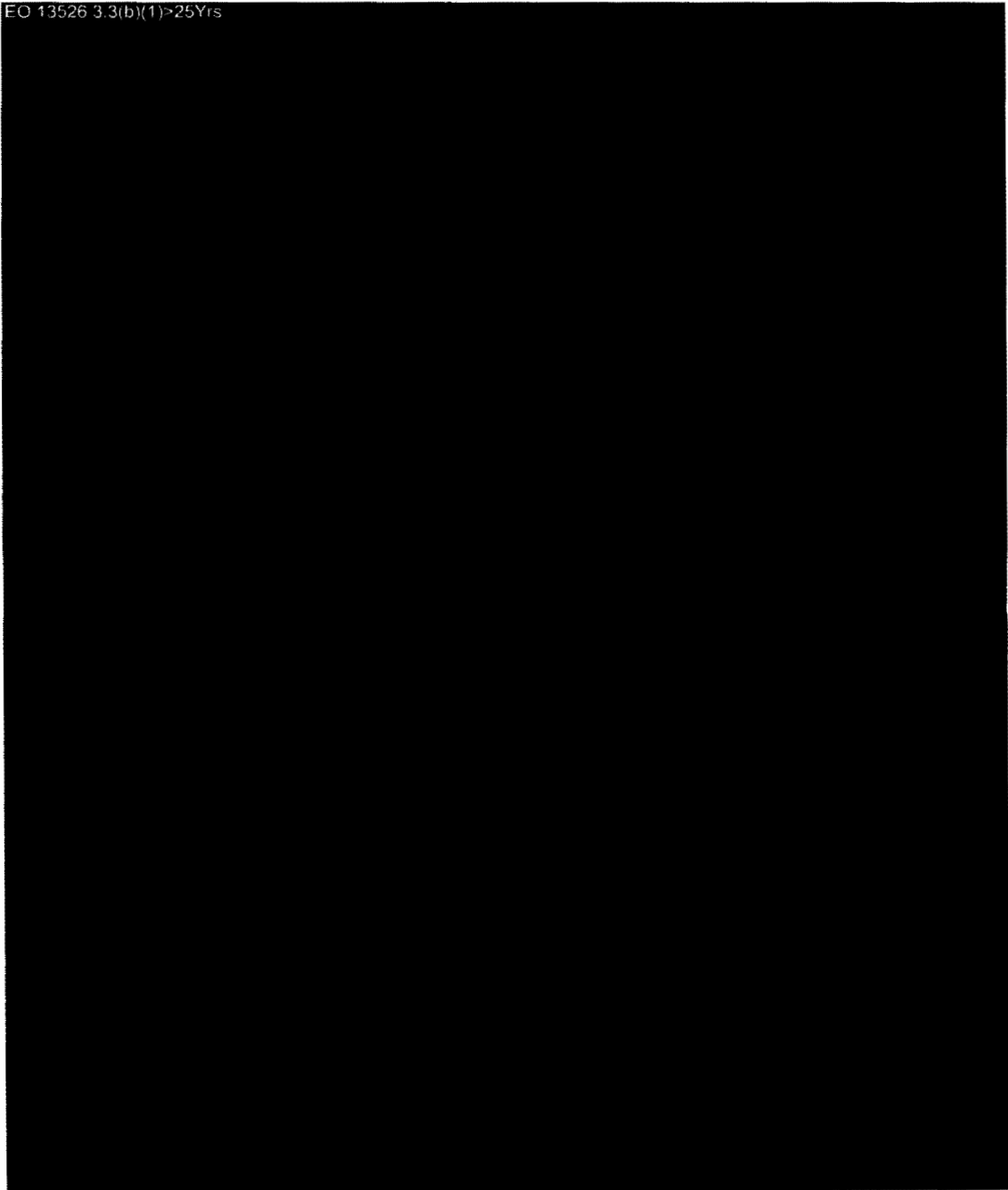
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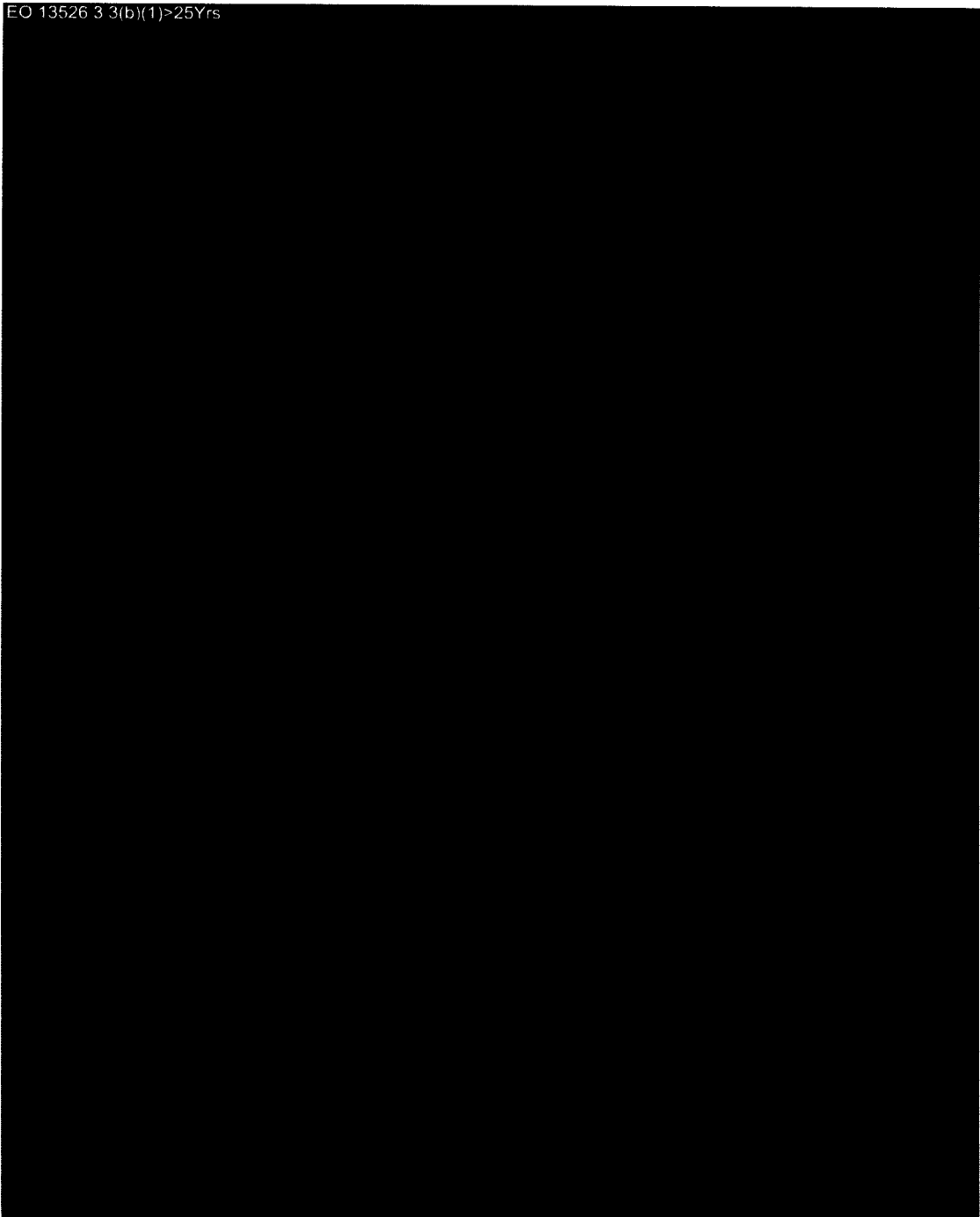
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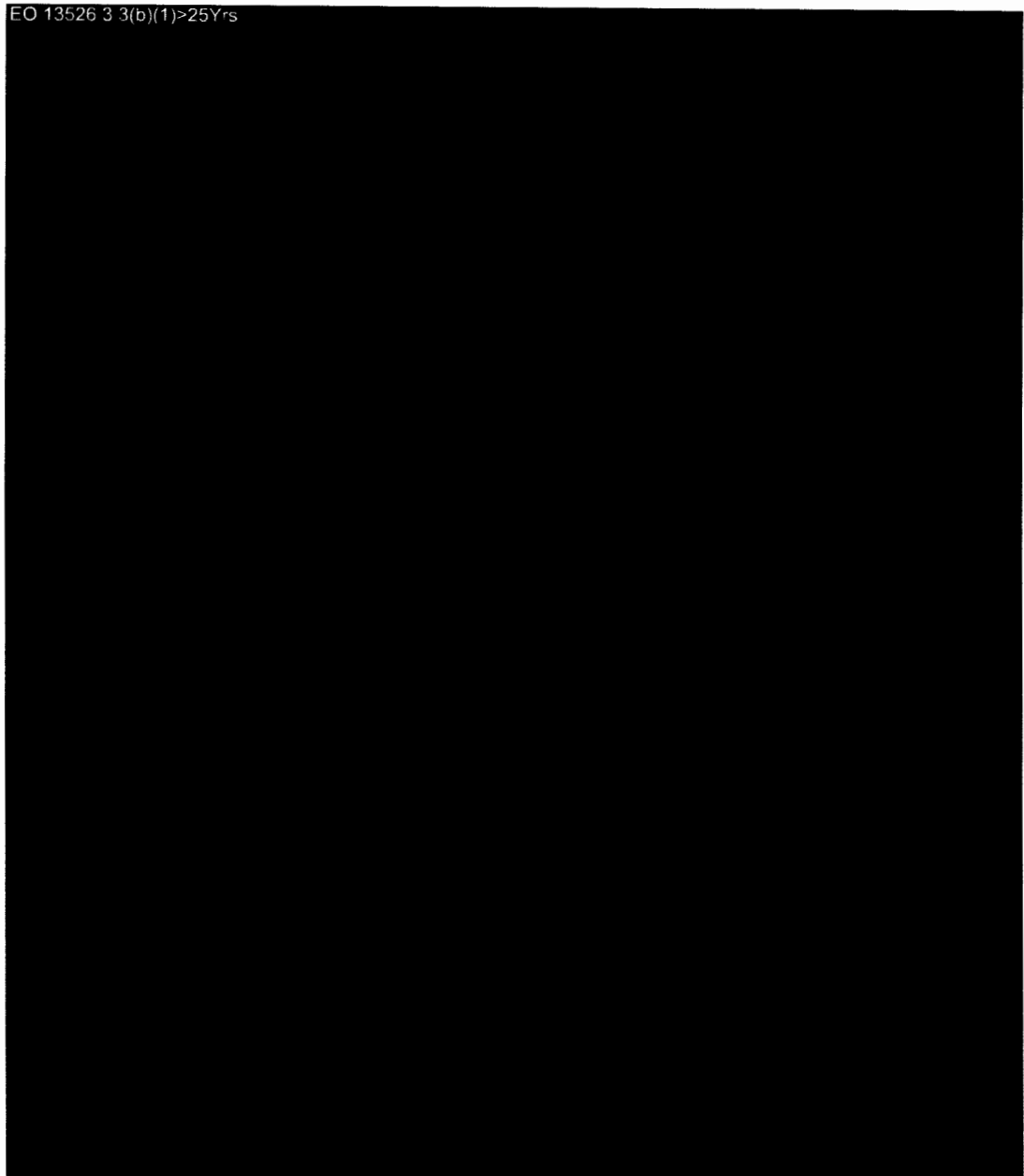
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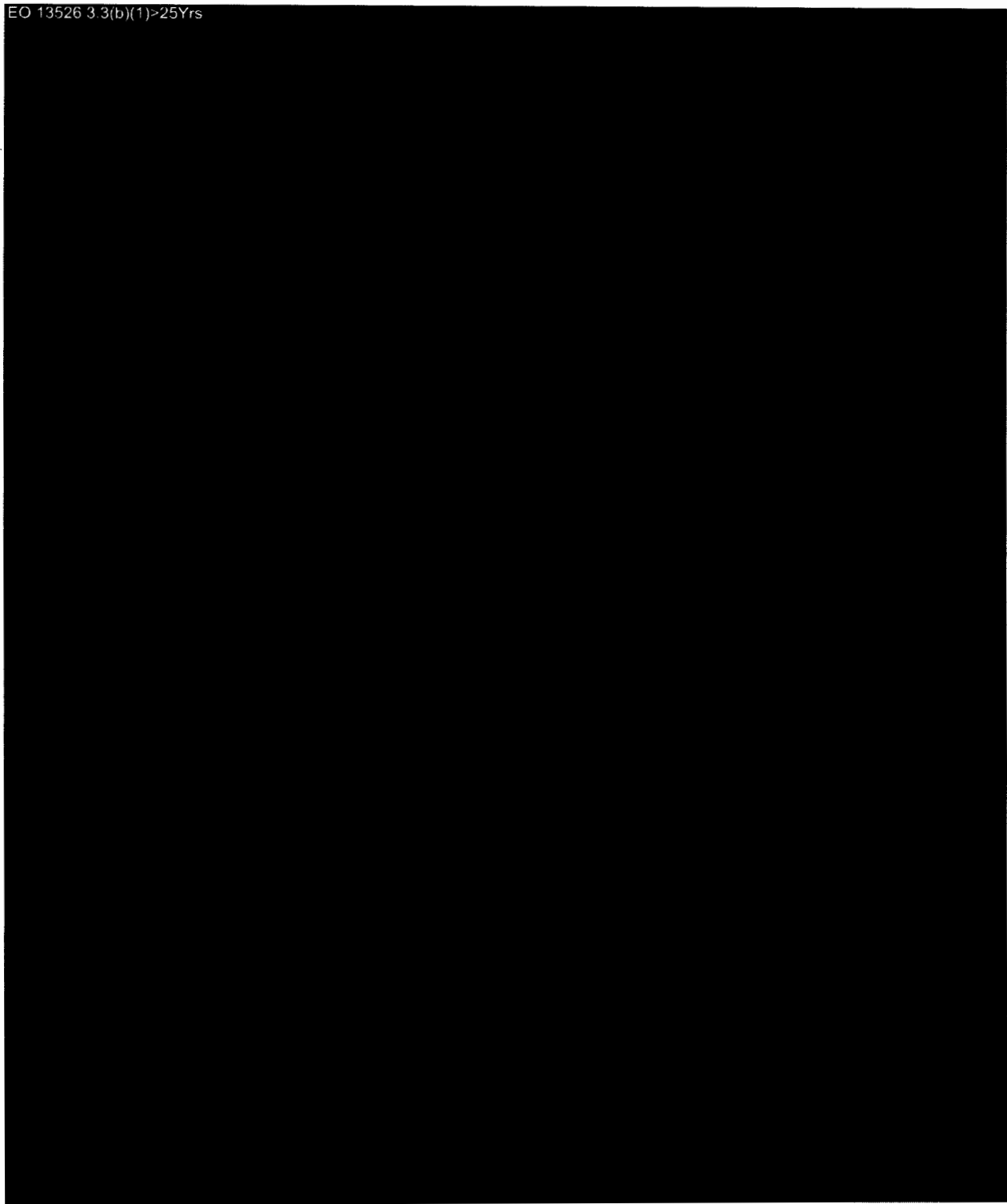


