~~SECRET~~ SPECIAL HANDLING

Mgt 1-4

DISCUSSION POINTS FOR EASTMAN KODAK COMPANY

The following points are presented as the salient elements of information which should be considered in any discussions with EKC concerning their schedule for the DORIAN Program. Attached to this paper for background information is a general chronology of schedule data and descriptive data pertaining to the development models used in the DORIAN Program.

1. EKC has been consistent in their schedule information since their Dec 65 position even though it may appear that they have extended the schedule since that time. This consistence is apparent from the following examination of the key schedule items.

a. The Dec 65 schedule (Plan A) provided for an Oct 69 delivery of a checked out mission module at Rochester. Assuming the possibility of shipment of the mission module directly to VAFB with a three month test and launch cycle, Plan A resulted in a Jan 70 launch date for the first DORIAN Sensor (FM-1).

b. In early Feb 66, in response to our continued exercising of the schedule problem, EKC presented Schedule Plans B and C. Plan B showed a six month schedule improvement with FM-1 delivery in Apr 69. This was accomplished by elimination of the compatibility model. Plan C retained the compatibility model and showed a three month schedule improvement over Plan A with FM-1 delivery in Jul 69. This was accomplished by concurrent release dates for the compatibility and qualification models.

~~SECRET~~ SPECIAL HANDLING

c. During the MOL Management Review of 5 Feb 66 it was agreed to use Oct 69 as a planning launch date for the first all up sensor. That is, we were in the "ball park" with the Jul 69 delivery date for FM-1 under Plan C assuming a three month launch cycle after shipment from Rochester.

d. All of the above plans were based on an EKC facility go-ahead no later than 1 Feb 66. Actual facility approval was obtained 5 Apr 66 resulting in the delivery date of FM-1 moving from Jul 69 to Sep 69.

e. The test flow plan, as now defined, requires the mission module to go from EKC to DAC to VAFB. The DAC, VAFB span is approximately seven months. Based on Sep 69 delivery of FM-1 this results in an Apr 70 flight date.

2. From the above discussion, two points could be considered, both of which deal with program risk. First is the consideration of eliminating the compatibility model entirely or actually flying it on the first manned flight. Either approach does introduce elements of technical risk into the program and are not recommended. The second point is that of modifying the present baseline test flow by shipping the mission module directly to the launch base fromRochester. This would eliminate the thermal vacuum test of the complete lab vehicle in a mated configuration at DAC; however, the lab module and mission module would individually have a thermal vacuum test.

BYE-66692-66

3. During all of the many schedule discussions and investigations with EKC, the attempt has been made to find or identify the pacing items in the program. It has been extremely difficult to single out particular critical items so that they could be given special attention. As items have been identified such as mirror blanks, polish time, fabrication time, test time, etc., the contractor has maintained that in his judgement he requires the time spans as allocated for the various tasks. It is felt that there are three significant reasons that contribute to his position: First, he has undoubtedly factored into his planning the bitter experience he is presently having in attempting to meet G^3 schedules. Secondly, he is undoubtedly concerned about the availability on schedule of the large new facility and the unknowns facing him in the area of simulated zero gravity testing of 72" light weight mirrors. Thirdly, he must produce specification performance [redacted] on the first flight. Considering the cost per flight, he is not disagreeing with this rationale; however, past programs have started initially with lower specifications and worked up to specified performance over a number of flights

4. The Company's personnel policies should be recognized. It is felt that EKC is perhaps a bit too conservative in their hiring practices, and that the rate of new hires can and should be increased. The rate of hiring can only be understood by a knowledge of EKC's philosophy toward

its employees. They believe in a well groomed organization and believe that such an organization comes about in part by increasing personnel strength at a modest rate - a very modest rate in comparison with most other large DOD contractors. New personnel are sent through a short indoctrination course, and then assigned to a job with well defined responsibilities and interrelationships, thus preserving a solid "teamwork" attitude and approach to the project. EKC believes that this philosophy is more economical and is necessary to assure a satisfactory end product.

BACKGROUND INFORMATION ON EKC SCHEDULE BYE-66692-66

Prior to July 1965:

The target date for the first flight of a DORIAN Sensor was carried as October 1968 during the early study phases of the Program.

July 1965:

During July 1965 EKC officials discussed with Dr. McMillan the company's capacity to perform all work contemplated for EKC in view of the pending selection of a DORIAN contractor. The general consensus of these discussions was that EKC did not have the capacity to do all the work plus DORIAN on the time schedule contemplated.

Two alternatives were discussed in these preliminary talks:

a. One possibility suggested by EKC was a consortium arrangement, under which certain firms in the optical field would manufacture portions of the DORIAN payload.

b. Another possibility was suggested by Dr. McMillan, who asked EKC whether they could do all the projects except S-2, if S-2 work were transferred to Itek. On 16 July and again on 19 July, EKC advised Dr. McMillan that under certain conditions their answer would be in the affirmative. These conditions were:

(1) First DORIAN flight would not be before April 1969, and it may not be possible on the first payload to obtain optimum performance.

