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~~(S)~~ NATIONAL RECONNAISSANCE OFFICE  
WASHINGTON, D.C.

CORONA GAMBIT  
HEXAGON EARPOP

THE NRO STAFF

JUL 1968

MEMORANDUM FOR GENERAL BERG

SUBJECT: A Cursory Review of the Evolution of the SOC

Satellite operations have their real beginnings attached to the Sputnik I launch of 4 Oct 1957. During the months following the launch, while the national policy was being developed with regard to space activities, numerous proposals were pursued unsuccessfully for staking out a roles-and-missions assignment by various governmental departments and agencies. All DoD space related activities (\$157 million) were transferred to ARPA upon its establishment in Feb 1958. With the writing of the NASA Act in mid-1958 the U. S. announced its policy of space activities solely for peaceful purposes. This position was recognizable early in 1958 and resulted in President Eisenhower accepting a proposal to allow the development and operation of a covert photographic program for over-flight of denied areas by satellite vehicles.

There was in existence an Operation Center (OpCen) located at 1717 H Street, N. W., Washington, D. C. for the detail planning and operation of the U-2 program within the DDP/CIA. The covert satellite program was begun under the management of DDP/CIA and in cooperation with ARPA (to the AF) in the DoD. OpCen was jointly manned by CIA and DoD (predominantly Air Force) personnel. The procedures, detail mission planning, specific actual operations, security, and communications for the satellite program were patterned as near as possible after the successful covert aircraft program. The overt classified DoD SAMOS program was used as a cover for the covert satellite program. A project officer within the Air Staff (DCS/R&D) was established to support DDP/CIA and ARPA as well as coordinate activities in Washington and with BMD.

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Late in 1959 the AF was assigned the DoD responsibilities for its space activities. ARPA returned the SAMOS, MIDAS, and DISCOVERER Projects to the AF with instructions to submit new development plans for approval by ARPA before any program modifications could be made. Numerous new plans were submitted with no success, resulting in a memo of 10 June 1959 from President Eisenhower to SecDef requesting a total satellite reconnaissance program review for the National Security Council. Dr. Charyk, SAFUS, gave the presentation on 25 Aug 1959. There resulted a memo to SecDef establishing a missile and space organization within the Air Force, that eventually became the NRO, on 1 September 1960. Two other events need noting because of the influence on the national policy and internal program management: (1) the U-2 was shot down 1 May which terminated all covert overhead denied area reconnaissance; until (2) the first successful covert satellite operation in Aug 1960. The fully established covert aircraft/satellite operations center was manned and operated by DDP/CIA with key positions held by professional CIA civilian employees and the majority of the operations personnel were Air Force assignees to the CIA. OpGen moved from 1717 H St. to the new CIA building in McLean upon its opening.

The 1 Sep 60 NSC memo also directed the AF establishment of a recoverable satellite payload for high resolution convergent stereo photography (the covert GAMBIT Project), overt E-6 project, and SIGINT projects. As the flight date for the E-6 and GAMBIT projects approached, the DNRO in discussions with the DDP/CIA, agreed on the goal of integrating all satellite operations into a single center. The DNRO proposed, and got approval from FIAB in 1962, that "...all satellite projects of the NRP should be handled in the same manner by a single operations unit of the NRO Staff." The CORONA procedures (similar to U-2 procedures) were to be used as a general guide line for the development of procedures for other NRO projects which would be operated by and from the SOC. The operational authority was clearly understood to lie within the SOC and was best described as an "in line" function to be as near as feasible identical to the covert aircraft procedures. The satellite branch of OpGen contained a CIA branch chief, one AF Ops officer, and approximately six Ops NCOs which were eventually transferred to the SOC in the Pentagon. While arrangements to transfer the Satellite Operations were being completed and the SOC facility was being

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readied, two officers and three AF NCOs from the NRO Staff participated in the CORONA mission planning and on-orbit activities at OpCen.