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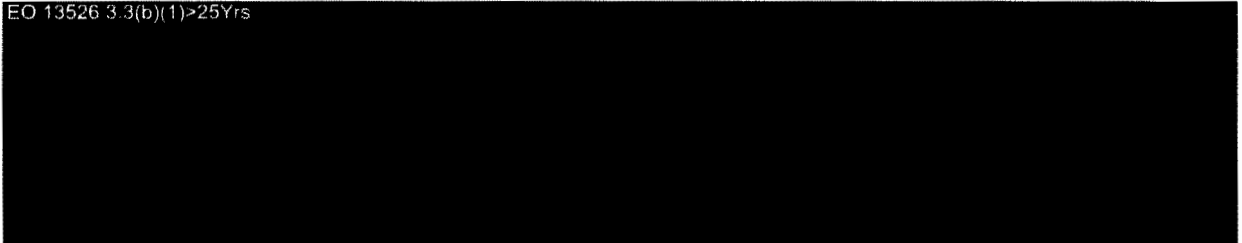
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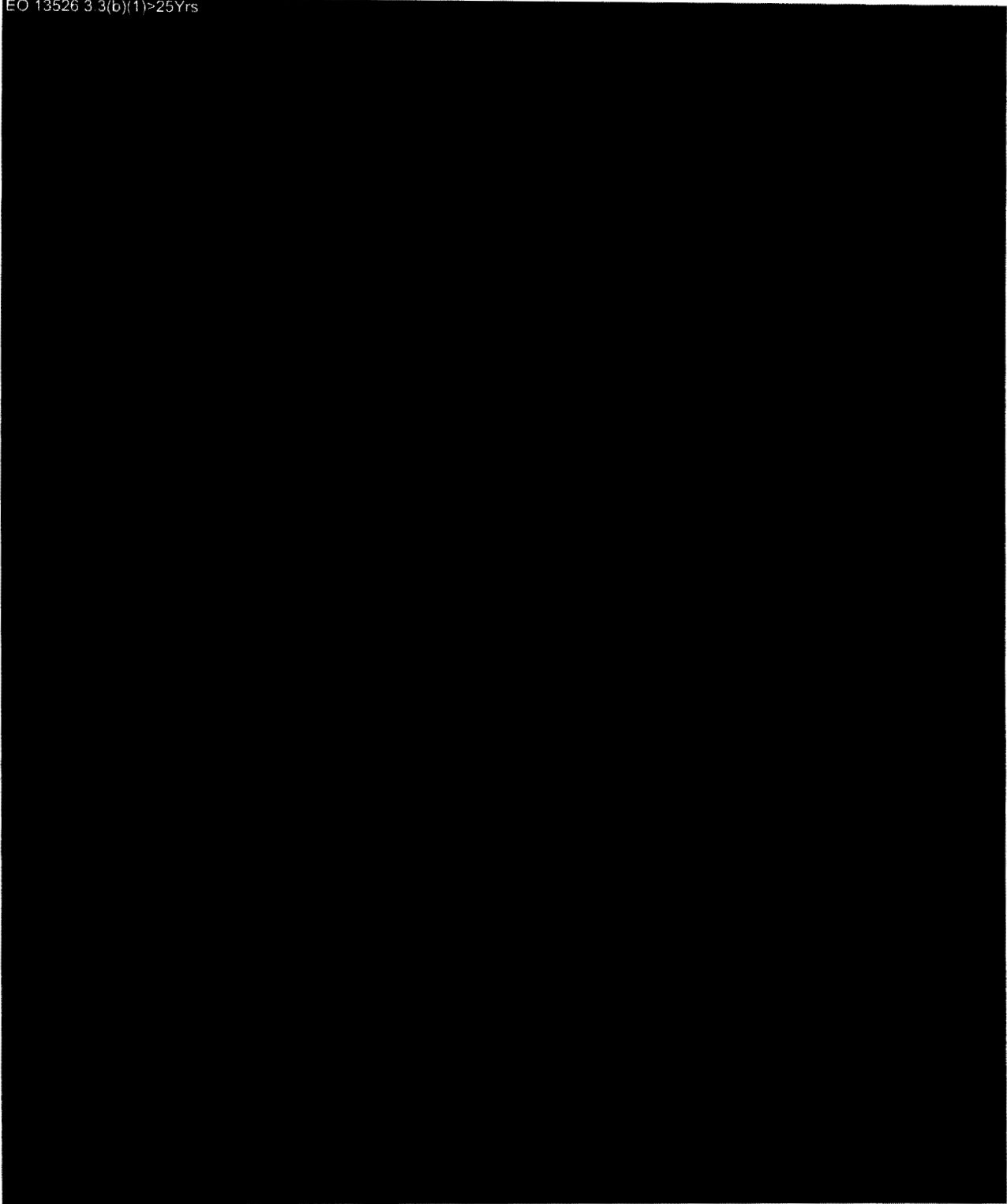
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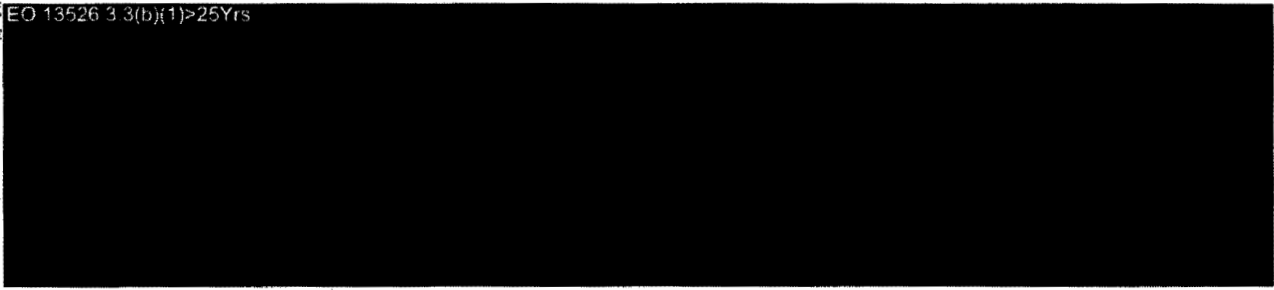
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# F Appendix

## About the Authors

**David D. Bradburn** was born in Hollywood, California, on 27 May 1925. He attended South Pasadena High School and the US Military Academy at West Point, New York, where he graduated in 1946. Commissioned a Second Lieutenant in the Army Air Corps, he was transferred into the US Air Force in 1947 and advanced through the ranks to Major General, US Air Force. He holds Master's degrees in engineering from Purdue University and in international affairs from The George Washington University.

