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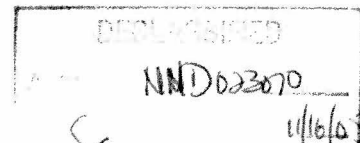
**HIGHLIGHTS IN THE HISTORY
OF THE
DIRECTORATE OF SCIENCE AND TECHNOLOGY**

The history of the Directorate of Science and Technology (DD/S&T) would appear to bear out the truism that war accelerates scientific and technological development. The successive periods of conflict beginning with World War II, which fathered the first atomic blast, have brought about a series of advances and discoveries which stagger the imagination. While achievements involving missiles, rocketry and space continue to pyramid we may have seen only the beginning since the competition in which we find ourselves, principally with the Soviet Union, inevitably calls for a more exotic system, program or device.

This describes in some measure the growth and development of DD/S&T. Even before its formal beginning as DD/R in February 1962, and later designation as DD/S&T in August 1963, events foretold the potential and importance of science and technology in intelligence as well as the need for concentrated, rather than random, exploitation of our national capability. The recognition of these indications by former Director John McCone and by the President's Foreign Intelligence Advisory Board (PFIAB), which clearly recognized the need for putting science to work across the board in CIA, was indeed fortuitous. The Director's election to create a center for science and technology, and the continuing persistence of others to man it with the most capable and qualified people obtainable have contributed substantially to our national posture.

ORGANIZATION

The first step toward bringing together the many fragmented parts of the scientific and technological

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effort was the establishment of the Directorate of Research in early 1962. Dr. Herbert Scoville, Jr., and Col. Edward B. Giller served as Director and Assistant Director, respectively. This directorate consisted of the Office of Special Activities (OSA), the Office of ELINT (OEL) and the Office of Research and Development (ORD). The next big step was the creation of the Directorate of Science and Technology (DD/S&T) in August 1963 under the leadership of Dr. Albert D. Wheelon. This added to the existing DD/R the Office of Scientific Intelligence (OSI) and the Office of Computer Services (OCS). Very soon thereafter the Foreign Missile and Space Analysis Center (FMSAC) was formed. The present organization of the Directorate was completed with the formal establishment of the Office of Special Projects (OSP) in September 1965. (Note: Organizational development is charted in Annex "A.")

This evolution has brought about an organizational structure which, at least for the time being, is geared to handle the various areas of DD/S&T concern. The office structure is designed to minimize overlap of responsibilities to the greatest possible extent.

The Office of the Deputy Director has recently been reorganized and now functions as follows: The Deputy Director, Dr. Albert D. Wheelon, has as his Assistant Deputy Director, Mr. Carl Duckett, who was appointed on 16 May 1968. Two Staff Offices, Research and Development Coordination, and Systems Analysis are headed by [redacted] respectively. The Executive Officer, [redacted] coordinates the activities of five staff sections discharging the functions of Comptroller, Procurement Management, Security Management, Administrative Support, and Intelligence Liaison Support.

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PERSONNEL

The growth of DD/S&T from a personnel standpoint to an on-board strength of [redacted] is indicated

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in Annex B. These figures, however, deserve further explanation. The need to strengthen Agency efforts in technological fields--the period of necessary build-up--coincided with a general personnel retrenchment within the Government. Significant in the growth of the Directorate is that an intensified recruiting program was, in large measure, successful in overcoming these obstacles.

Emphasis was placed on recruitment of personnel whose skills and background could impact immediately on the problems at hand. To obtain men and women of this caliber it was decided to use professional officers as specialized recruiters. It is noteworthy that these officers were able, in the face of a highly competitive professional labor market, to obtain talent in a broad spectrum of specialties from bioastronautics and nuclear physics to oceanography. Since August 1963 [redacted] with master's degrees

[redacted] with doctorates have been brought on board. (Annex C) The [redacted] represent degrees in 27 diversified categories. While advanced degrees are not necessarily a sine qua non to pursuit of intelligence objectives the special skills and training of these individuals were critically needed by the Directorate. The recruitment program concentrated on both short-term and long-term employment. A number of employees, among them professors on sabbatical and engineers from industry, were hired on short-term contract and have since departed. In the main the contributions of these specialists were highly significant.

To encourage cross-fertilization of ideas a series of "Advanced Technical Seminars" were held by the Deputy Director for the purpose of exploring validity of concept and depth of research concerned with new technical proposals. Similarly, periodic "dining-ins" were arranged where individuals having experience in intelligence would address small DD/S&T gatherings.

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FUNDING OF PROGRAMS

25X1 The series of National Reconnaissance Office (NRO) agreements negotiated during 1961-63 admittedly brought about a complex arrangement for funding and program responsibility within DD/S&T. In reviewing programs of the Directorate it should be kept in mind that approximately [] of DD/S&T personnel are directly or indirectly concerned with projects which are the responsibility of and are funded by NRO. Annex D illustrates the shift in funding arrangements for the period 1959-1967. Annex E reflects the growth of DD/S&T by Agency dollar.

OFFICES AND ACTIVITIES

There are now seven principal offices in the DD/S&T. The following sections deal with these individually in order of their establishment as an Office of the Directorate.

In addition to historical notes brief reviews of principal programs and activities are included.