The move to the Pentagon from OpCen was made in March 1963 and CORONA mission 9052, Apr 63, was the first mission conducted in the SOC. All necessary CPXs and communications procedures to insure adequacy and reliability were accomplished. The NRP Commo Center was collocated with and assigned to the Director of Operations, NRO Staff. The SIGINT satellite program is an outgrowth of two separate collection programs initiated by the Navy and responsive to Navy requirements and the AF SAMOS (subsystem F) responsive to AFNIN requirements. In Oct 61 they were made a part of the NRP and were essentially the POPPY (TRANSIT) and what remained from the de-emphasis of subsystem F portions of SAMOS (698BK). The SIGINT operational procedures, requirements, etc., were very much less defined and controlled nationally than the photo operations. At the same time that the photo satellite projects were transferred to SOC, the NRP SIGINT projects and operational responsibilities were defined and transferred to the NRO Staff and SOC, respectively. DNRO defined NRO organization and functions in July 62 with SOC authorized seven officers, four NCOs, and three secretaries.

The initial SOC operational methodology was centered around the "moment of truth." This was a briefing by a project officer (PO) to the DECISION MAKER (two people only: Colonel Heron or [redacted] for each series of passes. This briefing consisted of using JN charts with overlays covering all swath widths over the area of interest, annotated in codes that depicted which targets were selected (by a computer program at STC for GAMBIT and by hand for CORONA), which targets were changed by the PO, previous attempts this mission only; weather situations, and the priority location and COMOR ID of each of initially some six hundred targets for GAMBIT and two general search areas for CORONA. In order to prepare for this briefing several POs and Ops Sgts spent two to four hours to review a history book and the predicted target select or camera operations, make

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*just with my computer*

proposed changes, prepare the necessary Ops Manual message to direct changes which drove the STC software to command the Decision Maker's approved operation. The initial GAMBIT missions were done without the aid of computers and these early operations were solely manual. The CORONA with a four-day life and GAMBIT with six days from the first four missions were manageable. The SIGINT program consisted of a series of special auxiliary payloads with very narrow band widths flown on the short-lived photo satellites, separate piggyback (P-11) payloads with design life of approximately three months and 5-100 kc bandwidths, 698BK prime payload systems with design life of three to five days that provided fragmented coverage of 1600 mcs band width, and POPPY using its crystal video receivers with life expectancy of 40 days with approximately 600 mcs coverage. The SIGINT projects were not demanding at this stage. The rapid improvements in life, capability, complexity, and frequency of launch of both photo and SIGINT systems made it abundantly clear that the SOC procedures and capabilities would require updating and automation.

The photo systems have increased to 15 days and on-orbit programmers and the SIGINT systems have lived up to two years and at least one system has 167,000 collection mode options for on-orbit selection. The SIGINT operations have become formal in response to a better defined set of National requirements. The collection coverage is now essentially a continuum from 150-9500 mcs with selected bands to 14,500 mcs. During the period Jan 61 to July 68 a total of 84 SIGINT satellite missions have been launched; 14 General Search, 20 EOB, 48 Directed Coverage; 49 have been successful, 14 partially successful, and 21 failures.

The Director, NRO Staff by memo 9 March 64 defined in detail the Staff responsibilities. The salient features of that memo for this paper were:

a. The basic philosophy of the Staff is service. It is imperative that all members of the Staff understand that the NRO Staff is a staff and not a line element of the NRO.

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b. Responsibilities of the Deputy for Satellite Operations (SS-4):

(1) Intelligence Collection Requirements...principal working interface

(2) Satellite Operations

(a) Conducts general pre-mission planning and coordination

(b) Maintains mission following capability on 24-hour basis.