(2) Authority to proceed would be forthcoming immediately, and would include go-ahead on facilities, long lead items and unlimited overtime.

(3) There must be capability for quick decisions on the part of the Government.

(4) Secretaries McNamara, Vance or Brown would verbally indicate to EKC an assurance that DORIAN was planned to be carried out through a flight schedule, and that the project was not to be terminated soon.

(5) Other SP projects and Lunar Orbiter would not be transferred from EKC, and in future years similar levels of effort would be maintained at EKC, in order that the company might have such relatively less difficult work on which to train personnel for more advanced effort such as D.

As these discussions proceeded, Dr. McMillan requested through General Martin a Management Resources Survey of EKC. Such a survey was conducted by a committee under Colonel G. T. Smith with the results documented in "Report of Survey Committee", 30 July 65, BYE-40252-65. This report thoroughly explores the manpower situation at EKC in regards to actual and proposed workloads. The committee's conclusions essentially supported the EKC position contained in paragraph b. above and this course of action for the prosecution of the DORIAN program was subsequently directed on 22 September 65 by WHIG 0001.

The above information has been covered to point out that it was during the discussions of 16 to 19 July 1965 between Dr. McMillan and EKC that an earliest DORIAN flight date of April 1969 was established by EKC with a January 1969 delivery of the flight article. Prior to these discussions the target flight date had been October 1968 as pointed out above.

14 Dec 1965:

The April 1969 date with a January 1969 delivery had been used as the planning schedule prior to the receipt of the EKC letter of 9 Dec 65 indicating a 10 month extension in their previous schedule forecast. The EKC letter was received by SAFSP on 14 December 1965 and its contents were immediately discussed by General Martin with Dr. Brown and General Schriever with the understanding that SP had not had an opportunity to investigate the validity of this new schedule. This new EKC schedule was a key point of discussion at the MOL management review of 20 Dec attended by Dr. Foster, Dr. Flax, Mr. Fink, Mr. Ross, General Schriever and General Evans with the understanding that SP would conduct a review of this schedule situation. Dr. Foster also visited EKC with Messrs Fink, Kirk and Ross on 22 December to take a first hand look at the schedule problem.

5 - 8 January 1966:

To conduct the desired schedule review a committee appointed by

General Martin visited EKC in Rochester from 5 to 8 Jan 1966 and met with EKC officials, principally Messrs Simmons, Foster, Sewell, Soebbing, Fellows, Brown, Ratliff and Dr. Oder. The committee's approach was to examine in detail all available current EKC schedule information, the reasoning and philosophy behind this information, and the physical and personnel resources associated with the schedule information. In all applicable areas comparisons were made with GAMBIT and GAMBIT-CUBE experience noting differences in size, design, etc., and estimated differences in complexity. The affect of government decisions on schedule, e.g., facility go-ahead, factory-to-pad flow, etc., were also considered. During the final day of discussions at EKC, information was received pertaining to the desirability of maintaining essentially the original schedules for the UPWARD Program. Later discussions and a briefing to Dr. Flax on 20 January 66 indicate the manpower impact of this development on the DORIAN effort.

In response to the reviews in the above areas the contractor presented a considerable amount of preliminary schedule information. This information was presented as representing his first detailed look at the overall schedule during the Contract Definition Phase with this information prompting his 9 December 65 letter.

The results of this committee review are reported in Schedule Task Group Report dated 27 January 1966.

28 January 1966:

As a result of the above schedule review and the briefing to Dr. Flax on 20 Jan 66, EKC submitted by letter subject, Revised EKC DORIAN Schedule dated 28 Jan 66, the results of further scheduling studies. This letter contained a Plan B which eliminated the compatibility model and proposed delivery of FM-1 prior to completion of the qualification of the Qual. Model. This approach resulted in a FM-1 delivery of April 1969 as opposed to Oct 1969 under the original plan (Plan A). This approach was not considered desirable from a quality assurance point of view and EKC was asked to again consider the problem.

9 February 1966:

In response to our request above, EKC presented Plan C on 9 Feb 66 showing a July 1969 delivery date for FM-1 while still maintaing the compatibility model and completing qualification testing prior to the flight of FM-1. Applying the same 3 month time span from FM-1 delivery to launch gave a planning launch date of Oct 1969 for the first all up DORIAN Sensor. Go-ahead on EKC facilities was required by 1 Feb 66 to hold this schedule.

15 March 1966:

Based on the more definitive assignment of contractor's roles and responsibilities which occurred by TWX [redacted] 0191) on 19 Feb 1966 and meetings with EKC on 23 Feb and 4 Mar to clarify these roles and responsibilities, EKC presented revised schedule information on 15 Mar 66.

This schedule information showed delivery of a Camera Optical Assembly (COA) at Rochester 37 months from authorization to proceed with facilities.

21 - 31 March 1966:

A series of meetings were held with EKC during this period to investigate the 37 month requirement for COA delivery and to define the testing to be done at Rochester on the Mission Module after COA delivery. Agreement was reached for planning purposes on a test span at Rochester of 102 working days or approximately five months giving a total of 42 months from facility go-ahead to the availability of a checked out Mission Module.

