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MEMORANDUM FOR: Director of Central Intelligence

SUBJECT : Prospectus for Science and Technology
in CIA

Having traced the history of science and technology at CIA in a previous memorandum, it may be helpful to look into the future of the same activity. Since we are trying to harness the scientific and technological revolution for the intelligence mission, it is of first importance to try to predict how the technical opportunities and challenges will unfold. Our organizational, fiscal, and staffing response to such a future should follow such an evolution unless there are serious limitations which force choices between options. I submit that there are many more options than we can reasonably expect to exercise, no matter what their importance or potential, and that the principal challenge to DD S&T will be to select and prosecute those programs which have special significance to CIA and the national security.

To proceed further, it is necessary to be as orderly and specific as possible about the technological future. It is convenient to group the subject into the following categories:

1. Satellite reconnaissance
2. Manned aircraft reconnaissance
3. [REDACTED]
4. Peripheral technical collection
5. ELINT
6. Clandestine support
7. Communications
8. Data Processing and computers

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9. Photo interpretation
10. Life Sciences
11. Security and Counteraudio
12. Analysis of scientific intelligence

In each case, we will attempt to sketch the possibilities, recommend a desirable selection, and finally suggest the bureaucratic reinforcing which is required. No matter how much one would like to avoid the latter, it is important to note that almost all the present and past DD S&T problems come from a lack of planning for the clear, logical definition of its responsibilities. DD/P and DD/I have extraordinarily clear charters in comparison with DD/S&T, and it is time to begin to define what it is that the scientific component of the Agency is and is not to do, so that its total effort can be focused on the former.

1. SATELLITE RECONNAISSANCE

This subject now splits clearly into photographic satellites and electronic intercept satellites.

[REDACTED] CORONA, [REDACTED]

[REDACTED] its successors. This is more a cost-effectiveness and intelligence need problem, than a technical matter. The right avenue here is COMOR, USIB and the DCI stake in NRP as a whole. I would not consider it wise for DD/S&T [REDACTED] at this late date, even if it were politically feasible.

[REDACTED] Our participation in CORONA will probably continue on an acceptable basis to the anticipated end of the program three years hence and we should continue to put out the staff effort necessary to keep the Agency active and contributing. [REDACTED] is

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another story, since the 1965 NRO agreement divides the payload in an artificial way which maximizes the possibility for problems on the CIA/AF interface. We should contribute as well as we can under the circumstances, but should examine in one year's time whether we cannot move the interface or perhaps withdraw entirely from the program if it has become a source of major friction. On balance, I believe that we should try to [redacted] field, if we can do so on terms which allow us to contribute importantly. The present basis for [redacted] is substandard in this regard, and much depends on how things go for the next year.

I rather doubt that we will ever see a genuine successor to [redacted]

[redacted] One can imagine such a system, but it would necessarily be so large as to put one in a booster/payload class which would probably not be worth the additional cost. My guess is that we will want to search the earth's surface through [redacted]

[redacted] and are surely feasible. I would expect [redacted] to improve along such lines by gradually adding [redacted]

The payload capability is available and our [redacted] aircraft cameras already assure that we can achieve the necessary performance. We are now developing a proposal [redacted] in a CORONA (CIA) spacecraft in a little over one year. If NRO approves our going ahead with this, it will give the community its first sample of [redacted]

Presumably the next steps would be to either fly additional improved [redacted] solo flights and/or weave such a capability into [redacted]. This looks like the right direction for CIA to go, since it starts with existing CIA assets with high technical content and moves the NRP in an important direction toward which [redacted] alone may or may not move. A [redacted] [redacted] then should be a CIA objective, if we can get adequate support and flexibility from the NRO.

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The real problem will be to handle this diverse but rich product at NPIC.

There is likely to emerge another class of photographic satellite; the non-recoverable, readout satellite, which will produce current photographic intelligence on more than [redacted] weather permitting) and provide the results directly to Washington via television. This would place photography squarely in the mainstream of current intelligence, a role it played only briefly during the Cuban crisis of 1962. It will also permit very real economies in the expensive end of satellite reconnaissance--the boosters. We believe that a readout system could last in [redacted] or more, so that the burden of launching and recovering a satellite each month could be eased importantly. We began a research program in this area two years ago [redacted] which has produced enough data to support the confidence indicated above that such a system can be built. However, CIA is not receiving adequate R&D funds in this area to move ahead toward an actual system. At the same time, the Air Force element of the NRO is investing heavily in readout technology and is specifically proposing a readout version [redacted] a possible crisis management tool. With their lead, and our lack of financial support and people, I must conclude that we probably cannot expect to play a significant role here. If we can keep our hand in the technology, it may be that there will be a second time of asking--perhaps a readout [redacted] working via [redacted] which will come more naturally.

At this point, it is important to note one fundamental restriction on our ability to contribute significantly to the NRP. The BOB insists that no CIA funds be used to innovate in the reconnaissance area. While the 1965 agreement calls for major R&D efforts both in CIA and the Air Force, our share continues to be minimal and that minimum carefully metered by several elements of the NRO staff. Unless we can establish

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a source of funds in the order of [redacted] a year which can be spent on our initiative (but with full disclosure), there is a very real possibility that CIA will become simply a contractual linkage between NRO program/budgets decisions and Air Force launch/recovery operations. CIA participation in the NRO is only justified by its ability to set a fast pace in the right direction, and that ability is now circumscribed by charter and practice.