(3) Satellite Missions

(a) Pre-launch responsibilities

1 Specifies desired target coverage

2 Approves orbit

3 Specifies desired on-orbit target program options

4 Approves target program for each photo mission

5 Approves readin/readout program for SIGINT satellite missions

6 Specifies desired launch time.

(b) Post Launch Responsibilities:

1 Maintains mission following

2 Makes all on-orbit selection of photo target options, based on target weather or intelligence factors

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- 3 Makes and directs all tasking plans for readin/readout operations of SIGINT systems
- 4 For photo systems which have completed the developmental stage and have been declared operational, changes the mission duration, within the limits permitted.

## (c) Post Mission Responsibilities

- 1 Monitors the progress of the take
- 2 Analyzes degree of success

## (d) Other Responsibilities

- 1 Conducts cumulative analyses of take and collates with requirements
- 2 Supervises operation of NRP commo capability.

It is clear that the NRO Staff was a service staff but that the SOC performed "in line" functions with regard to satellite on-orbit activities. The series of DOD-CIA agreements support this view even to the point of being explicitly included as a function of the Staff in the latest agreement.

*Why does this follow 9 March 64 definition of Earpop?*  
1963 was a highly successful year for the SOC under its new management within the NRO Staff. By the start of 1964 the SOC was firmly established both in personnel and in operational procedures. It soon became apparent that the physical space *why, feasible?* was grossly inadequate. All projects were operating out of one *computers?* restricted open office area. Additional space was obtained by moving some DoD elements from adjacent areas resulting in doubling the available space and the space was ready for occupancy in Oct 1964. No subsequent additions have been made.

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The satellite reconnaissance projects enjoyed a phenomenal growth in capability, complexity, and life. The frequency of launch, success rate, abundant take, outstanding growth in quality, and the simultaneous influence and control of a mushrooming bureaucratic process forced an in-depth review of the collection requirements, collection systems, and exploitation capabilities throughout the entire governmental structure. The effect on SOC was and continues to be extensive. In 1965, a contract with GE was initiated to study the SOC functions, measure the time and motion activities, conduct over-all analysis of SOC responsibilities and operations, culminating in a recommendation for what, how, and when automated capability should be introduced into the SOC for the period 1966-70.

The first significant modification to the first SOC operational methodology described above began in April 1966 and was initially applied to GAMBIT. The plotting on JN charts was replaced by using the small ASC Series Charts (five for the entire world) to depict satellite ground traces and depended on primary aim points as the basic bookkeeping unit. Using a computer printout, in conjunction with the ASC chart, showing all the targets, by COMOR ID, that were accessible and the recommended camera Ops (aim points) within the swath, the PO selected the operational sequence and directed the STC to execute. For lack of any other automation, two Univac 1005s with four tapes each (unique for SOC) were obtained from Commo. This beginning in automation was structured for GAMBIT and was later applied to the CORONA by breaking the world into area cells with a value function for each cell depending on last coverage, priority, weather, etc. The software programs have continued to evolve into major activities within each project. In 1966 by Director, NRO Staff direction, SOC was to assure at least one function in the on-orbit operational process would always be the sole responsibility of the SOC for all projects. This would assure the SOC the capability to exercise its assigned functions and responsibilities as well as maintain a clear authority line and would diminish the success of any proposal to move the SOC out of the Pentagon.

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By memo of 28 Apr 66 the Director, NRO Staff outlined the responsibilities and functions of the Dep for Ops in six areas: collection requirements, satellite operations (general), launch schedules, missions, overflight approvals, other. Some of the features of this memo that changed the previous memo were:

- a. SS-4 solely responsible for all schedules.
- b. Conducts analyses of collection requirements and compares with capability to provide basis for NRO program planning.
- c. Coordinates all auxiliary payload assignments.
- d. Removed NRO Commo supervision.

