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HANDLE VIA BYEMAN CONTROL SYSTEM

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

OFFICE OF THE DIRECTOR

MEMORANDUM FOR THE DIRECTOR, INTELLIGENCE COMMUNITY STAFF

SUBJECT: NASA Manned Space Station (MSS) Concept (Your Memo, Dec 23, 1982, ~~TC3-815905-82~~)

The NRO has participated in many studies over the years to evaluate the potential of man in space for intelligence reconnaissance applications. These studies have always led the NRO toward the development of unmanned space systems as the most cost-effective approach for satisfaction of mission requirements. The most exhaustive series of studies, conducted during the Manned Orbiting Laboratory program in the late 1960s, concluded that requirements for manned space reconnaissance could not be adequately justified in view of capabilities then demonstrated by automated techniques in unmanned satellite systems. Further advances in space system capabilities have led to a mature mix of unmanned reconnaissance systems which demonstrated a high level of reliability and operations effectiveness during the 1970s. NRO technology and planning projections indicate that unmanned operations will continue as the mainstay for intelligence collection throughout the 1980s and the 1990s.

If a national capability is developed for a Manned Space Station, however, the NRO would thoroughly explore potential opportunities which that capability might afford for satisfaction of overhead intelligence collection requirements. Although there are currently no unique NRO requirements for a manned space station, tentative formulations of potential NRO missions which could use a manned space station can be postulated; and considerable study and refinement would be necessary before they could be considered valid needs.

Of course, any NRO involvement in a NASA MSS development program and/or MSS operations is contingent upon definition of a satisfactory policy and security control environment. As you know, NRO operations require specialized cover arrangements that could substantially alter MSS operations/deployment concepts. It is our understanding that the SIG(S) MSS Working Group is addressing policy and security implications associated with general national security issues attendant to the MSS. If the NASA MSS concept proceeds, however, it will be imperative to define any NRO policy/security and programmatic interface constraints and to determine the degree of NRP participation.

The utility of a manned space station to the NRO would depend heavily upon the ultimate MSS design and deployment concept, which is currently undefined. While use of a space station to support NRO satellites may appear promising in the long run, more experience is needed with the operational Space Transportation System (Shuttle) to validate many of the potential manned operations support and servicing concepts which might logically project into manned space station operations.

Potential NRO use of a manned space station might consist of operations/support functions, such as those discussed in Tab A. This does not imply, however, that these functions are necessarily unique or even enhanced by an MSS capability, because other means could be evolved for their support. Alternative means of performing these functions might include the MSS, an unmanned space station, the Shuttle, or current techniques. These alternatives would have to be evaluated before use of the MSS could be justified as a cost-effective approach for each mission area.

Implementation of operations/support functions with the Shuttle and MSS may ultimately influence the design and architecture of NRO satellite systems. For example, an NRO spacecraft in the MSS era would have to be designed to be improved, replenished or repaired via the MSS and its remote teleoperator/inspector. Conversely, a number of characteristics in the MSS concept would have to be designed to be compatible with NRO mission requirements. Examples of some of these required MSS characteristics are discussed in Tab B.

In closing, I would like to emphasize that none of the potential MSS applications discussed in this memo are unique to an MSS capability; nor can it be said that current NRO mission performance would be degraded through use of an MSS system tailored to NRO mission needs. Whether the cost-effectiveness and performance of current NRO missions could be satisfied equally well or even enhanced by an MSS has yet to be determined. If the NASA MSS becomes established as a national commitment, however, the NRO will manage any technical, programmatic, and policy/security interfaces for overhead reconnaissance consistent with national security directives.

E. C. Aldridge

POTENTIAL NRO OPERATIONS/SUPPORT FUNCTIONS

Potential NRO use of a manned space station (MSS) might consist of operations/support functions, such as those listed below. However, these functions are not necessarily uniquely supported or even enhanced by an MSS capability, because other means could be evolved for their support.

a. Assembly of large scale structures - An MSS might be useful to support construction of payloads or satellites which are too large for a single Shuttle launch. Large antennas and large mirrors are two examples of payloads that could fall in this category for advanced intelligence collection systems. At this time, however, there is no known collection requirement which would demand this level of capability. Once a large structure is assembled in the MSS orbit, it would be boosted by the Orbital Transfer Vehicle (OTV) into its mission orbit for final deployment and operation.

