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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330



OFFICE OF THE SECRETARY

September 15, 1969

MEMORANDUM FOR DR. ~~M~~LUCAS

SUBJECT: NASA Astronomy Program Considerations of
DORIAN Technology

The NASA Orbiting Astronomy activities center principally on the OAO Program. This program which has been underway since 1965 is approaching completion of a highly successful and scientifically useful year of astronomical observations by OAO-II. A description of the instrument package in this spacecraft is in the attachment. OAO-B is currently scheduled for launch in the 4th quarter of this year, but may be delayed if OAO-II continues to perform satisfactorily. OAO-B will fly a Goddard scanning spectrometer that has a high quality 38 inch diameter cassegrain telescope. This spacecraft is to be followed in 12 months by OAO-C which will include the Princeton Experiment Package with a high resolution 32 inch cassegrain telescope. OAO-D is planned two years later and while its experiment package has not been firmly identified, it will probably carry a single large telescope based on the OAO-B instrument. It is now intended that OAO-D will be tasked in response to requests from throughout the Astronomical Community. If all goes as planned, it will provide for a quite active observing program principally in the UV, and the trend will be towards improved resolution, improved pointing and offset guidance for examination of faint sources.

I am told that Astronomers have difficulty in agreeing on goals, objectives and ways and means which of course, complicates NASA's program. However, I do feel there is a general consensus that OAO is reasonably well arranged within the financial and technological constraints that exist or are believed to exist.

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As to the NASA's future intentions relative to this field, a very strong case has been made to the Presidential Space Task Group for a vigorous orbital astronomy program even if faced with severe and unanticipated funding restrictions.

The Agency's plans call for an evolutionary continuation of the OAO series featuring instrument improvements in both performance and capability. By OAO-G, in the early 1980's, the plan calls for a man tended 120 inch diameter diffraction limited telescope in orbit for a much extended duration. To reach this goal, it has been estimated that a program expenditure level of \$100 million annually will be necessary commencing no later than FY 1971. This would be about twice their current level.

A large but very uncertain fraction of this \$100 million level is planned for the acquisition of manufacturing and test facilities capable of developing the 3 meter optic. Hence the sudden interest in the Eastman facilities.

As I see it, the problem has two distinct facets. One of these is the physical facilities required; and the second is the technology involved in designing, manufacturing and adequately testing the optic. At Col Allen's suggestion, I discussed this matter with Dr. A. Mienel who along with others has just recently completed a review of the status of competence and capabilities of our major optical manufacturer for Dr. Land under his PSAC responsibilities. Based on this current information it is Mienel's view that the existing technological and facilities basis at both Perkin Elmer and Itek are, with some relatively minor upgrading, quite capable of doing the NASA job. Incidentally, Mienel also calls attention to the existence of the imminently applicable but near idle 150 inch colimator at Wright Field.

The second factor, NASA's desire to avoid repeating the learning phase represented by Eastman's experience with DORIAN, could be far more severe. However, with suitable consulting services which appear readily available, Mienel believes this, too, could be largely avoided.

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An uncertainty in this entire business is the schedule by which NASA would want the 3 meter mirror if it can be assumed that technology is not constraining. I am aware of some discussion of a two meter stellar telescope, a derivative of the Apollo Telescope Mount, as a primary element of the second dry workshop in AAP. This mission is currently scheduled for mid calendar 1974. In order to meet such a schedule, the telescope work should be initiated at once--especially if it is to be done by a supplier other than Eastman. Perhaps if a sufficient transfer of technology could be arranged, NASA could begin a two meter program with either Itek or Perkin Elmer and a more lengthy three meter program with the other. Mienel feels either could do either job. This would unquestionably be costly and program scheduling factors might not require a parallel development. However, it would certainly be a welcome (in many quarters) shot in the arm for the country's optics community.

A second and potentially related step would be to follow a two meter telescope in AAP in mid 1970 with a two meter or larger telescope in the OAO series in late 1970. Such a program could entail by-passing OAO-E and F in favor of what is now planned as OAO-G.

A program of this scope is being discussed within NASA and is reported to be favorably received. NASA has expressed interest in studying the problem of integrating a DORIAN size mirror into the ATM design and will, I understand, ask for permission to make such an analysis. It should involve briefing not more than two or three people on the Eastman operation. Attendant to the study would be an estimate by someone like Dr. Mienel as to the degree of difficulty involved in getting from the DORIAN primary mirror design to one suitable for stellar astronomy.