April 1966 saw the final GE report and recommendations on proposed improvements in the SOC's capability and it was presented to Director, NRO Staff. One result was a reorientation of the GE contract to provide technical assistance to the SOC in preparing a specific plan to implement some of the recommendations in order to cope with the collection capability postulated by 1970. There resulted a plan known as SOC 70 which received DNRO approval but was not implemented. As an interim, the SOC was reorganized to include a data branch which provided daily direction to the GE contract and concentrated on utilizing the available Univac 1005s for automation of many of the SOC operational procedures as well as providing the initial bookkeeping and historical data base for SOC operations.

By memo of 14 Nov 1966 the Dir, NRO Staff updated the responsibilities of the NRO Staff. The changes and emphasis provided by this memo re SOC are:

- a. With the exception of SOC in translating USIB requirements into operational direction and the scheduling of film production, the Staff exercises no line or management responsibilities.

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b. The NRO Staff has no contracting authority nor does it exercise technical direction over contractors.

c. The normal tour of duty for personnel assigned to the NRO Staff is three years.

d. The SOC is responsible for translating USIB requirements into launch schedules, orbit parameters, and on-orbit target programs for both image-forming and SIGINT satellites. During the course of each mission, the SOC selects photographic and other image-forming sensor target options on the basis of weather and/or intelligence factors and directs execution of such selections.

e. The SOC is responsible for the tasking of all non-synchronous SIGINT satellite systems (management arrangements for tasking synchronous SIGINT satellites may or may not directly involve the SOC) on the basis of intelligence needs and system factors.

It should be noted that with respect to (b) above, the SOC/GE support contract work statement was written by SOC, a separate NRP budget line item was established to fund this effort, SAFSP administered the contract, and SOC provided the sole technical direction to GE for some two years. It is now proposed that Aerospace Corp. replace GE and increase their contract with SAFSP but still be under sole direction of SOC for the future SOC support.

Special attention need be drawn to two computer program developments in CORONA software during 1967-68. The development by OSP/CIA of an orbit select program to analyze orbits for SOC approval in accordance with intelligence criteria and status of satisfaction. Previously this was accomplished totally by manual techniques and was dependent on seat-of-the-pants experience. Also, the OSP/CIA development of a CORONA targeting program (CTP) which became necessary with the on-orbit commanding capability being included in CORONA and the weighted area cell data base. The extensive analysis and operational planning by TRW, Itek, LMSC, P-E, and OSP/CIA for the HEXAGON

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program was adapted to be compatible with the CORONA operational characteristics. The implementation of CTP will provide the data base, procedures, communications, debugging, and software to completely operate both or either CORONA and HEXAGON in a fully automated fashion. This capability is physically located at CIA with appropriate displays to be in the SOC when defined.

Subsequent to the DNRO approval of SOC-70 several oral and written exchanges concerning the SOC by Program Directors and the difficulties in obtaining the personnel and equipment as well as obtaining and modifying physical facilities resulted in a further review of the functions and responsibilities of the SOC. By personal memo to Dir, SOC from Dir, NRO Staff of 18 Dec 67, parameters of the additional review were defined. These instructions were:

a. "...line function is the determination of how, and precisely when, something is to be accomplished and staff function is the determination of what and in what period of time something is to be accomplished, then in this context, I wish the SOC to be a staff function.

b. SOC is the operational interface between the Intelligence Community and the Program Directors. It is not part of either....Once a requirement has been established then SOC must translate into operational planning data such as criteria, priority, and collection guidance to which the Program Directors may be responsive. I believe the SOC shall:

(1) Review and concur in the Ops plan prepared by the operator.

(2) Follow the mission and provide special guidance as necessary...including weather.

(3) Establish and maintain a data bank for the purpose of comparing collection requirements vs collection attempts.

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(4) Develop and operate, off-line, a mission optimization capability.

(5) ...additionally, I view these functions as internal to the SOC.

(6) I cannot agree entirely with a concept I see emerging that the NRO is in a completely operational role when our satellites are spaceborne or on orbit. Reconnaissance satellites are never 'operational.'