Vulnerability of low altitude reconnaissance satellites is of major national concern because of the evident Soviet investment in major tracking facilities. Thus far, it has evinced only a token response from the AF element of the NRO, who have the complete responsibility for building defensive systems [redacted] which can be flown on NRP satellites when needed. The traditional role assigned to CIA is to define the threat, and OSI has worked away at this over the years; in FY 67 we have [redacted] for threat modeling. It is possible that we could make this field as active as we have the aircraft electronic countermeasures, but it would probably require substantial rearrangement of the spacecraft and orbital control responsibilities, which are now assigned to the Air Force by the 1965 NRO agreement. The recommended course here is to be helpful and hope that the Soviets do not start intercepting our satellites. In the meantime, it might be prudent to have DD/I do some contingency planning by trying to estimate what the impact of such a loss would be on our estimative, current and basic intelligence programs and how we could proceed without photography.

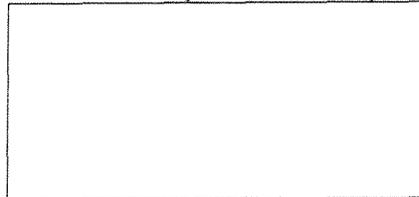
This brings one around to the field of electronic intercept satellites. [redacted] is our big stake here, and is the one satellite program in which we have a complete system responsibility. However, this is a good place to have our large chip riding for we believe that [redacted] will work the same kind of transformation on signals intelligence that CORONA did on photographic. Our problem here is to prosecute the program effectively and try to enlarge progressively its frequency capability

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upward [redacted]
 [redacted] We do feel that [redacted] will contribute importantly to many phases of CIA activity (agent commo, black box relay) not related to the NRO mission, and it is important to keep a degree of flexibility in the design and operation of the system.

There is a second type of electronic intercept satellite, based on [redacted]



[redacted] The problem with the latter is that they bury NSA under a near-impossible data processing load. Thus far, we have participated in [redacted] satellite program; they have been strictly an Air Force plus Navy show. The immediate objective of this activity should be to make a more orderly program of the diverse payloads and objectives (an NRO job) and to really plan through the development-operation-processing chain for such missions (an NSA/NRO job). It seems to me that this area has so much heredity confusion and involves such a difficult NSA/AF interface, that we are well clear of it, especially in terms of our other commitments and national objectives. We can and should try to guide and challenge such programs via the COMOR/USIB and NRO/ExCom arenas by making studies of new [redacted] and more flexible equipment configurations for which there is a continuing need.

All told, our role in the satellite reconnaissance programs should be on the cutting edge technologically and focused on innovative systems like [redacted]. We should try to influence the entire NRP, via the COMOR and ExCom mechanisms, with thoughtful studies of technical possibilities and cost effectiveness analysis of alternatives. We should participate selectively in those

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programs where we can make a unique, pace-setting contribution which is compatible with our present resources. We need to improve our position and flexibility in the NRO considerably to fulfill that goal.

2. MANNED AIRCRAFT RECONNAISSANCE

The original logic for assigning the U-2 responsibility had several features. Firstly, the Air Force declined the opportunity. Secondly, there was the problem of confidential negotiations with foreign governments for overseas basing, which CIA was uniquely well placed to undertake. Thirdly, there was the whole question of a deniable, covert operation for which there already existed a CIA precedent in the body-drop and black flight business. It is of interest to ask if ten years later the logic is still sound. After all, the U-2 is no longer a secret airplane, nor is the basic OXCART vehicle. It is true that our U-2 operations still depend in large measure on special relationships with foreign governments. [redacted], but this load is lightening, and the SAC units have displayed a commendable willingness to take on such responsibilities in Cuba, Southeast Asia and elsewhere. The OXCART is closely tied to Air Force tanker and airbase support. And besides, satellite reconnaissance is providing far more photography at far less risk. The problem might be restated to, "Why manned, reconnaissance at all?"

I believe that there is a valid ongoing mission for manned aircraft. They represent our only existing means for acquiring prompt photographic intelligence should a crisis situation arise [redacted]. It is impossible to obtain frequent coverage with satellites in some areas of the world where weather and geography combine, and the prompt response characteristic

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of manned aircraft is a unique asset. Should the Soviets elect to deny us satellite reconnaissance, they would implicitly do so on a worldwide basis, and aircraft programs would provide our only insights. It is probably important to begin some contingency planning as to how many of the critical COMOR targets could be covered with the U-2 and OXCART per mission, and this task is now laid on to OSA. However, it is important that we not again try to use airplanes for search photography--as we did the U-2. They simply cannot pick up the CORONA load for any reasonable number of missions per month. Several manned aircraft missions would make an adequate substitute for the essential targeting of [REDACTED]

[REDACTED] Of course, under such circumstances, it would be necessary to refine the present COMOR target priorities considerably.