Office of Special Activities

OSA began its life, organizationally, early in 1955 as a small project group of six people. Grafted onto the staff of R. M. Bissell, Jr., then Special Assistant for Policy Coordination, Office of the DCI (SAPC/DCI), its project was the covert development and operation of the U-2 aircraft in conjunction with the U. S. Air Force--Project AQUATONE. The SAPC/DCI relationship continued as the project grew. By mid-1957 the project strength was [] which gave an unwieldy overload to the Office of the Director. Project personnel were thereupon separated from Mr. Bissell's personal staff and renamed the Development Projects Staff, retaining their organizational affiliation with the Director only in the term DPS/DCI. When Mr. Bissell became DD/P in February 1959, DPS was renamed Development Projects Division and blended into the DD/P. In February 1962, when Mr. Bissell resigned

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as DD/P, DPD was transferred to the newly formed DD/R and was renamed OSA. The on-board strength at this point was [redacted] and the Director was Col. Stan Beerli, USAF. During the early summer of 1962, Col. Beerli was transferred and Col. (later General) Jack Ledford, USAF, was selected as his replacement. In mid-summer 1966 Gen. Ledford departed and was replaced by Col. Paul N. Bacalis, USAF.

Until the fall of 1963 OSA's area of responsibility covered not only manned reconnaissance systems but satellite systems as well. Early in its history, therefore, OSA was deeply involved in the development and operation of CORONA, the initial satellite photographic reconnaissance system. This project started in March 1958 and had its first launch in January 1959. In November 1959 cover was transferred from ARPA to SAFSS/USAF. The CORONA program experienced 13 failures before its first successful launch occurred on 20 August 1960. Numerous successful launches followed and are continuing with vastly improved photographic equipment. (See OSP Activities Report)

With the formation of OSP in the fall of 1965 that office assumed all responsibility for satellite systems, leaving OSA concerned with manned reconnaissance systems, first the U-2 and followed by OX CART.

Highlights of the U-2 project, which was approved by the President in November 1954, include the first flight of a U-2 on 6 October 1955 (eight months after the contract had been let); the first flight over USSR on 4 July 1956; the last flight over USSR on 1 May 1960; and the 50 Agency flights over Cuba (the last on 5 October 1962) immediately preceding the missile crisis.

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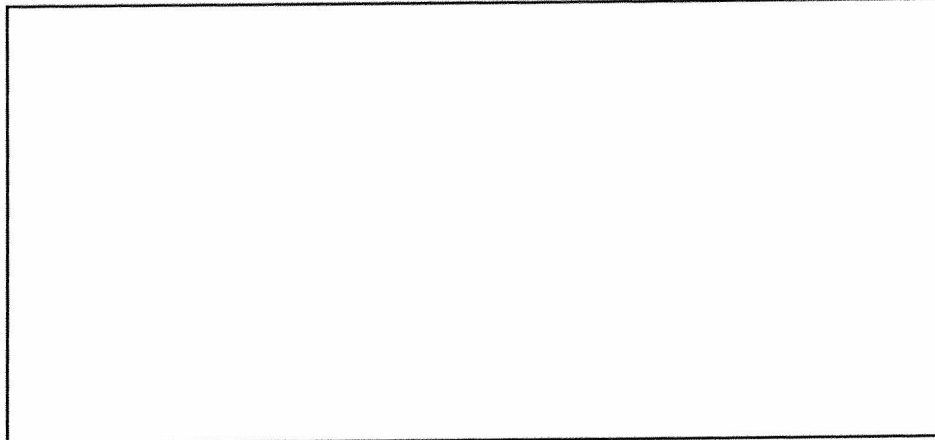
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Since the basic U-2 was produced CIA has developed a refueling version and a carrier take-off/landing capability. The original engine was replaced in 1959 to permit an important altitude increase.

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The OXCART project, a successor to the U-2, which began in September 1954 after earlier Presidential approval, led to the development of the first MACH-3 aircraft. The first flight of an OXCART occurred on 26 April 1962 [redacted] and the first MACH-3 flight took place on 9 May 1962. Through August 1966 a total of 245 hours of flight time at MACH-3 or above had been accumulated. The OXCART, a large-scale development undertaking of CIA, has demonstrated a capability to produce high-resolution (one foot) photography at penetration altitude and speed, and was declared operationally ready in November 1965. The current OXCART fleet consists of nine aircraft and one trainer. On 1 June 1965 the Agency was authorized to proceed with a deployment plan at Kadena AFB, Okinawa. By 15 November 1965 support facilities and supplies were in place to permit operation on an emergency basis. By 1 December 1965 arrangements had been completed, making it possible to deploy to this advance base

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on a fully operational basis within 15 days of a decision to effect such deployment.

The DD/S&T has not had any direct responsibility for photographic drone aircraft; however, OSA did perform the initial development on TAGBOARD, a drone version of OXCART. This program has been transferred by NRO to the Air Force.

Although no additional manned reconnaissance aircraft programs have been approved for development, OSA has continued active investigation of several advanced concepts including ISINGLASS, a boost-glide vehicle with a much higher altitude and speed capability.