As a consequence of my discussion with Dr. Mienel, I tend to feel that the facilities question is noise level. This provided NASA can be convinced that it is unnecessary to duplicate all of the ONF facility at some other vendor. Far more serious, I fear, and impacting the new facility question as well, is the problem of NASA repeating the pre

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1965-1969 learning process that Eastman went through on G³ and then DORIAN with either Itek or Perkin Elmer. In this regard, it occurs to me that it might be useful for NASA to pay Eastman through the Air Force to develop a fairly detailed cost and time estimate of the engineering task and minimum facilities involved in doing the NASA job. Such an estimate could then be used by NASA to evaluate proposals by Itek or Perkin Elmer.

It may develop that schedule considerations will delay NASA's need for the capability such that that which exists at Eastman could be made available at some time sufficiently far in the future that the sensitivity factor would be less severe. However, NASA's current planning as modified by their new understanding of the state of optical technology, will likely result in their proceeding much earlier.

To summarize, it appears that an approach can be developed that will make possible an adequate "white" facility capable of fulfilling NASA requirements. There also appears to be a way in which excessive duplication of existing developments can be avoided.


SAMUEL H. HUBBARD
Technical Advisor
MOL Program

DORIAN

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NASA ORBITING ASTRONOMICAL OBSERVATORY PROGRAM

	<u>Launch Date</u>	<u>Duration</u>	<u>Program Status</u>
OA0 - I	1st Qtr 66	Failed*	
OA0 - II	4th Qtr 68	Continuing	
OA0 - B	4th Qtr 69		Approved
OA0 - C	4th Qtr 70		Approved
OA0 - D	4th Qtr 72		Planned

*Spacecraft Subsystems

OA0 - II
Experiments:

1. Wisconsin Experiment Package
 - (a) four 8 inch Stellar Photometers
 - (b) two Scanning Spectrometers
 - (c) one 16 inch Nebular Photometer
2. Smithsonian Astrophysical Observatory Package
 - (a) four telescopic Schwarzschild Camera, Electronic Rec. with imaging Uvicon

Objectives:

1. Collectively Map Celestial Sphere
2. Determine Stellar Energy Distributions
3. Measure UV Emission Line Intensities in Diffuse Nebulae

Performance:

All objectives have been met. Spacecraft and all experiments continues to function normally. By January 1969, the WEP had made 213 observations of 120 objects and obtained 204 pictures of celestial sphere.

OA0 - B launch may be delayed pending continued High Performance of OA0 - II.

OA0 - B

1. Goddard Experiment Package

(a) Scanning Spectrometer with 38-inch Cassegrain

Objective: Obtain spectrophotometric data on stars, nebulae, and galaxies in the UV with a spectral resolution of about two angstroms.

Status: Spacecraft is in final systems test and can support the launch date late this year.

OA0 - C

1. Princeton Experiment Package

(a) High resolution 32 inch Cassegrain telescope with primary resolving power of 0.1 angstrom for UV. 0.1 arc second pointing.

2. Universitys of London and Liecester Package

(a) X-ray monitor.

Status: Prototype assembly and qualification testing, acceptance testing of spacecraft components. Princeton experiment in advanced testing, delivery and acceptance testing of X ray experiment.

OA0 - D

1. Single large OA0 - B type telescope

Objective:

1. Improved spectral resolution
2. Offset guidance

Status: Planning, Experiment, Definition, Experiment
Design and Spacecraft fabrication initiated in CY 1969.

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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330



OFFICE OF THE SECRETARY

[REDACTED]
June 30, 1969

MEMORANDUM FOR MR. HANSEN, SAFRD

Although I am aware of various efforts underway in the MOL Program and Systems Offices, the Air Staff, and NASA aimed at exploiting MOL residuals and/or carrying-on essential work, I nevertheless feel that a more formal, comprehensive review should also be undertaken to insure that maximum national benefit is realized from MOL hardware, technology, and experience.

What I have in mind is an Ad Hoc Group of appropriate individuals to accomplish the following:

- o Identify all significant MOL hardware, test and checkout equipment, technology, etc., which might be useful to DOD and/or NASA. Review MOL Program/System Office disposition actions and plans in this regard and provide any necessary additional guidance.