Notice that in the above we have not referred explicitly to the U-2, OXCART [REDACTED]. My view is that these are simply alternate tools which are (or can be) available to do a similar job, and that the group with the assigned mission must be relatively free to select the appropriate scalpel. I believe that the U-2 can continue to operate over China with some losses so long as we stay ahead in our development of ECM equipment. It can be used indefinitely in Africa, the Near East, South America and throughout the Far East if such coverage is required. The OXCART exists and with its present ECM can operate over China and throughout the world. It can be committed over the USSR now, but its future capability depends on our skill in developing adequate ECM to counter the "Tallin ABM/SAM system" which is now being deployed in the USSR. [REDACTED]

[REDACTED] This initial task has not yet begun for the Tallin system, and it is this need which adds special urgency to the establishment of a specially tailored CIA [REDACTED] Program [REDACTED]

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[REDACTED]
 [REDACTED] If our
 predictions are correct, however, it is technically
 feasible to develop this vehicle and operate it [REDACTED]

[REDACTED] Its coverage would be like
 that of OXCART, so that it too would fill the spotting
 requirement--but not the search need.

At this juncture, the topic of drones arises because it is felt that their loss is not so painful as that of a live, testifying pilot. This argument needs a little more examination in itself: For instance, what would be the political impact of a TAGBOARD drone down in the USSR or China or Cuba? Drones have gotten a thorough working out in Southeast Asia and have demonstrated a high vulnerability and low reliability; only about half return home with usable film. TAGBOARD is in serious development troubles. I believe that we will come to rely on a weak reed if we take the drone narcotic too often.

[REDACTED]

This brings one around to the fundamental question: "Why should CIA fly such missions in 1966- or 1976?" I will not try to plead an answer, except to say that one is urgently needed and by the highest authority. We now find SAC duplicating our aircraft and staff capabilities, proclaiming a mission of covert overflights, and probably able to do about as well as we in most respects. The consequence of this is constant confusion, duplication and a considerable amount of unseemly competition for specific mission assignments. If there is a clear continuing need for a CIA covert reconnaissance capability not directly related to DOD and under specific

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White House operational control, it is high time that that decision is announced to all hands, preferably in the form of a NSCID. If it is perfectly acceptable to the State Department and White House to have the Air Force fly such missions, there are [] people in DD/S&T that can contribute importantly to the national security in other ways. The problem is not a petty bureaucratic one. It is a major uncertainty as to future role and mission for which CIA deserves clarification in the name of orderly government and real economy.

If we are to stay in this business with proper charter, our present strength is about right to do the missions I would foresee, save the satellite backup. We should try to anticipate what that load is likely to be so that the U-2 and OXCART units will be neither too large nor too small. The mix of aircraft needed to do this job should be left to the operators, and we should not allow ourselves to be partitioned according to the tools.

In 1963 there were repeated proposals to move the operational control of our manned missions to the NRO, and these were fortunately resisted. To turn over operational control of such missions to the Pentagon would overturn the basic reason for our being responsible for the aircraft in the first place.

Lastly, let us take a deep breath and eliminate the British element from our U-2 activities: They have not flown any missions since 1959, are unlikely to do so

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All in all, we have an exciting opportunity to collect important intelligence information from denied territory which is not now being collected. It is not an expensive program in comparison with reconnaissance activities or covert action, and could well provide an important new string to the CIA bow in deriving finished intelligence on Bloc countries. DD/S&T is now under way with this conviction.

4. [REDACTED]

[REDACTED]

Those of us who have worked closely with such systems believe that few of them are as effective as hoped and some are outright white elephants. Those collection systems that fail, usually fail at the processing stage, where inadequate capability exists to turn the raw data into finished intelligence. This profusion and confusion is a problem for the DCI and NIPE and the community to regulate and stimulate, perhaps with technical backup from DD/S&T.

CIA itself operates a few such systems [REDACTED] [REDACTED] and is likely to be engaged in additional overlapping activity (see above) if our new programs go well. This is a good time to step back and examine

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the logic for our participation in technical collection programs [redacted] In examining this question, we suggest the following checklist:

a. Does the system meet a real national intelligence need?

b. Is there an essential element of covertness or genuine discretion required in the operation?

c. Is it a program that DOD is unwilling to mount, for whatever reason, despite its urgency?

d. Is there a unique technical and/or operational competence in CIA to provide such a capability?

e. Is it important that CIA be up front [redacted] or other reasons or act to eliminate unwanted duplication? [redacted]

f. Is it important for CIA to participate in such an activity to establish its bona fides so as to support a DCI overview, stimulate the field, or ensure access to the data produced by other systems?

On the basis of these criteria, we were unable to persuade ourselves that CIA should be engaged in the routine [redacted]

[redacted] NOR could we generate any enthusiasm for reinserting ourselves in the [redacted]

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[REDACTED]

On the other hand, we did feel that the [REDACTED] is properly placed in DD/S&T. Although it fills almost all the criteria listed above, the crucial decision turns on its intended use to read out [REDACTED], specifically [REDACTED] it may also be used to track and monitor overnight aircraft which are a CIA responsibility. Thus, even though DOD could probably operate it, the covert utilization tends to make it stick in DD/S&T. The [REDACTED] the same stock, although it has been closed for many months. What is needed, both for [REDACTED] at [REDACTED] and for [REDACTED] [REDACTED] is a system as powerful as [REDACTED] somewhere in the [REDACTED]. With the political problems in [REDACTED] and need to upgrade the [REDACTED] it might be best simply to start all over [REDACTED] salvaging as much equipment as possible from [REDACTED]. Again the compelling logic for CIA operation is the interlocking covert and detection missions.

