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30 June 1965

MEMORANDUM FOR: Chief, CIA Imagery Analysis Division, NPIC

SUBJECT: Inspector General's Report

1. Attached is the Inspector General's Report and a numerical listing of the recommendations contained in the report accompanied by the name of the division or divisions responsible for commenting on each recommendation.

2. Will you please furnish me by 9 July 1965 your written comments on each of the recommendations indicated as well as any general comments you might have on specific parts, or the whole of the study, or any other recommendations that you feel are of interest to you.

[Redacted Signature]

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Assistant for Administration, NPIC

Attachments: (2)
IG Report
List of Recommendations

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11 June 1965

MEMORANDUM FOR: Deputy Director of Central Intelligence

SUBJECT : Inspector General's Survey of the National
Photographic Interpretation Center

1. Submitted herewith is a report covering the inspection of the National Photographic Interpretation Center (NPIC), DD/I. Also attached for your signature is a memorandum to the Deputy Director for Intelligence requesting his response within sixty days to the recommendations contained in the report.

2. The last Inspector General's Survey of NPIC was made in 1962. I am impressed at how remarkably little change there has been in the operating problems NPIC faces. Most of the conclusions we reached three years ago are still valid today. I am also impressed by the accomplishments of NPIC since 1962 in coping with its steadily and rapidly rising workload. While its personnel strength was a little better than doubling, film inputs to it were increasing some fourteen-fold.

3. The requirements of the intelligence community for photographic intelligence have always exceeded the production capacities of NPIC, and probably always will. Similarly, the capability to collect new photography has expanded at a faster rate than NPIC's production capacity, and the scheduling of individual satellite missions has been made without regard for availability of photo interpretation manpower. We saw a developing need three years ago to establish a Committee on Exploitation at the USIB level, and it is now time to create such a mechanism.

4. Although there has been a revolutionary expansion of the photographic collection capability, the techniques for interpreting photography have evolved much more slowly. Little attention has been given to the need for compatibility between collection systems design and exploitation techniques. NPIC has been and, as things now stand, will continue to be faced with having to resort to extensive manual operations in its analysis of photography.

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5. NPIC has compiled a forecast of personnel and financial resources required over the next five years to cope with the increasing volume and improving ground resolution of film expected to be delivered to it for interpretation. The forecast is based on NPIC's past experience factors in handling present film formats and on professional judgments of the impact of improved systems whose design parameters are known. NPIC sees a need by 1970 for a personnel strength approaching [redacted] and an annual program cost in excess of [redacted]. In terms of NPIC's experience to date, these figures may well be conservative. The forecast addresses itself only to the impact of major new systems that can be expected to operate within the next five years and the design specifications of which are known. The state of the art of sensor systems design is moving rapidly toward search and surveillance capabilities

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As these systems come into operation, the dimensions of the exploitation problem will radically change.

6. We devoted particular attention to the technological aspects of photo interpretation. It appears to us that the break-through needed to materially cut the human-hours spent in photo interpretation, if break-through is in fact possible, will be found in vastly improving the integration of collection systems design with photo interpretation techniques. Because this is a highly technical field, there would be much to be gained from a cross-disciplinary examination of photo interpretation technology and procedures by a panel of competent consultants. I have had conversations with the Assistant Deputy Director for Intelligence toward this end and have furnished him with a list of individuals whom we have identified as being particularly well qualified to participate. The Director has already signed a letter to the Chairman of his Scientific Advisory Board requesting that such a panel be formed.

7. If the panel of consultants is unable to arrive at workable recommendations for substantially reducing man-hour

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per foot of film: factors within the near future through further automating of photo interpretation techniques, then I see no alternative to being prepared to begin rapidly expanding the Agency's allocation of personnel and financial resources to AFIC.

J. S. Earman
Inspector General

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List of Recommendations

<u>Recommendation</u>	<u>Action</u>
1	Office of the Director
2	Office of the Director
3	TID and P&DS
4	IPD, TID & P&DS
5	P&DS
6	P&DS and SS
7	P&DS
8	Office of the Director
9	SS
10	SS, TID, IPD, P&DS and PID p. 98
11	Office of the Director
12	PID p. 104
13	SS
14	SS and TID
15	
16	Office of the Director
17	Office of the Director
18	PID p. 110
19	PID and SS p. 111
20	PAG
21	PAG, PID , PSD, Records Management Officer p. 113

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INSPECTOR GENERAL'S SURVEY

OF THE

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

June 1965

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INTRODUCTION

Most of the conclusions reached as a result of our Survey of the National Photographic Interpretation Center (NPIC) in 1962 are still valid. (See extracts at Tab A). The intervening years have brought remarkably little change in the operating problems NPIC faces. Three years ago NPIC was jammed into the Stuart Building, a converted garage, and was using inadequate and antiquated processing equipment; it then had an on-duty strength of [] against an authorized strength of [] Today it is housed in the recently reconstructed [] which was functionally designed for photo-interpretation purposes. It has an on-duty strength of [] against an authorized strength of [] Thus, personnel strength over the last three years has more than doubled. Why then should NPIC still be operating under the same sort of near-desperate work pressures? The answer is to be found in the film inputs to NPIC. While personnel strength was a little better than doubling, film inputs were increasing some fourteen-fold. Our survey uncovered essentially the same set of problems we treated then and our conclusions today differ only in degree from those of three years ago.

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EVOLUTION OF THE ROLE OF PHOTOGRAPHY IN INTELLIGENCE COLLECTION AND ANALYSIS

1. The three years since the last Inspector General's survey of NFIC have seen peacetime reconnaissance of denied areas by photography firmly established as a major instrument of national intelligence collection. A substantial portion of U.S. knowledge of Soviet and Communist Chinese weaponry, hardware development and testing, military programming, military intervention abroad, and economic activity was initially obtained from overhead photography, and much of it is still unobtainable in like quantity or quality from any other sensor or human collection capability.

2. Human intentions and activities in developmental laboratories within denied areas are only indirectly accessible, if at all, to sensor collection systems. On the other hand, sensor systems (such as COMINT, ELINT, photography, [REDACTED]) today provide the only partially assured access to the visible manifestations of the results of plans and development in areas protected by efficient security and police systems. Sensor collection systems and human source collection systems are clearly complementary in intelligence collection; however, it is our view that photography is now established

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as the lead contributor to national intelligence estimates on the military postures of the Soviet Union and of Communist China.

3. Sensor systems, with photographic collection and exploitation as a prime example, have been caught in a dynamic and sophisticated post-war technological revolution. Major systems innovations, including high- and low-level aircraft and satellite systems, are occurring at the rate of at least one every three to five years. For example, the KH-4 system appeared in 1960, the

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[] Although we have witnessed and are witnessing a revolutionary expansion of the photographic collection capability, the techniques for discovering the intelligence contained in photography have evolved much more slowly.

4. United States photographic systems development is currently, and very belatedly, entering the era of integrated systems design. The key principle, now increasingly appreciated, is that no element of the collection device may be varied without significant impact on many other elements of the total collection/exploitation design concept. All three current U.S. operating systems, the U-2 and the KH-4 [] meet only partially and inadequately the technical exploitation requirements of NPIC. Despite certain design deficiencies in the U.S. photographic reconnaissance effort of the first ten years, the effort has achieved a significant

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capability to conduct repetitive search and identification of activity in denied areas and is now moving rapidly into an era of continuing surveillance and analysis of change in known targets.

5. Concepts within the U.S. intelligence community for the complete exploitation of photography and for integrated analysis of all other sources of information, by photo interpreters, intelligence analysts, and estimators are at an early stage of evolution. Some current trends include:

a. An intensification of area specialization to match initial functional specializations, e.g. in guided missiles, in nuclear weapons and installations, or in electronics.

b. An expanding effort to improve data processing and retrieval systems, utilizing all-source information, and serving both photo interpreters and intelligence analysts.

6. In the last analysis, photo interpretation deals in judgments, not in facts, particularly given today's state of the art in controlling ground resolution in high-altitude photography. Photo interpretation is a human skill that can be supported by but not replaced by automation. The key to continuing and improving effectiveness in the exploitation of photography is free communication between the photo interpreter, the analyst, and the consultant, with each acquiring greater competence in the others skills.

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**COMPARISON OF THE NPIC WORKLOAD WITH THAT
OF THREE YEARS AGO**

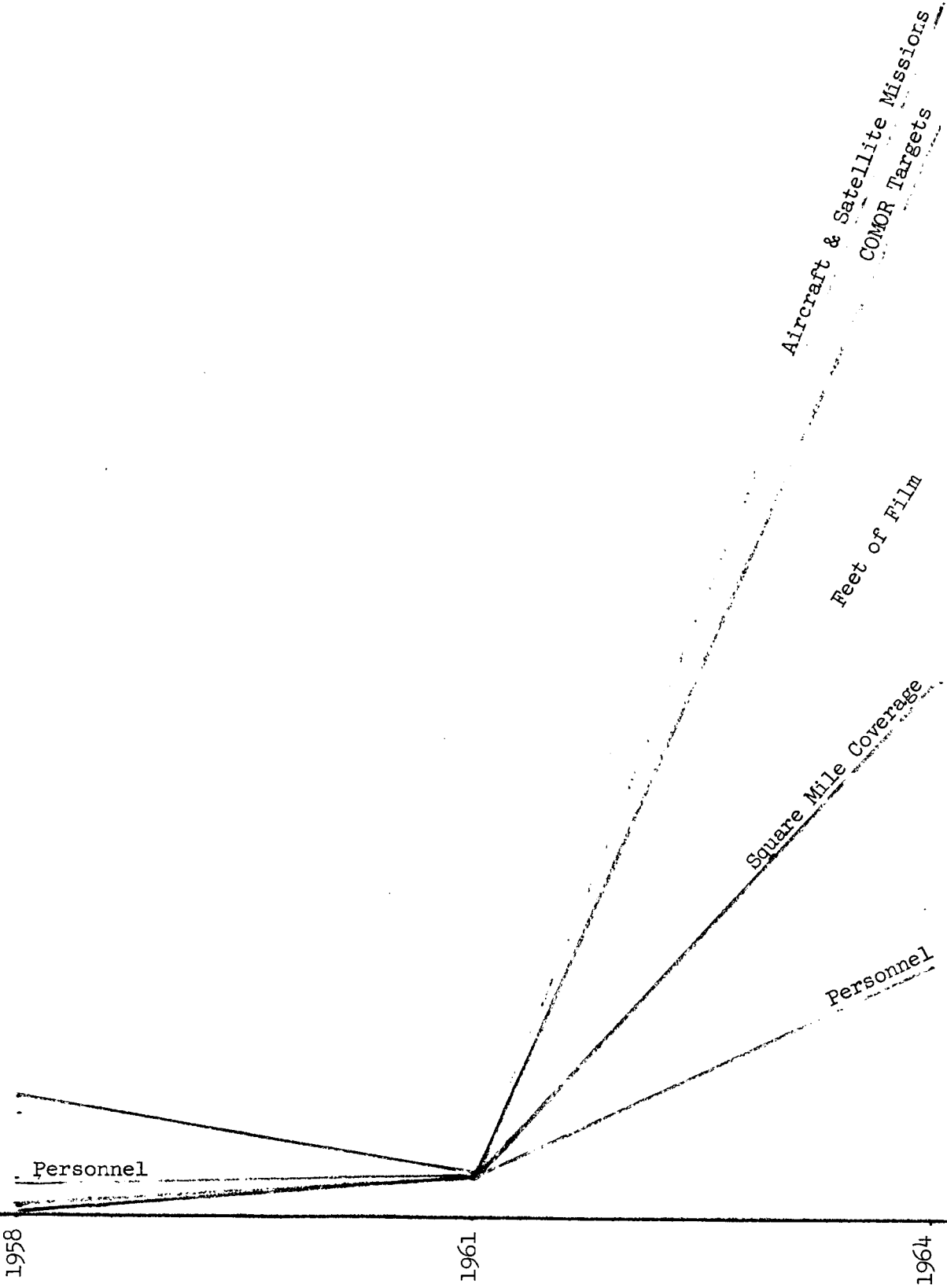
1. A valid comparison of today's workload in NPIC with that of any prior year requires that many variables must be taken into account. An indication of the tremendous increase can be obtained from comparing such factors as number of aircraft and satellite missions flown, linear feet of film delivered, square miles of the earth's surface imaged on photography, or the number of COMOR targets designated for coverage. None of these criteria, however, take into account what can be seen on the film and can be described and measured accurately. The more the photo interpreter can see on the film, the more time he must spend in searching out fine detail. As a corollary, the more details the photo interpreter can observe, the more numerous and more complex are the requirements levied on him.

2. The time required to interpret photography varies with the volume of film delivered, the number of targets covered, and image quality. Image quality is affected by such factors as the resolving capability of the camera system, the film, and the film processing and viewing equipment, and by cloud cover, obliquity, haze, snow, darkness, sun angle, contrast, vehicle altitude, etc.

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1961

1964

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3. A Photo Working Panel, under the technical direction of Dr. Sidney Drell of Stanford University, spent some three months last year studying problems of image quality. The Panel's principal conclusion was that much work is yet to be done in getting accurate, quantitative measures of image quality. Although precise measurement of image quality is not yet possible, there are certain yardsticks that may be used in arriving at a gross estimate of how quality has improved over recent years.

a. When what we now know as the KH-4 system first became operational in 1960 it delivered photography with a ground resolution of perhaps 100 feet. By 1962 it was delivering photography with 25-foot resolution and occasional frames on which it improved to perhaps 10-15 feet. Now the KH-4 system is quite regularly delivering resolution on the order of 10-15 feet.



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4. Vastly improved image quality has been paralleled by a geometric expansion in number of missions flown, in film footage delivered, and in COMOR targets covered. The graph reproduced on the opposite page compares the various ways of gauging workload for each of the years 1958, 1961, and 1964. The scale is relative and is arrived at by adjusting all elements to a common norm in 1961. The same information is conveyed statistically in the chart that follows.

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5. Although none of these statistics taken singly is an accurate measure of workload, taken in the aggregate and combined with dramatically improved image quality they add up to an explosive expansion of the workload over a very short time. We can further illustrate this statistical presentation in these three observations:

- a. NPIC's film holdings at the end of 1964 were almost double what they were at the beginning of that year.

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b. Aircraft missions flown in 1964 approximately equalled the total of all missions flown from 1956 through 1963.

c. Eleven KH-4 missions in 1964 approximately equalled in film footage the product of all 30 satellite missions flown from 1960 through 1963.

6. We include a curve on the graph showing personnel growth, primarily because this is a good place to make the comparison. We will speak to the subject of staffing later in the report; however, it is pertinent to observe here that it is evident that personnel growth is badly out of step with the expansion of the workload.

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NPIC's ACCOMPLISHMENTS TO DATE

1. NPIC has been remarkably successful in building and in maintaining an establishment capable of a continuous, high quality performance. This conclusion is supported both by our own observations during the course of the survey and by the comments of those outside NPIC whom we interviewed. The criticisms we heard were niggling and almost invariably were preceded by a qualifying comment to the effect that "NPIC is doing a whale of a good job." Officers in the Foreign Technology Division of the Air Force Systems Command and in the Strategic Air Command, both of which we visited, were high in their praise of the timeliness and the quality of NPIC's readout of photography.

2. NPIC has scanned every foot of film delivered to it, and examined some of it in great depth, to discover new targets and to report changes in those already identified. However, much of the film in the NPIC library has not been exhaustively exploited. Installations sometimes must be reported as unidentifiable as to function simply because there is not time to pore over the film and compare an installation with other similar objects on other photography, which might lead to identification. Much could be done in the field of area studies of industry, mining, transportation,

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agriculture, and the like, but the necessary photo interpreter manpower is lacking. It is also true that NPIC occasionally misses something that comes back to haunt it. The failure to discover the SAM sites [redacted] which may have contributed to the loss of [redacted] mission C025C last January is an example. There have been other instances in which targets were not discovered at first opportunity either at NPIC or other photographic interpretation centers.

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3. We are not inclined to be at all critical of NPIC's occasional failures to discover something that is there to be seen. Perfection in photo interpretation is unattainable. The viewing instrument is the human eye, supported by various mechanical optical devices, and the human is fallible. We spent days watching photo interpreters at work and several hours ourselves at light tables looking at film through various magnifying viewers. We are impressed with the skill of experienced photo interpreters in picking out objects of intelligence interest from thousands of feet of film of highly variable image quality. An excellent example was the finding of the SAM site near Hanoi, only a small portion of which was peeking out from under heavy cloud cover.

4. We are impressed with the quality of NPIC's management.
By and large, it is a forward-looking group--proud of its past

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accomplishments, aware of areas in which improvement might be made in the present organization, and planning realistically for what it must do to cope with the problems of the future. It is a flexible organization--one that is constantly undergoing change. It has been careful, for the most part, to avoid committing itself to policies, programs, or techniques that would impair its flexibility. The graph reproduced opposite page 7 demonstrates that NPIC's workload has increased several times as rapidly as personnel strength. The fact that NPIC has been able to keep up with this disproportionate increase is a tribute to its managerial skill in devising more effective organizational approaches to photo interpretation and in finding ways to do mechanically many of the tasks that once had to be done by hand--as well as a tribute to the motivation, devotion, and stamina of all of its employees.

5. NPIC has an excellent record of finding solutions to problems that are its to solve. Unhappily, most of the major impediments to an even more effective NPIC performance are beyond its control or influence. It is these latter problems, the ones that are outside NPIC's sphere of authority, to which the bulk of this report is addressed.

6. A major share of the credit for NPIC's success goes to its Director. He is an unusual combination of dynamic leader

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and technologist recognized as eminent in his field. He is highly esteemed within his own organization and is respected by those outside it. He has shown great skill in exercising functional control of an organization over which he has incomplete administrative control.