Office of Research and Development

In 1962 ORD was created by the Director of CIA, upon the recommendation of Dr. Scoville, as the scientific development and research element of DD/R. When ORD came into being, it was staffed by three people and had a budget of a little more than [redacted]. Personnel initially staffing the office were transferred from TSD/DD/P. The office developed an initial plan for reaching [redacted] and a budget of [redacted] within a three-to-five year period. It was to be primarily concerned with new applications of existing scientific knowledge which might have intelligence applications. In mid-1963, Mr. Robert M. Chapman and [redacted] became Director and Deputy Director, respectively, of ORD. The basic division in this office has been between life sciences on the one hand and physical sciences on the other. The former includes biological, medical and behavioral sciences while the latter is concerned principally with the fields of optics, radio physics, physics and chemistry, and audio physics. ORD began FY 1967 with a [redacted] budget and a personnel allotment of [redacted].

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One of the major efforts in the life sciences area is the program to improve and upgrade the performance of the polygraph. This program was initiated in FY 1964 with the goal of developing new sensors and improved indicators for the polygraph and automating its operation through the use of computers. Results of this program have already led to the installation of improved equipment in the polygraph rooms and the adoption of new computer methods for exploiting polygraph data.

The ORD Audio Surveillance program was inspired by the National Security Action Memorandum No. 170 dated 6 July 1962 in which the White House emphasized the critical importance of audio surveillance in intelligence collection and the extremely serious problem of protecting the U. S. Government from penetration by enemy audio systems. As a result, the CIA-DIA Scientific Guidance Panel was convened in 1963 and recommended advanced research efforts in both the audio surveillance and countermeasures areas. The DCI, Mr. McCone, endorsed these recommendations to the White House and gave instructions for these efforts to proceed.

Beginning in early 1964, a set of intensive studies and investigations proceeded involving the most advanced technology in microelectronics, speech recording and analysis, microminiature sensors, laser probe systems, and microwave techniques for the purpose of seeking order-of-magnitude improvements over current technology. By 1966, ORD was able to propose an advanced scientific and technological program based on the results of these investigations - the [redacted] which proposed to elevate to a completely new level CIA capability in this intelligence collection area

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FY 1966 and is being augmented in FY 1967 to the extent of [redacted] An operational [redacted] a real breakthrough in this

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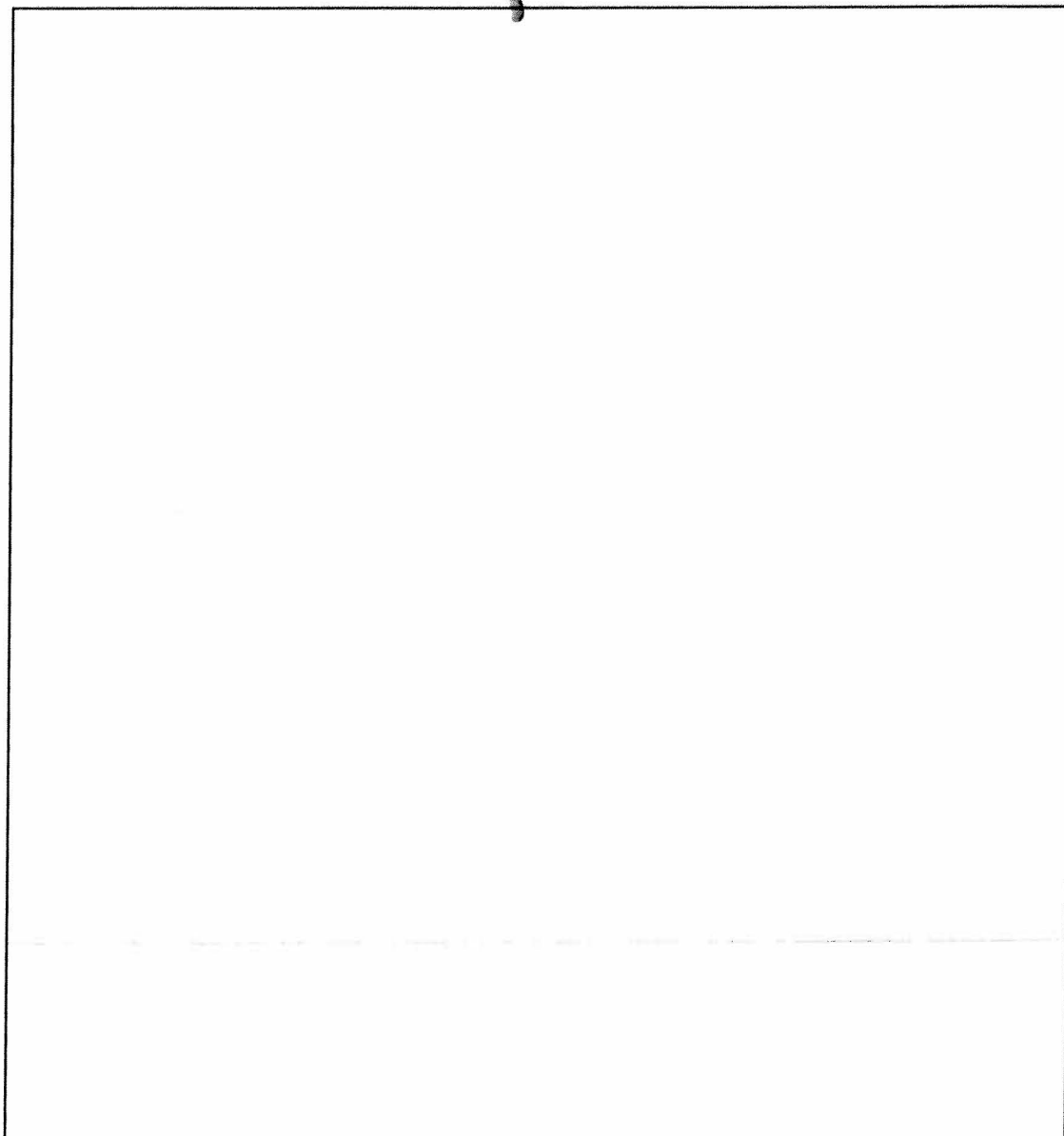
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Office of ELINT