We have examined the long-range versions of the [REDACTED] [REDACTED] assuming that the same signals which are detected at [REDACTED] can be heard at [REDACTED] [REDACTED] the question arises as to who should operate such a system on the [REDACTED]. Our view is that if such a system can reliably detect [REDACTED] [REDACTED] it should be placed at the principal NSA sites, including the [REDACTED] since [REDACTED] [REDACTED] is very important to SIGINT collection and analysis efforts. We would like to co-locate such a unit with

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[redacted] so that we could have a double cut at [redacted]
[redacted]. However, we see little
merit in staffing up DD/S&T to man separate sites in
[redacted] and elsewhere.

There is the general [redacted] foreign
missiles and space vehicles [redacted]
[redacted] This
is now done by a combination of [redacted]
[redacted] on the periphery supplemented by [redacted]
[redacted] We
have a useful [redacted] and are installing
an [redacted] which should allow us
uniquely to nip down the [redacted]
[redacted]

[redacted] This is done as a natural supplement to our
assigned [redacted] job, and is done with existing
personnel. While we are reluctant to use our staff to
establish new stations for the purpose of [redacted]
[redacted], we believe that it makes sense
to do so in close conjunction with other functions so
long as the price is modest. We also have a third party
arrangement with the [redacted] to use their existing
[redacted]

[redacted] it costs only training
and processing time, yet provides us with an important
backup to the [redacted], in addition to helping
the [redacted] relationship.

Chemical and biological warfare are important
intelligence problems throughout the world, but especially
in the USSR [redacted]

[redacted]
The problem represents a serious intelligence gap for
the U. S., and ORD has been studying technical ways to

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The combination of diverse collection requirements plus the need to close-couple this to the intelligence analysts in OSI persuades me that CIA should mount this program. I believe that we can do so in DD/S&T for about [redacted] and less than [redacted]--and do it uniquely well. If we do not do so, it will almost surely not be done, and we will continue to live in the dark on Soviet and Chinese programs. If an Office of Technical Operations were to be established in DD/S&T, this [redacted] would be a natural part of its activity, yet could be intimately coupled to the R&D activity in ORD and intelligence analysis activity in OSI. There is still about a year of R&D to accomplish before anyone makes a commitment to fund such a system, and DD/S&T is actively trying to establish its precise capabilities and configuration.

5. ELINT

The working definition for CIA's ELINT activities has changed materially during the past ten years. In the beginning there was COMINT [redacted] and ELINT [redacted]. CIA played a supporting role to NSA and the services by collecting both types of material [redacted] and via a few uniquely well-placed ground installations [redacted] and later through ELINT systems carried on the U-2.

[redacted] NSA has gone to the concept of fused ELINT and COMINT--called SIGINT. [redacted]

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[REDACTED]

At the same time, another trend has started to develop. Large military intercept facilities are becoming unpopular in many countries, and NSA must look seriously to other means of collecting raw SIGINT.

[REDACTED]

[REDACTED] The question is- "How much of a load should CIA shoulder in this field and how should the Office of ELINT in DD/S&T relate to it?"

The decision to that question is conditioned by the bureaucratic, operational, and technical implications of NSCID 6 and the National ELINT Plan, both of which were designed to bring the military services into coordinated effort under NSA.

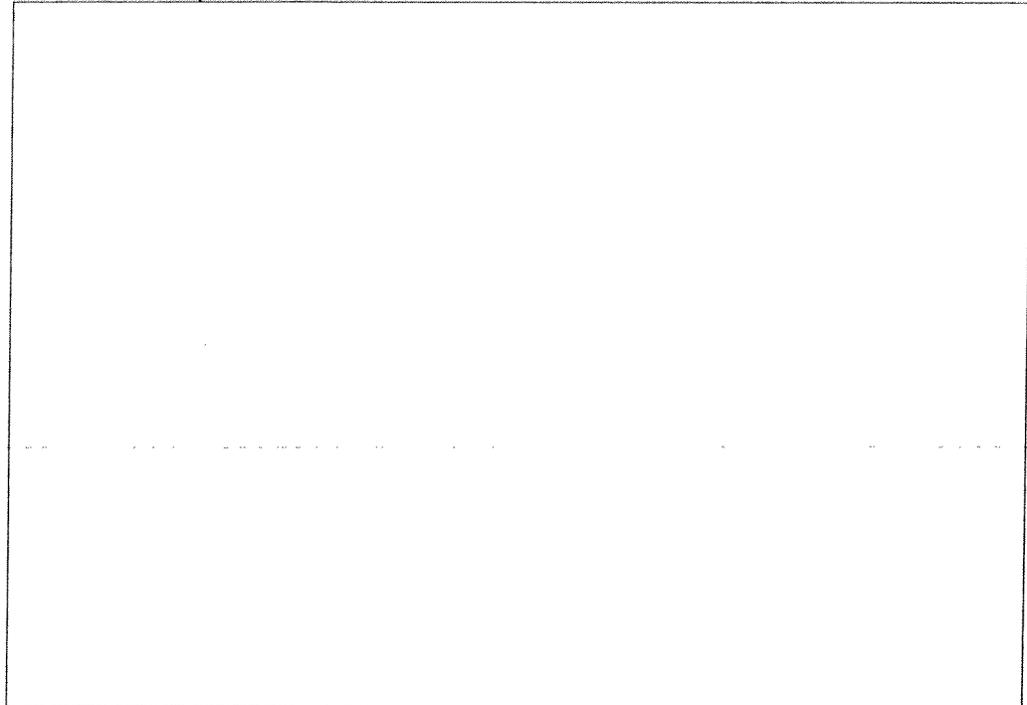
[REDACTED]

[REDACTED] A great deal depends on how the NEP is implemented by NSA. The problem is raised here as a possible source of irritation and limitation.