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**PROJECTION OF THE NPIC WORKLOAD
OVER THE NEXT FIVE YEARS**

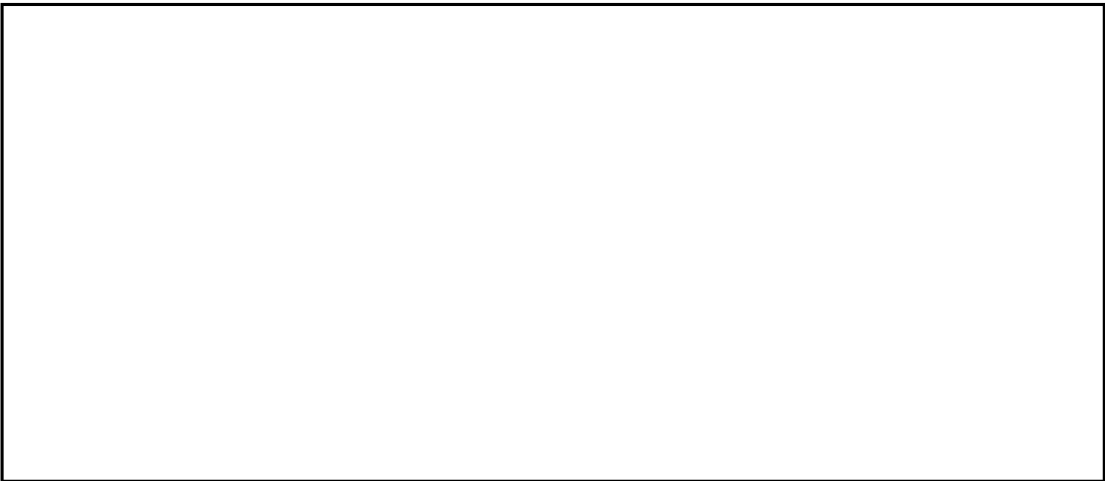
1. In 1963 the Director, NPIC, initiated a computer-based work measurement program. The program provides for detailed inputs to a computer on manpower utilization and production efforts of the Center and permits manipulation of these data to meet the needs of NPIC management. The system furnishes NPIC management with an accurate measure of the man-hour costs for more than 150 activities carried out by the Center and in time should be highly useful in indicating the ratios of input and cost of each service to all others measured. Statistics alone cannot indicate an optimum mix for the resources to be invested; this mix is in the final analysis a matter for management decision.

2. If we take any exception to NPIC's five-year projection it is to the use of the currently valid ratio between support and photo interpretation needs over the five-year span. The statistical base from which support man-hours are projected was compiled from work records of support components some of which are sorely understaffed. As these support components approach authorized strength and more man-hours become available, we believe that the ratio between support and photo interpretation will drop and

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the required increase in support personnel will be somewhat less than now envisioned by NPIC. However depending on future developments in both the technical and requirements areas the NPIC projection may well be conservative rather than inflated.

3. The documents of the Committee on Overhead Reconnaissance (COMOR)/USIB that we have studied reveal that KH-4 missions are to be launched at the rate of ten per year, plus two additional missions primarily for mapping purposes. These documents discuss the National Reconnaissance Office (NRO) capability 25X1D



4. We find no evidence of concern in the COMOR/USIB documents that photo interpretation resources would be adequate before determining the frequency of KH-4 [redacted] 25X1D
Taking NPIC experience factors over the last year, we calculate that the Center has enough photo interpreter regular time manpower

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devoted to the national effort to complete the immediate exploitation
(first and second phase readout) of ten KH-4 missions []

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[] No regular time,
however, would then remain for work on detailed projects, which
during calendar year 1964 occupied about one-third of the photo
interpreter time devoted to the national effort.

5. NPIC must continue to work detailed projects because
the immediate exploitation is done rapidly and yields much con-
densed reporting, and it is likely, in our judgment, that the proportion
of time devoted to detailed projects must be increased. []

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[] NPIC must anticipate
a growing demand from its customers for more detailed interpreta-
tion. Thus, NPIC appears destined to face a workload expanding at
a faster rate than its personnel resources, even if no new collection
systems were to be introduced. It is pertinent to note in this con-
nection that []

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[] A single U-2 mission over the
USSR during the period 1956-1960 averaged 50 targets and 150,000
square nautical miles of coverage.

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6. New systems are just over the horizon, however, and
the outlook for NPIC is grim. Officers in the DD/S&T have been

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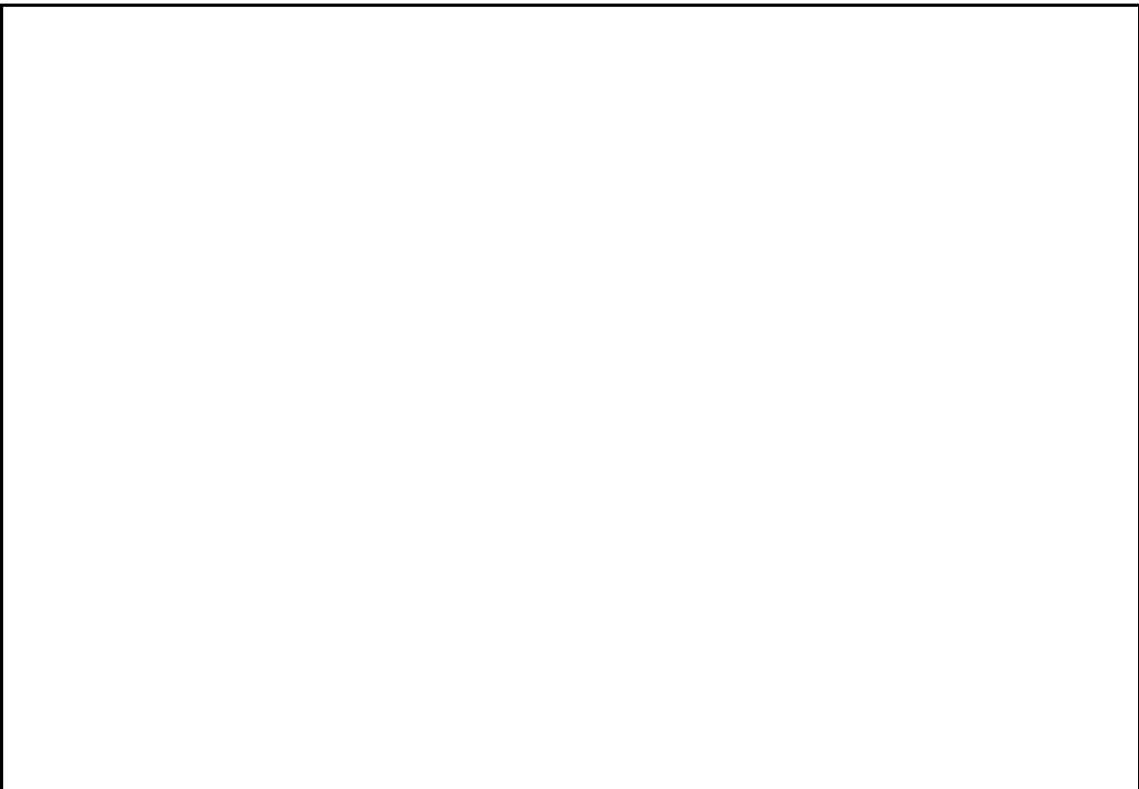
discussing with NPIC a concept for designing a SUPER CORONA
which could become operational within 12 to 18 months

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The SUPER CORONA
would be a modified KH-4 system delivering in four missions
the equivalent of the 1964 film yield from eleven KH-4 missions.
Since four missions of 20 days' duration each would not provide
the continuity of coverage of denied areas generally required by
the U.S. intelligence community, it is very possible that more
missions and a substantial new increase in NPIC workload could
be forthcoming from this innovation.

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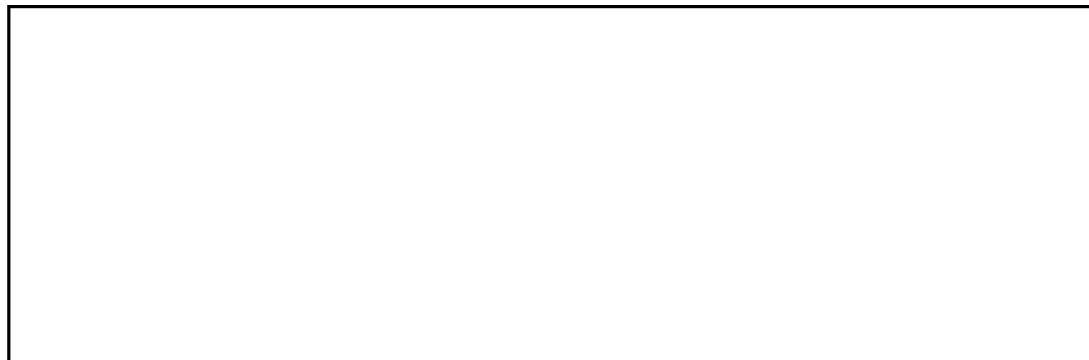
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8. The DD/S&T is also working on the design of a search system as an eventual replacement for the KH-4. []

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9. NPIC has compiled a forecast of personnel and financial resources required over the next five years to cope with the increasing volume and improving ground resolution of film expected to be delivered to it for interpretation. The forecast is based on NPIC experience factors in handling present film formats and on professional judgments of the impact of improved systems whose design parameters are known. NPIC sees a need by 1970 for a personnel strength of [] and an annual program cost of []

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10. In terms of NPIC's experience to date, these figures may well be conservative. These estimates concern only the impact of major new collection systems that can be expected to operate within the next five years and the design specifications of which are known. The state of the art of sensor system design for operation against denied areas is moving rapidly toward search and

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surveillance capabilities that could afford continuous manned observation, selective use of multi-sensor capabilities, and electronic delivery of data from collection vehicles on command. As these systems come into operation, the dimensions of the exploitation problem will radically change.

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ORGANIZATION AND PROCEDURES FOR PHOTO INTERPRETATION

1. NSCID No. 8, effective 18 January 1961, specifies that a National Photographic Interpretation Center shall be provided as a service of common concern by the Director of Central Intelligence in consultation with the interested members of the USIB. Among the other key points of the directive are these:

a. No complete separation of interest is possible or desirable in photographic intelligence activities.

b. Departments and agencies represented on the U.S. Intelligence Board shall continue to be individually responsible for photographic interpretation . . . in support of departmental or agency responsibilities

c. The Director of NPIC shall be designated by the Director of Central Intelligence after consultation with the interested USIB members and with the concurrence of the Secretary of Defense.

d. The Intelligence Board departments and agencies engaged in photographic intelligence production shall jointly provide appropriate personnel and other support for the Center, as agreed by them with the Director of Central Intelligence. Such supporting personnel shall be functionally under the direction of the Director, NPIC, for joint activities, but shall remain administratively responsible to their parent organizations.

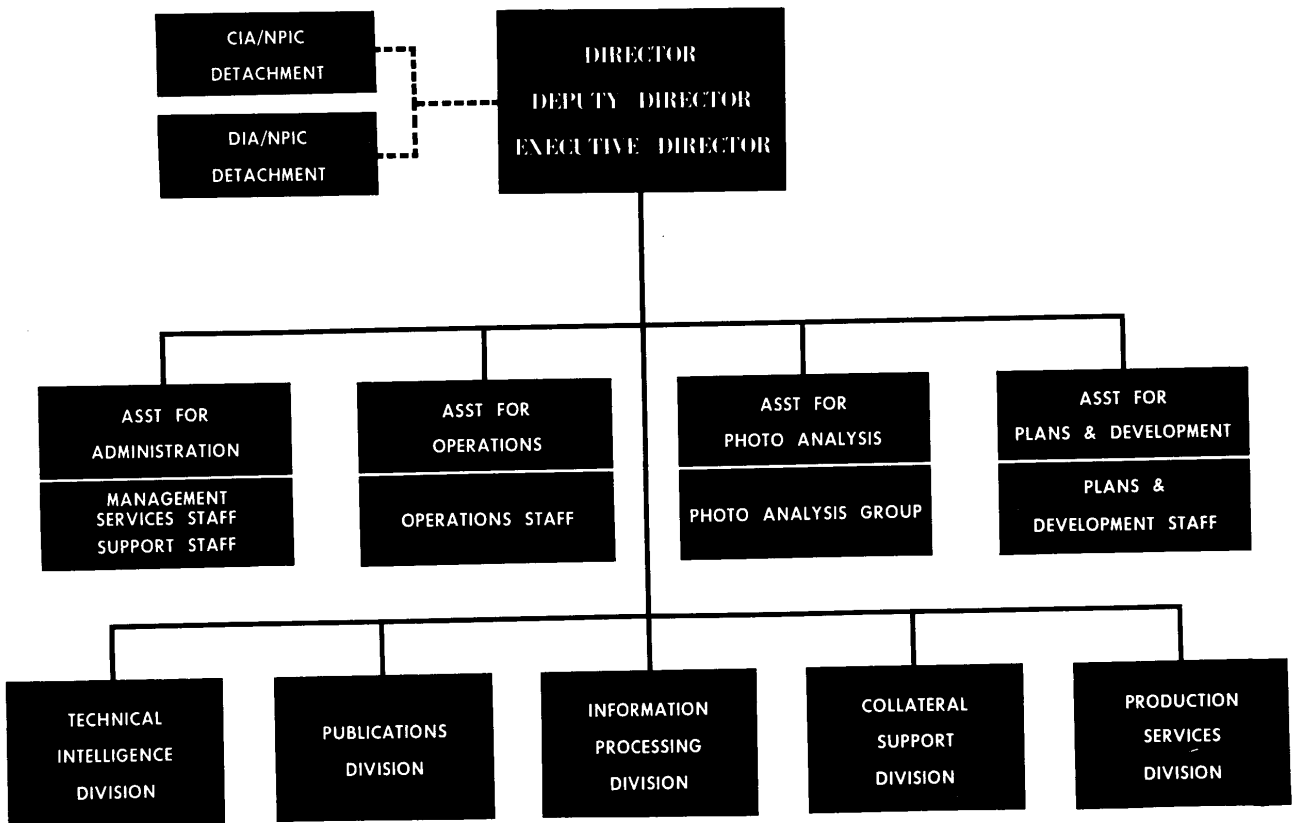
e. The administration of NPIC in time of war shall be transferred to the Secretary of Defense.

f. The NPIC shall engage in or sponsor, as appropriate, the development of specialized equipment for the intelligence exploitation of photography, and shall provide information about such specialized equipment to interested

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elements of the intelligence community for their possible use or further adaptation.

g. In discharging its responsibilities, the NPIC shall consult, as appropriate, with individual departments, agencies and committees of the U.S. Intelligence Board. The intelligence chief of each department or agency represented on the U.S. Intelligence Board shall coordinate photographic intelligence activities within his parent organization with the National Photographic Interpretation Center.

2. At the time NPIC was established as a national Center, the DCI elected to continue its subordination within the Directorate for Intelligence where it had existed since 1956 as Project HTAUTOMAT. In the DDI it appears on the organizational chart at the office level, equivalent to the Offices of Central Reference, Current Intelligence, Research and Reports, etc.

3. The internal organizational chart of NPIC is reproduced on the opposite page. Some explanation of the chart is in order because it does not reveal the functional alignments among the various components.

a. The Photo Analysis Group (P.A.G.) under the Assistant for Photo Analysis is the designation of the component engaged in the national effort, the fulfillment of national photo interpretation requirements, which include the immediate exploitation of all film delivered to NPIC.

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b. Photo interpretation in response to departmental requirements is carried out by separate CIA and DIA Detachments.

c. The Assistants for Administration, for Operations, and for Plans and Development function in support of the Director, NPIC, in carrying out his responsibilities for the management of the Center.

d. The five support divisions named in the lower row of boxes work directly in support of the photo interpretation effort, both the national effort and the departmental efforts. It should be noted that NSCID No. 8 specifies that support to departmental efforts shall be furnished only to the extent that such departmental support does not degrade support of the national effort.

4. The sequence of steps followed and the products generated in the exploitation of photography at NPIC are outlined in very condensed form below. Illustrative data cited relate to the processing of satellite photography, but are applicable in the main to aircraft missions as well.

5. Photo interpretation as performed by NPIC falls into two categories: a) immediate readout of photography as received

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from reconnaissance missions, and b) detailed readout of all photography available in the NPIC film library covering a specific target of national interest. The immediate readout operation is tasked with a) identification and analysis of significant change in COMOR selected priority targets and with b) search of the photography and reporting of new targets. Detailed analysis is concerned with the exhaustive study of particular targets to appreciate their operating systems and their strategic or tactical implications.

Preparations for Readout

6. The selection of targets and the designation of the priority sequence in which they are to be covered is the responsibility of the Committee on Overhead Reconnaissance (COMOR) under USIB. COMOR representatives working with the representatives of the National Reconnaissance Office (NRO), DoD, begin

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Immediate Exploitation

8. Briefing Boards - Prior to its receipt of the photography, NFIC selects from among the most important targets on which coverage is anticipated a list of from 25 to 75 items for which it schedules the preparation of enlarged, annotated prints, or briefing boards. Briefing board teams check these targets immediately upon receipt of the film and, where cloud conditions and quality permit, extract the images for expedite processing. The sets of briefing boards are customarily produced during the first 24 hours and utilized in briefing the senior officials of the U. S. Government. Many sets of prints and view-graphs for projection are subsequently generated and disseminated among participating U.S. organizations.

9. First Phase Report - The initial investigation of incoming photography is concentrated on analysis of the status of known targets bearing COMOR priority designations. As of the second week of June 1965 there were 284 KH-4 [redacted] active, COMOR priority targets. The Photo Analysis Group (PAG) at NFIC manages the readout operation and generates first phase reports known variously as OAK, IPIR (Immediate Photographic

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Interpretation Report), or SITSUM (Situation summary), depending on the type of mission. The results of each day of OAK readout are disseminated by cable and by separate published installment to the cleared TKH audience throughout the world. COMOR targets covered during the OAK are heavily concentrated on advanced weapons and military information, hence PAG assigns the OAK readout to teams of interpreters varying from [REDACTED] in number who are specialized in the various categories of missiles, nuclear weapons, electronics, and order of battle including air, land, and sea aspects. Significant new or "bonus" targets are reported if discovered but there is no concerted search for such items in first phase readout.