- o Identify any essential MOL work which must be continued in other AF projects. Review actions already taken, underway, or planned and provide any necessary guidance or direction to the appropriate AF agency.

- o Identify desirable MOL technology which might be continued as follow-on Exploratory or Advanced Development projects, and provide any necessary guidance or direction to the appropriate AF agency.

- o Prepare a report on all of the above as of August 1.

For composition of the Ad Hoc Group, I suggest Dr. Yarymovych as Chairman, with General Hedrick, General Gilbert, and appropriate representatives from MOL and SAMSO as members. Additionally, consideration should be given to

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the inclusion of NASA and DDR&E representatives as members of the group; as a minimum, an early and continuing liaison should be established with those agencies.

Although those elements of the DORIAN camera system that are applicable to an unmanned system and in the process of transfer to the National Reconnaissance Program are excluded from this review, the Ad Hoc Group should consider all man-unique aspects of the MOL camera system regardless of classification.

To facilitate its use, the report of the Ad Hoc Group should be a non-BYEMAN document and make no inference of any such material. BYEMAN-classified aspects of the MOL Program dealt with by the Group should be covered in a supplementary annex to the basic document.

Attached for your use, as appropriate, is an unclassified version of this memorandum.



ROBERT C. SEAMANS Jr.

Attachment
a/s

cc: SAFUS
AFCCS
AFSC (SCG)

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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330



OFFICE OF THE SECRETARY

June 30, 1969

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Robert C. Seamans Jr.

ROBERT C. SEAMANS JR.



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THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

JUN 9 1969

Honorable L. Mendel Rivers
Chairman, House Armed Services Committee
House of Representatives

Dear Mr. Rivers:

We have decided to terminate the Manned Orbiting Laboratory (MOL) Program.

The primary purpose of MOL, as you know, has always been the collection of technical intelligence through very high resolution photography of Soviet and Chinese weapons and equipment. You will recall that when MOL was approved by President Johnson in 1965, only manual operation of the camera by the MOL flight crew appeared feasible. Later, as fully automatic operation of the camera began to appear more practical, there still were advantages to continuing development of the manned space vehicle. Additionally, it was also apparent that the MOL manned reconnaissance system would always possess certain unique capabilities, operational flexibility, and somewhat better performance.

Unfortunately, the MOL Program development phase has stretched out and the total cost increased for various reasons. At the same time, the technology required to operate the camera in an unmanned satellite has continued to mature. It will be considerably less costly to terminate MOL, and to develop an unmanned system using the MOL camera. We should save about \$275M in FY 70 and \$300M in FY 71.

Since the camera payload in the MOL spacecraft has always been a very closely held matter (and is being developed under a covert contract), the public announcement will indicate that the entire program has been cancelled and that several million dollars will be saved. The continuation of camera development and its incorporation into an unmanned spacecraft will be handled covertly, as are the unmanned reconnaissance satellites in the National Reconnaissance Program.

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Attached is an unclassified notice to you of MOL termination for use
as you deem appropriate.

Sincerely

Attachment

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THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301



9 JUN 1969

MEMORANDUM FOR THE SECRETARY OF THE AIR FORCE
DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

The Air Force is hereby directed to terminate the MOL Program except for those camera system elements useful for incorporation into an unmanned satellite system optimized to use the TITAN III D. Directions to MOL contractors should be issued on Tuesday morning, June 10, at which time we will also notify the Congress and make a public statement that MOL is cancelled.

Close-out costs for MOL, which I understand are approximately \$75 million more than is now available to the MOL Program, should be included in the unclassified FY 70 Air Force budget. An additional \$175 million should be included in classified NRP portions of the FY 70 Air Force budget. This will provide for development of the camera system at a reduced pace, for competition for a new spacecraft, and for possible initiation of system development late in FY 70.

All future work on the camera and an unmanned system will be part of the NRP. As a security measure, appropriate elements of the MOL Project Offices and the camera system contracts should be transferred to the Air Force NRP Special Projects Offices at an early date. Overt MOL activities should be phased out in conjunction with the closeout of MOL Program activities.

A plan for development of the unmanned system should be submitted to the Executive Committee by August 1. This plan should include proposed system performance, cost, and schedules. Other than continuing the camera system development at a reduced rate, no new work should be initiated until this review.

cc: Mr. Helms
Dr. DuBridge

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