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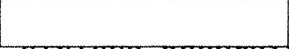
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Against this partial picture of the future, one must lay the problems of implementation. CIA now has three groups playing on this field: TSD, ORD, and Commo. One might argue that Commo is separate, but the new technology



 their efforts are supposedly divided according to research in ORD and development in TSD. The actual situation is something closer to a horse race, with a good deal of advertising and competition at the working level. We have considered withdrawing from this field entirely so as to tidy up the interface, but have concluded that the faster pace set by competitive running is worth the friction.

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This does raise a broader question of how R&D for clandestine support should be done in the Agency. Scoville felt that TSD ought to join DDR, while others felt that only its [redacted] development activities should. There is a fair sentiment in DD/S&T to quit claim to the field, on the principle that it is more trouble than it is worth to DD/P. An interesting organizational solution would be to create an Office of Clandestine R&D, to include Commo's [redacted] [redacted] the research from ORD and development activities in TSD. The problem is where to put it? I come out cold on all three points. I believe that the traditions of clandestinity in DD/P are so strong that a group outside their ranks would have real trouble in knowing their needs and working on the right problem; TSD has enough trouble as a member of the club. It is probably better to have a knowledgeable R&D element in DD/P trying to make contact. The inverse of withdrawal is wrong on two counts. Clandestine operations are one of the major responsibilities of the Agency and to have a well-financed, bright group with a major R&D charter ignoring DD/P will not wash. It is also tough for TSD or any group in DD/P to put aside real research money and keep it in the budget year after year in the face of operational and fiscal pressures. Like all organizational gimmicks, I am suspicious of the Office of Clandestine R&D concept. This may make sense in time, but it will depend upon professional attraction and a round conviction that it is the way for CIA to go.

In the absence of a neat solution, however, I would like to suggest that we start now a substantial yearly exchange of a half dozen people

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between TSD and ORD to tone down the competition and turn up the mutual respect and understanding. It also seems to me that ORD should identify a specific fraction of its effort as being for support of the clandestine services and be prepared to tell DD/P clearly what it is they are trying to accomplish for them. At the same time, one must prevent DD/P from trying to rearrange or second guess the ORD program, since its insulation, daring and agnostic view is probably what TSD and the area divisions need most. The communication does need to be improved--both ways.

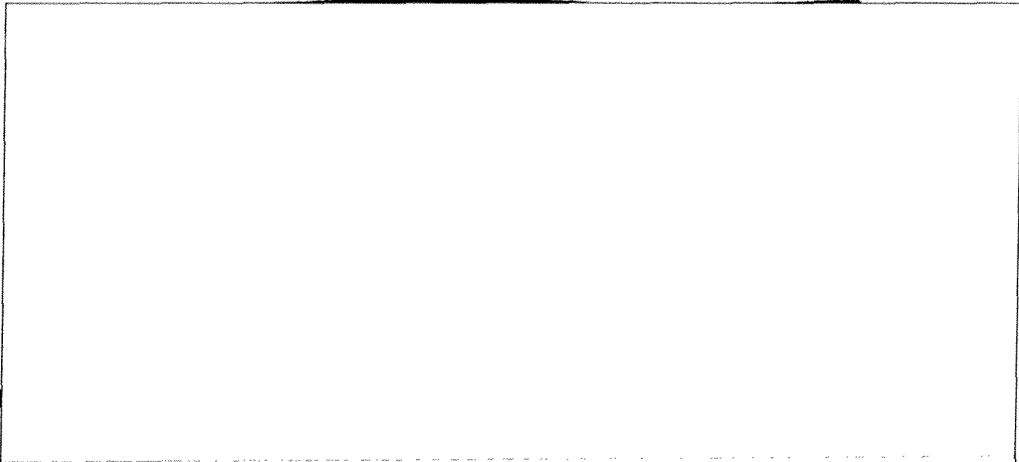
There is one last point which I shall make here, as it is as good a place as any other. I am and have always been a supporter of the single Agency management and fiscal control concept embodied in the Executive Director/Comptroller and PPB functions - and believe now that they should continue. However, I believe that the detailed review of individual technical programs initiated against agreed goals (which all sizable projects receive) is not helpful for two reasons. Firstly, it becomes primarily an educational process with time delay penalty. Secondly, by halfway lifting the responsibility from the offices and directorates to this staff, one implicitly relieves the functional units of the very real responsibility for mounting daring, successful programs. The stage to do this second guessing is in the program-planning phase. This really is not a complaint. It is just that I sense the line offices running with the saddle girth looser each year; and we should put the responsibility squarely on their back.

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There is one important problem facing the Agency which does not fit the classical pattern and this is the need for communications between large computers and/or storage banks. The COINS data interchange program will force this coupling early on an intramural basis, and we are well advised to get on with the communication switching which is now our responsibility. However, even if this proposal had not come along, we would be facing similar problems at about the same time. Remote consoles for the IBM 360 computer require sophisticated communications between the consoles and the central computer. More fundamentally, we are going to systems in which domestic and overseas inputs to Headquarters are going straight to the central computer, where preprocessing of raw material can be done and formatted intercept and status reports can be readied for retrieval and correlation by analysts. This is just the first step; farther downstream is the possibility of computer preprocessing of large amounts of the overt , COMINT and possibly photography inputs. ~~THIS IS REALLY~~ an ADP/computer

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dream, but it evidently places new requirements on the CIA communications system. The classical concept of a network of physically isolated code-rooms in which messages are typed, encrypted, transmitted, decrypted, and eventually read by human eyes will in large measure give way to the system described above. The communicators and computer people must work closely together to plan for this future. For instance, we will want to make sure that circuits feeding into our central brain do not permit an inadvertent reverse flow or provide a clandestine technical access to our data storage. What kind of automatic encryption and decryption is possible? These are technical and programming problems which deserve our best talents.