While the Agency became involved in ELINT analysis in 1956 to provide necessary secure facilities for analysis of U-2 missions, OEL, as such, was not established until 30 July 1962. It was formed from a relatively small group from the Office of Scientific Intelligence and a similar group from the Office of Communications.

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At that time the office was organized into a staff and three divisions: Operations, Analysis, and Research and Development. [REDACTED]

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[REDACTED] The Director of OEL is Mr. George C. Miller who has been in charge of the office since its assignment to the Directorate.

In the area of ELINT operations there have been a number of projects which stand out from the other on-going operations serviced by OEL.

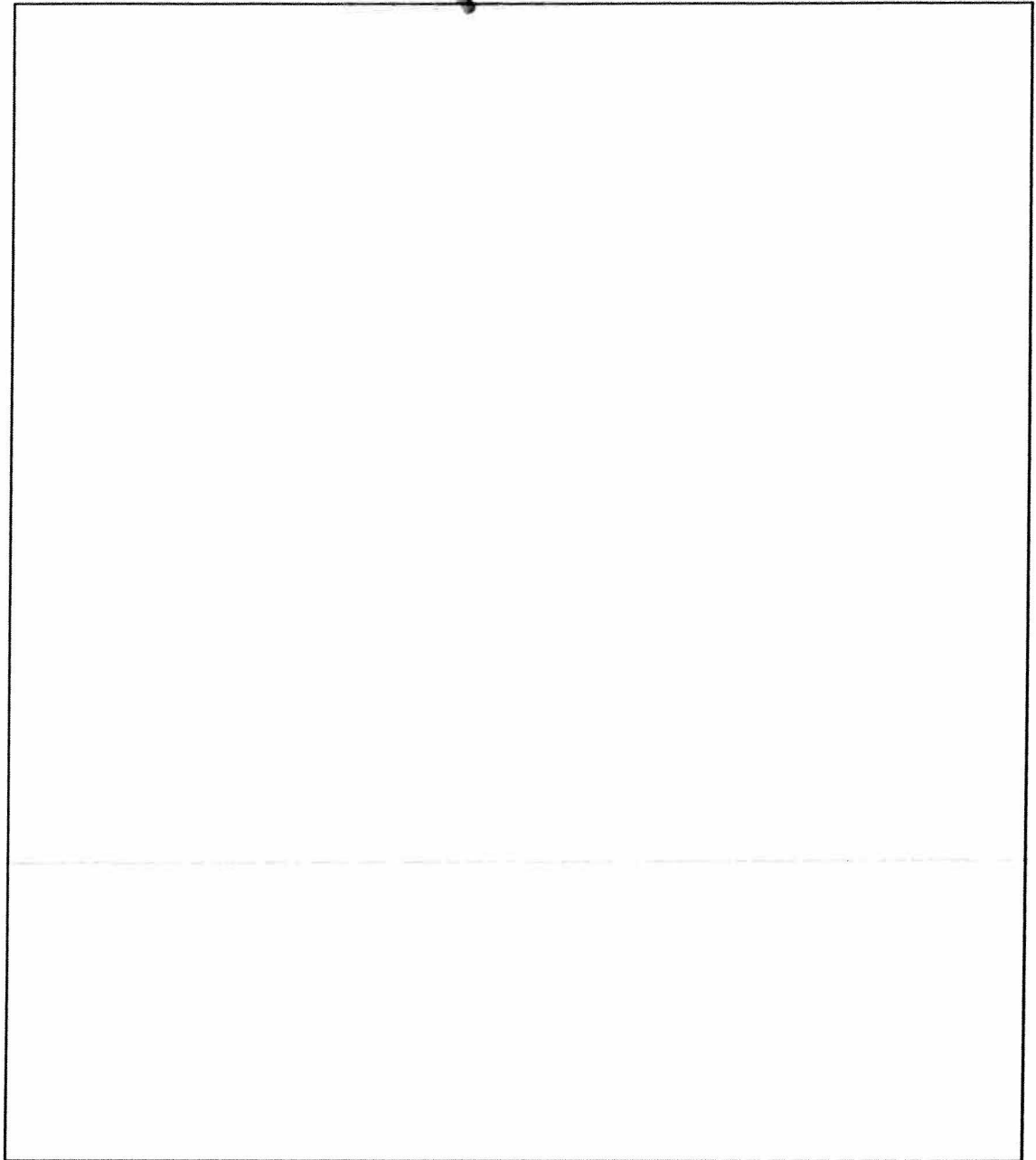
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Office of Scientific Intelligence

The origin of OSI may be traced to the Manhattan District (ca. 1944), the Central Intelligence Group (CIG) (1946) and to the Office of Strategic Services (OSS). As a formal entity, however, OSI

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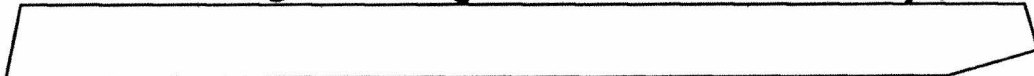
was established on 1 January 1949 under Dr. Willard Machle as a merger of two scientific intelligence entities (Scientific Branch/ORE/CIG and a nuclear energy intelligence group transferred from Manhattan District to CIG after World War II).