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10. Second Phase Report - Upon completion of the OAK, the FAG management launches a detailed search of the mission photography to identify new targets and determine significant change in known targets. Published reporting of the second phase readout is identified as the Mission Coverage Index (MCI). The total NPIC target file including COMOR targets now numbers some 19,000 items. The given mission may provide information on as many as 3,000 of these targets. Second phase reporting is assigned by FAG to teams of photo interpreters who are primarily area

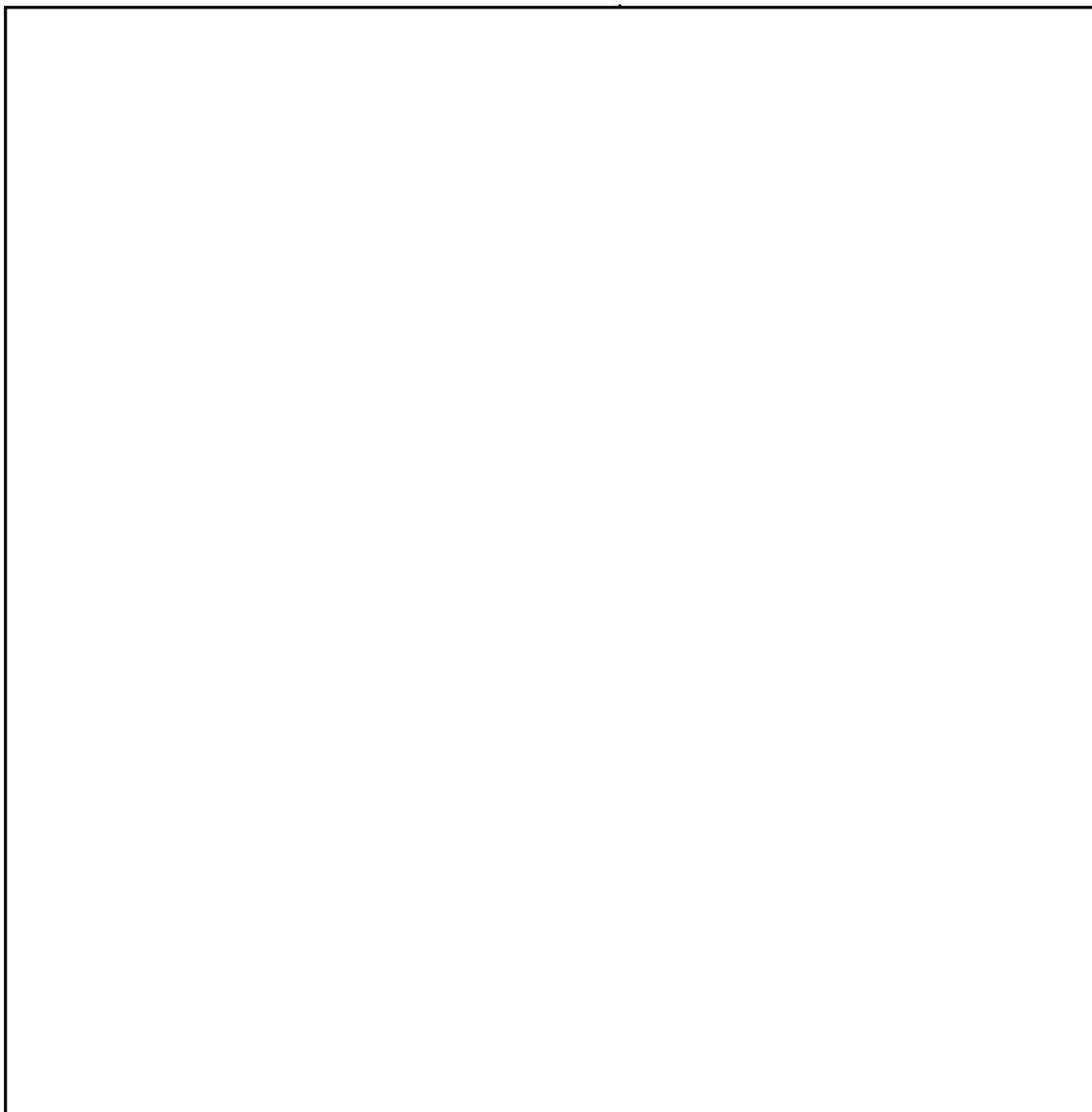
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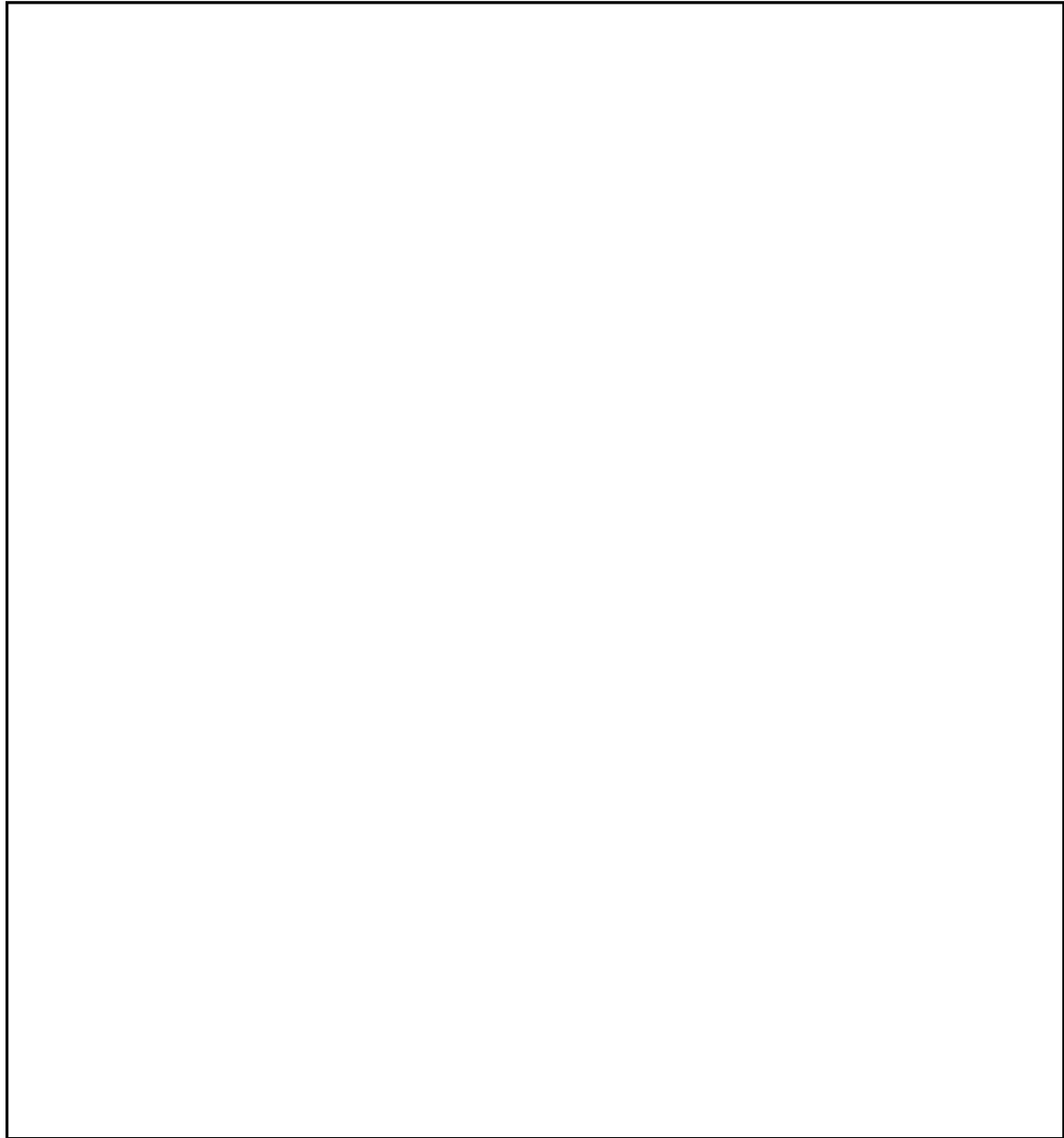
rather than weapons specialists and the size of the team effort again may range from 40 to 80 personnel. Unlike the OAK which is usually completed in one to five days, the MCI requires up to three or four weeks of readout varying with the quality of the photography obtained.

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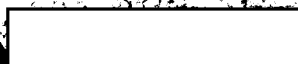
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Detailed Exploitation

13. Stimulated to a substantial degree by the flow of new information on targets contained in the OAK and MCI reporting, the intelligence community levies a continuing flow of requests on

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NPIC for the thorough interpretation of all photography pertinent to targets of special interest. These projects for detailed analysis are breaking down today into a variety of specialized analytical programs which may be summarized as follows:

a. Military Order of Battle (MILOB), Traffic

Analysis, Strategic Hamlet Reports, and SAM SEARCH -

The projects devoted to these reports were based on great numbers of individual installations. They result in separate, short, tightly formatted reports for each installation. The SAM search requirement called for a repeat search of photography of China to lessen the chance of one having been missed.

b. Other Detailed Reports - These reports require a detailed interpretation of a single target, a complex of targets, or a series of a relatively few closely related targets. There is considerable variation both in the length of reports and in the amount of work required to prepare them.

c. Post-Mission Support - Conduct evaluations of photographic collection system performance and products, prepare product assessments, and provide data to assist in system appraisal and improvement.

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THE IMBALANCES AMONG COLLECTION CAPABILITY,
NPIC'S EXPLOITATION CAPACITY, AND THE REQUIREMENTS
OF NPIC'S CUSTOMERS

1. There is a serious imbalance between collection and exploitation capabilities. Historically, recommendations on the scheduling of photographic reconnaissance missions have originated in the Committee on Overhead Reconnaissance (COMOR), a committee of USIB. We are informed that the two CIA members are consistently outvoted by the DoD majority.

2. We have reviewed COMOR/USIB documents over the past several months. We find considerable attention being given to scheduling on the basis of availability of launch vehicles, phasing of the launch readiness cycle, and the over-riding military requirements. We find no evidence, however, of consideration being given to photo interpretation capability. The nearest thing to it was a COMOR proposal that a mission not be launched until targets could be selected on the basis of readout of the last previous mission. This proposal was rejected by the NRO on the grounds that orbit selection had to be made too early in the readying cycle to permit change based on previous mission results.

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3. These points illustrate the extent to which collection scheduling and exploitation capability are out of phase: Film inputs to NPIC in 1964 were twice those of 1963 while its personnel resources were increasing by only three per cent, and NPIC was overloaded in 1963; the USIB decision to launch ten KH-4 missions (plus two primarily for mapping) [redacted]

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[redacted] appears to have been made with no regard to photo interpreter manpower availability; in a recent instance scheduling has resulted in the delivery of film to the Eastman Kodak processing center from two satellite missions on the same airplane.

4. Related to the need for a better match between collection and exploitation capabilities is the need for closer and earlier coordination between collection equipment design and the problems of photo exploitation. In recent years insufficient attention has been given to the problems of photo interpretation in designing collection systems. [redacted]

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5. Not only is NPIC's production capacity out of balance with the collection capability, but it finds itself in a perpetual struggle to keep up with the needs of its customers for photo intelligence. NPIC has a "can-do" philosophy which unfortunately conveys the image of a facility with nearly unlimited capacity for doing almost anything asked of it. The backlog of detailed projects and the delays in completing them are excessive, particularly during periods of heavy film inputs. In our interviews with consumers at Headquarters, we often encountered the comment that many more requirements could be levied on NPIC, but they were withheld simply because NPIC hadn't the manpower to devote to them. On the other hand, senior management at NPIC held that they should be the ones to decide whether NPIC had the capability to fulfill a requirement, not the potential originator. There is validity in both positions; however, we are inclined to agree that there is little point in submitting a new requirement when final reports on already accepted requirements are long overdue.

6. Part of the delay in completing detailed projects results from the fact that the photo interpreter working on a photo analysis of a particular target is repeatedly interrupted by the demands of higher priority tasks. The immediate exploitation of new film takes precedence over detailed work. A good example is Project

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No. 11499-4 concerned with a dozen or so seemingly related unidentified installations that are referred to as "Sensitive Operational Complexes." It is apparent that the installations are of considerable significance, but their precise function has not yet been discovered. The photo interpreter assigned to the project is a DIA civilian employee working in the Photo Analysis Group (the group that works on national requirements). He began his analysis on 28 May 1964. Through 25 April 1965, he was able to work on the project, at least part time, on 109 of the 214 days he was present for duty during the period. He had to set the project aside at least 30 times. Some of the interruptions resulted from his having to wait for mensuration or graphics support; some resulted from his being diverted to tasks of higher priority. The project was still incomplete as of 25 April. For whatever reason interrupted, discontinuity of effort is a serious handicap, and it is a major factor in causing project backlog.

7. Another is a tendency by analysts to request that a going project be updated by cranking in new photography of the target acquired since the project was initiated. At the rate at which current missions are being flown it is almost impossible to complete a lengthy project without establishing a cut-off point beyond

which new acquisitions are to be disregarded. The analyst, of course, is anxious that the photo interpretation report he receives be based upon the latest available data, and he is inclined to add bit-and-piece requests to his original requirement. An example is Project C 815-64, a study made of dual HEN HOUSE radar sites in the Soviet Union by a senior photo interpreter in the CIA departmental detachment. He received the original requirement on 7 May 1964. He completed it approximately one year later. While the study was in process, the photo interpreter received ⁴ six follow-up requirements, which in his judgment called for analysis that was implicit in the original requirement. The requirements screening mechanisms both at Headquarters and within NPIC failed to recognize the redundancy of the later requirements.

8. Discontinuity of effort and piecemeal additions to the requirement are inevitable when a single photo interpreter is assigned to work on a project that will require a great many man-hours for its completion. NPIC uses the team or task force concept in working the immediate exploitation of the new film. At one time the Center made extensive use of the task force technique in working detailed projects. With the creation of a

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jointly staffed national effort, the task force approach to detailed projects has all but disappeared, and we think there is much to be gained by reinstituting it.

9. Discontinuity of effort and additions to requirements before the photo analysis is completed are serious hindrances to orderly production scheduling, but the real problem is that there is simply more work to be scheduled than there are hands available to do it. If relief is to be found, and it must be, some hard decisions must be made, and they are decisions to which the intelligence community as a whole must agree. Our recommendations appear at the end of this section.

10. The first step that should be taken is to cut down on the time devoted to immediate exploitation of new photography. During the 1964 calendar year, 46.6 per cent of the total photo interpreter time available for work on national requirements was devoted to the immediate exploitation (first and second phase) of new photography. Immediate exploitation accounted for 60.5 per cent of the overtime worked on the national effort. The intelligence community has become accustomed to an exploitation cycle and a reporting sequence and formats that originated in the early days of U-2 photography. The procedures were appropriate when

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film footage and number of targets imaged were low; they have become intolerable as film footage delivered and targets covered have increased hundreds-fold in the era of satellite photography.

11. We recommended three years ago that the Mission Coverage Index (the report of the second phase scanning operation) be converted from a sort of encyclopedic summary to a pure index. The recommendation was not acted upon because NPIC could not get its acceptance by the customers. NPIC has recently proposed to the community that it concur in a revision of NPIC's immediate exploitation cycle to include modifications in both first and second phase readout and reporting procedures. The proposed revision may not be bold enough to afford substantial relief over the long run, but it may be bolder than the community will tolerate. Early indications are that the community will accept it in its present modest form only with some reluctance.

12. Some additional relief could be found in immediate exploitation by a more precise definition of targets required to be read out immediately. The priority targets designated by COMOR are perhaps adequate for collection guidance, but they are inadequate for the purpose of selecting targets for immediate reporting by NPIC. A select list should be established of targets of current

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and indications intelligence interest, primarily those that represent a strategic offensive or defensive threat to the United States, and NPIC should confine its first phase readout to these targets.

13. The procedures for levying requirements on NPIC and for NPIC's accepting them stand in need of close and continuing attention. Requirements processing, both at Headquarters and at NPIC, is essentially a staff function, and traditionally staff elements are given responsibilities that exceed their authorities. These are our principal conclusions regarding the requirements process:

a. There is need for a stronger management hand in originating and approving requirements to be levied on NPIC.

b. There is need for a stronger management hand within NPIC on the acceptance of requirements that call for a commitment of resources not commensurate with the value to be gained from the product.

c. The criteria for distinguishing between national and departmental requirements are vague and are susceptible to manipulation by the requestors.

d. NPIC's Advisory Committee of USIB agency representatives, which recommends approval of national



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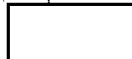
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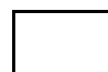


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projects and their priority of performance, exercises little effective influence in its area of responsibility.

e. The needs of analysts for photo intelligence will always exceed NPIC's production capacity--and by a very large margin.

14. The imbalances among collection capability, NPIC's production capacity, and the requirements for photo intelligence are not new. We found and reported precisely the same thing three years ago. We then saw developing need for some formal mechanism to assist in bringing collection, exploitation, and requirements into closer harmony, but because satellite systems were in an early stage of development, the extent of the disparity was not then evident. It now is. NPIC cannot demand that design details of planned collection systems be divulged to it while systems are in development. Much of its knowledge of oncoming systems is acquired through informal and unofficial liaison with acquaintances in government and in industry. We think it is time to elevate the problems of exploitation to consideration at the USIB level commensurate with the attention given to collection scheduling. Our recommendations for reducing the imbalances among collection, exploitation, and requirements are drastic, but we are convinced



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that a rigorous approach is called for. The proposal to create a USIB Standing Committee on Exploitation is consistent with precedent established in DCID No. 6/1 setting up a SIGINT Committee. We envision the role of the Committee on Exploitation, as regards sensor reconnaissance, as being essentially similar to that of the SIGINT Committee as regards signals intelligence.