As I see it, the role of DD/S&T is to support the Office of Communications. We can and are helping them importantly with our [redacted] technology. We should work together to see if a common solution [redacted] the [redacted] is possible. We should make them aware of our other developments, [redacted] which have commo potential. Our computer people must work most closely with OC on the last-mentioned problem. Lastly, we must try to establish with OC whether they want ORD to work for them in the future on communications research, as they do for other elements of the Agency.

8. DATA PROCESSING AND COMPUTERS

This field is so enormous and so potentially vital to CIA activities that it is difficult to structure a simple discussion. It is even more difficult to distinguish clearly between the realities and myth of its potential. Let us start therefore with the fundamental problem. CIA receives each day a vast--

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and increasing--amount of raw intelligence data. Our statutory responsibility is to distill this mountain down to three pages for the President and store the rest for future reference. To be sure, we also make estimates and in-depth intelligence studies, but this only exaggerates the basic distillation process. One may find the analogy of CIA to a distillery odious, but that is what we are doing with information. We are now trying to do this job with more and more people and we are already overloaded. The problem is similar to that faced by the telephone industry. In projecting their needs for switchboard operators, they came to realize that they would soon need every female in the U. S. sitting behind a telephone switchboard to handle the expected communication load and promptly started work on automatic dialing and switching devices. We are at the same point. CIA has not yet faced up to the trouble it is in, and the agony of NPIC is but one symptom. The analysis of vast quantities of overt intelligence is not as difficult as that of photography, only because we largely ignore it. And everyone knows that NSA has data which it has not and cannot process. The intelligence community in my view is already hopelessly behind in recognizing and sizing its problem. We have not yet even analyzed the operation of our distillery. To be sure, most of the input is low grade ore, or at least contains little new information. However, it is the grist for our mill, and we must find a way to cope with it.

The solution to this problem is not to succumb to the sales promises of large computer companies. The fact is that our problem is quite different from most other customers they serve, and they have so far been unwilling to turn to, in a major way, to solve our special problem. We need and are developing an in-house competence to size our problem and recommend equipment solutions. The problem is that we cannot delegate this job entirely to an automation staff.

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I believe that everyone must begin to learn about ADP techniques, just as we all had to learn the basic intelligence business. There is a crying need for ADP training at all levels up to the Deputy Directors, and we should direct OTR to get on with it.

The classical indexing and warehousing function of the CIA reference services is going well. CHIVE is an important first step, but we must move on. There apparently is a need for wider involvement in the indexing scheme, lest data be salted away without handles which can later be used to bring it back in a relevant form that may be important to those who are now not concerned with this function. Over and above this, we already have too many documents to index daily for the number and qualifications of people who do this work by personal reading. We should realize this enigma and decide what to do about it, lest we become a large but unusable library.

Automatic language translation is a perennial favorite--and a perennial loser. We have taken some modest steps toward machine-aided translation, and this is sound. My own view is that real language-to-language conversion, either in written or spoken form, will not be possible until a whole new class of vastly enlarged computer storage devices are developed.

DD/S has made the correct decision to move toward an integrated system of data processing, and this should be supported all around. DD/P has an indigestion problem in handling the output of its

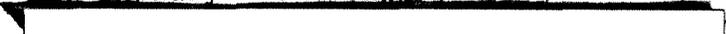
[REDACTED]
[REDACTED] ADP in its broader sense can probably deal with this problem in time. DD/P does have a fine counterintelligence file. The same approach

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to positive intelligence operational support is probably feasible. DD/S&T is now the most disorderly but aggressive user of computers. Satellite and manned aircraft reconnaissance mission planning has been done on computers for some time. Numerical processing of ELINT and technical intelligence data is a way of life in DD/S&T. However, the basic problem is not to do more arithmetic on machines--we know we can do this. The real problem is to use machines to aid the analyst in evaluating raw data and in producing finished intelligence.

A crude first example of this new departure is going on now in FMSAC. 

 Such a system is more than an aide-memoire; it really is an extension of his own thought process. We need to extend such techniques so that they correlate relevant data, rather than simply supply it in batch form. We need to be able to search routinely and rapidly the totality of our data holdings--
--to find those things which support and those which refute a new input or conjecture. One cannot substitute a computer for professional judgment, but we can develop powerful electronic arms which will continuously reach out and gather in relevant information, arrange and correlate it, and present it to us. It is also likely that we can look toward machines which are self-improving. As we reward or correct their data gathering and arranging, they can rearrange their procedures automatically to do the job better according to one's individual needs. All of this is already in the technological promise, the problem is to get it into effective operation for CIA.

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Having spun this vision, it is necessary to say that our existing computers and staff are now stretched well beyond their capacity. Until we can size our ultimate posture and lay a plan for working toward it, we must establish a decent system of ADP priorities.