His Air Force assignments included 50 missions as a B-26 light bomber pilot in Korea in 1950 and 1951 and a tour as a research and development (R&D) staff officer at Headquarters, Air Research and Development Command (ARDC), in Baltimore, Maryland, from 1952 to 1957. Trained in electrical engineering at Purdue and in R&D staff work at ARDC, he moved to California in 1957 to help Col Fritz Oder set up the WS-117L office. In 1960 he was among the first to join the SAMOS Project Office, again using his R&D and space experience to help BGen Robert E. Greer organize the new "black" Air Force space projects. From 1962 to 1964 Bradburn originated and orbited the QUILL Project, a satellite-borne synthetic aperture radar, which demonstrated the engineering

feasibility of imaging radars in space.

From 1967 to 1971 he was head of <sup>EO 13526</sup>  
[redacted] during the fer-  
ment of the ABM problem, and took a major  
part in the planning and launch <sup>EO 13526 3.3(f)</sup>

[redacted] <sup>EO 13526 3.3(b)(1)>25Yrs</sup>  
[redacted] <sup>EO 13526 3.3(b)(1)>25</sup> from 1971 to 1973 he was  
Director of the Office of Space Systems (NRO  
Staff); and from 1973 to 1975, he was  
Director of the Office of Special Projects  
(SAFSP).

In 1975, just in time for the US Bicentennial and a great time to be in New England, Bradburn moved to Hanscom Air Force Base, Bedford, Massachusetts, as Vice Commander, Air Force Electronic Systems Division. When he retired from the Air Force in 1976 the Bedford Minutemen, a social/historical association, came out to play with fifes and drums. In 1978 and 1979, Bradburn was the Representative of the Joint Chiefs of Staff on the US team negotiating with the Soviet Union on limitations on antisatellite weapons (ASATs). At that time, under the Carter Administration, the United States was opposing the development or use of ASATs, a position consistent with President Eisenhower's Open Skies strategy.

In 1979 Bradburn joined TRW Defense Systems Group in El Segundo, California, as Director of Engineering, concentrating mainly on TRW's project management

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methods with Gen Samuel C. Phillips, the expert who managed Apollo. Retired from TRW in 1987, Bradburn volunteered for this assignment as a historian in 1990 and has been busy and happy managing this smaller project ever since!

**John Copley** was born in Bangor, Maine, on 26 August 1922 at the height of a severe thunderstorm which, some believe, may have shaped certain events in his future. His father was a teacher who, in search of greener pastures (or warmer?), made several career moves in a southerly direction. As a result, Copley's early education was in Massachusetts, but he spent his high school years in New Rochelle, New York, where he graduated in 1940. He attended Williams College, Williamstown, Massachusetts, until November 1942, when he entered the Aviation Cadet Program, eventually piloting a B-24 with the 15th Air Force in Italy during 1944 and early 1945.

The next 12 years were spent in communications and electronics assignments in such locations as Johnston Island and the Korean Peninsula. In 1953 he entered the Air Force Institute of Technology, graduating with a degree in electrical engineering in August 1955. Following two and a half years at Rome Air Development Center, Griffis Air Force Base, New York, in charge of the ground quick reaction capability (QRC) program at the Intelligence and Electronic Warfare Laboratory, he found himself in Inglewood, California, assigned to the Air Force WS-117L Program Office (thanks mostly to the launch of Sputnik I in October 1957). His initial assignment was development of Subsystem H, the

Ground/Space Communications System; however, his SIGINT background prevailed and in July 1958 he was assigned to Subsystem F, the "ferret" payloads. He continued as the SIGINT payload chief for SAMOS and then <sup>EO 13526</sup> when the project was classified as BYEMAN in December 1962.

In July 1964 he was assigned to the Manned Orbiting Laboratory in an attempt to expand the mission into the SIGINT area. When this attempt was terminated in 1967, he became the first National Reconnaissance Office (NRO) assignee to the National Security Agency (NSA). While there he was Chief of K-45 <sup>EO 13526 3.3(b)(1)>2-</sup> charged with processing the data <sup>EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526</sup>

Copley retired from the Air Force in May 1974. The next 15 years were spent at Rockwell International Space Division where he finally realized a lifelong ambition and was able to actually participate in the engineering development of electronic systems for spacecraft (including the space shuttle). In February of 1990, MGen David D. Bradburn invited him to participate in the writing of this history, after which a third retirement should be in order!

**Raymond B. Potts** was born in Wellsburg, West Virginia, on 15 September 1931. He graduated from West Virginia University in 1954 with a bachelor of science in electrical engineering, majoring in electronics with a mathematics minor. He also completed the Modern Engineering Management Program at Carnegie Mellon

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University in 1964 and the Federal Executive Institute, Senior Executive Development, in 1982. He served in the US Air Force from 1954 to 1956, attaining the rank of First Lieutenant and later Captain in the US Air Force Reserve in 1957.

His career at NSA actually began while he was in the Air Force, and his first work there involved research on the use of transistors. From 1956 to 1958 he worked on some special R&D projects including the first computer to use transistor logic, SOLO. From 1958 to 1960 he worked on EO 13526 3.5(c) an effort to solve a major cryptanalytic problem. From 1960 to 1963 he was Chief of the Technical Planning Staff for equipment that required technology beyond the state of the art. He started into the satellite field in 1963 as task leader for the development of the high speed analog-to-digital converter for processing analog data from the Air Force prime payloads in EO 13526 3.3(b)(1) managed by SAFSP. From 1966 to 1971 Potts was Deputy Chief of the Office of ELINT and Chief of Special Projects; in these jobs he was responsible for NSA participation in the low-orbit SIGINT satellite projects. He managed all the analysis and processing of SIGINT collected data, made agreements with the Strategic Air Command, established the EO 13526 1.4(c)<25Yrs, EO 13526 3.3(b)(1) EO 13526 1.4(c)<25Yrs, EO 13526 and started the activity of processing SIGINT data by means of a contractor, Lockheed Missiles and Space Company, under an Air Force contract. He also represented NSA in development of the high-altitude SIGINT satellite projects.

After a series of increasingly responsible jobs, including Deputy Assistant Director NSA for Science and Technology, in 1974 Potts became Deputy Director of Training, NSA/Central Security Service/Commandant of the National Cryptologic School, where he managed courses in equipment maintenance through graduate-level language, computer science, and management. From 1980 to 1985 he was Deputy Chief and Acting Chief, Operations and Control, managing SIGINT collection operations via satellites, comsat remotes, high frequency, and embassies. From 1985 to 1987 he was Deputy Chief, Joint Programs, leading the acquisition of major collection systems jointly bought by NSA and the Service Cryptologic Agencies. Potts received the NSA Meritorious Civilian Service award in 1980.

On his retirement in 1987, Potts became a Cryptologic Reservist at the National Cryptologic School at NSA, where he prepared a book on "Lessons Learned in Systems Acquisition" for use in systems acquisition training. He also organized the Acquisition Management Association to provide a forum to exchange information and ideas on acquisition. In 1990 Potts agreed to take a leading role in writing this SIGINT history, which is based to a large degree on his experience and interests, which have kept him at the center of the satellite SIGINT world. With this job done, he plans to spend a lot more time with his family and keep his hand in the SIGINT business from time to time.

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EO 13526 3.5(c)

In 1952 he joined NSA as an electronics engineer working on development of microwave antennas and over-the-horizon SIGINT ultra-high-frequency collection equipment. This began a lifelong career in SIGINT. In 1957 and 1958, <sup>EO 13526</sup> served in Tokyo as Chief of the R&D staff involved in experimental collection systems; from 1958 to 1964 he was in the technical planning staff, monitoring US Air Force and Navy SIGINT satellite projects; and in 1964 he joined the NRO staff in the Pentagon, helping to tie NSA and NRO interests together. In 1967 he became Chief of R83 at NSA, the office of SIGINT satellite projects; and from 1967 to 1970 he was advisor to the Director, NSA, on SIGINT satellite reconnaissance. From 1970 until 1973 he was Chief of WO5, responsible for ELINT end product reporting. From 1973 to 1976 he was Chief of the NSA group of analysts/linguists integrated in the Central Intelligence Agency

(CIA) headquarters to evaluate special covert SIGINT; from 1976 to 1979 he was Scientific Advisor to the Chief, A6, monitoring special Navy SIGINT; and from 1979 to 1986, <sup>EO 13526</sup> was Scientific Advisor to the Chief of A Group, the largest operations group responsible for collection, analysis, and planning for SIGINT on Soviet and East European countries.

Since his retirement from NSA in 1986, <sup>EO 13526</sup> has been a consultant for the CIA on advanced SIGINT and related satellite programs. In 1988 he was a volunteer at the Smithsonian Museum of Natural History as a docent for the waterfowl exhibit, and from 1989 to the present he has been a volunteer for Recording for the Blind, Inc., in Washington, DC, reading, monitoring other readers, controlling the master tape recorder, and duplicating tapes on over 100 textbooks for college-level electronics, physics, mathematics, and technical trade school courses. He was awarded the Air Force Meritorious Service Medal in 1966 and the NSA Meritorious Service Medal in 1968. In his retirement, <sup>EO 13526</sup> has had time to concentrate on a lifelong interest in singing. Since 1972 he has appeared in over 100 concerts with the Paul Hill Chorale in the Kennedy Center in Washington, DC. He volunteered for the assignment as a main member of this SIGINT history team in 1990 and plans to concentrate on singing and summers in Martha's Vineyard in the future.