It is recommended that:

No. 1

The Deputy Director for Intelligence:

- a. Prepare and submit through the CIA member of USIB a proposal for the establishment of a USIB Committee on Exploitation (COMEX) whose function would be to ensure a better correlation among collection capability, NPIC's production capacity, and the requirements for photo intelligence.
- b. Recommend to the Chairman of the Committee on Exploitation that the Committee give immediate attention to the task of establishing a priority list of first phase readout requirements to be levied on NPIC for accomplishment.

It is recommended that:

No. 2

The Director, NPIC:

- a. Abolish NPIC's Advisory Committee.
- b. Establish the policy that any photo interpretation requirement whose fulfillment would call for an estimated commitment of NPIC man-hours in excess of a prescribed maximum be referred to

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the USIB Committee on Exploitation for approval; that the Director, NPIC, prescribe this maximum; that the maximum be flexible; and that it be revised periodically to reflect current and anticipated NPIC workloads.

c. Submit to the Chairman of the USIB Committee on Exploitation quarterly reports detailing NPIC's existing workload, including backlogged detailed projects, and estimating NPIC's capability to take on added work during the next quarter.

d. Reinstitute the practice of assigning detailed projects to specially created task forces whenever the project is of such magnitude as to require approval by the USIB Committee on Exploitation.

e. If the proposed revision of the exploitation cycle fails to gain acceptance, refer the proposal to the Committee on Exploitation for resolution by the USIB.

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INTEGRATED SYSTEMS DESIGN
IN PHOTOGRAPHIC RECONNAISSANCE

1. One of the principal conclusions of the present, as of the 1962, inspection of NPIC has been that the exploitation or photo-interpretation function requires full and equal representation at the planning table in the design of photographic reconnaissance systems. Stated otherwise, optimum performance of photographic reconnaissance requires that the design, development, operation, and adaptation of collection vehicles (aircraft and earth satellites), cameras, film, and the utilization of computers in their many supporting roles, be managed with great care for their effect on the exploitation of the photographic product by NPIC.

2. This conclusion was steadily reinforced for the inspectors in their many discussions with NPIC photogrammetrists and computer programmers, who are coping daily with substitute solutions of their data reduction and mensuration problems due to the failures of the systems designers to take their needs into account. While the record on cooperation between collectors and exploiters of photography is neither purely black nor purely white, (see paragraph 3 below), it nevertheless strongly reflects compartmentation, unilateral management actions, and a lack of adequate appreciation of the fundamental requirements of

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photo interpretation on the part of systems designers and systems operators.

3. The route to cooperation between collectors and exploiters up to the present time has been via committee action. NPIC has participated in and provided good leadership of Performance Evaluation Team (PET) post mortems of each reconnaissance mission. These teams composed of NPIC and camera manufacturer representatives have regularly reviewed U-2 and satellite missions to analyze malfunctions in equipment, and any degradations appearing in the photography. Such evaluation has stimulated corrective action in satellite/camera performance after the given system has become operational. Similarly in the case of satellite systems, the National Reconnaissance Office (NRO) has maintained since 1960 a Configuration Control Board (CCB) and a sub-committee designated originally as the Systems Engineering and Technical Development Committee, now known as the Systems Engineering Committee (SEC). NPIC has had regular representation on the SEC committee but its activities have become irregular in the past year and there has been no meeting since January 1965. It is credited by NPIC with having done useful work in securing systems modifications that better satisfy NPIC needs but, again, after the given system has become

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operational. As to the Configuration Control Board, NPIC has not had representation on this Board until early in 1965. The CCB is particularly concerned with review and approval of contracts involving system adaptation as well as development. In summary, while much of the work of these three committees has been useful to NPIC, continuity of effort and/or representation have from NPIC's point of view been unsatisfactory; committee input to the design of new systems has to NPIC's present knowledge been very limited; and the NPIC contribution has not been based on close working relationships between its specialists and those in the design laboratories and manufacturing plants of contractors.

4. The case for representation of exploitation requirements in collection systems design rests on the fact that the determinants of photographic image quality, image suitability for measurement, and of the geographic coverage of each mission and photograph, are derivatives of design decision and must be measured if at all during the actual operation of the collection vehicle and its cameras or other sensor gear. As discussed, for example, in the section of the inspection report dealing with automation, the dominant approach in accommodating these exploitation needs in present-day operating systems, the U-2,

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the KH-4, [] has been one of retrofit or the addition of performance observing and recording devices after the given system has been placed in operation. There are two critical limitations on design by the retrofit route. The first is that in satellite reconnaissance missions only the photography is recovered while the collection platform and cameras are permanently lost. Hence the performance of a new or modified component introduced during a particular mission is extremely difficult to analyze with requisite scientific precision. The second limitation on retrofit is that the weight and power economies of satellite vehicles are so stringent that many changes in configuration which are feasible and desirable in themselves are ruled out by their probable reductions of the performance capability of the entire system.

5. Thus the rationale for integrated systems development effort on the part of collectors and exploiters of photography may be stated in highly generalized terms as follows:

a. The purpose of photographic reconnaissance is the collection and extraction of intelligence information from images on film.

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b. Photogrammetry, defined as the science of obtaining reliable measurements of objects from their photographic images, or, more broadly, as the technical support of photo interpretation, is now absolutely critical to the effective interpretation of very high-altitude photography of modern strategic weapons, equipment, and the installations for their production, testing, and deployment.

c. Precise measurement of the location, attitude, and mechanical performance of the vehicle/camera system at each point of exposure of film is fundamental to photogrammetry.

d. The performance characteristics of present-day high altitude, high speed vehicles (particularly satellites) preclude change of route to cover dispersed targets at optimum camera angles, hence a high proportion of the targets within the range of the given system camera will be covered from widely varying angles.

e. The frame and strip cameras employed today yield a very narrow swath of ground coverage in vertical perspective simplifying photogrammetric analysis.

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Correspondingly, they yield a high proportion of the area of each photograph in which ground coverage is at oblique angles which introduce distortion and require the most sophisticated techniques of photogrammetric analysis. Hence, it follows, that exploitation of oblique photography accounts for a substantial portion of NPIC's work, that it yields a high proportion of the intelligence information now being obtained from photography, and that the relative efficiency with which it is performed can increase most significantly the economic performance of photographic reconnaissance.

6. The inspectors accumulated considerable evidence of failure on the part of systems designers and operators to take exploitation problems into account. These failures run the gamut from faulty design of performance measuring devices, omissions of equipment, lack of investigation of significant problems, inadequate communication, to inadequate management arrangements.

a. Recording of time in binary language in data blocs spaced at close intervals in KH-4 film is highly essential to NPIC mission plotting computation. The design of the time-recording data bloc does not incorporate

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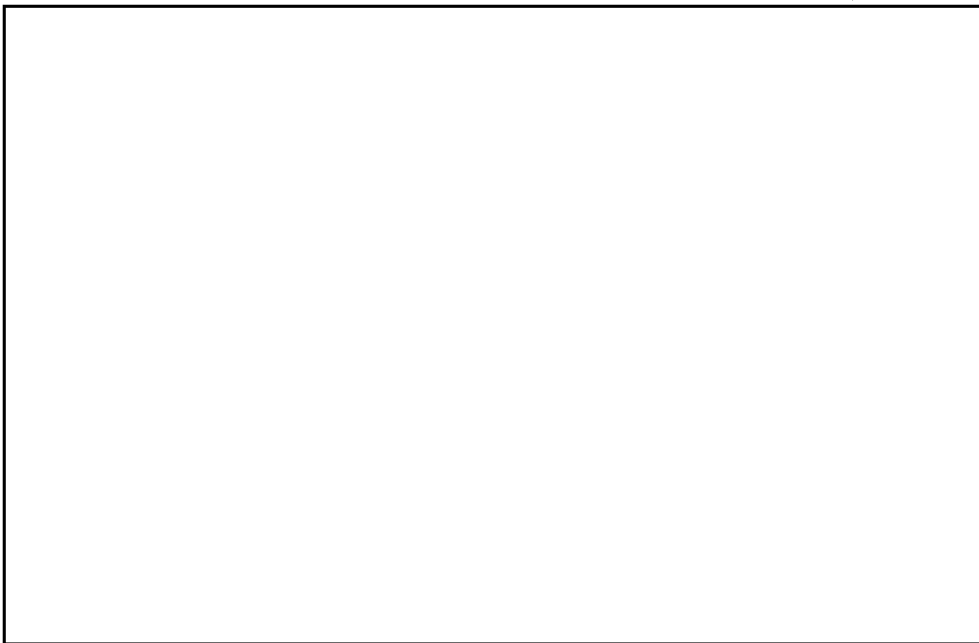
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an error detection routine. Error detection is thoroughly understood in the computer world and well within the state of the art in terms of providing for it in satellite camera design. NPIC personnel are unaware of error detection provisions [redacted] In all of the above cases the omission is almost certainly attributable to simple failure in communication.

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c. The development of a mathematical model of the camera (how the camera operates) by NPIC programmer/mathematicians is a basic step in the programming of the computer to support mensuration. The models for the KH-4 [redacted] cameras have been developed after the systems became operational. There is no arrangement

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for NPIC, at the present time, to produce the mathematical

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The prevailing pattern

may be seen to be one in which NPIC begins interpretation of photography from new systems before it is prepared to employ the computer in support of the photogrammetric analysis.

d. The Report of the Photo Working Panel on the C/M System (CORONA/M camera) summarized the work of a Committee under Dr. Sidney Drell (see paragraph 3, page 6) which investigated a number of problems relating to image quality in the CORONA (KH-4) system during 1963 and early 1964. Their conclusions included the following:

"...Rather we have emphasized the fact that at this rather late date there still remains the need to construct an objective and quantitative measure of image quality that is both reliable and operationally practical. Although promising techniques were discussed and measurements were made toward filling this need, much continuing work is required."

"In addition we have very strongly emphasized the urgency of a measurement program in order to identify sensitive parameters of the C/M system and orbital environment which limit the present performance level. Such a measurement program, as well as timely, systematic performance analyses are needed to close the loop back to the system designers who

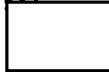
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have thus far received extremely limited feedback on the performance of individual components.

While sympathizing with the priority of maintaining an operational schedule we recommend that an increased number of research and developmental tests be included in the C/M program. The potential value to be gained for this as well as other satellite reconnaissance programs is very high.


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Among the problems cited by the Drell Committee were film fogging due to corona discharge (glow from static discharge), the presence of uncontrolled light leaks, shifts in camera focus due to uncontrolled changes in thermal environment, effects on the camera of vibration caused by the firing of control rockets, and the effects of varying atmospheric conditions on image formation. Some fifteen months following the publication of the Drell Committee Report, the inspectors found no evidence in NPIC of follow-up action on the above problems.

We are not using the same camera system investigated by the Drell groups

e. Development and operation of satellite reconnaissance

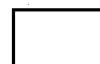
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systems are conducted in a security control system  and with separate compartmentation for individual projects,

 which are rigidly separated from the security system for photographic exploitation (TALENT-KEYHOLE).

Few NPIC specialists in photogrammetry and computer

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programming acquire the necessary operational clearances during the early stages of design and development of new systems.

f. The present-day compartmentation of the management of systems development, systems operation, and photographic exploitation accounts for a noticeable unevenness of organizational arrangements and procedures essential to coordinated effort, e. g. the partially effective working arrangements of the Space Engineering and Control Configuration Committees noted in paragraph 3 above, and the absence of arrangements for continuing working-level contact between NPIC specialists and design engineers in the laboratories and manufacturing plants engaged in the development of new systems. There is no provision for the designation and accreditation of NPIC systems teams to work with their opposites in industry, in the NRO/DoD, nor in the DD/S&T of CIA. There is no planning and programming mechanism which establishes and executes projects and employs PERT-type controls to ensure that all decisions are effectively scheduled and coordinated. There is no reporting mechanism by

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means of which projects undertaken and results obtained are made known throughout the photo-reconnaissance community. To promote maximum integration of collection and exploitation effort in photo reconnaissance:

It is recommended that:

No. 3

The Deputy Director for Intelligence:

a. In collaboration with the Deputy Director for Science and Technology, prepare a proposal, for the DCI to submit to the Director, NRO, for an integrated systems design program in photo reconnaissance; and

b. Include, as an essential element of the program, a provision for the establishment for each reconnaissance system in existence or under development, an NPIC design team (composed of photogrammetrists and computer programmers as well as representatives of the NPIC Plans and Development Staff) to work on a continuing basis with, and have direct access to, design specialists in NRO and in contracting manufacturing firms.

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THE STATUS OF AUTOMATION AT NPIC

1. Automatic Data Processing (ADP) concepts and equipment have been employed at NPIC from the beginning of the national photo-interpretation activity in 1956. They are being employed today on an increasingly ambitious and effective scale. NPIC's computer program has experienced continuing growing pains in acquiring and retaining qualified staff, in developing workable systems and machine instruction programs, i. e. software, and in imposing disciplined operation of equipment. While significant problems continue to exist in all of these areas, the remedial measures underway and the present general posture of the computer center--the Information Processing Division--are much improved. The difficulties encountered in the NPIC ADP operations are by no means unique among computer centers throughout the country, and, in addition, at NPIC they have included extremely rapid growth of workload, the pioneering of new methods of analytical photogrammetry by use of mensuration equipment on-line to the computer, and the perennial challenge of programming mensuration for the photography from U-2, KH-4 systems despite the fact that these systems were not designed to meet NPIC's exploitation needs.

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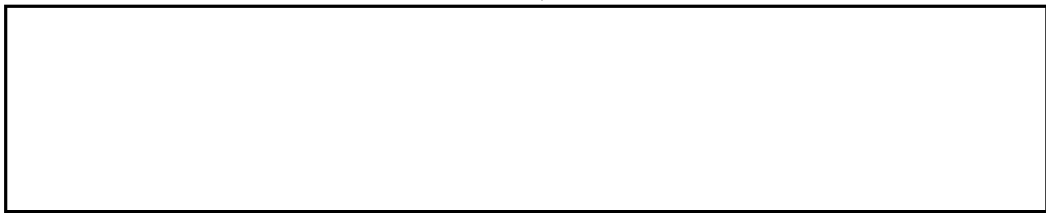
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2. It was readily apparent to the inspection team throughout this survey that automation plays an indispensable role in photographic reconnaissance. Camera-bearing satellite vehicles could not be operated without the computer and, NPIC, similarly, could not establish measurements of ground areas and of ground objects of acceptable accuracy in the absence of computer processed data from collection vehicles and cameras. This is not to say that NPIC cannot perform gross mensuration in the absence of a properly designed, fully automated system for collection and exploitation of photography and other sensor inputs. It is doing so today employing a hodge-podge of data inputs some of which are acquired by sophisticated applications of the computer, some by laborious manual readouts of mensuration data recorded in the film, and some of which are introduced as



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3. The thrust of developments in the mensuration field will be fateful for NPIC, and this subject is discussed further in subsequent paragraphs. Meanwhile, there is a second equally important area of employment of the computer at NPIC, namely, the storage and retrieval of textual and graphic information

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on targets. Here NPIC has already achieved a high degree of control of the written reports of photo interpreters in reading out targets from the ten year input of photographic reconnaissance. New concepts are taking shape at the present time for employing the computer to retrieve and present target information on remote cathode ray tube (CRT) displays located in the photo interpreter's working area. This approach gives excellent promise of enhancing the interpreter's capability to perform search and target analysis in photography, to correlate target information acquired through

Practically no further along than 3 yrs ago

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and to write, edit, publish and disseminate newly acquired target information by fully automated procedures. The perfecting of such display and reporting systems is certain then to open the way to more meaningful and more timely communication between the photo interpreter, and intelligence analysts, estimators, and command authorities.

4. We have discussed elsewhere in this survey the trend in national reconnaissance of denied areas towards the relatively early use (5 - 10 years) of manned collection vehicles, continuously on site, [redacted] delivering images or signals on a real time basis on command, and producing a flow of information digitalized for computer processing and prompt

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delivery to the photo interpreter. One conclusion seemed inescapable in our efforts to analyze the role of the computer in photographic interpretation. This is that the computer is essential but in a supporting role. It cannot displace human, trained inspection and analysis of every square millimeter of photography. The computer is being employed with increasing success to enhance the interpreter's comprehension through sophisticated methods of image control and presentation but human search and analysis of the end product remains fundamental to the entire reconnaissance effort.

Organization and Activities of the Information Processing Division (IPD)

5. The current table of organization for the Information Processing Division provides for [] divided almost 25X1A equally between professional systems analysts and programmers on the one hand, and key punch (data input) and equipment operators on the other. The Division's photogrammetry programs are accomplished on a UNIVAC 490 computer and its information processing programs are based on an IBM 1401 computer. An Eastman Kodak Minicard system is also employed for document and for selected photo-image storage and retrieval.

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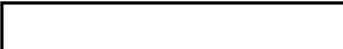
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6. Under the impact of the recent heavy acquisition of new targets  NPIC has clearly outgrown its IBM 1401 equipment. It is now undertaking, therefore, to streamline its target information files and to transfer their control to the UNIVAC 490. Effort is also underway to transfer the information handling activities now on Minicard to the 490 which will leave Minicard as a document/graphics storage and reproduction system. We stated in our 1962 survey and see no reason to modify the 1962 conclusions from the present investigation that Minicard is a remarkably high cost system employing outmoded concepts. Its high quality optics probably justify its use as a graphics copying device, but otherwise we consider that its indexing and document storage features would be better performed employing other modern systems.