There is an organizational question as to the placement of OCS and similar activities in the Agency. [redacted] felt that all computers should be under one roof. [redacted] and I take a more relaxed view--put them where they can do the most good. Aside from the pooling of scarce skills which centralization offers organizational decision will depend in part on whether the concept of a data processing "utility"--with powerful computers shared by all users--can be realized. However, my concern is somewhat broader. A Directorate for Data Processing by 1970 may make sense, since computers by then should be a very large part of CIA activity. On the other hand, perhaps the right way to inject this massive dose of ADP technology is to infuse it uniformly throughout the CIA body. In any case it is a problem that should be continually reexamined. For the time being, I believe that OCS can proceed most rapidly in DD/S&T, provided that it is treated as something of a sacred cow when budget cuts come along.

The IPRD activity in ORD is "palying the long ball" in adapting computers to CIA's need. It is an attempt to lap our current efforts, which are directed toward coping with chronic indigestion and a late start. The IPRD program is basically sound, but has not be effectively sold to the participating elements. In supporting IPRD we should not confuse the need, the substance, and the customer relations problem. However, ORD should be directed to do a better job on the last front. In particular, OCS and DDI should be drawn more deeply into framing and implementing the IPRD program.

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9. PHOTO-INTERPRETATION

The problem of dealing with increasing quantities of overhead photography is a distressing one to the CIA in view of its executive responsibility for the National Photographic Interpretation Center. [REDACTED]

[REDACTED]

One does have the feeling that a major new departure in machine-assisted photo-interpretation is feasible. We may even be able to do automatic film scanning, using the diffraction pattern formed by passing coherent light through the film to detect man-made objects, and save the photointerpreters to examine objects so-located. There is a real need to locate and correlate promptly all previous photographic coverage of a given location and this may be feasible. [REDACTED]

[REDACTED]

The immediate problem is that we are not well postured to pursue this revolution, and there is some honest question in my mind about the ability of NPIC to spend intelligently the R&D money it now has. This skepticism on the R&D front has nothing to do with my high regard for NPIC as a whole. It is simply a candid evaluation of the shortage of qualified R&D people in NPIC that are needed to match the magnitude of their problem. We tried to bolster up their capability last year by detailing [REDACTED] to NPIC, but he was looked upon as a penetration and largely rejected during the year he was with them. NSCID-8

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gives NPIC a clear shot at the photo-interpretation R&D responsibility, and they (like OSA) are reluctant to share or delegate that responsibility.

My own assessment is that their existing R&D staff is too small and far from qualified to cope with the magnitude of problems they have. In truth, their problem may be too large and difficult for DD/S&T or any group. However, I am quite satisfied that no outside group can help NPIC with its R&D problem until NPIC itself changes its approach. They must hire far abler R&D people and assure that their organizational structure permits this group to directly influence the Director of the Center. I believe that DD/S&T should leave them alone until something changes except for the long range research in IPRD of ORD, We will also try to do more in OSP toward planning for

[REDACTED]

If we begin to use NRO funds and talent (mostly DD/S&T) to solve the NPIC problem, we are inviting the Air Force and DOD into the management of NPIC, and that is the last thing NPIC needs or CIA wants. All in all, I am discouraged by the NPIC R&D problem, but believe that it is an enormous one, even if all other factors were favorable.

10. LIFE SCIENCES

My enthusiasm for the intelligence importance of this field proceeds not out of any special professional competence on my part. Rather, it stems from my conviction that biophysics generally will play the same role in the next twenty years that physics itself has played in the past thirty. The vast field of drug research will intrude more into our lives and civilization.

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Manipulation of personality, and perhaps even physiology will come about. The control of reproduction and perhaps heredity will become real. Understanding of the human brain and its auxiliaries will suggest new ways of aiding and probably manipulating human behavior--individually and in groups. We already know how to produce protein foods from petroleum and grasses, and this will affect the world food supply--and population.

My view is that CIA must be a party to this revelation, no matter how it proceeds. We must do so both because we must be watchful for such developments abroad, and also because it will have an important impact on intelligence collection operations. To guarantee our participation, we must attract increasing numbers of able life scientists. We must make sure that they infuse through the organization. They must find recognition and opportunities to contribute at CIA. We are in a competitive market for such people; the National Institute of Health alone is spending over one billion dollars a year in this field. We must begin to recruit and place and budget and spend as if we too thought it was the wave of the future, rather than a special staff to keep track of ESP.

I believe that we can attract, and already have attracted, very able people in the life science field in both OSI and ORD. [redacted] is the deputy in ORD, and there is no reason why the deputy in OSI should not be a life scientist in the future. We need to provide a career service identification for them within DD/S&T, rather than the Office of Medical services, since few of the people we need have any real interest in clinical medicine and the majority do not come from medical schools. There are other places in DD/S&T where we can inject life scientists. OSA has an immediate need for a thoughtful examination of pilot selection and

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performance. OCS and ORD both have man-machine problems of real importance. OEL has a human factors/psychological [redacted] with small groups of people living and working together in isolation, and their selection standards for that work. DD/S&T must work to make life scientists feel just as at home as physicists or electronic engineers do in the Directorate.

I believe that the type of life science problems that CIA offers are as challenging and varied as are offered anywhere. [redacted] and I believe that we can be professionally competitive in recruiting able men in this field. Our polygraph program is not only important to the CIA, it is also exciting life science. So also is the [redacted] program. What we need to do as an Agency is to declare ourselves squarely in this game, so that good men will have no hesitation in joining us on a career basis.