# Appendix

## Acronyms and Abbreviations

AAA	antiaircraft artillery
ABM	antiballistic missile
ADCS	analog-to-digital conversion system
ADD/DP	Assistant Deputy Director for Data Processing EO 1352
AD/FO	Assistant Deputy for Field Operations (SAFSP)
ADP	Assistant Director for Production (NSA)
AES	anti-Earth satellite
AFB	Air Force Base
AFBMC	Air Force Ballistic Missile Committee
AFBMD	Air Force Ballistic Missile Division
AFCGM	Air Force Office of Guided Missiles
AFSA	Armed Forces Security Agency (pre-NSA)
AFSC	Air Force Systems Command
AFSCF	Air Force Satellite Control Facility
AFSS	Air Force Security Service
AIL	Airborne Instruments Laboratory
AJOY	analog-to-digital converter and computer system provided by NSA to SAC to process ELINT data
AMC	Army Missile Command
AMIE	analog magnetic instrumentation equipment, a spaceborne, wide-bandwidth, helical-scan magnetic-tape recorder used on Program A SIGINT reconnaissance satellites
APE	analog processing equipment
APL	Applied Physics Laboratory (Johns Hopkins University)
ATIC	Air Force Technical Intelligence Center, Wright-Patterson AFB, Ohio
ARDC	Air Force Research and Development Command
ARPA	Advanced Research Projects Agency
ARS	Advanced Reconnaissance System
ATI	Applied Technology, Inc.
BUWEPS	Bureau of Weapons (Navy)
C-band	radar operating frequency, 4 to 8 GHz
CAMS	computer-aided manual search
CCP	Consolidated Cryptologic Program
CDC	Control Data Corporation
CEP	circular error probable (locations)
CES	Communications Equipment Subsystem
CIA	Central Intelligence Agency

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<b>CIG</b>	Central Intelligence Group
<b>CINCPAC</b>	Commander in Chief, Pacific (US military forces)
<b>CINCPACFLT</b>	Commander in Chief, Pacific Fleet
<b>CNO</b>	Chief of Naval Operations
<b>COMINT</b>	communications intelligence
<b>COMNAVINTCOM</b>	Commander, Naval Intelligence Command
<b>COMOR</b>	USIB Committee on Overhead Reconnaissance
<b>COMSEC</b>	communications security
<b>CONUS</b>	Continental United States
<b>COTR</b>	Contracting Officer's Technical Representative
<b>CSAW</b>	Communications Supplementary Activities, Washington (Navy)
<b>CSWG</b>	COMOR SIGINT Working Group
<b>CVR</b>	continuous video recording
<b>CW</b>	continuous wave (versus pulsed) electromagnetic signal
<b>DACS</b>	Data Acquisition and Control Segment
<b>DAGER</b>	Director's Advisory Group for ELINT and Reconnaissance (NSA)
<b>DAHOPS</b>	Data Handling and Operations Plan
<b>DCI</b>	Director of Central Intelligence
<b>DCS/D</b>	Deputy Chief of Staff for Development (USAF)
<b>DDC</b>	Data Distribution Center
<b>DDI</b>	Deputy Director for Intelligence
<b>DDO</b>	Deputy Director for Operations (NSA)
<b>DDR&amp;E</b>	Deputy Secretary of Defense for Research and Engineering
<b>DDS&amp;T</b>	Deputy Director for Science and Technology (CIA)
<b>DEFSMAC</b>	Defense Special Missiles and Astronautics Center
<b>DF</b>	direction-finding
<b>DIA</b>	Defense Intelligence Agency
<b>DIRNSA</b>	Director, National Security Agency
<b>DNI</b>	Director of Naval Intelligence
<b>DNRO</b>	Director, National Reconnaissance Office
<b>DOD</b>	Department of Defense
<b>DSP</b>	Defense Support Program
<b>DSU</b>	data storage unit
<b>EDL</b>	Electronics Defense Laboratory (Sylvania)
<b>ELINT</b>	electronic intelligence (primarily radars)
<b>ELT</b>	ELINT technical (reporting)
<b>EMPINT</b>	electromagnetic pulse intelligence (nuclear detonation)
<b>EOB</b>	electronic order of battle (radar locations)
<b>ERA</b>	Engineering Research Associates
<b>ERP</b>	effective radiated power
EO 13526 3 3(b)(1)>25Yrs	
<b>ESV</b>	Earth satellite vehicle
<b>EW/GCI</b>	early warning/ground-controlled intercept (radar)
<b>EXCOM</b>	Executive Committee of the NRO

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<b>FBI</b>	Federal Bureau of Investigation
<b>FDM</b>	frequency-division-multiplex
<b>FIS</b>	foreign instrumentation signals
<b>FM</b>	frequency modulation
<b>FMSAC</b>	Foreign Missile and Space Analysis Center (CIA)
<b>FOC</b>	final operational capability
<b>FOV</b>	field of view
<b>FSK</b>	frequency shift key
<b>FTD</b>	Foreign Technology Division
<b>FY</b>	fiscal year
<b>GCHQ</b>	General Communications Headquarters (UK)
<b>GCI</b>	ground control intercept (radar)
<b>GE</b>	General Electric Company
<b>GHz</b>	gigahertz (one billion cycles per second)
<b>GOR</b>	general operational requirement
<b>GPS</b>	Global Positioning System
<b>GRAB</b>	Galactic Radiation and Background
<b>GS</b>	general search
<b>HF</b>	high frequency (3 to 30 MHz)
<b>HF/DF</b>	high-frequency/direction-finding
<b>HUMINT</b>	human intelligence
<b>Hz</b>	hertz (one cycle per second)
<b>I&amp;W</b>	indications and warning
<b>IBM</b>	International Business Machines, Inc.
<b>ICBM</b>	intercontinental ballistic missile
<b>IEEE</b>	Institute of Electrical and Electronic Engineers
<b>IHF</b>	Intercept History File
<b>IMINT</b>	imagery intelligence
<b>IOC</b>	initial operating capability
<b>IR</b>	infrared
<b>IRINT</b>	infrared intelligence (primarily missile radiation)
<b>ITEP</b>	Interim Tactical ELINT Processing (Equipment)
<b>JAN</b>	Joint Army/Navy (publications, nomenclature, etc.)
EO 13526 3.3(b)(1)>25Yrs	
<b>kbps</b>	kilobits per second
<b>kHz</b>	kilohertz (one thousand cycles per second)
<b>L-band</b>	radar operating frequency, 1 to 2 GHz
<b>LMSC</b>	Lockheed Missiles and Space Company
<b>LMSD</b>	Lockheed Missiles and Space Division
<b>LOP</b>	line of position

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<b>MADS</b>	mission and data services (processing)
<b>Mbps</b>	megabits per second
<b>MCC</b>	mission control center
<b>MGS</b>	mission ground station
<b>MHz</b>	megahertz (one million cycles per second)
<b>MOL</b>	Manned Orbiting Laboratory
<b>NASA</b>	National Aeronautics and Space Administration
<b>NATO</b>	North Atlantic Treaty Organization
<b>NAVSPASUR</b>	Naval Space Surveillance Center
<b>NIC</b>	Naval Intelligence Command
<b>NORAD</b>	North American Air Defense Command
<b>NPIC</b>	National Photographic Interpretation Center
<b>NRL</b>	Naval Research Laboratory
<b>NRO</b>	National Reconnaissance Office
<b>NRP</b>	National Reconnaissance Program
<b>NSA</b>	National Security Agency
<b>NSC</b>	National Security Council
<b>NSCID</b>	NSC Intelligence Directive
<b>NSD</b>	NSA Support Detachment
<b>NSG</b>	Naval Security Group
<b>NSOC</b>	National SIGINT Operations Center
<b>NTPC</b>	National Technical Processing Center
<b>OCMC</b>	Operations Center for Mission Control
<b>OEL</b>	Office of ELINT (CIA)
<b>ONI</b>	Office of Naval Intelligence
<b>OPELINT</b>	operational ELINT
<b>OSD</b>	Office of the Secretary of Defense
<b>OSDBMC</b>	Office of the Secretary of Defense, Ballistic Missile Committee
<b>OSI</b>	Office of Scientific Intelligence
<b>OSP</b>	Office of Special Projects (CIA)
<b>OSS</b>	Office of Strategic Services (pre-CIA)
EO 13526 3.3(b)(1)>25Yrs	
<b>PACELINT</b>	Pacific ELINT Center
<b>PAM/FM</b>	pulse amplitude modulation/frequency modulation
<b>PAPS</b>	POPPY Automated Processing System
<b>PCM</b>	pulse code modulation
<b>PDE</b>	priority data extractor
<b>PFIAB</b>	President's Foreign Intelligence Advisory Board
<b>PPM</b>	pulse position modulation
<b>PRC</b>	People's Republic of China
<b>PRF</b>	pulse repetition frequency
<b>PRI</b>	pulse repetition interval
<b>PSAC</b>	President's Science Advisory Committee
<b>PSK</b>	phase shift key
<b>PW</b>	pulsewidth



**QRC** quick reaction capability

**R&D** research and development  
**RAND** Research for America's National Defense (the RAND Corporation)  
**RCA** Radio Corporation of America  
**RF** radio frequency

EO 13526 3.3(b)(1)>25Yrs

**RTG** Reconnaissance Technical Group  
**RTS** remote tracking station  
**RTTY** radio teletype

**S** Secret

**S-band** radar operating frequency, 2 to 4 GHz  
**S/S E** Subsystem E (SAMOS photo payload)  
**S/S F** Subsystem F (SAMOS electronic reconnaissance, or "ferret," system)  
**S/S I** Subsystem I (WS-117L processing system)  
**SAC** Strategic Air Command  
**SAFMS** Office of Missiles and Space (Air Force)  
**SAFSP** Office of Special Projects (NRO Program A)  
**SAFSS** Office of Space Systems (NRO staff)  
**SAFUS** Under Secretary of the Air Force (DNRO)  
**SALT** Strategic Arms Limitations Talks  
**SAM** surface-to-air missile  
**SAMOS** ARPA unclassified designator for former SENTRY Program  
**SAMS** Signal Activity Monitor System (ELINT)  
**SAS** Signal Analysis Subsystem (COMINT)  
**SCA** Signal Analysis Console  
**SCF** Satellite Control Facility  
**SDS** Students for Democratic Society  
**SecDef** Secretary of Defense  
**SEL** Stanford University Electronics Laboratory

EO 13526 3.3(b)(1)>25Yrs

**SGLS** space-ground link system  
**SHARS** signal handling and recording segment  
**SIGINT** signals intelligence  
**SIOP** Single Integrated Operating Plan

EO 13526 3.3(b)(1)>25Yrs

**SOC** Satellite Operations Center, NSA  
**SOCOMM** Satellite Operations Communications network (Air Force)  
**SORS** SIGINT Overhead Reconnaissance Subcommittee (USIB)  
**SP** SAFSP, including EO 13526 3.3(b)(1)>25Yrs, EO 1352  
**SPO** system project office  
**SR** system requirement  
**SRI** Stanford Research Laboratories  
**SSAT** Special Signals Analysis Team

EO 13526 3.3(b)(1)>25Yrs

**SSSC** SIGINT Satellite Support Center (NSA)  
**STANCIB** State/Army/Navy Communications Intelligence Board (pre-USCIB)  
**STC** Satellite Test Center