7. As noted subsequently, NPIC is now placing a variety of first generation mensuration equipment (see paragraph 15 below) on line to the 490 computer. The data storage requirements that such equipment is placing on the 490 plus the arrangements being worked out to acquire mensuration data in machine language by data link from satellite operations centers are now bringing into question the capability of the 490 to accommodate its growing workload. NPIC has therefore



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launched an investigation of its needs and of the desirability of installing more powerful equipment, possibly the UNIVAC 494, within the next 12 to 18 months.

Computer Support of Mensuration

8. NPIC's charter for the exploitation of photography on behalf of national level programs requires among other duties that it determine and publish precise measurements of ground area coverage for each reconnaissance mission and for each frame or strip of photography acquired. Following determination of ground coverage, NPIC is further responsible for acquiring, processing, and utilizing all data necessary for accurate determination of width, length, height, orientation or azimuth, and ground location, of targets imaged in photography.

9. These are the basic NPIC missions in analytical photogrammetry. NPIC's capability to perform these missions with maximum speed and efficiency and with maximum economy in manpower/computer resources is a function of the provisions within the collection vehicle and the camera systems to obtain, record, and provide to human and computer processors all pertinent data concerning the total system environment during operation. The analysis of dimension in photographic images is not yet perfectly understood and much additional theoretical

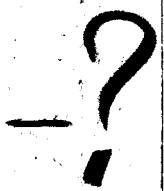
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investigation and testing remains to be undertaken. Nevertheless, the list of variables in high altitude reconnaissance that are understood, can be recorded and do enhance the accuracy of mensuration is growing steadily. Among these variables are speed, altitude, and known locations of the vehicle, e.g. over U.S. targets, that contribute to the precise determination of its track; also, the vehicle's pitch, roll, and yaw which permit determination of attitude, the angle of the camera lens at the time of film exposure, and derivation of the ground area covered. Measurement of time is critical to both location and attitude determinations. More is being learned daily about the effects of temperature, vibration, pressure, humidity, movements in air masses, and both satellite and camera mechanics as each and every one of them affects the quality of information captured in photography.

10. It appeared to the inspectors that collection system design is moving haltingly and must move far more aggressively in the future to equip collection vehicles with instruments to record and return continuous observations of environmental change significant for mensuration. Three methods of data delivery are available and need to be employed in an integrated



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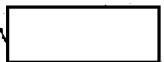
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design concept. These are (1) data delivery by telemetry, (2) data recording on tape aboard the vehicle, and (3) recording of such information in data blocks in the film at each time of exposure. All camera systems aboard the vehicle including those specifically designed to assist in orientation and mensuration must be integrated in the data recording program. All data must be digitalized for computer processing with minimal human intervention except for quality control.

11. If the above suggests in broad terms the present state of the art and the dominant trends in the evolution toward better photogrammetry based on maximum automation, then actual realization of this capability at NPIC lies some distance in the future. And the remedy as we see it, and have noted at many points in this survey, lies largely beyond NPIC's control. The essential requirement is that each collection system be designed or modified with fullest consideration given to the data reduction and mensuration requirements of NPIC.

12. Of the three high altitude operation systems in use today, the U-2 aircraft and cameras were developed in advance of present-day concepts of mensuration. Re-engineering of the total U-2 system to achieve highly accurate location and attitude data now appears impractical due to the aircraft's design.

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limitations and its clear vulnerability to surface to air missiles and probably to defending aircraft. The excellent ground resolution-- three feet--achieved by the U-2 cameras has permitted acceptable mensuration by older, less sophisticated methods.

13. The second system, the KH-4 satellite and cameras, has now acquired over some six years of evolution a fairly sophisticated capability to support photogrammetry through telemetry, through the operation of six supporting cameras that record track, horizon and stellar data to determine location and attitude, and through recording of time in data blocs in the film from the main cameras. Unfortunately much of this data must be processed manually, the data bloc does not incorporate an automatic check on accuracy, and the KH-4 operations management continues to alter the equipment providing mensuration data from time to time without advance notice to NPIC's technical and computer personnel. The Information Processing Division at NPIC completed at the end of 1964 a family of UNIVAC 490 programs that cover all aspects of photogrammetric analysis of KH-4 photography. This accomplishment is highly significant and praiseworthy chiefly in its educational effects in charting a path for future systems. On the other hand, because the KH-4 raw data is in many formats

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and requires much manual analysis, NFO processing continues to consume days where hours should be sufficient. As with the U-2, the need for re-engineering of the KH-4 system to fully automate its data collection and processing is now being overtaken by ongoing systems using bigger vehicles, and better able to accommodate space and weight demands of a broader range of position sensors and recorders.



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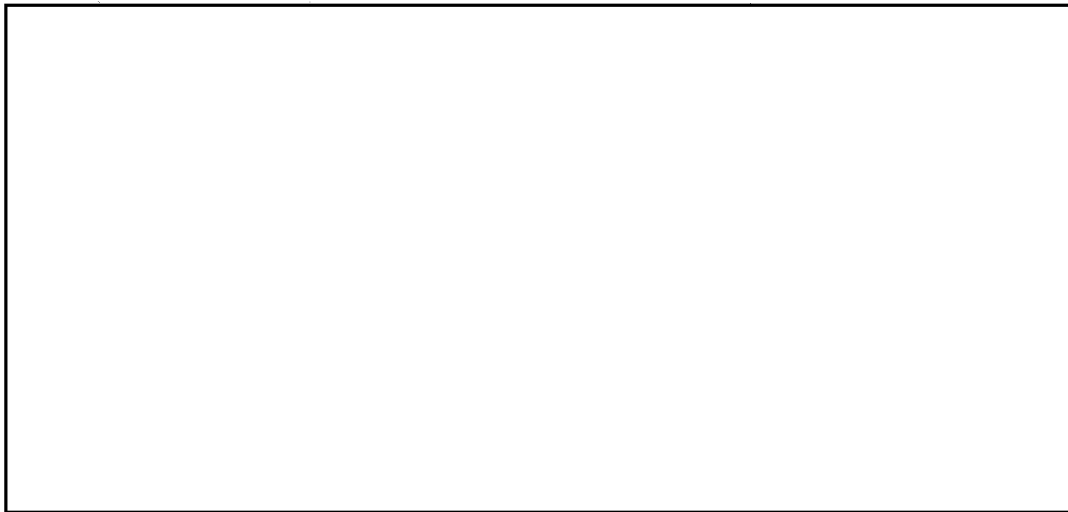
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15. While NPIC's data processing capability has been seriously impeded by lack of integrated systems design, its efforts to develop on line, real time computer supported equipment for use by photo interpreters and photogrammetrists has achieved significant progress since our 1962 survey. As of mid-1965, NPIC had in place and operational a dual screen comparator, a film reader, an opto-mechanism chip comparator, and two plotters. See illustrations at Tab B. While each of these computer based instruments faces further evolution before freezing of production models, each represents solid design progress and promises increasing involvement of photo interpreters in computer supported operations in the early future. NPIC's prime remaining responsibility with such computer based equipment development is to ensure and enforce its most intensive utilization in order to speed its widespread deployment.

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16. The panel of outside experts (as discussed beginning on page 117) will of course reach its own independent conclusions on NPIC's achievements in this area of automation. Considering that these instruments are generally unique in industry and government, that they represent NPIC design exploration, and that they have involved self-education of NPIC computer programmers and photogrammetrists, we believe that NPIC has registered some significant achievements, but additional resources could have been brought to bear in attacking these major design problems.

Information Storage and Retrieval

17. Moving from the scientific data processing to the information handling area of NPIC computer operations, we find the Center freed of most external constraints and able to proceed largely on its own initiative in a still complex but better understood field of computer operations. NPIC's information processing activities divide in four parts and include (a) the control of textual information on targets as supplied by photo interpreters during their readout of successive inputs of photography, (b) the micro-image storage and retrieval of documents and photographs, (c) the indexing of photographic interpretation

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reports, the servicing of requests for information from such reports and the provision of various library services through automation, and, finally, (d) the operation of a computer based Management Information System through which NPIC achieves statistical, cost and management analysis and control of all of its activities.

18. All of the above programs are aimed directly or indirectly at serving the photo interpreter and speeding the dissemination of his findings to the TKH cleared community. Target information for the most part concerns named objects and established or presumed facts. As of mid-1965 the NPIC target file numbers some 19,000 items, many of which have been examined numerous times over the ten years of reconnaissance operations. Accordingly, it now appears that reconnaissance is steadily shifting its emphasis from search for new targets to surveillance of change in known targets. The record of what has been observed previously on each target is an invaluable tool for guiding the photo interpreter in identifying significant change.

19. Much of the burden of managing target information arises from the need for high speed printing of the target reports from each mission, the updating of each target file, and the

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compilation of an updated set of target briefs tailored to the geographic coverage of each new mission. Under the pressure of rapid growth of the target files and overload of the IBM 1401 printing capability, a number of programs are now underway to streamline this entire activity. Utilization of the cathode ray tube remote display of computer controlled target information promises the most substantial long-range benefit for it offers the possibility of eliminating much of the printing burden. It is hoped that prototype equipment will be available for experimentation before the end of FY 1966.

20. Planning is also underway to sort each file of target information into active and historical categories and to eliminate the latter from further processing by printing out a history file as a photo interpreter reference tool. A further innovation is the inauguration of a Basic Information Reporting System (BIRS) which provides for reporting by computer tabulations on certain categories of targets such as missiles and airfields. The latter two programs will help to relieve current pressures and provide NPIC with more time to decide upon its future ADP equipment needs in information processing.

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Operating Problems of the Information Processing Division

21. Personnel: The programmer staff of IPD is youthful and possesses extremely limited experience in its profession and in the Agency. Only a handful have worked in NPIC longer than three years. Most programmers have been hired as college graduate math majors, have taken a short course in programming from UNIVAC, and learned their present skills on the job. In view of the remote location of NPIC and the brief time allotted thus far for orientation, few programmers possess adequate understanding of the Agency or even of the activities underway in the other components of the Center. Supervisors are inexperienced and unable to provide strong leadership of these new, highly motivated, and generally very bright people. Turnover is fairly high but not attributable to specific dissatisfactions. Entrance salaries are generally competitive in the programmer market, but opportunity for career advancement in IPD is not competitive with the market for individuals with three years of experience in the sophisticated world of photogrammetric computer programming. Agency promotion via the GS-8 and GS-10 grades is undoubtedly a discouragement to the promising individual in this highly

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competitive market. Physical working conditions are generally good and improving. Programmers are highly frustrated in securing checkouts of their programs on the IPD 490 computer. Many programmers at NPIC believe that the staff is critically short of skill and experience in writing computer programs for on-line equipment, and in monitoring the linking of remote mensuration equipment to the computer. In a world where millions of dollars are expended on reconnaissance hardware these individuals are forthright in stating that the Center is pound foolish not to enter the programmer market and pay the salaries necessary to acquire individuals with the requisite skills and experience.

22. Communications Problems in Programming: The challenging projects in programming lie in the field of photogrammetry. The bright and aggressive math major is well equipped to learn photogrammetry and to undertake the demanding projects of preparing mathematical models of reconnaissance camera systems and contributing concepts for dealing with the problems of satellite mechanics. His natural inclination accordingly is to expect to ask and obtain answers to any questions he considers germane to programming in these

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several fields. Inevitably, the experienced people in the fields of photogrammetry, camera design, and collection systems engineering are skeptical of the programmers' needs and motives. Many such specialists have an inadequate appreciation of the capabilities and promise of automation. Hence there is considerable opportunity for clash of interests between groups holding inaccurate concepts of each others skills. In NPIC, the problem is further complicated in that the photogrammetrists are so short-handed and overworked that they do not supply written presentations of their problems to IPD. Much of this problem relates to inadequate communication and very little has been done up to this point to breakdown the communication barriers.

has been a constant battle for year + years + year + years + year +

23. Computer Operations: There is a notable lack of agreement and considerable ferment within IPD on the merits of the UNIVAC line of computer equipment. Approximately one-half of those interviewed described the 490 as unsuited to scientific data processing and essentially an information processing instrument. The others interviewed held just as firmly to the reverse opinion. Most were in agreement that UNIVAC programs are far less reliable and company support

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far inferior to those provided by IBM. Programmers customarily write a short sequence of program instructions and send them to the computer for a checkout to verify their adequacy. Many computer centers are reported to offer half-day turn-around time on checkouts while in IPD most programmers were highly distressed by the number of checkouts requiring several days and even a week for servicing. Computer operators at IPD were seriously short-handed during the period of this survey, were working excessive overtime to meet operating deadlines, and accordingly were described by some programmers as poorly disciplined in maintaining and operating particularly the 490 computer. The IPD management during the survey period instituted a number of significant changes in operations control, tape library management, and supervision which indicated both the validity of the charges and the promise of early improvement in daily operating performance. IPD expects to place its computer operations on a three-shift schedule as soon as the necessary recruitment of personnel can be accomplished.

24. Integration of NPIC and other Agency Computer

Operations: NPIC is under some pressure at the present time to subordinate its computer management to the Office of Computer Services. Hard evidence on the merits of this proposal is lacking.

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There is no ready evidence, however, that current NPIC computer problems would be any less acute under outside OCS management. The problems could become more acute due to added difficulties in communication. We have stated our belief earlier that IPD is making progress in coping with its problems. IPD's principal need is time in which to permit its various remedial measures to take root.

25. In our judgment, NPIC should pursue a posture of maximum cooperation with the Office of Computer Services in recruitment, training, and career management of ADP personnel; in the application of common standards of work measurement; in standardizing procedures; in the assessment and support of development of new equipment; and in systems design where compatibility permitting the exchange of programs and data may be desirable from an overall Agency point of view.

It is recommended that:

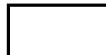
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The Director, NPIC:

[a. Inaugurate a program of orientation of plans and development staff, photogrammetrists, and computer programmers in each others skills with particular emphasis on the application of computers.]

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b. Direct that all NPIC components requiring data processing services, or under investigation for possible computer applications, supply in writing to the Information Processing Division all information required by programmers to execute their assignments.

c. Inaugurate for the purpose of breaking down group prejudices a series of informal seminars in which specialists in programming and photogrammetry present briefings and lead discussions setting forth their accomplishments and their problems, e.g. with the UNIVAC equipment.

d. Establish for each reconnaissance system in existence or under development a design team composed of a representative of the Plans and Development Staff; a photogrammetrist, and a computer programmer; that each systems team work on a continuing basis with manufacturers and with their opposites in OSA of the DD/S&T; and, subject to approval of Recommendation No. 3.b. (page 50), in the NRO of the Department of Defense to develop maximum integration of collection and exploitation effort in reconnaissance.

e. Assemble a small board of computer system managers and senior programmers from such firms as United Aircraft, Boeing, North American Aviation, and Lockheed, and that appropriate NPIC personnel join with this board to review policy and performance of the Information Processing Division on a quarterly or more frequent basis.

f. Move aggressively in NPIC's relations with UNIVAC to demand and obtain solutions for present-day difficulties with UNIVAC equipment and computer programs and routines.

g. Delay a decision on the acquisition of a next generation of more powerful equipment until current computer programs are performing effectively and until existing workload has been effectively streamlined, e.g. by sharp cutback of the target brief workload.

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h. Provide the Information Processing Division immediately with sufficient increase in F/O and accelerated recruitment to permit the inauguration of a fully staffed, three-shift computer operation.

i. Direct the managements of all NPIC components concerned with mensuration, e. g. the Photo Analysis Group (PAG), the Photo Interpretation Division (PID), and the Technical Information Division (TID), to arrange intensive, continuing orientation and utilization by their personnel of mensuration equipment on line to the computer, to keep accurate records of such activity, and to ensure proper reporting of design limitations or malfunctions encountered, in order to speed debugging and freezing of production models for general use throughout the Center.

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**EQUIPMENT, STEREO VIEWING,
AND RESEARCH AND DEVELOPMENT**

Equipment

1. Previous surveys and investigations by expert outside consultants have commented on the inadequacy of some of the equipment used by NPIC for certain aspects of photo interpretation. These observations are still valid, despite a very considerable past and present effort by NPIC to obtain, or to develop, the best possible equipment for the full and efficient exploitation of photography delivered to it. Existing equipment deficiencies result primarily from these three factors:

a. The market for shelf items useful for exploiting the present high-resolution photography is limited to a rather small circle of Government customers. Industry is not willing to commit much of its own R&D money to the development of photo interpretation equipment.

b. Because of the explosive rate of expansion of film inputs, NPIC has had to commit itself to shelf items prematurely.

c. The NPIC applied research and development effort has yielded and is continuing to yield substantial

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contributions across the entire spectrum of photo interpretation equipment, but the NPIC effort is too narrowly based both in manpower and in monetary allocations.

2. Many of the tools given the photo interpreter to carry out routine photographic analysis strike us as being still in the Model T stage, while collection systems and the imagery they deliver have advanced spectacularly. This does not mean that the photo interpreter cannot do the job that is expected of him; however, he has to do it under primitive and difficult circumstances--probably at the expense of a lower rate of productivity than would otherwise be possible and with an increased risk of missing significant targets during the scanning phase. Examples of antiquated equipment are the Richardson rear projection viewer, which is obsolete or very nearly so; the variety of light-tables, many of which can neither be "sat at" nor "stood over" comfortably; and the workhorse Bausch & Lomb zoom stereo microscope, a highly flexible instrument but one with pronounced optical limitations. Examination of U-2 photography is carried out primarily with monocular tube-magnifiers whose magnification may be satisfactory but whose field of view is severely limited. Maps and charts essential to photo interpretation are displayed by sticking them onto a wall with masking tape.

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3. We cannot be too critical of deficiencies in existing photo interpretation equipment because they do not result from oversight or poor planning.