11. SECURITY AND COUNTERAUDIO

Having spun a frightening tale of new opportunities for [redacted] one can only worry about the security of our own intelligence operations. [redacted]

[redacted] However, this is a chess game, in which there are certain standard moves that prevent disaster.

[redacted] However, none of these schemes are helpful

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without [] discipline and the flexibility to take the obvious, sensible actions in our installations.

We have looked at the question of how to organize the counteraudio R&D program. Should it be separate from or integrated with the positive program? I come out on the side of integration. The likelihood of withholding new developments in a climate of competition between separate groups is too great to offset the problem of putting it all in one place. This is the way it is in ORD.

More generally in the security field, the polygraph research and development program is now heading into the homestretch and should provide a real boost to our ability to use--and defend the use--to screen our own staff and agent personnel. It will probably also come out with a significant improvement in the present polygraph device. The importance of correlating polygraph data with medical and psychological information is becoming recognized.

There are other problems like automatic facial recognition and facial characteristics files in ADP form. Such data can probably be stored domestically on computers and searched instantaneously from overseas if we can increase the band width of our commo circuits.

We have recently put the security clearance records on tape, and it is possible to get a total cut at one's clearance by a single query to the computer. This can probably be extended to investigatory information, if it is desirable to do so. In this way, it would be possible to search all individual files for the relative occurrence of certain types of derogatory information, or look for common denominators in or common suppliers of derogatory information. When more civic and state records are put in machine form and it is possible to query them remotely by data link, it should be possible to do much of the bona fide checking and

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confirmation by machine inquiry. The whole field of security is ripe for novel approaches offered by ADP and R&D generally. DD/S&T and ORD in particular should become more heavily involved in such problems.

12. ANALYSIS OF SCIENTIFIC INTELLIGENCE

Possibly the most important challenge for the DD/S&T is that of constantly improving its analytical capability. Much of the developmental work toward better collection methods will represent a waste of effort if we do not keep our analysis techniques in step. In my view the two principal requirements are a continued effort to attract top quality analytical people and to take full advantage of new technologies in data processing. Since I have already discussed data processing, this section will deal primarily with the organizational and people side of the problem.

The proper placement of OSI and FMSAC within the overall Agency structure has been discussed many times in the past four years. I will not attempt to re-argue the whole question here, but will simply note that I am more convinced than ever that these organizations can do the best job as part of DD/S&T. While coordination problems between DD/I and DD/S&T do and probably will continue to exist, I believe the advantages far outweigh the problems.

Assuming that a scientific and technical analysis function will remain with DD/S&T, it is appropriate to examine the internal analytical structure. An appropriate question is -- can we justify keeping OSI and FMSAC as separate offices or would we realize personnel savings and improved efficiencies by combining them?

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The basic reason for establishing FMSAC was recognition of the need for a "giant step" toward improving the entire community effort in missile and space analysis. A gradual build-up in OSI would have taken too long and probably would not have enjoyed the specialized leadership that FMSAC required. I believe we have accomplished most of the goals we set for FMSAC. Now many of the arguments for keeping it separate from OSI may no longer apply. The missile and space problem will surely continue as one of our major concerns and the increasing number of countries involved suggests that this area of intelligence activity must grow. My recommendation is that we keep them as separate shops, at least for the immediate future.

In OSI's area, we have recently examined some organizational changes which might improve our analytical capability in the basic sciences. It is difficult to decide whether we have too much effort on an area where the pay off has been small or if in fact the importance of making longer range projections makes it necessary to try even harder. I have concluded that our "middle of the road" approach is the proper one, and recommend that we keep the level of effort about the same. There are some minor changes in organization, particularly between general and life science groups which may prove worthwhile. These are still under study and I have no final recommendation, but believe some change will be desirable.

The general caliber of our analytical personnel is high and improving. A number of recent actions will help to assure that the curve continues upward. We are working more actively with OP in recruiting top young scientists. We have the first one year DD/S&T career training programs off to a good start. I believe the most important remaining steps are to increase the exchange of personnel between R&D and analysis units, and to provide more opportunities for our analysts to

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keep up to date through outside assignments and refresher education.

The real measure of our success in the analysis business is the degree to which we impact on policy. In my view there has been a marked improvement in this area over the past several years. The quality and distribution of our publications has improved significantly. This method of communication must be augmented by a continuing program of personal contact. In the scientific and technical field this requires a professional rapport, thus providing strong motive for keeping able, recognized technical people in the DD/S&T. I am not only concerned about our impact outside the Agency but believe there is room for improvement within CIA. Although we make dozens of written contributions to National Estimates each year, I am convinced that a senior scientist should be assigned to the Board of National Estimates. The extent to which science and technology influences and even controls world events supports this view.

In the field of analysis, as well as other functions of DD/S&T, we face the very difficult problem of resource allocations--how much effort should we allocate to the collection and filing of basic intelligence on foreign countries as a hedge against unexpected involvement vs. the task of prompt, accurate evaluation of current intelligence. Of course this problem is not a new one and it is certainly not unique to this Directorate--it is the classical problem of inventory control. Business and defense managers are forced to make similar decisions every day and many have developed techniques which may be useful to our profession. Further study and evaluation of these techniques may be even more important than all the new equipment we will develop for years to come.


ALBERT D. WHEELON
Deputy Director
for
Science and Technology

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