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<b>STIC</b>	Scientific and Technical Intelligence Center (ONI)
<b>STL</b>	Space Technologies Laboratories
<b>STRUM</b>	standard technical report using modules (NSA format)
<b>TAC</b>	Technical Advisory Committee
<b>TAT</b>	thrust-augmented Thor
<b>TCP</b>	Technological Capabilities Panel
<b>TCR</b>	time-critical reporting
EO 13526 1.4(c)<25Yrs, EO 13526 3.5(c)	
<b>TDY</b>	temporary detached duty
<b>TEBAC</b>	Telemetry and Beaconry Analysis Community
<b>TECHINS</b>	technical instructions
<b>TELINT</b>	telemetry intelligence
<b>THF</b>	technical history file
<b>TI</b>	technical intelligence
<b>TK</b>	Talent-Keyhole security compartment
<b>TOA</b>	time of arrival
<b>TOG</b>	Technical Operating Group
EO 13526 3.3(b)(1)>25Yrs	
<b>TS</b>	Top Secret
<b>TV</b>	television
<b>TW</b>	tactical warning
<b>UAR</b>	United Arab Republic
<b>UHF</b>	ultrahigh frequency (300 to 3,000 MHz)
<b>USA</b>	United States Army
<b>USAF</b>	United States Air Force
<b>USCIB</b>	United States Communications Intelligence Board (pre-USIB)
<b>USIB</b>	United States Intelligence Board
<b>USN</b>	United States Navy
<b>USSR</b>	Union of Soviet Socialist Republics
EO 13526 3.3(b)(1)>25Yrs	
<b>VAB</b>	vehicle assembly building
<b>VAFB</b>	Vandenberg Air Force Base
<b>VCR</b>	video cassette recorder
<b>VHF</b>	very high frequency (30 to 300 MHz)
<b>WADC</b>	Wright Air Development Center
<b>WDD</b>	Western Development Division (Air Force)
<b>WS-117L</b>	Weapon System 117L
<b>X-band</b>	radar operating frequency, 8 to 10 GHz
<b>YIG</b>	yttrium-iron-garnet

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### Military Rank Abbreviations

<b>Gen</b>	General
<b>Adm</b>	Admiral
<b>LGen</b>	Lieutenant General
<b>VAdm</b>	Vice Admiral
<b>MGen</b>	Major General
<b>RAdm</b>	Rear Admiral
<b>BGen</b>	Brigadier General
<b>Col</b>	Colonel
<b>Capt</b>	Captain (USN)
<b>LtCol</b>	Lieutenant Colonel
<b>Cmdr</b>	Commander
<b>Maj</b>	Major
<b>LtCmdr</b>	Lieutenant Commander
<b>Capt</b>	Captain (USAF)
<b>Lt</b>	Lieutenant (senior grade)
<b>1Lt</b>	First Lieutenant
<b>Lt (j.g.)</b>	Lieutenant (junior grade)
<b>2Lt</b>	Second Lieutenant
<b>Ens</b>	Ensign

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~~NOFORN, ORCON~~

# Appendix

PL 86-36/50 USC 3605

PL 86-36/50 USC 3605  
EO 1.4.1.c

## Index

AAA

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526 3.5

EO 13526 3.3(b)(1)>25Yrs, EO 13526 1.4(c)<25Yrs, EO 13526



~~Top Secret~~  
Handle via BYEMAN-TALENT-KEYMOLE-  
COMINT Control Channels jointly  
BYE-9197.94



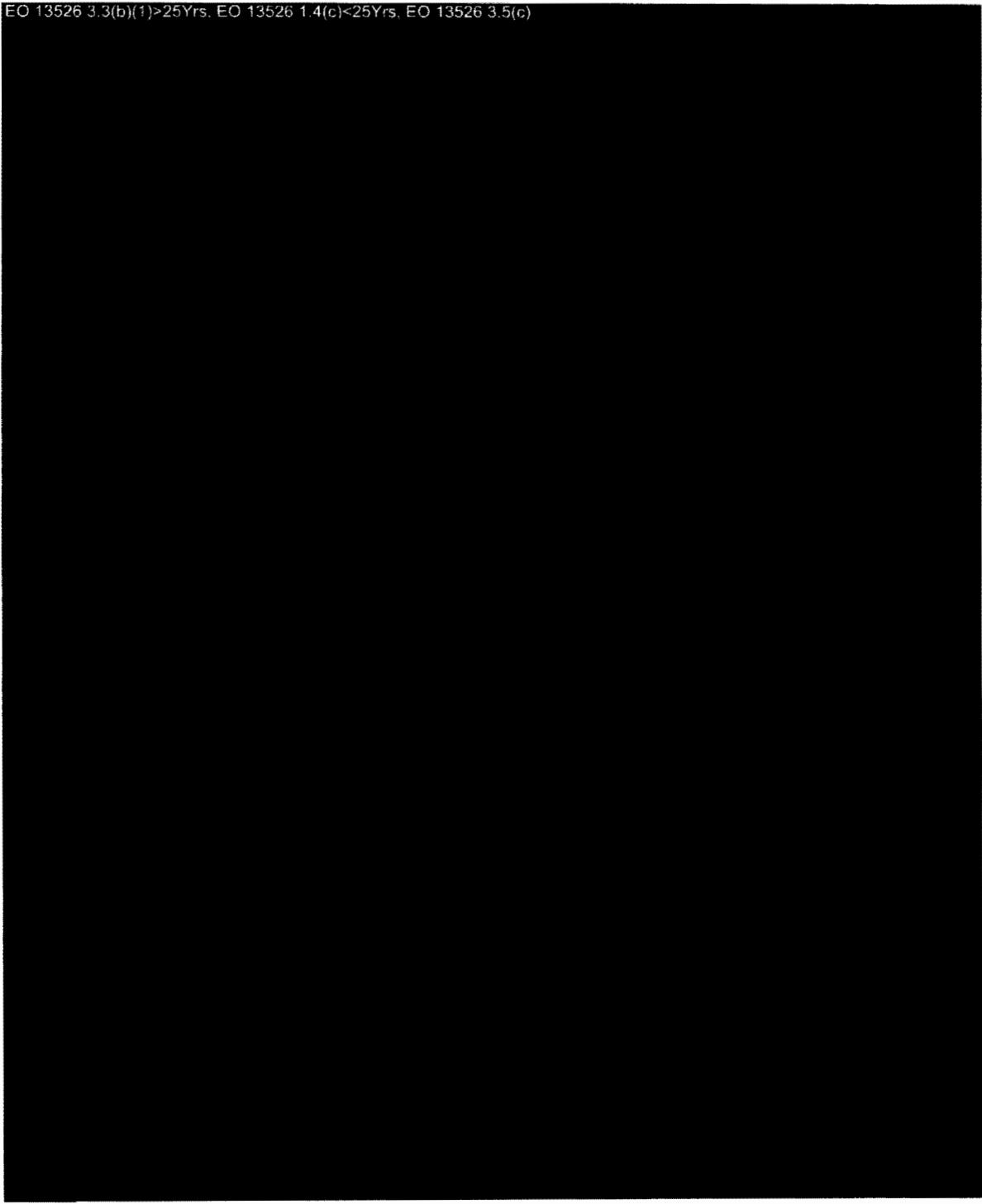
NRO APPROVED FOR RELEASE

12 JUNE 2015  
EL 86-36750 USC 3605  
EO 1.4.(c)

~~Top Secret~~  
~~NOFORN/NOK/NOPI~~

EL 86-36750 USC 3605

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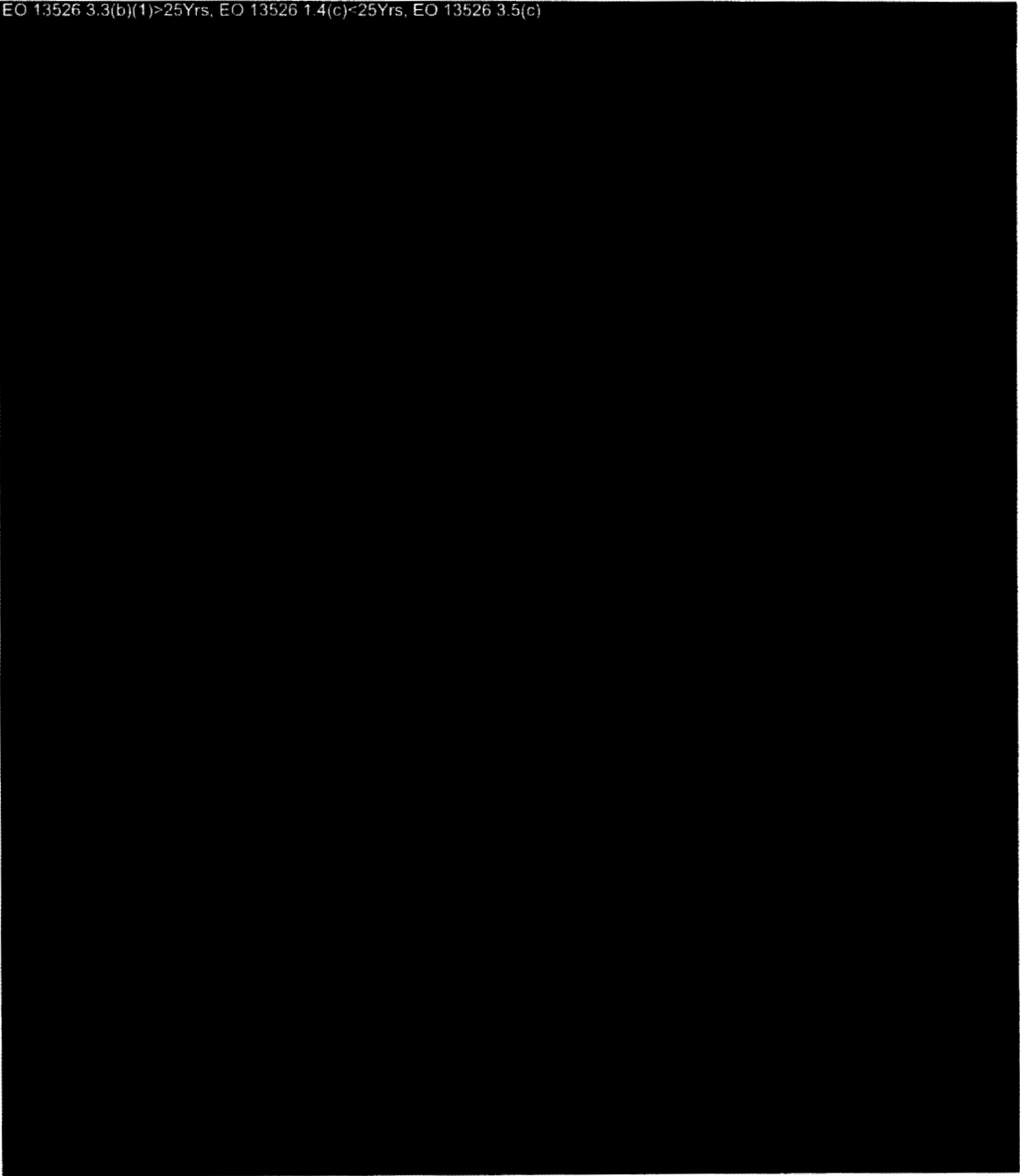