b. Supply of equipment/expendables - An MSS could be used as a storage facility for equipment such as parts and subassemblies or expendables like propellants and batteries. Resupply operations conducted from the MSS via OTV or teleoperator vehicle to operational orbits might prove more economical than the current concept of resupply from the Shuttle or retrieval/replacement of mission vehicles.

c. Staging base - An MSS might serve as an efficient cargo or payload transfer point between the MSS orbit and mission orbits. It could provide a staging area for final assembly, storage, and launch of satellites as required. On-orbit storage might be particularly useful for maintaining a crisis reaction capability or for quickly responding to premature failures in operational mission vehicles. In addition, testing of experimental sensor packages might be particularly useful in the MSS orbital environment.

d. Servicing and Maintenance - An MSS could provide a support base to refuel, replenish, and refurbish mission vehicles. It might provide an efficient means of inspection, checkout and repair of NRO mission vehicles. Given these capabilities, the MSS might offer new opportunities for close-up inspection of foreign space objects.

e. Enhance potential for covert operations - An MSS might offer new opportunities to launch or deploy mission vehicles intended to deceive or escape detection by foreign countries.

CANDIDATE MSS CHARACTERISTICS
FOR POTENTIAL NRO OPERATIONS/SUPPORT MISSIONS

The following is a candidate list of characteristics which would have to be considered in the design of an MSS intended to support NRO operations/support functions.

a. Multiple platforms - At least two MSS platforms would be necessary to provide full spectrum operations/support utility to the NRO. Intelligence collection requirements dictate the deployment of NRO satellites in multiple orbital configurations to provide access and coverage of key foreign areas of interest. A near-polar MSS would be necessary to provide operations/support to NRO vehicles in high inclination, sun-synchronous orbits. Another MSS would be necessary in near-equatorial orbit for operations/support to NRO vehicles in geosynchronous orbits. Whether another MSS platform would be needed to support NRO vehicles in medium-inclination orbits, e.g., 63^{o}, would require further analysis.

b. Payload support provisions - In order to support the functions discussed above, an MSS would have to include power, thermal, structural and electrical interfaces which are compatible with NRO vehicles. Characteristics of these interfaces would have to be determined after further definition of the MSS concept.

c. Secure communications/relay interfaces - NRO missions require special secure communications capabilities which would have to be considered in the MSS design concept. A closed secure relay link would be necessary between NRO vehicles and ground facilities.

d. Large volume storage - Use of the MSS as a staging base or maintenance facility would require large volumes of on-orbit storage capability for supplies, equipment, payloads, etc.

e. Orbital transfer vehicle (OTV) - The MSS concept includes an OTV which would be essential in the NRO concept of operations. The MSS concept would offer practically no utility for NRO operations/support without a fully capable transfer vehicle to transport payloads or cargo between low altitude MSS orbits and operational mission vehicle orbits.

f. Teleoperator/inspector - The MSS concept also includes a Teleoperated Service Vehicle (TSV) that would comprise a key interface element between the MSS and NRO vehicles. The TSV might also have significant utility to support future foreign space object inspection/identification missions.

g. Station autonomy - NRO operations/support functions would not necessarily require permanent crew support in the MSS. Further, in the event that crew support could not be sustained, the MSS should be capable of unmanned operation without damage or degradation of NRO assets which may be on board the MSS.

h. Survivability - The inherent survivability and vulnerability of the MSS and its operations concept would have to be carefully assessed. This is a major consideration for any future NRO initiative and would have to be addressed in any future studies.

MANNED SPACE STATION (MSS) DISCUSSION

- o D/ICS TASKING TO COMIREX, SORS
  - NATURE, PRIORITY, UNIQUENESS OF REQUIREMENTS THAT COULD BE FULFILLED BY NASA MSS
- o D/ICS REQUEST TO DNRO
  - RELEVANT TECHNICAL AND OPERATIONAL EXPERTISE
  - SCOPE, PRIORITY, AND UNIQUENESS OF MSS OPERATIONAL/SUPPORT SERVICES OF COMMON CONCERN FOR THE INTELLIGENCE COMMUNITY
- o NRO STAFF ROLE
  - REVIEW PRIOR MSS AND STS EFFORTS
  - COORDINATE ON COMIREX, SORS RESPONSES
  - PREPARE NRO RESPONSE TO D/ICS
- o SCHEDULE FOR MSS REQUIREMENTS RESPONSES (IPS)
  - WORKING GROUP REVIEW, 8 FEB
  - REVIEW DRAFT RESPONSE, 15 FEB
  - REVIEW FINAL MEMO, 22 FEB
  - SORS MILESTONES LAG ONE WEEK
  - COMIREX/SORS/NRO SUBMISSIONS, 2 MAR