As an office of the Directorate of Intelligence (DD/I), OSI was under Dr. Herbert Scoville, Jr's., leadership during the period 1955 to 1962. Dr. Albert D. Wheelon then served as Director until the establishment of DD/S&T in 1963. At this time OSI became a part of DD/S&T and Dr. Donald F. Chamberlain was appointed its Director. Dr. Chamberlain still serves in this capacity, assisted by Dr. Karl Weber as deputy.

When OSI was assigned to DD/S&T its collection support was transferred to Collection Guidance Staff (CGS). With the creation of new components within DD/S&T OSI lost some of its other responsibilities and personnel. In particular, its ballistic missile and space functions and personnel were reassigned to augment the Foreign Missile and Space Analysis Center (FMSAC) in October 1965.

OSI is responsible for intelligence on foreign scientific and engineering research; and on the design, development, and performance capabilities of foreign devices, products, equipment and systems. Further, it is responsible for all aspects of foreign intelligence on atomic energy, biological and chemical warfare. OSI is charged with the establishment and maintenance of a coordinated program of collection support, research, analysis and production in these foreign scientific and technical intelligence fields.

OSI is the principal community contributor of S&T inputs to national intelligence. The Office contributes to principal military estimates and other papers on the USSR. In the 1960's greater attention began to be given to Communist China, as

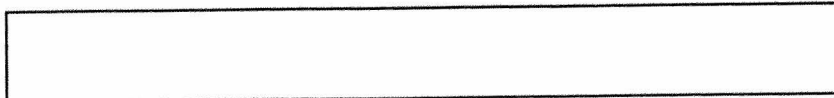


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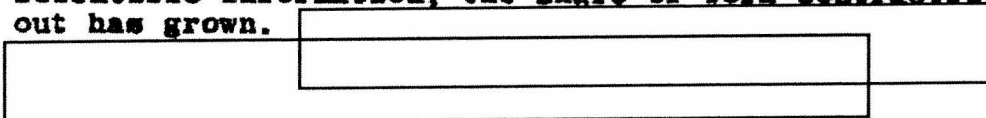
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Contributions to estimates are made directly or via three of USIB's technical committees, JAEIC, SIC, and GMAIC, the first two of which have always been headed by OSI officers. GMAIC was headed by an OSI officer until the formation of FMSAC in late 1965. The Office also contributes to the National Intelligence Survey Program, and today some 30 or so countries are covered in various S&T fields.

OSI has a current scientific intelligence effort and contributes to OCI daily and weekly publications. The Scientific Intelligence Digest, published since the early 1950's, is now published monthly.

In 1964 the importance of, and increase in, scientific intelligence material justified publication of a daily, the Surveyor, which soon appeared in weekly versions for the intelligence community. Important items of current interest and high priority appear as briefs or memoranda, and items are contributed to the weekly USIB Watch Report.

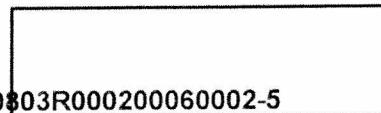
The backbone of OSI production has been the Scientific and Technical Intelligence Reports (formerly called Scientific Intelligence Reports.) These in-depth studies cover the gamut of foreign S&T developments and provide analyses and conclusions contributing to National Estimates. These number from 60 to 100 a year. Until the mid-1950's most research and analysis was done in-house but with the increase in the amount of available scientific information, the share of work contracted out has grown.



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OSI's major products support the National Estimate program; and ONE, directly or indirectly, is a principal consumer. Other periodicals and reports have a variety of audiences, some going only

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to top-level policy makers, others to as many as 800 consumers.

Several periodicals and many papers go to the White House, the Secretaries of State and Defense, the President's Scientific Advisor, the President's Science Advisory Committee, and the Foreign Intelligence Advisory Board, as well as to contractors and consultants in the U. S. industrial and academic worlds.

Office of Computer Services

During the period July 1961 to August 1963 the computer activity of the Agency began to emerge. As a first step the Automation Staff of DD/I merged with the CIA Management Staff and, augmented by fifty DD/I slots, formed the CIA Automatic Data Processing Staff (ADPS). This Staff was placed under the DD/S and charged with (1) establishing a computer center (IBM 1410/1401); (2) carrying on CHIVE (a joint OCR-OCS project to apply computer backup to the central reference facilities of the Agency); (3) technical supervision of DD/S/Comptroller/ADP Division; and (4) CIA Electronic Data Processing (EDP).

With the rapid advances in computer technology the Director recognized the need for a principal center which would consolidate the Agency's assets in this field and coordinate its overall effort.