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a. In part, the deficiencies can be traced to the need for flexibility in the arsenal of instruments for photographic interpretation. NPIC must be prepared to fulfill its obligation to interpret photography, regardless of type, size, quality, or quantity received. When compromises have to be made to accommodate the great range of film formats delivered, some specific sacrifices in equipment performance and economy must be accepted. Just where under these circumstances the line of sacrifice is to be drawn is clearly a matter of judgment. In our view, NPIC management has made these judgments conscientiously and only after weighing all variables.

what's new?

b. In part, the deficiencies reflect the unavoidable dilemma that equipment developers face in trying to devise equipment to please different individuals with different ways of doing things, and with differing personal preferences. Thus not unexpectedly the verdicts of the photo interpreters

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range from complete satisfaction with available equipment to severe criticism of its inadequacies.

c. Finally, the equipment shortcomings reflect another aspect of the general debilitating effects on NPIC resulting from the imbalance between collection scheduling and exploitation capacities, on the one hand, and from the lack of adequate interplay between system designers and exploitation managers on the other.

Recommendations on these points have been made elsewhere.

4. The rest of the equipment (beyond the day-to-day photo-interpreter tools), of which there is a great deal in NPIC, particularly in the Technical Intelligence and Production Services Divisions, appears to be entirely adequate. Much of it is pushing the very extreme of the state of the art, and NPIC management can take the credit for the development of much of it.

Stereoscopic Viewing

5. The whole photo interpretation community agrees that stereo viewing is required for maximum exploitation of overhead photography. [] KH-4 [] operated in stereo mode as will be future systems now under development. Stereo operation of a camera consumes twice as much film as

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monoscopic operation and therefore reduces proportionately the area coverage of each mission. Neither NPIC nor anybody else has any capability for projection viewing of roll film in stereo. The best available method for direct stereo viewing is the highly selective one of cutting chips from the roll film and examining them under high quality stereomicroscopes. Under these circumstances NPIC has at times been charged with being particularly deficient in developing a stereo-scan capability and as not properly exploiting the stereo photography which is acquired at the sacrifice of reduced area coverage.

6. NPIC has spent [REDACTED]

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dollars in research and development of a stereo-scan capability. The result of this effort is a prototype stereo projection viewer. The operator can, with some difficulty, succeed in getting registration of same-scale, stationary frames which can be seen in stereo through supplementary viewing spectacles.

7. This was an exploratory effort by NPIC, in effect to discover just what the state of the art was in stereo scan. The prototype proves, at least to us, that stereo scan is still beyond the state of the art. This particular R&D effort went the route of stereo registration by mechanical means. NPIC has been keeping abreast

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of an early developmental effort to accomplish registration elec-
tronically. The Director, NPIC, believes that electronically-sensed
registration has potential and has earmarked [redacted] in the
five year forecast for further research and development in this
direction. We know little of the technology involved and can there-
fore not judge the feasibility over the near future of devising a
projection stereo scanner that will accommodate differing film
formats, scales, and degrees of obliquity, and on which photography
can be viewed by the unaided human eye.

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be better to spend on
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Research and Development

8. The survey team lacks the technical competence to judge whether the NPIC R&D effort is headed in the right direction. We solicited the views of competent Agency scientists outside of NPIC who have some working knowledge of what NPIC is doing and how. We found no substantial area of agreement. One, for example, remarked that NPIC is good on gadgets but lacks the competence to work in highly complex technical fields; another expressed the contrary view that NPIC is devoting too much of its effort to the "far out" and not enough to the everyday tools of photo interpretation. From our observations and from reviews of R&D records, we conclude that the Plans and Development Staff recognizes its obligations

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in both areas, is working on the problems of today and of tomorrow simultaneously, but has only ^{left} two hands to do a four-hand job.

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9. The Plans and Development Staff has an authorized T/O of of which were filled as of 1 March 1965. The Development Branch has a complement of officers. These

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carry the responsibility for:

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- a. 104 contracts and requisitions amounting to about
- b. Keeping abreast of new developments in photographic exploitation.
- c. Developing proposals to meet exploitation needs for new photographic systems.
- d. Testing and evaluating bread-board models and production units resulting from completed contracts.
- e. Working with photo interpreters on equipment problems.
- f. Providing maintenance for the equipment on hand.
- g. Maintaining liaison with the intelligence community to coordinate joint development actions and joint procurement.

No elaborate documentation is needed to demonstrate that, despite

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the great amount of overtime (primarily contributed and not paid overtime) worked by these officers, they cannot adequately cope with the tasks they are facing. They have done a remarkable job over the years and the shortcomings that need correcting arise largely from factors over which they exercise limited influence, but could if they tried.

10. There are too few ^{good} people engaged in NPIC's R&D effort, even if the authorized ceiling were reached, and this fact is recognized in NPIC's five year forecast which sees a need for expansion to by FY 1970. Despite our understanding of NPIC's stress on the applied and practical aspects of R&D and despite the achievements of the present staff, we question whether technical and academic qualifications must not be raised at least for new personnel of the Plans and Development Staff in order to insure effective handling of the expanding and increasingly sophisticated effort. Any increase in the level of qualifications for R&D personnel at NPIC would require raising the grade structure of the Plans and Development Staff since it is now too low to attract high caliber personnel in the intensely competitive technical and scientific area. The DD/S&T has had considerable experience in hiring highly qualified personnel on today's market, and we think that NPIC might profit from studying his experience.

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Have long had two many chiefs of staff

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It is recommended that:

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The Director, NPIC, give priority attention to assessing the skills needed to fully meet NPIC's R&D obligations to the intelligence community, and to seeking revision of the grade structure of the Plans and Development Staff as necessary to attract personnel with the skills needed.

11. There are certain decided deficiencies in the management of the NPIC development program, most of which stem directly from a shortage of personnel. These are the more significant:

a. Contract monitoring has been reduced from a 30-day to a 60-day cycle. This is clearly detrimental from both substantive and financial points of view, as long distance telephone conversations are increasingly substituted for personal meetings.

b. Contracts are let in spurts and tend to bunch up in the last quarter of the fiscal year in the rush to obligate available funds. Despite a better attempt in FY 1965 to spread contracting more evenly over the year, only 42 per cent of the roughly available for NPIC R&D activities had been committed by 23 March 1965.

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c. The massing of new contracts toward the end of the fiscal year places NPIC's Technical Development Committee in an untenable position. It can give the proposals rubber-stamp endorsements and thus make sure no R&D money is lost through failure to obligate it, or it can examine the proposals with care and risk being responsible for the loss of unobligated R&D funds when its review extends beyond the end of the fiscal year. Bunched contracting also puts a strain on the Procurement Division of the Office of Logistics, and could result in otherwise avoidable frictions in the relationships between the two offices. The Deputy Director for Support has directed the Director of Logistics to discuss this problem with the Director, NPIC, in order to arrive at a workable solution.

d. NPIC is far too casual in the matter of establishing *ah men* technical specifications in its contracts. All too often the sequence appears to be for NPIC to ask a prospective bidder to come up with a technical proposal, and this proposal becomes, in effect, the technical specifications for the contract.

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*gone way back
in Stewart
Belly days*

e. Test and evaluation of equipment submitted for acceptance is on a catch-as-catch-can basis, with developmental and bread-board models receiving first priority and with many new production items left primarily to the users for evaluation.

f. A regular equipment maintenance program has only recently been instituted. A study leading to the establishing of a schedule and standards for continuing maintenance is being made under contract. Two employees of the Development Branch are assigned full time to maintenance work, but the effort, while an improvement, is understaffed and in our view should be established as a separate branch.

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12. Improvement in the general area of contract management depends to a large extent on the availability of additional personnel, although we see distinct evidence of the new chief and deputy chief moving to achieve better order in the management of the Staff even now. Early action should be initiated to improve technical specifications in contracts. Spare parts and technical manuals should not be overlooked when they are needed. We also believe that NPIC could profit from the favorable experience of the Technical Services

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Division of the DD/P in establishing test and evaluation completely apart from research and development, since those involved in development may lack the objectivity essential to unbiased evaluation.

It is recommended that:

No. 6

The Director, NPIC:

a. Begin now to build an improved capability to write technical contract specifications in house; and that contracts routinely specify spare parts and technical manuals when appropriate.

b. Divorce test and evaluation from the Plans and Development Staff and establish it as a unit immediately subordinate to the Executive Director, NPIC.

c. Remove the responsibility for equipment maintenance from the Development Branch of the Plans and Development Staff and establish it as a separate branch in the Plans and Development Staff with sufficient T/O positions to fulfill the maintenance function adequately.

13. While, in terms of currently available personnel, the R&D funds allotted to NPIC exceed the Staff's ability to manage them, we are convinced that the amount of money devoted to R&D in NPIC has been and continues to be insufficient. R&D budgetting consists of asking for what you think you need and of getting whatever is left from total allotted funds after current operating expenses are met. NSCID No. 8 gives NPIC the responsibility for developing photo interpretation equipment for the entire community. Since NPIC is operating in a developmental arena where in many



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cases needs can be met only by extending the frontiers of the state of the art, and since the bulk of the development activity must be conducted by the Center for the entire community, NPIC's needs for R&D funds will continue to expand and probably at an even faster rate than over recent years. We state again, however, that allotment of additional funds must be preceded by the recruitment of additional qualified personnel. The Center must not be put in a position of having to allow contractors to serve as their own monitors in the use of Agency funds.

It is recommended that:

No. 7

The Director, NPIC, press with senior Agency management the imperativeness of a stable and expanding R&D budget, and, having done so, establish and enforce within NPIC a budgetting and staffing philosophy that assigns a much higher priority to the requirements for research and development than has been possible in the past.

14. Although NPIC, by NSC Directive, is given responsibility for research and development, we believe that NPIC has interpreted its authority too narrowly. It has not encouraged other members of the intelligence community to participate sufficiently in the area of joint development. The joint procurement meetings have in the past been not much more than fashion shows of NPIC-produced equipment. The other participants were welcome to put



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in their orders for already-developed equipment, but have had little voice in the original designs. In saying this, we are not minimizing the real savings that have accrued to the Government as a whole through lowering unit costs as a result of larger production runs. We also recognize that the large number of participants with varying levels of clearances restricted discussions to the lowest individual clearance level.

15. We endorse the initiative of the new Chief of the Plans and Development Staff, and his deputy, in proposing the establishment of a Committee for Photographic Equipment and the assignment of a full-time Executive Secretary. The proposal envisages Committee participation by NPIC, CIA, NRO, DIA, Army, Navy, and Air Force. All participants are to have all of the necessary operational and product clearances, since without them the usefulness of the committee will be severely limited.

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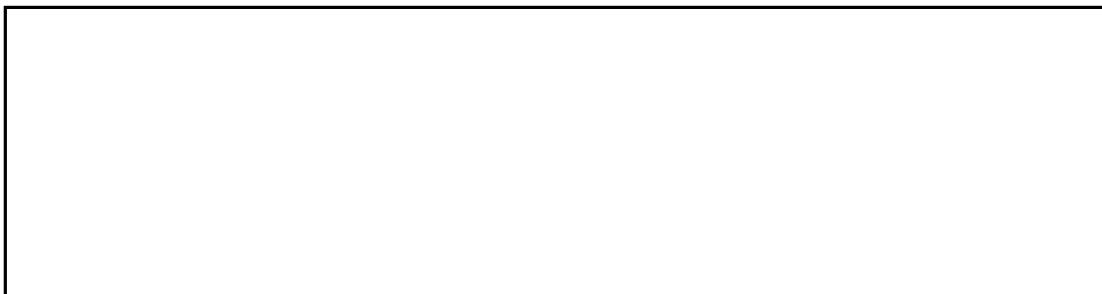
HAND-HELD PHOTOGRAPHY

1. The severest criticisms we heard of NPIC in our interviews at Headquarters concerned NPIC's supposed deficiencies in the exploitation of hand-held or ground photography. The criticisms appeared to arise from a single but major NPIC error in measurement of an ICBM displayed for the first time in the 7 November 1964 Moscow parade. The Central Intelligence Bulletin of 9 November described the ICBM as being about 90 feet long. The comparable DIA publication for the same date gave it a total length of about 75.5 feet. The DIA figure turned out to be the correct one, and CIA was considerably embarrassed.

2. We inquired into this incident rather extensively to discover whether it was illustrative of a weakness in the NPIC capability. We conclude that the error did not result from a lack of skill on the part of the NPIC mensurators. The DIA correct figure was based on []

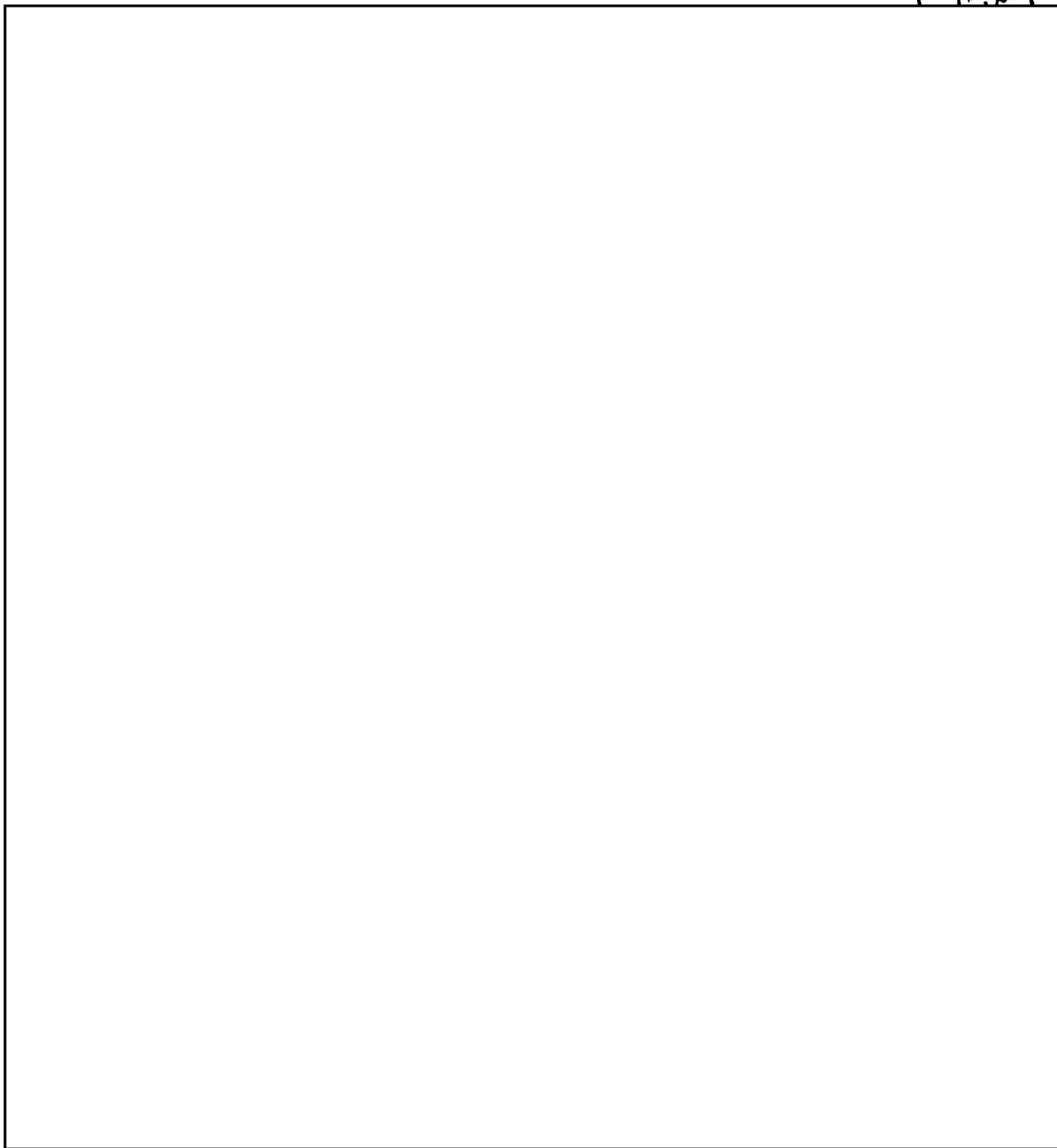
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a. The calibration of the camera--its focal length, lens aberrations, and other characteristics.

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- b. The film.
- c. The range from the camera to the object.
- d. The obliquity of the object to the camera axis.
- e. The film printing process (cropping or enlarging).

In the final analysis, the best way of determining the size of the object to be measured is to compare it with another object in the photograph whose size is known. We reached this conclusion from our conversations in NPIC, and it was reinforced in the interviews we held at the Foreign Technology Division.

5. NPIC has personnel who understand the geometry of measuring ground photography and are extremely skillful at it. We believe though that the whole field of ground photography is neglected and is poorly coordinated. NPIC itself has been oriented primarily toward exploitation of the photography from overhead reconnaissance. We see evidence of and strongly endorse a movement by NPIC to reassert itself in the field of ground photography. It has recently published a manual on ground photography for community-wide use. It is initiating an in-house course on ground photography to be taught under contract by a recognized authority on photogrammetry. This year NPIC was able to insert itself into the Air Force analytical

effort [redacted]

It sent a

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6. It would appear that there was once better community coordination on ground photography than now exists. In 1954 and 1955, the CIA officer who is now Director of NPIC took the lead in establishing a Joint Working Group on Intelligence Ground Photography. He chaired the group. For several years it met every six to eight weeks and was an excellent mechanism for exchanging information on a variety of subjects having to do with photographic intelligence, primarily in the field of research and development. The Joint Chiefs of Staff were so impressed with the effectiveness of the Group that they asked permission to charter it as a subcommittee of the JCS Photographic and Survey Section. The committee continued active until about 1963. The establishing of the Defense Intelligence Agency resulted in the break-up of many of the existing

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groupings of intelligence representatives, and the ground photography group was one that virtually collapsed. It has been dormant since at least 1963. we think that substantial worth could be gained from reactivating it.

and NPIC?

It is recommended that:

No. 8

The Director, NPIC, take the lead in reestablishing the Joint Working Group on Intelligence Ground Photography as a mechanism for coordinating community efforts in ground photography and for the exchange of information in related fields.