(7) ...the Program Director must always have the full responsibility for his vehicles. The SOC will never duplicate his activity by such things as real-time rev-by-rev on-orbit control nor...to ever develop the software for operating reconnaissance satellites. SOC software is unique to SOC...."

Although the functions and responsibilities of the SOC, and the most efficient methodology to satisfy these functions and responsibilities are still being examined at high levels, it seems clear that the SOC will necessarily continue to operate as it has in the past until a satisfactory solution to the review has been completed. The strong position taken by Dir, SAFSP, the capability growing in OSP/CIA for search and surveillance systems, the advent of synchronous SIGINT satellites, the major turnover of personnel on the NRO Staff, and the continuing nature of the study of SOC functions and responsibilities (almost three years now) will have a profound effect on the SOC post-1970.

Attached is a brief resume of the launch and on-orbit history showing growth that has taken place. This does not show the impact on the "intelligence community" nor does it reflect the growth and complexity of the NRP (Satellite) and interface with the community. Having spent some time in preparing this paper, I would suggest that you consider assigning Mr. Perry (RAND employee who has been writing our history) the task of writing a detailed history of the SOC. Also attached

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are answers to the questions, as appropriate and that were not covered in the paper on NRO Staff analysis.

- 2 attachments  
1. resume  
2. answers to questions

  
Henry C. Howard  
Colonel, USAF

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LANYARD EARPOPAttachment 1SOC HIGHLIGHTS AND HISTORY OF MISSIONS

<u>Year</u>	<u>Highlights</u>
1963	Mar - SOC Activated Apr - First SOC Mission - 9053 Jul - First GAMBIT Mission Aug - First 2RV CORONA
1964	Mar - GAMBIT/OCV Apr - First GAMBIT 4-day mission Nov - First CORONA 9-day mission Dec - CORONA <input type="text"/>
1965	Jan - First CORONA 10-day mission Apr - First GAMBIT 5-day mission May - CORONA totally allocated to MC&G
1966	Jul - First GAMBIT CUBED mission Aug - First THORAD launch Aug - First CORONA 13-day mission
1967	Jun - First GAMBIT CUBED 10-day mission Jun - First CORONA 15-day mission Jul - Termination GAMBIT Sep - First CORONA J-3 mission

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<u>Year</u>	<u>Missions</u>	C	A	G/G <sup>3</sup>	L	SIGINT*
						<u>Primary/Secondary</u>
1963	Launches	9	3	4	3	1/9
	Recoveries	7	2	4	1	
	Life (days)	31	14	6	3	11/150
1964	Launches	13	-	10	-	3/20
	Recoveries	20	-	8	-	
	Life (days)	88	-	17	-	560/243
1965	Launches	13	-	9	-	2/12
	Recoveries	25	-	8	-	
	Life (days)	98	-	23	-	1421/1716
1966	Launches	9	-	12/3	-	2/13
	Recoveries	16	-	12/3	-	
	Life (days)	90	-	73/19	-	
1967	Launches	9	-	3/7	-	2/11
	Recoveries	16	-	3/6	-	
	Life (days)	111	-	24/58	-	

\* Mission life is not easily determined due to multiple payloads, multiple frequency bands, partial failures, and slow degradation. Trend only is noted in life.

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Attachment 2Requested AnalysisA. Assess the main trends and policy decisions.

Until your memorandum removing the "in-line" actions of the SOC, the trend from the beginning has been to enhance the "in-line" capability by providing data bases, automation, maximizing the efficient collection per mission, and maintaining a strong and viable authority line. An accepted and understood criteria has been from the beginning (U-2 onward) that overhead reconnaissance targeting would be done solely in Washington. This grew to include "a nationally oriented group within the jointly manned NRP." It is certainly conceivable that this function can be done, with or without an NRO Staff, by the "field" Program Directors.