On 5 August 1963 the ADPS was renamed the Office of Computer Services (OCS) and transferred from DD/S to DD/S&T. The personnel allocation was increased to [] through transfer of [] from the Office of the Comptroller. Mr. Joseph Becker served as Director until 1 June 1966 when Mr. Charles A. Briggs of DDI/OCR was named to replace him.

An important purpose in establishing OCS was to solidify hardware and personnel assets and to build a strong cadre of people capable of applying machines intelligently to Agency research and production work.

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Early in 1965, after considerable study, the decision was made to convert to third-generation computer hardware, the ultimate model selected being the IBM 360/67. The OCS Computer Systems Planning Report was issued on 1 June 1965. From that date to the present, the evolutionary process has been going on through smaller 360 computers -- the models 30, 50, and 65. The IBM 1400 and 7000 series Systems and the [] will be replaced early in FY 1968.

Foreign Missile and Space Analysis Center

FMSAC, one of the offices more recently established in DD/S&T, had its beginning in November 1963. Its creation was, again, an inevitable development occasioned by the need to improve significantly the technical quality and timeliness of analysis on foreign space and missile activity.

On March 1964, construction of a FMSAC Control Center was completed and a 24-hour watch office was established. Simultaneously a Daily Missile and Space Summary began to be published to describe significant activities on a current basis to the intelligence community.

In April 1964, FMSAC commenced the publication of a series of Event Reports. These reports contain a detailed technical analysis of significant Soviet missile and space operations based on all of the information collected by this government on each particular event. Through 31 August 1966, 138 of these reports have been disseminated []

On 25 October 1965, the missions, functions and analytical responsibilities of the Ballistic Missile and Space Division of the Office of Scientific Intelligence and the Foreign Missile and Space Analysis Center were combined by []

[] The new organization retained the

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name of FMSAC and Messrs. Duckett and Brandwein remained as Director and Deputy Director, respectively.

The original FMSAC had, by the time of this organizational change, achieved a personnel strength of [] were transferred from OSI to FMSAC with this merger.

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At the time of the reorganization a Project Staff was established with responsibility for systems analysis of all foreign missile and space systems except defensive weapons, the preparation of various special assessments, and submissions to National Intelligence Estimates. It was organized into groups responsible for such problems as ICBM and IRBM systems, space systems, tactical, naval, and the various non-Soviet missile and space efforts.

Following this merger, arrangements were made with the Office of Scientific Intelligence to continue producing certain types of reports through the Production Staff of that Office, thereby negating the need for duplicative production establishments. Since late 1965, a total of 20 reports have been published through this mechanism.

In May 1966 when Mr. Duckett was appointed Assistant Deputy Director for DD/S&T, his deputy, Mr. David S. Brandwein was named to succeed him as Director, FMSAC.

Office of Special Projects

The beginning of OSP as a formal part of the DD/S&T organization started in the winter of 1963 when an operations analysis group called the Special Activities Staff (SAS) was established under Mr. Jack Maxey. Most of their activities were concerned with support of overhead reconnaissance programs. In August of 1964 the Deputy Director, S&T, obtained DCI approval for designating this group--then called Special Projects Staff (SPS)--to handle all CIA satellite reconnaissance programs. Later approval in principle was sought for establishing a separate office within DD/S&T to perform this function. On 15 September 1965 the Executive

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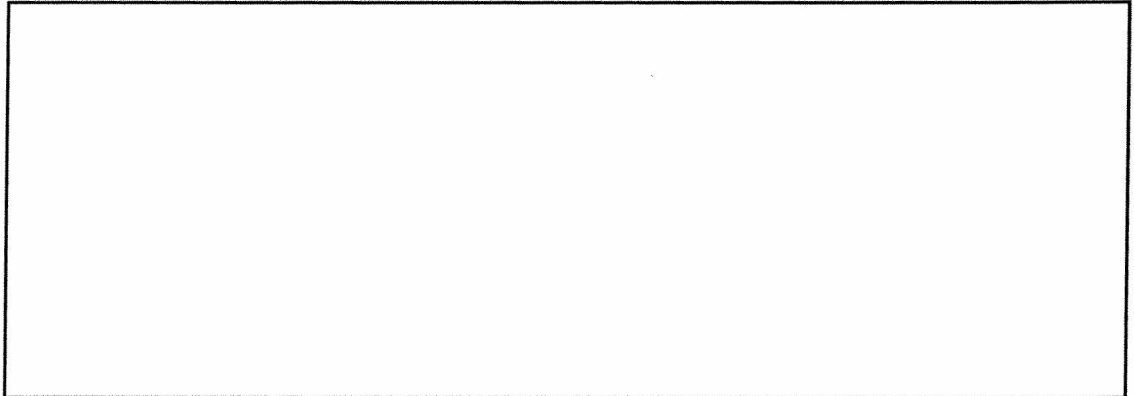
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25X1 Director-Comptroller, CIA, approved the establishment of the Office of Special Projects (OSP) with a planned authorized table or organization of [] personnel. Mr. John J. Crowley was appointed Director of the office.