KEY CONCERNS FOR THE DNRO ON NASA MSS CONCEPT

- POTENTIAL IMPACTS ON THE NRP
- NATURE OF THE MSS PROGRAM
- NATIONAL POLICY
- SECURITY

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SYNOPSIS

ON NRO INVOLVEMENT

IN PRIOR MSS EFFORTS

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HISTORY OF MANNED SPACE STATION/RECONNAISSANCE

- DYNA-SOAR (1962)
- MANNED ORBITING LABORATORY (MOL) (1963)
- DORIAN (1964)
- MANNED/UNMANNED STUDIES (1965-1966)
- BUDGET/DEVELOPMENT/SCHEDULE PROBLEMS (1966-1968)
- MOL TERMINATION (1969)

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HISTORY OF MANNED SPACE STATION/RECONNAISSANCE (CONT'D)

o DYNA-SOAR (1962)

- FIRST DEVELOPMENTAL PROGRAM FOR AN AF SPACE STATION
- LED TO TECHNOLOGY OVERLAP WITH NASA GEMINI
- LACKED ON-ORBIT OPERATIONAL CAPABILITY
- SECDEF MCNAMARA REMARKS TO HOUSE ARMED SERVICES COMMITTEE (FEB 63):

> I personally believe that rather substantial changes lie ahead of us in the Dyna-Soar program, but we are not prepared to recommend them to you yet. I say this, in part, because of the Gemini development. Gemini is a competitive development with Dyna-Soar in the sense that each of them are designed to provide low earth orbit manned flight with controlled re-entry. Dyna-Soar does it one way, and with flexibility, and Gemini another....
>
> We are very much interested...in the Gemini project. When we become more familiar with it and understand better its potential I suspect it will have a great influence on the future of Dyna-Soar....
>
> The real question is: What do we have when we finish (Dyna-Soar)? It will cost to complete, in total, including funds spent to date, something on the order of $800 million to $1 billion. The question is: Do we meet a rather ill-defined military requirement better by proceeding down that track, or do we meet it better by modifying Gemini in some joint project with NASA?

HISTORY OF MANNED SPACE STATION/RECONNAISSANCE (CONT'D)

- o MANNED ORBITING LABORATORY (MOL) (1963)
  - EXPERIMENTAL PROGRAM, UNRELATED TO SPECIFIC MILITARY MISSION
  - UTILIZED GEMINI TECHNOLOGY
  - INTENDED TO IDENTIFY MAN'S ROLE IN SPACE
  - SECAF BROWN REMARKS TO SENATE COMMITTEE ON AERONAUTICS AND SPACE SCIENCES (MAR 64):

    If you just send a man up there without knowing what experiments he is going to do when he gets there, what you are likely to find is that everything he can do you have a machine that can do just as well.

    I am gradually becoming convinced that there are some things he can do better, but I want the experiment specified first so when he goes up there he will actually be able to show he can do better.

    I think I can give you one specific example: I think a man can probably point a telescope more accurately than automatic equipment can. However, unless you design the equipment to measure that before you send a man up, and unless you give him a piece of equipment that will answer that question...you are not going to get the answer.

HISTORY OF MANNED SPACE STATION/RECONNAISSANCE (CONT'D)

o DORIAN (1964)

- STUDY AND DEVELOPMENT OF RECONNAISSANCE CAPABILITY OF MOL
- PLACED WITHIN NRO BYEMAN CONTROL SYSTEM
- COMPARISON WITH CONVENTIONAL UNMANNED SATELLITE RECONNAISSANCE
- DNRO MCMILLIAN MEMO TO SECDEF MCNAMARA (APR 64):

> Should the MOL experiments demonstrate satisfactorily that a man may be able to make important contributions to the effectiveness of satellite reconnaissance missions, it will be necessary to compare carefully the potential cost and performance of very high resolution systems, manned and unmanned. Such comparisons will require complete access to the present unmanned satellite reconnaissance program. They will be carried out exclusively by the NRO as Project DORIAN.