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~~Top Secret~~  
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PL 86-36, 50 USC 3005

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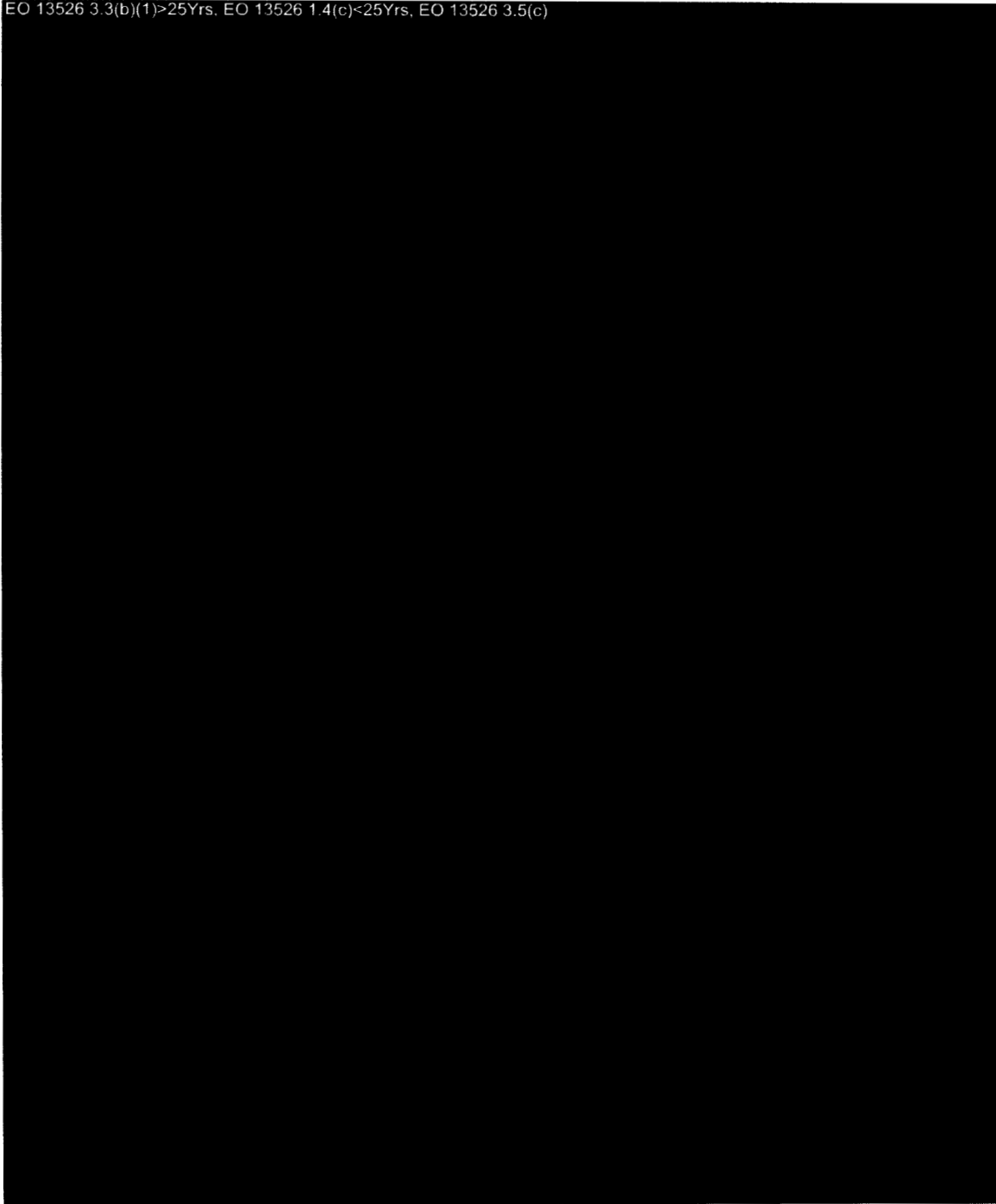


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COMINT Central Channels Jointly  
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~~Top Secret~~  
~~NOFORN/NOFORN~~

EO 1.4.(c)  
PL 86-36/50 USC 3605

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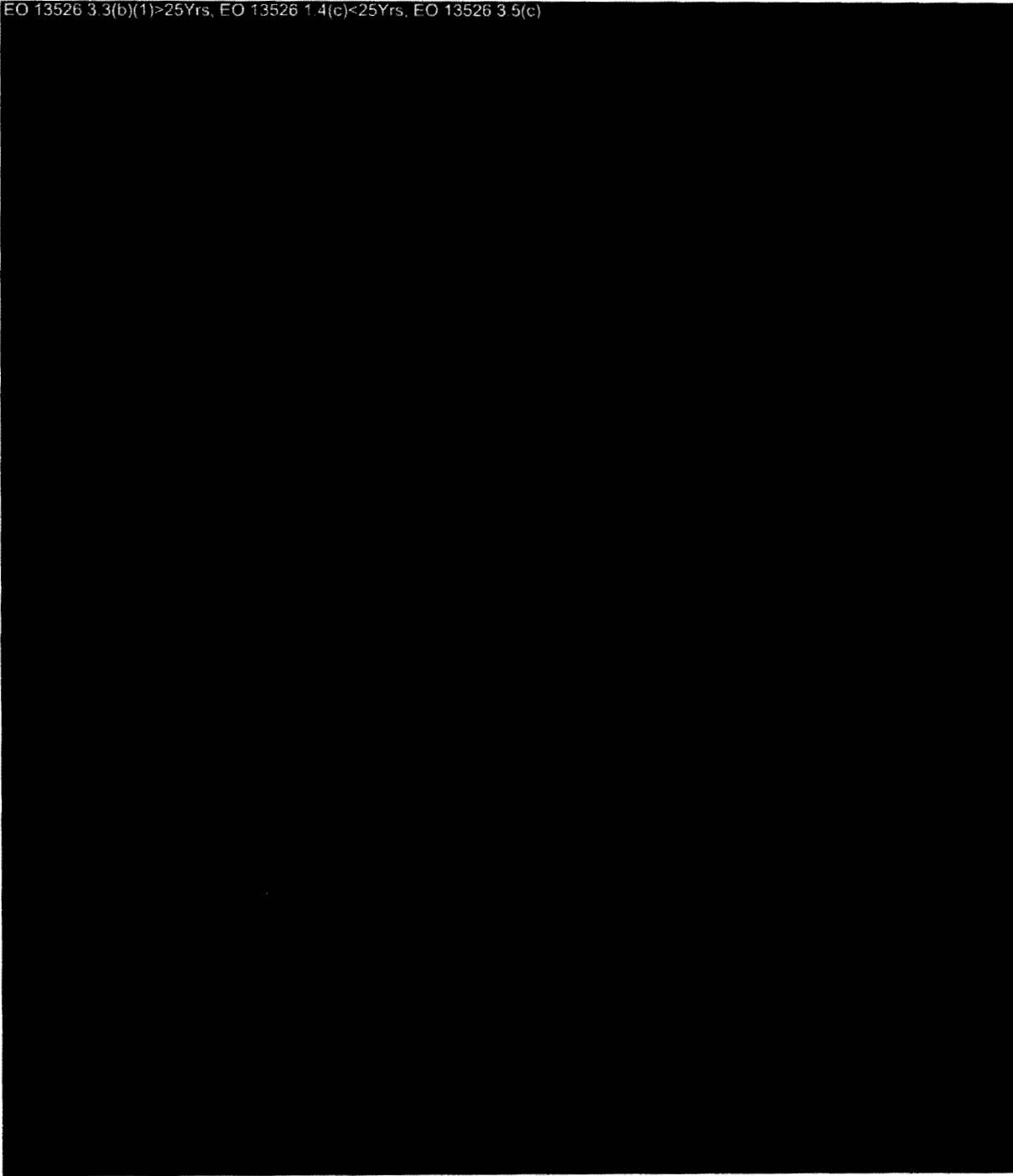


~~Top Secret~~  
Handle via ~~BYEM~~ TALENT KEYHOLE-  
COMINT Control Channels Inntlv  
BY 0107-02

~~TOP SECRET~~

EO 13526-3/50 USC 1605

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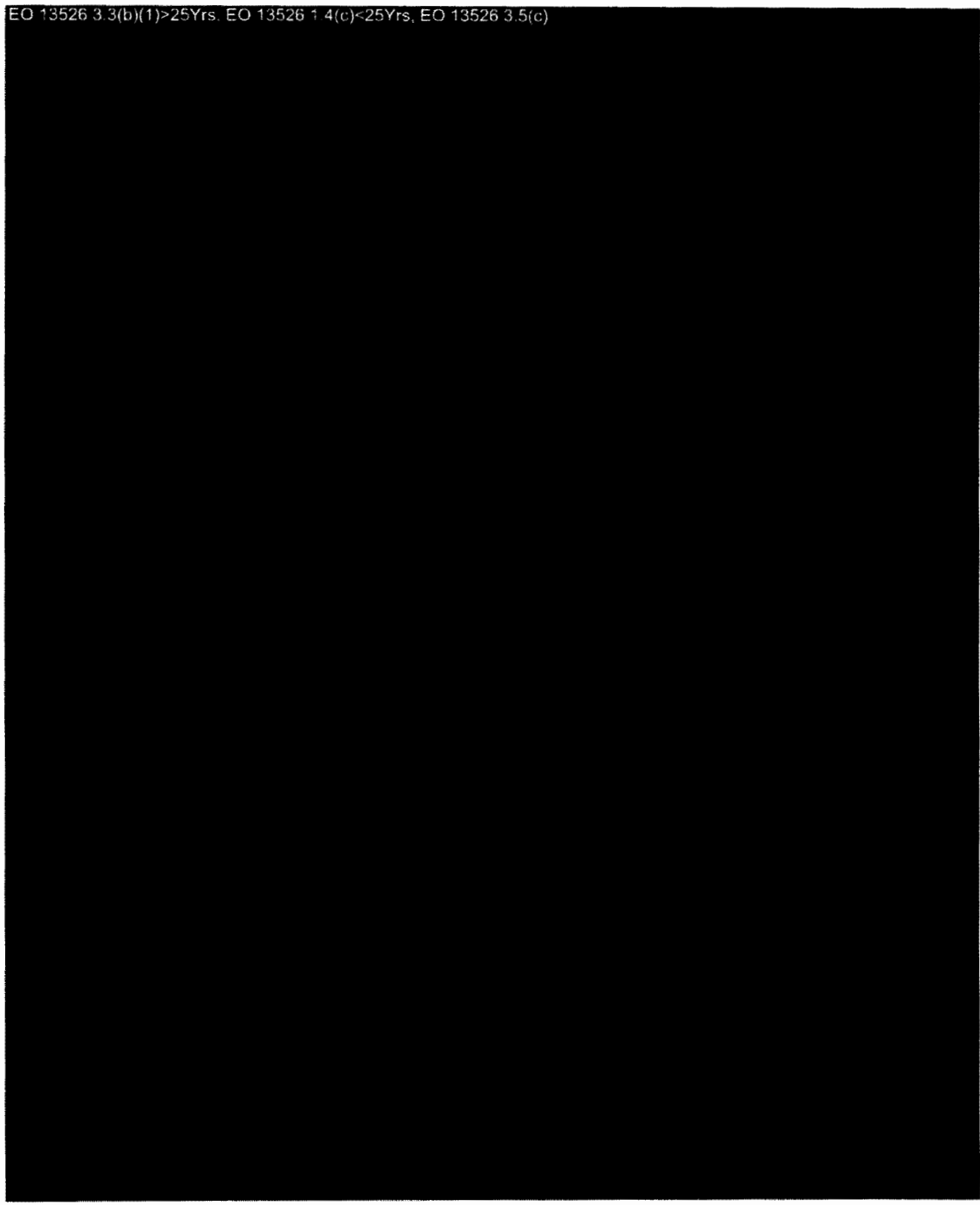
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~~COMINT~~ Control Channels jointly  
BYE-419794