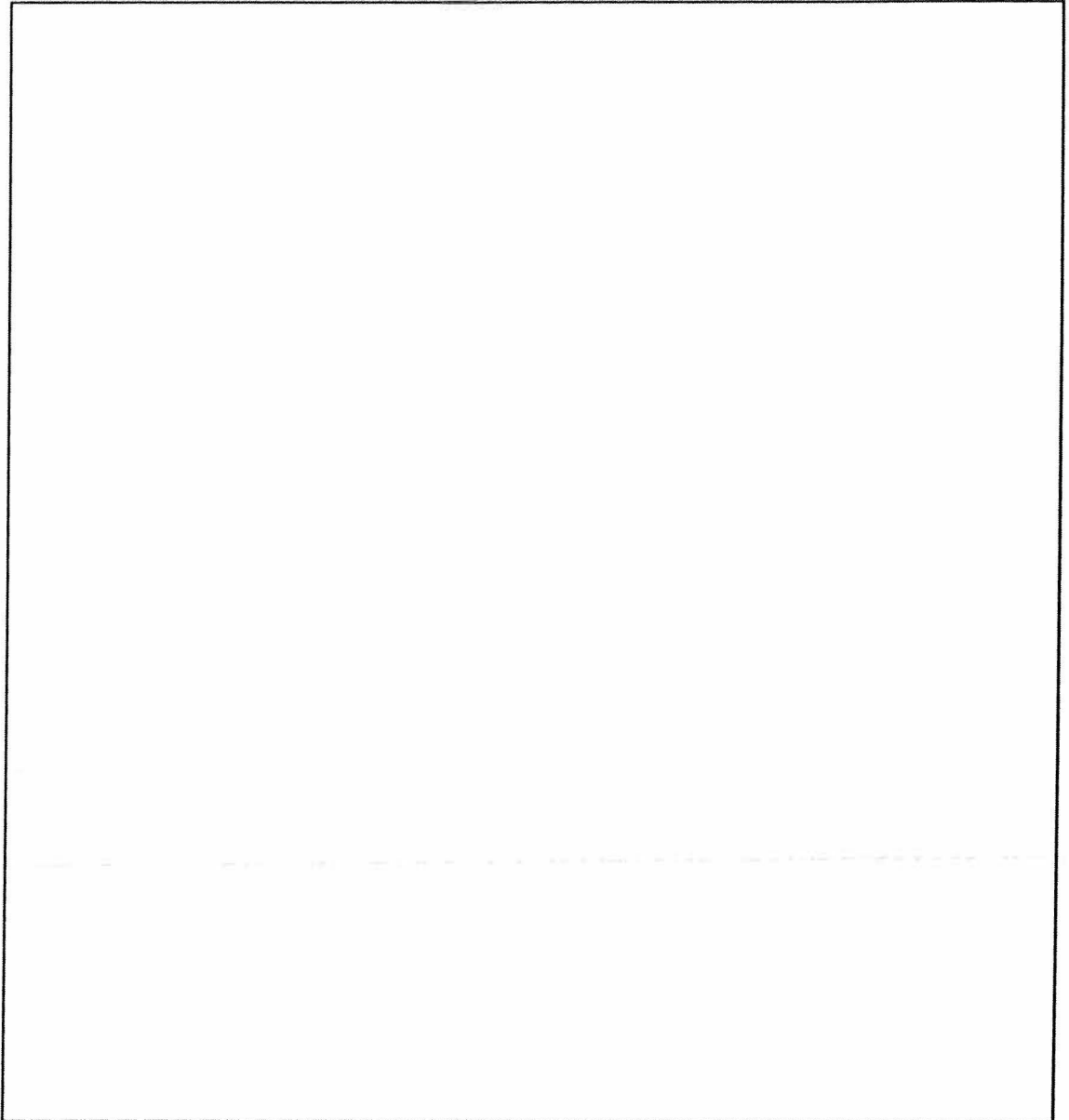
25X1 The principle efforts of OSP are the CORONA, [] projects. In addition, the Design and Analysis Division is engaged in work involving applied research, advanced technology, []

The CORONA project is a satellite photographic search and surveillance system with two recoverable capsules for retrieval of exposed film. A typical CORONA mission provides about 10,000,000 square nautical miles of coverage with an average resolution of 10 feet. The project was initiated in 1958, and the first capsule of film was recovered in August 1960. To date, 90 capsules have been returned from 79 launches, and have brought back more than 95 percent of our intelligence photography of the Sino-Soviet Bloc. The CORONA J-3 configuration, scheduled for launch in August 1967, will allow for an 80 nm perigee and other improvements thus improving average resolution from 10 to 7 feet. OSP is responsible for the CORONA cameras, recovery vehicle, payload housing and structure including assembly, integration, check-out, pre-launch mission planning, on-orbit camera operation and diagnostics, post-mission analysis and evaluation.

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COMMITTEES AND PANELS

DD/S&T has historically been actively involved in the committee structure of USIB, providing chairmen and

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administrative support for as many as five separate committees concerned with scientific and technological matters. A listing of these committees and their areas of interest follows:

Guided Missile and Astronautics Intelligence Committee (GMAIC) - Chairman, Mr. Carl E. Duckett, former Director, FMSAC, currently Assistant Deputy Director, DD/S&T. GMAIC coordinates guided missile and astronautics intelligence production activities of the Government; it also develops a community approach to problems in the field and promotes interagency liaison. FMSAC provides the secretariat and substantive support.