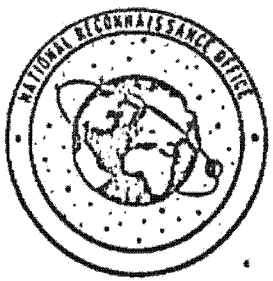
HISTORY OF MANNED SPACE STATION/RECONNAISSANCE (CONT'D)

- o MANNED/UNMANNED STUDIES (1965-66)
  - CABINET LEVEL CONCERN WITH NEED FOR A MANNED SYSTEM
  - DOD DECISION TO DEVELOP MOL WITH AND WITH/OUT MAN
  - PSAC MEMO, DR LAND TO DR HORNIG (AUG 65):

(13)

A solution to these problems would permit the unmanned system, operating with essentially the same camera, to achieve the same ground resolution on prescribed targets as the manned system. It would also contribute significantly to the manned operation by relieving the observer of much of the routine tracking and identification task, and making the pointing and selection of area of interest less critical.

The conclusion that an unmanned vehicle would result in a lower resolving power seems to us, therefore, unwarranted; the further implied conclusion that the solution of the problems involved when a man is not employed to direct the telescope, would seriously delay the program also seems to us unwarranted. Indeed, it appears that the limiting factor in the schedule will probably be learning how to design the mechanics of very large mirrors so that they will retain their shape in their mounts in space. We, therefore, recommend...the MOL system...camera payload be designed as a completely automatic system. This device could then be flown with or without a man depending upon a national judgement on each occasion about the need or desirability of adding the special human capabilities for target selection, selection of data to be transmitted to ground station and verbal reporting.



HISTORY OF MANNED SPACE STATION/RECONNAISSANCE (CONT'D)

- MOL TERMINATION (JUNE 1969)
  - FUNDING LIMITATIONS/ADVANCES IN UNMANNED SYSTEMS
  - CAMERA SYSTEM DEVELOPMENT CONTINUED IN NRP
  - SECDEF LAIRD BEFORE HOUSE APPROPRIATIONS SUBCOMMITTEE (JUNE 69):

    With the President's concurrence (I have decided to cancel MOL. Reasons for the decision, include the need) to either drastically cut back or terminate numerous small but important efforts or one of the larger, more costly programs...(and) major advances have been made by both NASA and DOD in automated techniques for unmanned satellite systems....These have given us confidence that the most essential Department of Defense space missions can be accomplished with lower cost unmanned spacecraft.

SUBSEQUENT DEVELOPMENTS IN SPACE RECONNAISSANCE SYSTEMS

- ADVANCES IN UNMANNED SYSTEMS (1970s)
  - FILM SYSTEM DEVELOPMENTS EXCEEDED MOL EXPECTATIONS
  - INTRODUCTION OF NRT PHOTOGRAPHIC CAPABILITY
- DEPLOYMENT OF NRT ARCHITECTURE (1980s)
  - MATURE UNMANNED INTELLIGENCE COLLECTION CAPABILITIES
  - COMPLEMENTARY MIXES OF UNMANNED IMINT AND SIGINT COLLECTORS

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RECOMMENDED

NRO RESPONSE TO D/ICS

ON CURRENT NASA MSS CONCEPT

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POTENTIAL NRO USES FOR A MANNED SPACE STATION (MSS)

- o NONE PRESENTLY DEFINED
  - MORE STS EXPERIENCE REQUIRED
  - MSS DEFINITION REQUIRED
  - CONSIDERABLE STUDY REQUIRED
- o POTENTIAL NRO MISSIONS (NONE UNIQUE TO MSS)
  - SELECTED OPERATIONS/SUPPORT SERVICES
  - SELECTED COLLECTION SYSTEM(S) MISSIONS
- o ALTERNATIVE MEANS EXIST