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MANAGEMENT

Functional Management

1. Under the terms of NSCID No. 8 Intelligence Board departments and agencies are to provide personnel for the Center jointly, and these personnel are to be under the functional direction of the Director, NPIC, but remain administratively responsible to their parent organizations. Such an arrangement inevitably poses difficult problems of management:

a. Its Director wears two hats: one as Director of the national Center and the other as the DD/I's assistant director for photo ^{intelligence} interpretation. Although he does not carry the latter title, he is that in effect, because the CIA departmental photo interpretation effort is under his control.

b. The Director, NPIC, is given functional direction of personnel provided jointly from DoD and CIA for a common program but DoD personnel remain under the administrative control of DoD.

c. Certain of the key chief and deputy chief management positions are divided between CIA and DoD. For example,

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the Director is a CIA officer and his deputy is provided by DoD; the Assistant for Photo Analysis (the group responsible for fulfilling national photo interpretation requirements) is military and his deputy is CIA; the Assistant for Plans and Development (R&D) is military and his deputy is CIA; the Assistant for Operations is from CIA and his deputy is military. DoD officers in senior managerial positions, whether as chief or as deputy, have limitations on their usefulness: there are certain aspects of the relationships between NPIC and CIA components that can be supervised or monitored only by CIA employees.

2. This bifurcated managerial structure, extending from the very top down to section level in some cases and at least partially responsive to pressures from both CIA and DoD, forces the Director, NPIC, into a posture of directing by negotiation. That it works as well as it does, and it does work well, attests to the skill of the *Exec.* Director, NPIC, as a negotiator. Unhappily, direction by negotiation often results in decision by compromise, and arriving at acceptable compromise is one of the long-standing concerns of NPIC management.

3. The managerial philosophy of the Director, NPIC, revolves around the "Mr. Outside - Mr. Inside" concept. He keeps

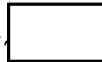
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himself thoroughly informed on what is going on in the Center and reserves major policy decisions to himself; but he and his military deputy concern themselves largely with briefings, coordination, and negotiation outside the Center. Day-to-day functional control of the Center and supervision of administrative relationships between NPIC and its CIA superstructure is vested in the Executive Director, NPIC, a CIA career employee.

4. NPIC makes effective use of the committee approach to airing common Center problems. Its Production Board and its Technical Development Committee are mechanisms for getting senior supervisors together to discuss Center-wide problems and to seek solutions that take all variables into account. We endorse the concept.

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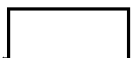
5. Communications within NPIC are good, both laterally and vertically, with the possible exception of a barrier that is beginning to appear between computer programmers and those they serve. Communications between photo interpreters and CIA Headquarters analysts are good in general but vary with the individuals concerned--primarily with the Headquarters analysts. There is no monopoly in the capacity of analysts, consultants, or photo interpreters to arrive at the insights that adequately explain ground

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patterns observed. All intelligence specialists concerned with photographic evidence require orientation in its use. All photography requires multiple, independent examinations as the only partially effective insurance against oversight or incorrect interpretation. We see need for a program for orienting analysts on the uses of photography and in the ways in which NPIC operates, particularly those analysts who are early in their careers. The Office of Training offers a course that is pertinent, but it needs sharper focus on NPIC itself. We are informed that the course has not been scheduled in over a year because of lack of candidates.

It is recommended that:

No. 9

The Deputy Director for Intelligence:

a. Direct the Director, NPIC, in collaboration with the Office of Training, to develop basic orientation and refresher courses in the uses of photography in intelligence analysis; and

b. Inaugurate a program within the intelligence directorate which would require all cleared analysts to receive such training on a scheduled basis and encourage the participation of cleared intelligence officers from other directorates.

Career Management

Staffing

6. NPIC has been chronically under strength virtually since

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its inception--both in the sense of having fewer people on board than it was authorized, and in the sense of having fewer people than was really necessary to meet its responsibilities. Only twice in the last five years has on-board strength approximated authorized strength, and then only momentarily--once just before an authorized increase in 1962 and again in 1964 when ceiling strength was frozen at on-duty strength.

7. Today, NPIC is under strength on photo interpreters, and in some specialties (computer programmers and photogrammetrists, for example) the present shortage is critical. Several factors contribute to NPIC's failure to reach authorized strength:

a. Freezing ceiling strength at on-duty strength

has cut the pipeline and filling it again is a time-consuming process. This happened in 1964 when for about one-third of a year NPIC's ceiling strength, the number of people it was actually permitted to hire, was frozen at the level of those already on board. This meant that all the candidates who were in various stages of recruitment processing had to be dropped. They went on to other jobs. When the cut was restored NPIC had to start from scratch to build up the pipeline again. It is only now recovering from this blow.

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b. NPIC's grade structure is not competitive in certain scarce labor markets. For example, there are fewer than a dozen PhD photogrammetrists in the country, all have well paying jobs, and some are not clearable for sensitive intelligence work. We found the Chief of NPIC's Technical Intelligence Division trying to induce one of these specialists to transfer to NPIC but the best he could offer was less than the \$19,000 per year the man was already being paid.

waste!

c. College graduates with specialties in high demand (mathematicians, in particular) are unwilling to wait out our security clearance delay. The problem is even more severe in the case of experienced computer programmers. Those who come into the labor market are snapped up immediately. Over the last year not a single one of the experienced computer programmers that NPIC put into recruitment processing actually entered on duty. They took other jobs before security approval was granted.

d. NPIC's specifications for photo interpreter trainees are too narrowly based. NPIC is advertising for photo interpreter trainees with degrees in geology, geography, or forestry. These happen to be fields in which the supply

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exceeds the demand. The earth sciences are somewhat related to photo interpretation, but we think much less directly than NPIC holds. It is the view of the Foreign Technology Division of the Air Force Systems Command, which runs a sizeable photo interpreter shop, that there is no relation whatsoever between the earth sciences and photo interpretation; a liberal arts major is just as likely to become as good a photo interpreter as is a forester. It is true that photo interpreters are often concerned with earth features and things that are done to them (mining, crops, etc.), but more often they are concerned with objects that have been built on the earth. For this aspect of interpretation, we believe that NPIC should be hiring more specialists in engineering, construction, architecture, transportation, electronics, communications, and the like. We were struck by the fact that all of the photo interpreter shops we saw were almost exclusively staffed with males. The Foreign Technology Division uses women in a sort of pre-screening of the photography. CIA has one female photo interpreter. Male dominance may be explained in part from the fact that recruitment is concentrated on ex-military types who did

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photo interpretation in the service and on fields of specializa-
tion that are highly male-dominated. It is our feeling, however, *
that the exclusion of females is deliberate, and that it is a
short-sighted policy.

e. NPIC has not pursued its recruitment program as
aggressively and as imaginatively as it might have done.
Success has varied among the divisions and is proportional
to the degree of effort exerted. NPIC had the Agency
recruiters in for a day of briefings while our survey was
in progress. This is a good first step. There is now need
for an aggressive and centrally-directed follow-up.

*poor understanding
what has been
done*

It is recommended that:

No. 10

The Director, NPIC:

a. Seek authorization from the Director of Personnel
to establish certain positions in NPIC under the Scientific
Pay Schedule, including reserve appointments if appro-
priate, in order to attract experienced, highly qualified
personnel, particularly for work in the Technical Intel-
ligence and Information Processing Divisions and in the
Plans and Development Staff.

b. Request the Director of Personnel to expedite
approval of NPIC's proposal for establishing certain photo-
grammetrist positions under the GSS pay schedule in a special
pay category for scientists and engineers 7.

c. Initiate a concerted recruitment drive patterned
after that of the Office of Scientific Intelligence to fill
existing vacancies in the NPIC T/O. The recruitment

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effort should be monitored by the Executive Director, NPIC, and weekly progress reports, by Division, should be submitted to him. The effort should combine a dragnet approach largely involving Agency recruiters and a rifling approach directly involving several senior NPIC officers.

d. Direct that the search for photo-interpreter trainees be broadened to include fields other than the earth sciences and that the search not be limited, wittingly or unwittingly, to males.



Overtime

8. Overtime in NPIC is excessive by any standard and the situation is chronic. It is not at all unusual to find employees recording overtime patterns of one or two twelve-hour days per week and seven-day work weeks for weeks in succession. A few employees record occasional seventy to eighty-hour work weeks.

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[redacted] of NPIC's approximately [redacted] per year budget is for the payment of overtime.

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9. NPIC, along with other Agency components, has been under continuing pressure to reduce its overtime costs. Because NPIC could not control the input of film and the resulting requirements, it had little control over the amount of overtime that had to be worked. Its response to pressures to reduce overtime costs has been to decree that certain categories of personnel shall not be paid for overtime directed and worked. There are five overtime

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classifications among personnel assigned to the national photo interpreter effort:

- a. Military personnel are paid no overtime.
- b. DIA civilians are paid for all overtime, regardless of grade or position.
- c. CIA employees in supervisory positions are paid no overtime.
- d. CIA employees, grade GS-11 and above, not in supervisory positions, must contribute the first eight hours of overtime worked. This is in accordance with

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- e. CIA employees, grade GS-10 and below, are paid for all overtime.

A considerable portion of the overtime results from the policy of beginning first phase readout on the day following the film's arrival, of continuing the readout through a weekend, and of producing massive quantities of briefing aids to support readout reporting. We wish that we could in good conscience recommend that NPIC be put on a straight five-day work week, and that overtime in excess of 16 hours per pay period not be directed, but we cannot. We do think, however, that the Director, NPIC, should

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employ the 16 hour per pay period level of overtime as an optimum. Strenuous efforts should be made to see that all staff in a given component work that amount before any are authorized to exceed it for lengthy periods of time. Inevitably, the advantages of utilizing the most competent and experienced personnel dictates that they carry much of the overtime work burden, even though that burden (a 60 to 70 hour work week) far exceeds any reasonable regard for fatigue and family stress and carries with it a high risk of overlooking critical photo intelligence and of turning out a poorer quality product. Continuing overtime patterns of this unreasonable nature, in our judgment, indicate a failure in the entire Agency chain of command to take appropriate remedial action. However, NPIC appears doomed, at least for the foreseeable future, to a continuation of its present excessive overtime load. It is now time to begin paying for the service we demand.

10. We have considered the feasibility of having NPIC positions designated as production positions, virtually across the board. Such position designation carries with it authorization to pay full overtime. However, NPIC has already tried this approach and failed to get acceptance. [redacted]

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It is recommended that:

No. 11

The Deputy Director for Intelligence seek approval for payment of all overtime directed and worked by CIA employees assigned to NPIC, without regard to grade or position [redacted] subject only to the statutory limitations.

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Career Advancement

11. We note that NPIC gave no Quality Step Increases during the last year, which is appreciably at variance from custom elsewhere in the Agency. The explanation is found in the fact that promotion in NPIC is, or at least has been, fairly rapid in comparison with most other Agency components. Because of available head-room, the individual who might have warranted a Quality Step Increase has been given a grade promotion instead.

12. In a component such as NPIC where many of the functions are largely technical in nature, there is need for opportunity for the individual to advance either through the managerial or through the technical channel. The concept of advancement through either the managerial or the technical line is poorly developed in NPIC. The top non-supervisory positions for photo interpreters are GS-14's, which may be high enough for the skills required; however, the positions for the most part are filled by interpreters who have failed at or shown little potential for

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management. We have no recommendation on this point, because the concept is one that must evolve slowly. We think that NPIC needs a better thought out program for advancement of outstanding personnel along technical lines.

Fitness Reports

13. The 1963 distribution of NPIC fitness report ratings was comparable to the Agency-wide distribution pattern. Some employees complained to us that their 1964 fitness reports gave them a poorer rating than they had received in 1963 and that the poorer rating was defended to them on the grounds that NPIC was adjusting its rating scale to accord more with Agency standards. Although senior NPIC management denied that there was a program to shift the scale, we reviewed some fitness reports on which such a statement appeared. In fact, in 1964 the distribution curve shifted strongly toward the "proficient" rating, with "adequate" and "strong" being correspondingly decreased.

14. We have one major criticism of fitness report procedures in NPIC. All CIA photo interpreters are carried on the T/O of the CIA departmental detachment (PID), even though approximately half of them are detailed to serve in the group that handles national requirements (PAG). Thus, the person occupying the T/O position



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of branch chief in the CIA departmental detachment might actually be working in the national group. To accommodate to this situation in which supervisors are not actually working with those who appear subordinate to them in the T/O, the CIA departmental detachment has devised a formal and quite complicated mechanism for grading each employee on a 17-point evaluation sheet. This evaluation sheet is completed by the supervisor. The branch chief then presents it to the detachment's career panel. The final evaluation represents the consensus of a committee, not the views of the immediate supervisor. This is just plain improper. It confuses fitness reporting with competitive evaluation ratings for purposes of promotion and it should be changed at once.

It is recommended that:

No. 12

The Director, NPIC, direct that fitness reports be written by the immediate supervisor; that the role of the PID Career Panel be confined to an ex post facto review; and that uniformity in ratings be attained by educating supervisors in proper fitness reporting.

O This complaint in same is held by small minority

Training

15. NPIC has made substantial progress since the survey of three years ago in establishing an in-house training program. The program is still suffering from growing pains and is understaffed. We urged then that NPIC establish a course for orienting

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new personnel on the organization and functions of NPIC. NPIC concurred in the recommendation. They have not gone far enough, however. One of the commonest complaints we heard from new employees concerned the length of time it took to learn "who does what, where does he sit, and how do I go about getting what I need."

It is recommended that:

No. 13

The Director, NPIC, expand the internal orientation course materially, perhaps to a full week in length.

16. NPIC's experience to date demonstrates that many persons trained in the skills it seeks are already earning more than NPIC can afford to pay. In fact, the colleges do not train in some of the skills. Photogrammetry is an example of a field in which the number of graduates annually is substantially less than the number of vacancies in government and industry. The best school of photogrammetry is in Holland. NPIC is making arrangements to send one of its better mathematicians there for a year of post-graduate study. This is only a beginning. NPIC must be prepared to expand materially its embryonic skills development program and will have to do much of it through Agency-financed external training. Consideration might be given to developing a cooperative program with certain

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of the universities under which we would finance a portion of an outstanding undergraduate's education in exchange for a commitment from him to work for us.

It is recommended that:

No. 14

The Director, NPIC, initiate a phased program for training personnel in skills that are not now on the market at prices NPIC can afford to pay; and that he give consideration to developing a cooperative program at the undergraduate level.

17. NPIC has never succeeded in having one of its candidates nominated for attendance at the National or Service War Colleges or at the Harvard Advanced Management Program. We know of no other component in CIA that is as deeply and as continuously involved with the military in working on joint problems. Certainly, many of its senior officers are of the caliber that can well represent the Agency. The Agency is missing a good bet in repeatedly ignoring NPIC's candidates for nomination, perhaps through ignorance of NPIC itself.

It is recommended that:

No. 15

The Deputy Director for Intelligence request the Chairman of the Training Selection Board to give due consideration to the nature of NPIC's responsibilities, its extensive involvement with the military, and its contribution to the total national intelligence effort, in the selection of nominees for the senior war colleges.

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Rotation

18. As mentioned earlier, all CIA photo interpreters in NPIC appear on the Table of Organization of the CIA departmental detachment known as the Photographic Intelligence Division (CIA/PID). National requirements are worked on in the Photographic Analysis Group (PAG), which by agreement is to be staffed by equal contributions of photo interpreters from CIA and from DIA. DIA elected to meet some 60 per cent of its commitment by permanent assignment of civilian photo interpreters to PAG. CIA chose to meet its by rotation of photo interpreters between CIA/PID and PAG.

19. The Director of the Defense Intelligence Agency protested to the Deputy Director of Central Intelligence, in writing in December 1964, that rotation of CIA photo interpreters was degrading the national effort. The then Deputy Director of Central Intelligence replied that rotation was necessary in the interests of career development. We endorse the concept of rotation of photo interpreters for reasons of career development and to relieve monotony, but we are not in accord with the way it is carried out.

20. An orderly, long-range rotation scheme is impossible without stable organizational structures, with clearly defined

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positions to be filled, between which to rotate. Such is not the case in the PID/PAG set-ups. CIA/PID has a formal T/O; PAG has an informal manning chart. Because there is not a position-to-position rotation and because all CIA photo interpreters, wherever assigned, occupy positions on the CIA/PID T/O, CIA winds up with its own photo interpretation detachment being run by acting supervisors. For example, the Chief of the CIA/PID Atomic/Biological/Chemical Branch is actually working as Chief of the Nuclear Branch in PAG. The Deputy Chief of the CIA/PID/ABC Branch is assigned as Acting Branch Chief. The number three man in the branch, a GS-14, in a non-supervisory T/O position, is Chief of the Industrial Branch in PAG. A GS-12 from well down in the T/O ranks has been elevated to the position of Acting Deputy Branch Chief. Each of the four CIA/PID branches is being run by an acting chief and acting deputy chief.

we hear from the minority again & again

21. The result of this musical chairs approach to filling supervisory positions is that, while rotation may be a good way of developing photo interpreter skill, it is creating havoc in management. An individual may be a supervisor one year and not the next. An orderly development of managerial skill and progression up through the managerial ranks is out of the question.

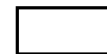
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not true

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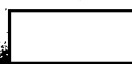
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It is recommended that:

No. 16

The Director, NPIC, establish a formal T/O, separate from that of CIA/PID, to accommodate CIA personnel assigned to PAG for duty; that responsibility for personnel administration of CIA employees assigned to PAG be transferred from Chief, CIA/PID, to the senior CIA officer in PAG.