The HEXAGON,  and modifications to current systems is causing a proliferation of "SOC, Jr's" with varying degrees of NRO Staff coordination, concurrence, or influence. A conscious and deliberate decision for all active participants' guidance needs to be made to enhance whichever mode of operation is to be in being for the future. One such arrangement was described in the paper done on the NRO Staff and forwarded to you earlier. It appears that the arrangement included there is still strongly applicable.

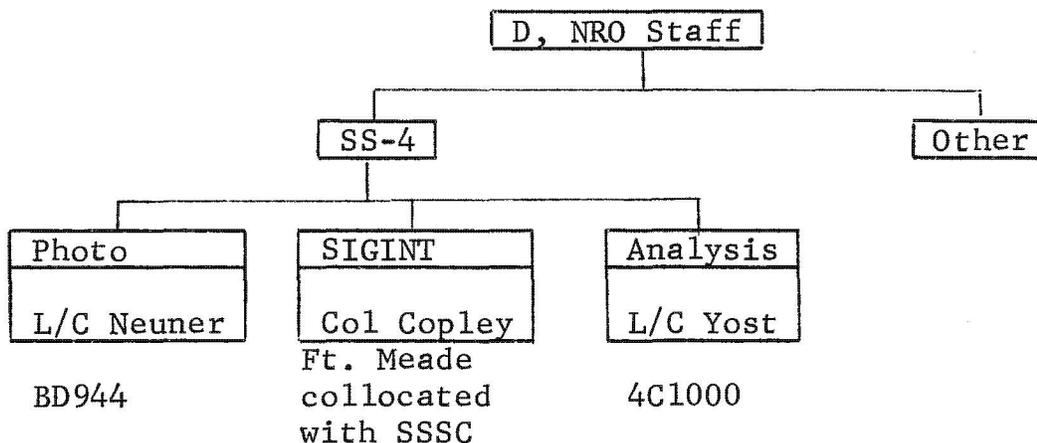
B. Some specific questions about SOC:

1. SOC Deputy Director. The establishment of a SS-4 office in the 4C1000 complex with three deputies reporting to the Director, SS-4 is strongly recommended. It is not clear if a Vice Director, SS-4 is needed, but if desired then the Deputy for Ops Analysis could easily and proficiently accomplish that as an additional duty. The three deputies would be for:

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Satellite Photo Operations; Satellite SIGINT Operations; Ops Analysis. One suggested arrangement could be as follows:



2. The skills required to head the Photo & SIGINT Sections are:

- a. Flexibility in managing in a complex bureaucratic environment so as to get the job done without creating undue stress and strain at the interagency and intradepartment interfaces.
- b. Total familiarity with the requirements to be satisfied.
- c. Total familiarity with the operational capability of the collection system.
- d. Familiarity with automatic data processing methods and techniques coupled with a capability and desire to practice invention for improved, less costly, collection capabilities.
- e. Ability to represent NRO at any level, internal or external, within his assigned specialty.
- f. A minimum of three years direct association with the operation of satellite reconnaissance systems and a Masters degree in Science or Engineering.

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The skills required to head the Ops Analysis Section are:

a. Tenacious devotion to duty. Technically and intellectually honest and independent. Patience and smooth working techniques to allow maximum effectiveness with Program Directors, DoD departments and agencies, and other government agencies.

b. A total familiarity with the history of the NRO, the NRO policies and practices in dealing with outside agencies, and a demonstrated ability to manage a joint group.

c. Be a very clear and concise writer and an outstanding presenter.

d. Technically competent to fully analyze requirements and collate with achievements. Invent methods and procedures to be instantly responsive to questions and status and recommendation for application of resources against requirements.

e. A minimum of three years direct association with the NRO and preferably with detailed knowledge of operations and a Masters degree in Math, Science, or Engineering.