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POTENTIAL NRO OPERATIONS/SUPPORT MISSION CATEGORIES FOR AN MSS

- o UNIQUE TO MSS CAPABILITY
  - NONE AS YET IDENTIFIED
- o ENHANCED BY MSS CAPABILITY
  - REQUIRES FURTHER STUDY AND ANALYSIS
  - REQUIRES MSS DEFINITION
- o SATISFIED EQUALLY WELL BY AN MSS OR OTHER MEANS
  - SELECTED OPERATIONS/SUPPORT SERVICES
  - SELECTED COLLECTION SYSTEM(S) MISSIONS
- o DEGRADED BY MSS CHARACTERISTICS
  - NONE AS YET IDENTIFIED

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POTENTIAL NRO OPERATIONS/SUPPORT SERVICE FUNCTIONS

(NONE UNIQUE TO MSS)

- o ASSEMBLY OF LARGE SPACE STRUCTURES
  - LARGE ANTENNAS, MIRRORS
  - BOOST FROM MSS TO OPERATIONAL ORBITS
- o SUPPLY OF EQUIPMENT/EXPENDABLES
  - PROPELLANTS, BATTERIES
  - PARTS, SUBASSEMBLIES
- o STAGING BASE
  - ASSEMBLY/LAUNCH OF SATELLITES
  - ON-ORBIT STORAGE FACILITIES
- o SERVICING AND MAINTENANCE
  - REFUEL/REPLENISH/REFURBISH
  - INSPECT/CHECKOUT/REPAIR
- o ENHANCE POTENTIAL FOR COVERT OPERATIONS

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CANDIDATE MSS CHARACTERISTICS FOR POTENTIAL NRO OPERATIONS/SUPPORT MISSIONS

- o TWO PLATFORMS FOR FULL SPECTRUM UTILITY
  - NEAR POLAR
  - NEAR EQUATORIAL
- o PAYLOAD SUPPORT PROVISIONS TBD
- o SECURE COMMUNICATIONS/RELAY INTERFACES
- o LARGE VOLUME STORAGE ON/NEAR MSS
  - SUPPLIES, EQUIPMENT
  - PAYLOAD(S)
- o ORBITAL TRANSFER VEHICLE
- o TELEOPERATOR/INSPECTOR
- o STATION AUTONOMY

POTENTIAL NRO COLLECTION SYSTEM MISSIONS FOR AN MSS *
(RESERVED FOR COMIREX/SIGINT COMMITTEE RESPONSES)

(NONE UNIQUE TO MSS)

[redacted] (b)(1) (b)(3)

- o SIGINT GAP-FILLING
  - VARIABLE ACCESS/VIEWING GEOMETRY
  - MONITOR FOREIGN INTELLIGENCE AGAINST MSS
  - TECHNICAL/THIRD WORLD INTELLIGENCE
- o MULTIPURPOSE OPTICAL C[redacted]ECTION (b)(1) (b)(3)
  - HIGH VALUE TARGETS [redacted] (b)(1) (b)(3)

* LIST DERIVED FROM SPACE SHUTTLE POTENTIAL MISSIONS IDENTIFIED IN IC STAFF ASSESSMENT OF "HERMANN REPORT"

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POLICY/SECURITY ISSUES

- POLICY AND SECURITY IMPLICATIONS ASSOCIATED WITH GENERAL NATIONAL SECURITY ISSUES TO BE ADDRESSED IN SIG(S) MSSWG

- DEGREE OF NRO PARTICIPATION DEPENDENT UPON MSS BASELINE SELECTED AS A MATTER OF NATIONAL COMMITMENT

- SPECIFIC NRO CONCERNS
  - MSS CONCEPT INVOLVES INTERNATIONAL PARTICIPATION/SUPPORT
  - NRO OPERATIONS REQUIRE SPECIALIZED COVER ARRANGEMENTS
    - -- COULD LIMIT/ALTER MSS OPERATIONS/DEPLOYMENT CONCEPTS
    - -- WOULD LIKELY IMPACT NRO PLANNING/BUDGETING
  - MSS CONCEPT DEVELOPMENT SHOULD BE MONITORED BY NRO
    - -- IDENTIFY POTENTIAL SECURITY/POLICY PROBLEMS EARLY
    - -- MONITOR DEVELOPMENT FOR USE BY NRO IF MSS ULTIMATELY AFFORDS UNIQUE OR COST-EFFECTIVE CAPABILITY

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