22. As of 9 March 1965, there were CIA photo

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interpreters on duty in NPIC. of them were assigned

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to the departmental effort in CIA/PID and only were assigned to the national effort in PAG. *why? because of new inexperienced*

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photo interpreters to be assigned to the national effort. DIA

had not yet met its commitment but had come much closer

than CIA. CIA is open to censure for having failed to meet

this commitment, even if doing so would significantly degrade

the CIA departmental capability.

*not true
DIA has
many
stop to
draw from
etc.*

It is recommended that:

No. 17

The Director, NPIC, transfer from CIA/PID to PAG enough photo interpreters to fill and keep filled the CIA commitment to the national effort, even at the expense of a short term degradation of the CIA departmental effort.

23. DIA, by assigning photo interpreters to PAG

permanently, ensures that the bulk of its personnel will be

experienced in the procedures followed in PAG. CIA, on the

other hand, has been and will be forced to detail personnel who

Baloney

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must learn PAG procedures virtually from scratch and this will be repeated again and again as new photo interpreters are recruited by CIA and rotated between the two components. In its early rotational staffing of its commitment to PAG, CIA/PID has assigned to PAG photo interpreters who had been on board in NPIC only a few weeks. Even though this would dilute the CIA departmental effort, we think it improper for CIA to assign a photo interpreter to the national effort who has not had at least a year of experience in photo interpretation. By NSCID Direction, if for no other reason, if one of the efforts must be degraded, the departmental should suffer.

*relatively few
but with much
service experience
prior to joining
CIA*

It is recommended that:

No. 18

The Director, NPIC, establish and enforce as long-term policy the concept that CIA photo interpreters assigned to the national effort will have at least one year's experience in CIA/PID before transfer to PAG.

24. There is need for a much greater formalization of the rotation system if it is to continue and is to succeed. We think NPIC would do well to adopt something similar to the DD/P's Field Reassignment Questionnaire mechanism, a flexible system for allowing the employee a voice in his reassignment but reserving final decision to management. The cycle is begun

*The only look
of formality has
been caused by
DIA bitching
& reviving
rotation to
please DIA*

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long before the employee is due for rotation. It allows for orderly management planning, which the present NPIC rotational system does not.

in many of 65 rotation had not completed at second year only 3 groups had rotated

It is recommended that:

No. 19

The Director, NPIC, establish a system for managing rotation between CIA/PID and PAG along the lines of the Field Reassignment Questionnaire mechanism of the Clandestine Services.

25. Some of the CIA photo interpreters assigned to PAG assert that DIA runs the national effort. There is some validity to the charge. Its chief has always been a military officer. At the division and branch levels the chief and deputy chief positions are divided between CIA and DIA and the split is about equal. At the team or section level, however, there is a clear DIA predominance.

The minority again

[redacted]

positions are occupied by DIA civilians. The chart on the opposite page illustrates why: 69.1 per cent of the CIA photo interpreters assigned to PAG are in grades GS-10 and lower; only 1.6 per cent of the DIA civilians carry a grade lower than GS-11.

26. Many DIA interpreters assigned to the Scientific and Technical Division of PAG do not "work the MCI." The

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MCI, or Mission Coverage Index, is the common way of referring to the second phase aspect of immediate exploitation in which the entire film is scanned for new targets and to detect change in targets not read out in the first phase OAK exercise. The MCI is a grueling, monotonous exercise that is widely disliked by photo interpreters. There is need for it to be more evenly shared than it now is. The Chief of PAG should adopt a policy of rotation of all his photo interpreters into and out of the MCI exercise, without regard to grade, experience, or personal preference.

It is recommended that:

No. 20

The Director, NPIC, direct the Chief, PAG, to establish a policy of rotation of photo interpreters within PAG to achieve equitable sharing of first and second phase scanning assignments and that this policy apply equally to CIA and to DIA photo interpreters.

Records Management

27. NPIC's records holdings, largely in its film library, are the second largest in the Agency (second only to the Office of Central Reference), and they nearly doubled during calendar year 1964. NPIC has been slow to come to grips with the problem of records management. NPIC now has an experienced records management officer assigned full time, but he did not come on

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board until April of this year while our survey was in progress. He is still trying to get a measure of the magnitude of his task, and it is too early for him to reach any judgments on how NPIC should go about coping with an unwieldy and rapidly growing accumulation of film. We seriously doubt that there is real need for NPIC to retain on file every frame of photography ever delivered to it. As NPIC's program for building a library of film chips (small pieces cut from roll film on which the target of interest is imaged) gathers speed, NPIC should be able to begin selective discarding of roll film that has lain dormant for years.

It is recommended that:

No. 21

The Director, NPIC, initiate a phased program of reducing roll film holdings by discarding film that is repeatedly duplicated by more recent coverage and which is revealed by NPIC film control records to be not of continuing intelligence interest.

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SECURITY CONTROLS ON PHOTOGRAPHIC INTELLIGENCE

During the course of our inquiries, particularly among Headquarters analysts, we encountered some very persuasive arguments in favor of expanding the use permitted of intelligence from photography acquired by overhead reconnaissance. We note that the conclusions of the Quadripartite Conference on China, published on 21 May 1965, had this to say on the subject of compartmentation:

"The interplay and cross-checking between SIGINT and photography is of the greatest importance; some relaxation of the stringent security controls on overhead photography would facilitate use of this material as guidance for the collection efforts, and in addition would benefit research and analysis."

As we explored the ramifications of any decision to enlarge the community of TALENT-KEYHOLE clearances or to elevate the Central Intelligence Bulletin and similar publications to the TALENT-KEYHOLE level, we soon discovered that the problem was of such magnitude as to exceed the scope of a survey of NPIC. I therefore deferred any consideration of this subject at this time, but will propose it as a matter for separate study at a later date.

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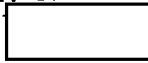
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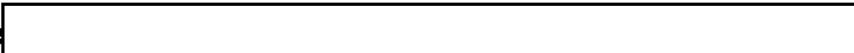
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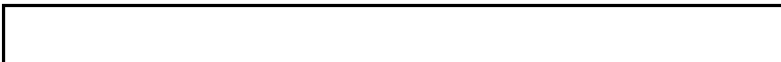

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THE LONG-RANGE OUTLOOK

1. We have dealt thus far in the report largely with the future problems of NPIC whose dimensions are known or are reasonably predictable. NPIC's 5-year forecast does not look beyond the 

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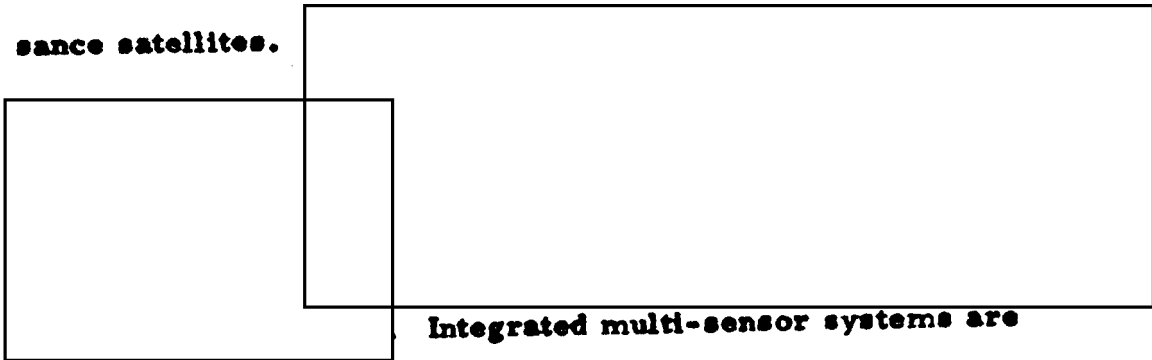
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 What about the next ten-year period? What might NPIC's posture be fifteen years from now? The success of the  program in real-time delivery of photographs of the moon suggests that a like capability is entirely feasible for earth satellite reconnaissance vehicles, and that such a system might become operational not too many years hence. The early successes in the GEMINI program are leading to a capability to operate manned photographic reconnaissance satellites.

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Integrated multi-sensor systems are

already here. The Navy's Integrated Operational Intelligence System is the beginning. The Strategic Air Command is building

a  processing facility at Beale Air Force Base to

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handle the outputs of the multi-sensor packages to be carried in the RS-71.

2. We are unable to give even the grossest estimate of what the impact on NPIC might be if these potential collection capabilities should be realized. It is not unreasonable to suppose that exploitation of photography might become as big a business as exploitation of SIGINT. We would prefer not to contemplate a day when NPIC might be an enterprise of a magnitude on the order of the National Security Agency, but it seems to us that that is precisely where the rapidly burgeoning capability to take photographs is leading us.

3. Historically, the intelligence community, and the military departments in particular, has tended to collect faster than it could digest. One of the more frequent observations made to us by analysts was to the effect that they were already "up to their ears" in photography. The Inspector General's survey of the handling of information during the 1962 Cuban missile crisis found the analytical effort flooded with paper. The volume reaching our Cuban experts was too large for them even to read, let alone analyze effectively. Whatever solution is eventually found for exploiting increased film inputs to NPIC will only increase the inputs to analysts and it is likely that analysis will be the area next needing attention.

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4. To date, photography is our best, and in many instances our only, source of information on denied areas that is visually interpretable. Since it represents new acquisition of information not otherwise available, it is inevitably looked upon as being of current intelligence significance. Much of it is, but much of it is not, and the intelligence community has been slow to separate one from the other. Over the next fifteen years and perhaps even within five, we would hope to see a shift in emphasis from the current intelligence aspect of photography to one of increasing attention to research.

5. We devoted particular attention to the technological aspects of photo interpretation. We see areas in which NPIC might be able, through automatic data processing applications, to do certain things it is not now doing. Taking on these new tasks, even though computer support was extensively employed, would add to NPIC's personnel requirements. Some of the very sophisticated gear that NPIC is planning or already has under development, which is discussed in the sections on Equipment and Research and Development and on Automatic Data Processing, will help the photo interpreter turn out a higher quality product; some will reduce the amount of time now spent in manual operations; but none that we

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know of will give the break-through needed to materially cut the human-hours spent in photo interpretation. It may be that the limited scientific and technical competence of the inspection team prevented its members from discovering areas in which major advances might be made through computer or other technological applications. For this reason I believe there would be much to be gained from a cross-disciplinary examination of photo interpretation technology and procedures by a panel of competent consultants. I have had conversations with the Assistant Deputy Director for Intelligence toward this end and have furnished him with a list of individuals whom we have identified as being particularly well qualified to participate. The Director has already signed a letter to the Chairman of his Scientific Advisory Board requesting that such a panel be formed. I believe it would be appropriate for the Director of Central Intelligence to authorize the Director, NPIC, to make this Inspector General report of survey available to the panel.

6. I think we would be remiss in failing to project our thinking beyond the possible accomplishments of the panel of consultants. If the panel is unable to recommend any workable technological innovations that would provide substantial relief from

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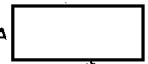
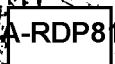


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the workload problems NPIC faces, and we reject any thought of cutting back the collection program, then I see no alternative to the Agency preparing to meet the predicted NPIC requirements for an expanding work force and operating budget. I doubt that estimated needs for over [] people and annual funds in excess of [] by 1970 can be met out of resources allotted to the Agency. It may be necessary to seek relief by referring the matter to higher authority.

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7. A work force of [] plus cannot be fitted into the present NPIC quarters. NPIC moved into [] in January 1963 after it had been renovated at a cost of about []

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The building can house perhaps [] people and there are already nearly [] in it (CIA, DIA, and Army). About 40,000 square feet of the building is occupied by the [] NPIC estimates

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that, if the [] could be persuaded to move, the space could accommodate perhaps [] NPIC employees. Renovation would cost perhaps []

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8. One final observation: even if the panel of consultants were to come up with realistic suggestions for making sweeping reductions in manual operations in NPIC that would result in a substantial savings in manpower, it seems likely that lead-time

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needed for development of equipment, writing of computer programs,
etc., would be long. The savings to be made might not be realized
in time to meet the predictable workloads of the near future, and
NPIC's needs are immediate.

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EXTRACTS FROM 1962 INSPECTOR GENERAL'S SURVEY OF NPIC

"The Center has been caught almost continuously in a substantial crisis in balancing its photographic exploitation capability with collection programs on the one hand and with the intelligence estimating process on the other hand. The reasons for this situation include the following:

- a. A collection technology and programming evolving to a considerable degree independently and more rapidly than the exploitation system has kept pace with it.
- b. The rapid evolution of photo interpretation in the intelligence process raising new problems in the coordination of information from many sources, e.g., ELINT, COMINT, and in stabilizing the roles of photo interpreters and substantive analysts in an extremely fast-moving field of intelligence analysis.

"We are convinced that responsibility for the matters we criticize must be generously shared outside the Center. By and large, NPIC has coped very commendably with a number of imponderables.

"Estimating the rate of expansion of collection capability is the key to the whole problem of exploitation planning. Miscalculation could mean steady repetition of present day crises.

"At no time does the technical planner get involved in general planning problems, as for instance how much exploitation manpower is required in scheduling 20 as against 15 missions in a given period of time.

"Dollar-wise the cost of affording immediate relief to NPIC is remarkably small in relation to the investment in the IDEALIST and CORONA collection mechanisms and insignificant in relation to the decisions on military expenditures which may be affected by the product of photo interpretation.

"Our recommendations throughout the survey look to . . . clarification of the role of the DD/I in overseeing the CIA contribution

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to NPIC and more direct communication between NPIC and the senior command of the Agency on the practical problems of balancing the exploitation capability against collection capability.

"Refocus of NPIC management prerogatives may require in the long run . . . establishment of a formal relationship between NPIC and USIB in the form of a Committee on Photographic Exploitation and change in the CIA command arrangement for NPIC which now runs via the DD/I to the Director of Central Intelligence. . . . No recommendations are offered on these matters at the present time. The Inspector General believes that they require close and continuing attention from the senior command of CIA over the coming months.

"Establishment of a USIB Committee on Photographic Exploitation might. . . focus inter-agency attention more properly on long-range issues of programming and policy concerning which the present NPIC committees have been ineffective. Each member organization would, of course, remain free to negotiate its interest directly with the NPIC management at any time.

"No combination of co-equal USIB organizations should expect to participate by vote in the day-to-day direction of the Center. On the other hand, the USIB ought to be served by a committee closely informed on NPIC operations, continuously evaluating the product of its efforts, and resolving issues of policy through consultation with the Director, NPIC. Such a committee might well follow the pattern of COMOR in settling issues of priority among requirements. . . . A working ground under a USIB Committee on Photographic Exploitation, closely aligned with the specialized committees such as GMAIC, JAEIC and SIC, might examine and recommend solutions to conflicts in priority between competing organizations or between broad categories of requirements, e.g., guided missiles vs. nuclear energy. Unresolved issues might be referred via the Director, NPIC, to the DD/I and where appropriate to the USIB.

"NPIC has obvious and basic ties to the intelligence processes within the DD/I as well as to the photographic collection system now under the DD/R now the DD/S&T. It appeared to the inspectors, however, that the DD/I's supervision of NPIC as a co-equal of the other DD/I components in matters of budget and

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stating has tended on occasion in the past to suppress the community implications of these decisions. No other component of the DD/I has experienced anything like the variety of community level coordination and programming issues experienced by NPIC. Thus, in NPIC's present state of imbalance, it does not make sense to require the administrative staff to go through a new recalculation of possible 5, 10 or 15 per cent cuts because all other components of the DD/I must do so. A good case can be made for elevating the NPIC position in CIA to a level where it can negotiate as an equal of the other CIA directorates for staff and funds. Until the new DD/I can establish his own views on this subject, we would leave NPIC subordinate to the DD/I. However, we believe that the current problems facing NPIC call for special consideration quite different from that accorded other DD/I components.

"Delays in the build-up of NPIC resources appear particularly unrealistic against the demands now placed on the NPIC staff. The entire staff at the Center has repeatedly demonstrated its ability and willingness to meet emergency situations through twelve-hour shifts, all-night work and sacrifice of weekends. But a schedule of two or three KEYHOLE readouts month after month from June forward spells totally unreasonable fatigue, dangerous eye-strain, disruption of family life, and the risk of increased error in photo interpretation.

"The present system for handling requirements for detailed readouts calls for the Center to accept virtually any requirement of a genuinely national interest which has not already been adequately answered by NPIC or some other member of the PI community. The rapidly growing backlog of high priority requirements is not considered an acceptable criterion for their rejection or the postponement of their acceptance. This attitude is governed by the philosophy that it is better to give the requester something, possibly a comparatively small slice of his requirement, than nothing at all. It is also argued that rejecting requirements might completely cut off the flow.

"The coming two years will be a period when rigid adherence to Agency recruitment policies will handicap efforts to flesh out NPIC's expanding T/O. Current competition for college graduates who have majored in mathematics is intense on the part of both government and business. Agency efforts to sign up mathematicians

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for NPIC's Technical Intelligence Division to work on mensuration or on computer programming have been slow. Efforts to attract qualified individuals would be enhanced if they could be offered the scientific or top step of an appropriate grade.

"There are fields of potential recruitment other than the male college graduate which it is hoped will not be overlooked. The one female PI in the CIA Detachment and those in the Air Force Detachment are professionally respected.

"The individual--whether he is a PI, an editor, or a mensurator--must frequently put aside the project at hand when another of higher priority is received. When he returned to the first project, the PI or the mensurator virtually has to start from the beginning in order to orient himself properly. On a project involving several days or weeks of work, it is quite possible for the PI to be interrupted several times.

"The Director, NPIC, while assigned responsibility for functional direction of the Center, was obviously placed under pressure to direct by diplomacy.

"In many cases a year's lead time is scarcely enough to develop processing equipment for a new collection system. A single major change in the latter can bring an entire processing system to a halt. . . . Future collection systems and schedules must be analyzed for their impact on NPIC photo interpretation, laboratory and computer equipment, and on NPIC manpower at the earliest date possible to insure NPIC time to adjust to its own long lead-time problems."

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