Joint Atomic Energy Intelligence Committee (JAEIC) - Chairman, Dr. Donald Chamberlain, Director, OSI. JAEIC fosters, develops, and maintains a coordinated community approach to problems in the atomic energy intelligence field, promotes interagency liaison, and gives community support to efforts of individual agencies. The Office of Scientific Intelligence provides the secretariat and also substantive support.

Committee on Overhead Reconnaissance (COMOR) - Chairman, [redacted] Special Assistant, DD/S&T. COMOR provides a focal point for information on, and development of foreign intelligence requirements for, overhead reconnaissance projects and activities of the Government over denied areas. The Committee coordinates the adaptation of priority requirements established by USIB to potential overhead reconnaissance systems. DD/S&T provides the secretariat and operational and technical support to the photographic, ELINT, COMINT, [redacted] collection.

Scientific Intelligence Committee (SIC) - Chairman, [redacted] Deputy Director, OSI. This Committee develops and maintains a coordinated Community approach to problems in S&T intelligence (except those of JAEIC and GMAIC), promotes liaison and gives Community support to efforts of individual agencies. OSI provides the secretariat and also substantive support.

SIGINT - Chairman, [redacted] Director of Reconnaissance, CIA. The responsibility of

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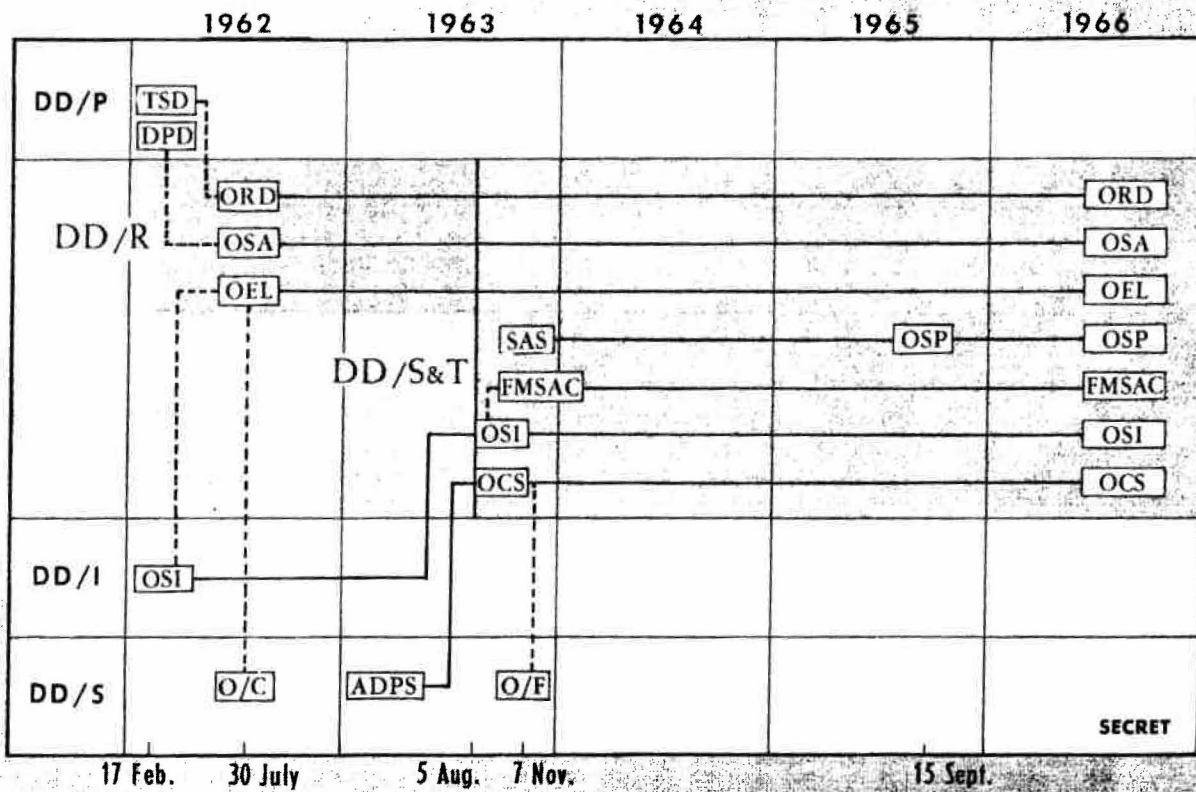
the SIGINT Committee extends to those matters within jurisdiction of USIB. DD/S&T provides slots for the SPINT Staff support to Chairman, SIGINT.

Research and Development Subcommittee of the Technical Service Countermeasures Committee (TSCC) of USIB. Mr. Robert M. Chapman, ORD, serves as Chairman. DD/S&T provides administrative and substantive support.

To permit the intelligence community to benefit from the knowledge and experience of respected scientific and technical leaders from industrial, governmental, and academic communities. Panels have been formed to advise the DCI and USIB. Three of these are in the areas of foreign strategic weapons systems, foreign space programs, and foreign nuclear energy programs. During the past year, on at least two occasions, the Strategic Weapons Intelligence Panel under Dr. Lawrence A. Hyland, the Space Intelligence Panel under Dr. Simon Ramo, and the Nuclear Intelligence Panel chaired by Mr. Louis H. Rhoddis met to consider the problems and new developments in their respective areas.

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DD/R - DD/S&T ORGANIZATIONAL DEVELOPMENT Feb. 1962 - Sept. 1966



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