~~Top Secret~~  
~~COMINT CONTROL CHANNELS~~

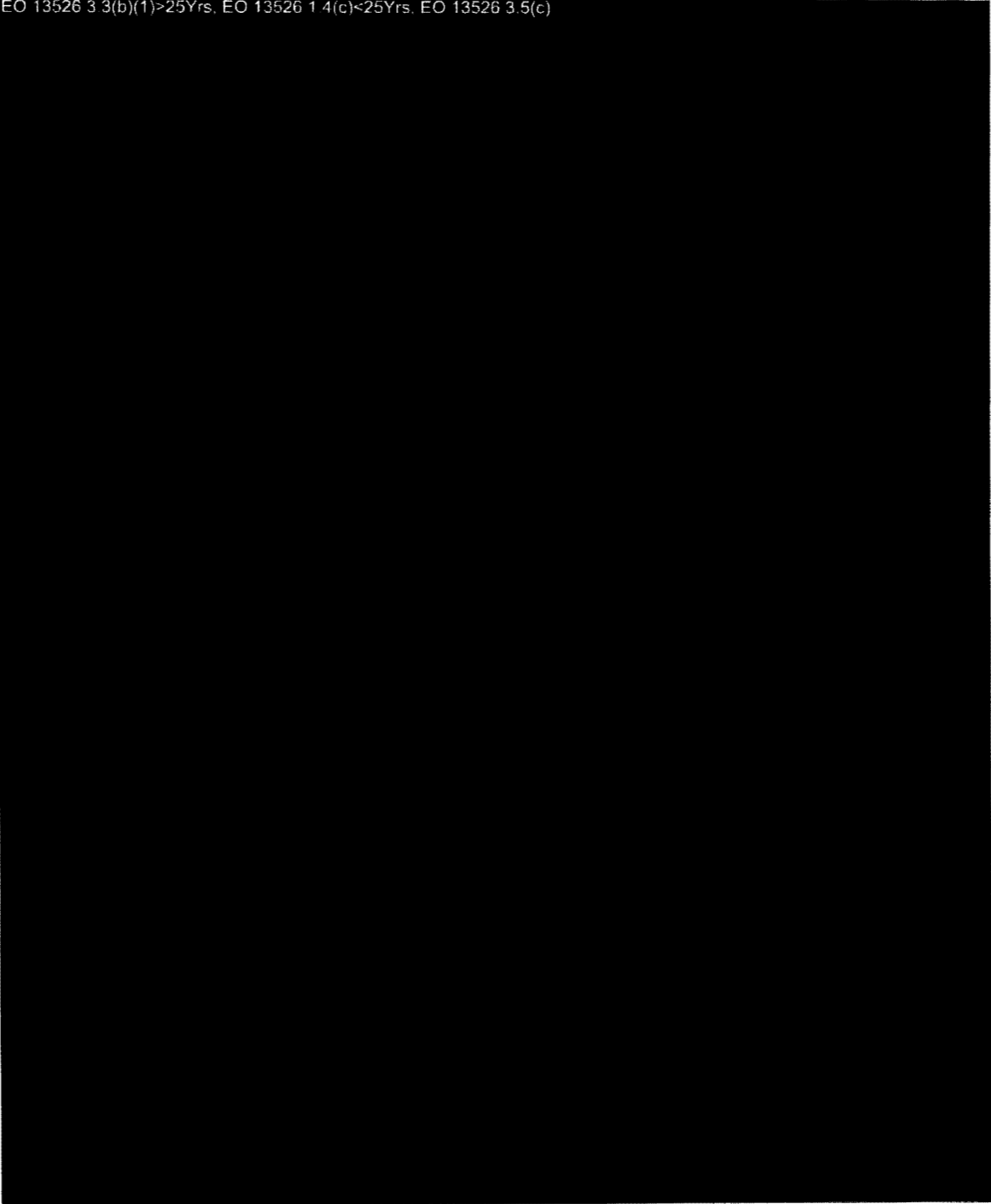
PL 86-36/50 USC 3605

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~~Top Secret~~  
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~~COMINT Control Channels Jointly~~  
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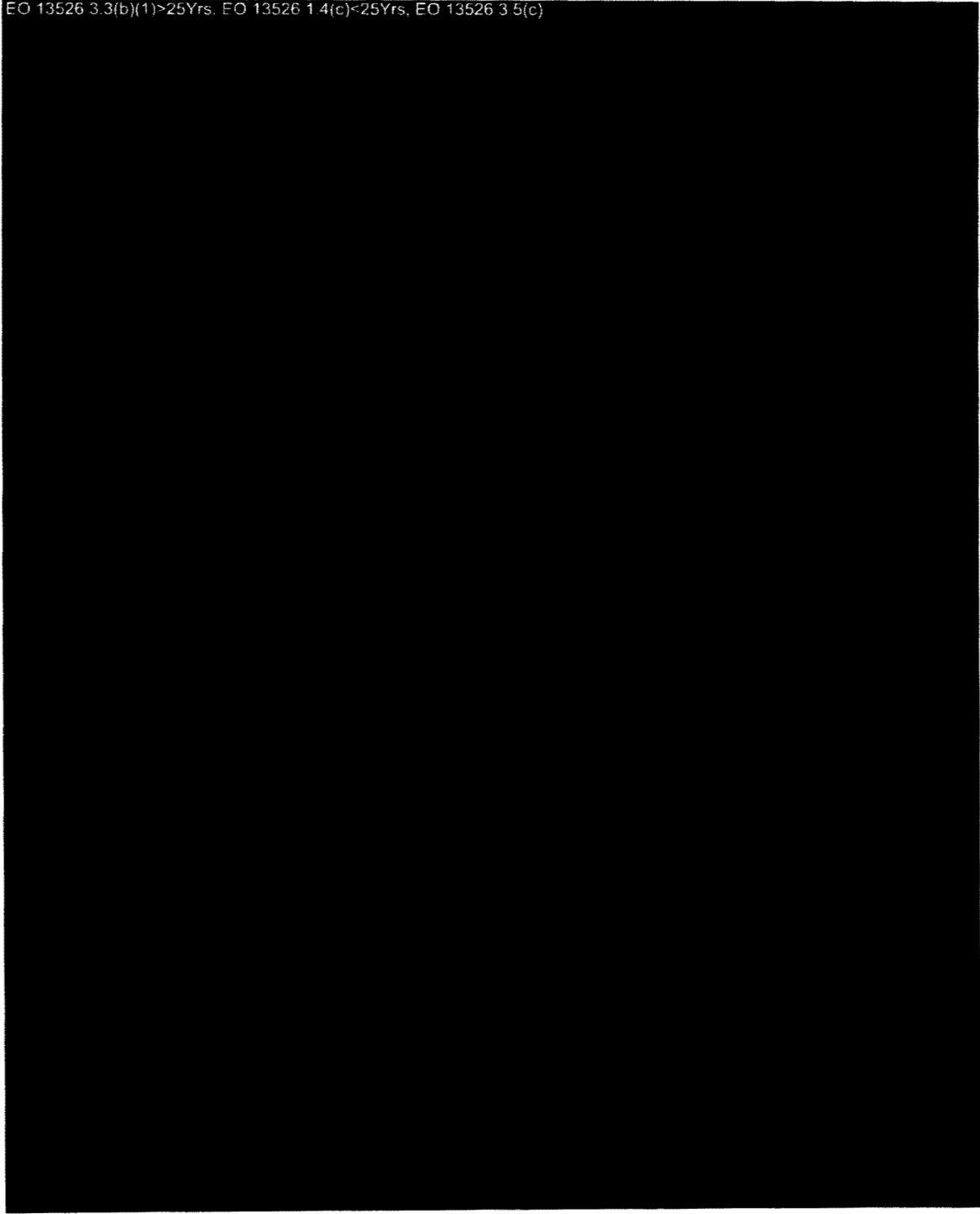
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~~NOFORN, ORCON~~