3. Functional Statement.

Deputy for Photo (SIGINT) Satellite Operations:

Responsible to Dep Dir, NRO Staff (SS-4) for maintaining current knowledge of the status and capabilities of all projects assigned and their closely associated support systems through liaison with appropriate Program Directors; for translating USIB intelligence requirements into operational planning data such as criteria, priority, and collection guidance; to review and concur in the Ops plan prepared by the operator; for mission following; to establish and maintain a data bank to compare collection requirements vs satisfactory collection; to develop an off-line mission optimization capability; as the NRO Staff focal point for the day-to-day liaison with the appropriate USIB structure to insure close correlation between collection requirements and satellite operations.

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Deputy for Ops Analysis

Responsible to Dep Dir, NRO Staff (SS-4) for maintaining a close relationship with JRC and Program Director D to assure current knowledge of the status and capabilities of all aircraft and drone systems and closely associated support resources; to assist all NRP Program Directors in obtaining DoD support for NRP project operations; to analyze for DNRO and subsequent submission to higher approval authority, the best method of obtaining reconnaissance coverage in response to USIB requirements-- all NRP resources; to monitor and assist, as required, the close coordination of NRP satellite and aircraft programs and DoD programs; to conduct studies and analyses of potential future collection requirements to recommend to the Director, NRO Staff possible future system development; for all knowledge of and determination of schedules in cooperation with NRP Program Directors; for support of NRO Comptroller for operational matters including recommending numbers of existing resources to satisfy requirements and preparing annual budget guidance; to prepare and/or assemble a USIB book for the DNRO/DDNRO prior to each USIB meeting, covering agenda, references, schedules, and other appropriate material; for development of NRO Staff emergency actions arising from inadvertent re-entry or crash of NRP reconnaissance vehicles in areas where hostile or undesirable reaction is likely.

4. Location of the Deputy Director, NRO Staff (SS-4).

From the above it becomes clear that the Chief, SS-4 would move into the 4C1000 complex. In addition, the Ops Analysis Section of SS-4 would also be in that area. The other two SS-4 Deputies would be remote (Photo in BD944 and SIGINT at Ft. Meade) and through secure commo and frequent meetings with Chief, SS-4 and the rather constant interface with the Ops Analysis Section will be kept as a part of the family. Response to DNRO and Director, NRO Staff should be significantly improved both in quality and timeliness.

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5. NRO Staff relationships with USIB: A personal rapport has been developed that allows outstanding communication and cooperation between NRO Staff and the USIB (including its various segments). It is unimportant whether the NRO participants are voting members or official observers. It is necessary that representation at USIB (DNRO; DDNRO; Dir, NRO Staff; and/or Chief, SS-4), COMIREX (and its subcommittees), and SORS be provided by the NRO Staff (SS-4). At all these levels the actual business is conducted by DIA, CIA, NSA, State, and NRO representatives. This is a necessary evil in the business of covert overflight reconnaissance and we are required to participate, however distasteful it may be at times. Additional participation with the USIB structure is not indicated. However, the NRO Staff coordination between USIB actions and ExCom actions could be improved by periodic Dir, Staff and Deputies meeting with DDNRO. The SS-4 (Ops Analysis) could replace the RPG activities and maintain a viable, knowledgeable staff that could respond to all queries. With the exception of the USIB representative, all NRO Staff representation should come from SS-4.

The NRO representation at USIB and its committee structure meetings is vitally dependent on the true national position of the NRO representation. An alignment in principle or practice with any one organization will destroy the existing NRO reputation and high degree of acceptance.

The Ops Analysis staff could perform an important function that is not being performed. A strict follow-up on all USIB action items (as well as those from ExCom and RPG that are related) to assure high quality, timely, and complete response from the NRO. The full-time analyses of requirements to determine tasking to collection projects and the subsequent degree of satisfaction could materially reduce the expended resources for collection. Advice to USIB, ExCom, PSAC, and all NRO peers could be measurably improved with a good Ops Analysis section on the NRO Staff.

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C. Operations Analysis Section for NRO Staff.

Questions answered in above discussion and in the earlier paper on NRO Staff analysis.

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