PL 86-36/50 USC 3605

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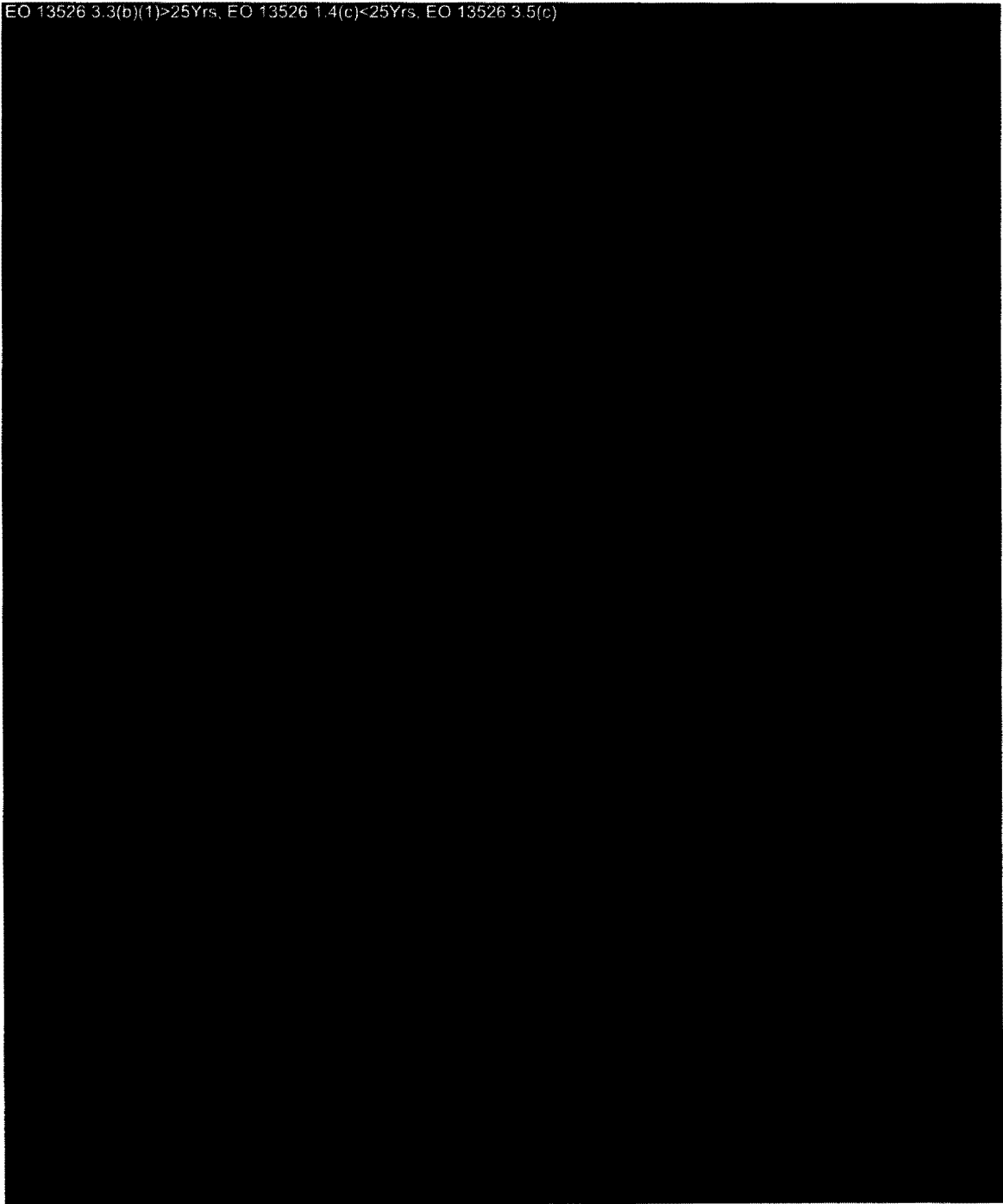


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~~COMINT~~ Control Channels Jointly  
BYE 019703

~~Top Secret~~  
~~NOFORN~~

PL 86-36/50 USC 3605

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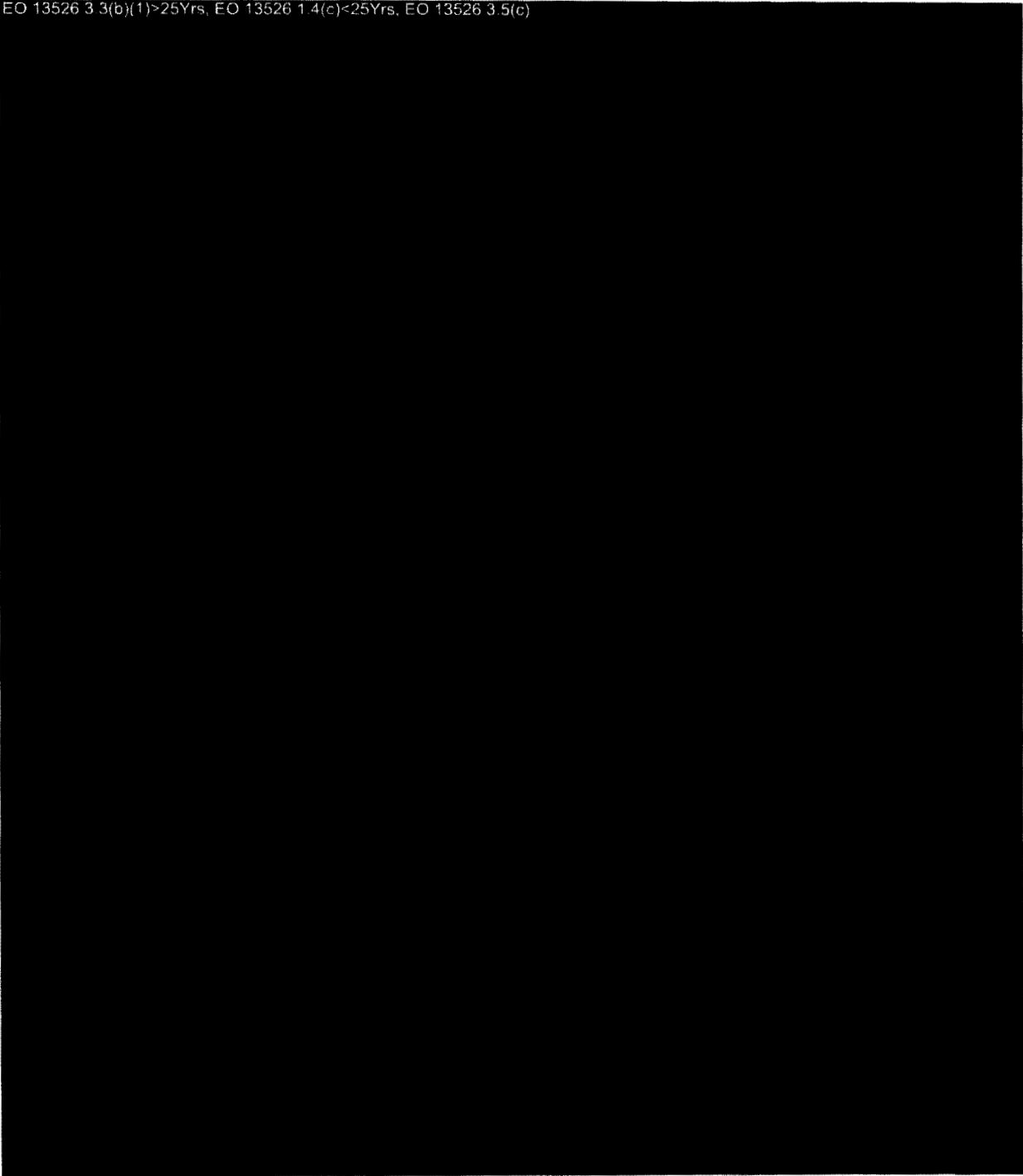
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BYE-919794

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EO 1.4.(c)

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Handle via ~~BYEMAN-TALENT-KEYHOLE-~~  
~~COMINT~~ Control Channels limits  
BYE 010704

PL 86-36/50 USC 3605

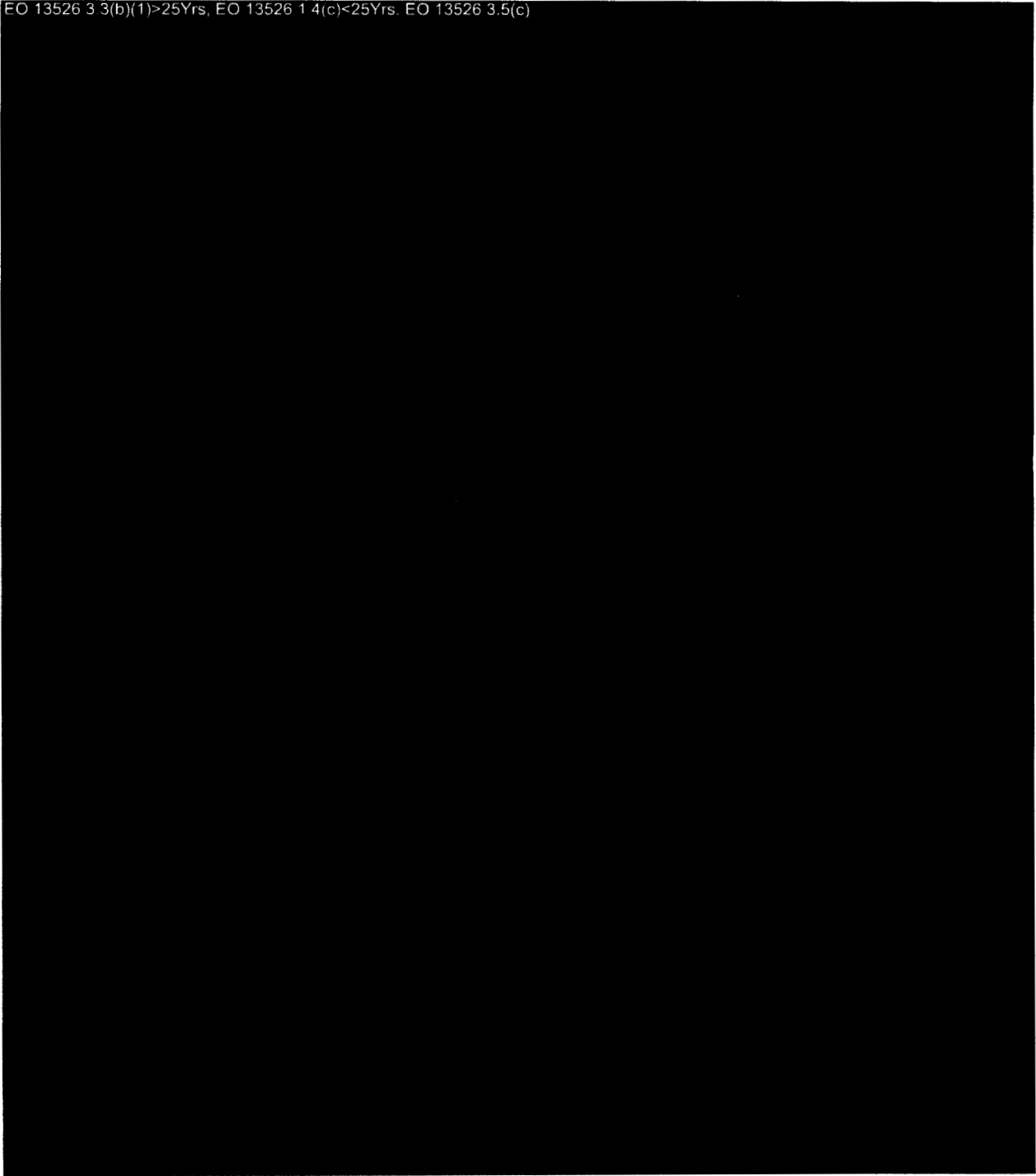
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~~NOFORN/NOFORN~~

PL 86-36/50 USC 3605

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Handle via BYEMAN/TALENT-KEYHOLE-  
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~~Top Secret~~  
~~NOFORN OR CON~~

PL 96-36/50 USC 3605

EO 13526 3.3(b)(1)>25Yrs, EO 13526 3.5(c), EO 13526 1.4



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COMINT Control Channels jointly  
~~BYE-919794~~