2 April 1966:

The above information was presented to General Schriever at the MOL monthly management review on 2 April. Assuming immediate facility go-ahead, this schedule would result in a Mission Module delivery to DAC in September 1969 and a launch in April 1970 based on the seven month test span time required at DAC and VAFB.

5 April 1966:

EKC facility go-ahead received.

4 May 66:

TWX to EKC containing Option 6 Flight Schedule which has the first manned flight in Dec 1969. EKC was informed that the Dec 1969

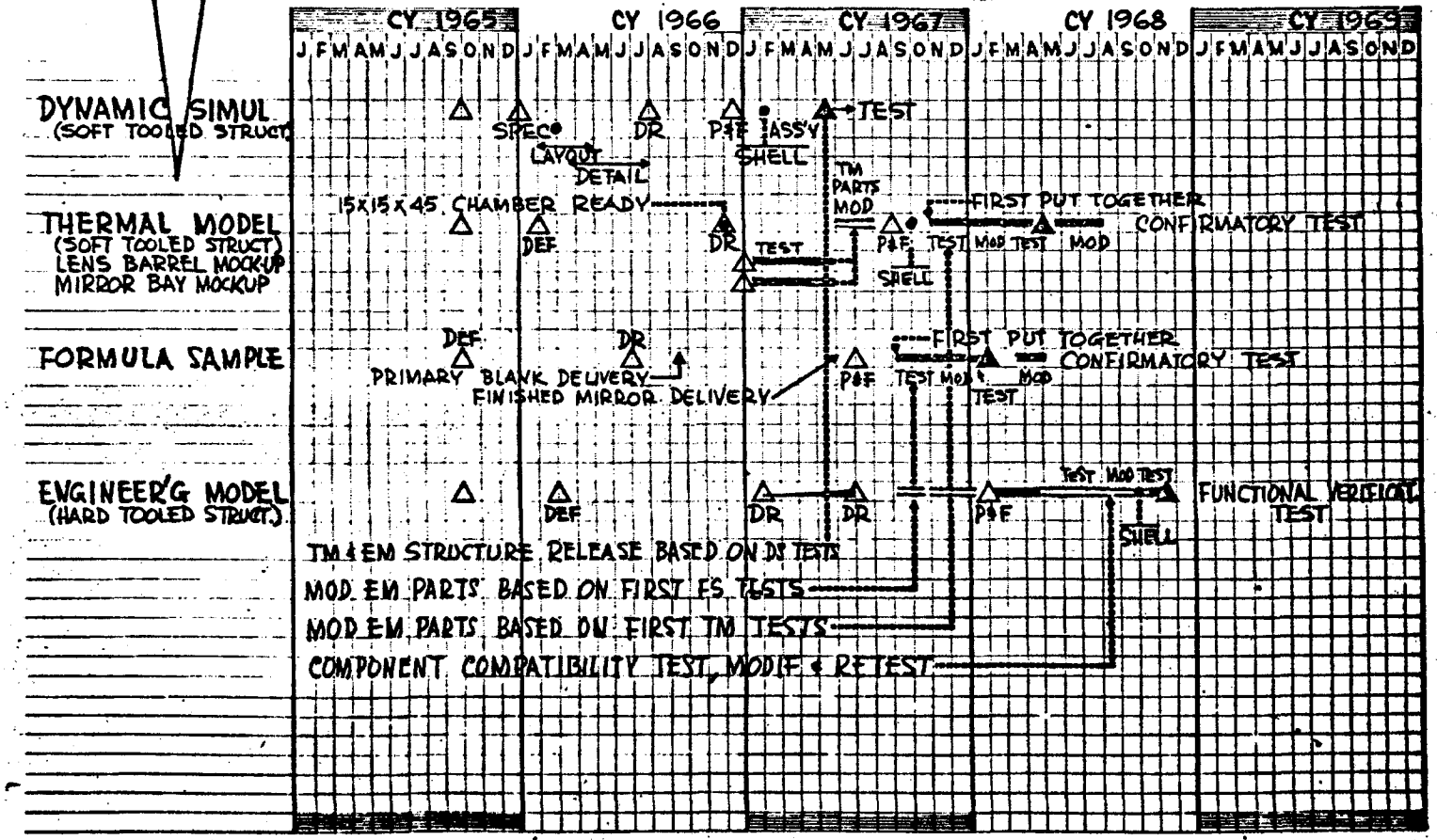
flight was to include all flight objectives which are possible and they were asked to define what these would be and to provide specifics in all respects where the payload for this flight would not meet fully qualified flight performance, either by degraded components and/or complete omission of components, or where this schedule increases risk in the program. They were also informed that the April 70 and subsequent flights were to carry equipment that is fully flight qualified to perform the reconnaissance mission.

10 May 66:

EKC reply received to 4 May 66 TWX.

EM DEVELOPMENT PROGRAM

PLAN "A"



EASTMAN KODAK CO.

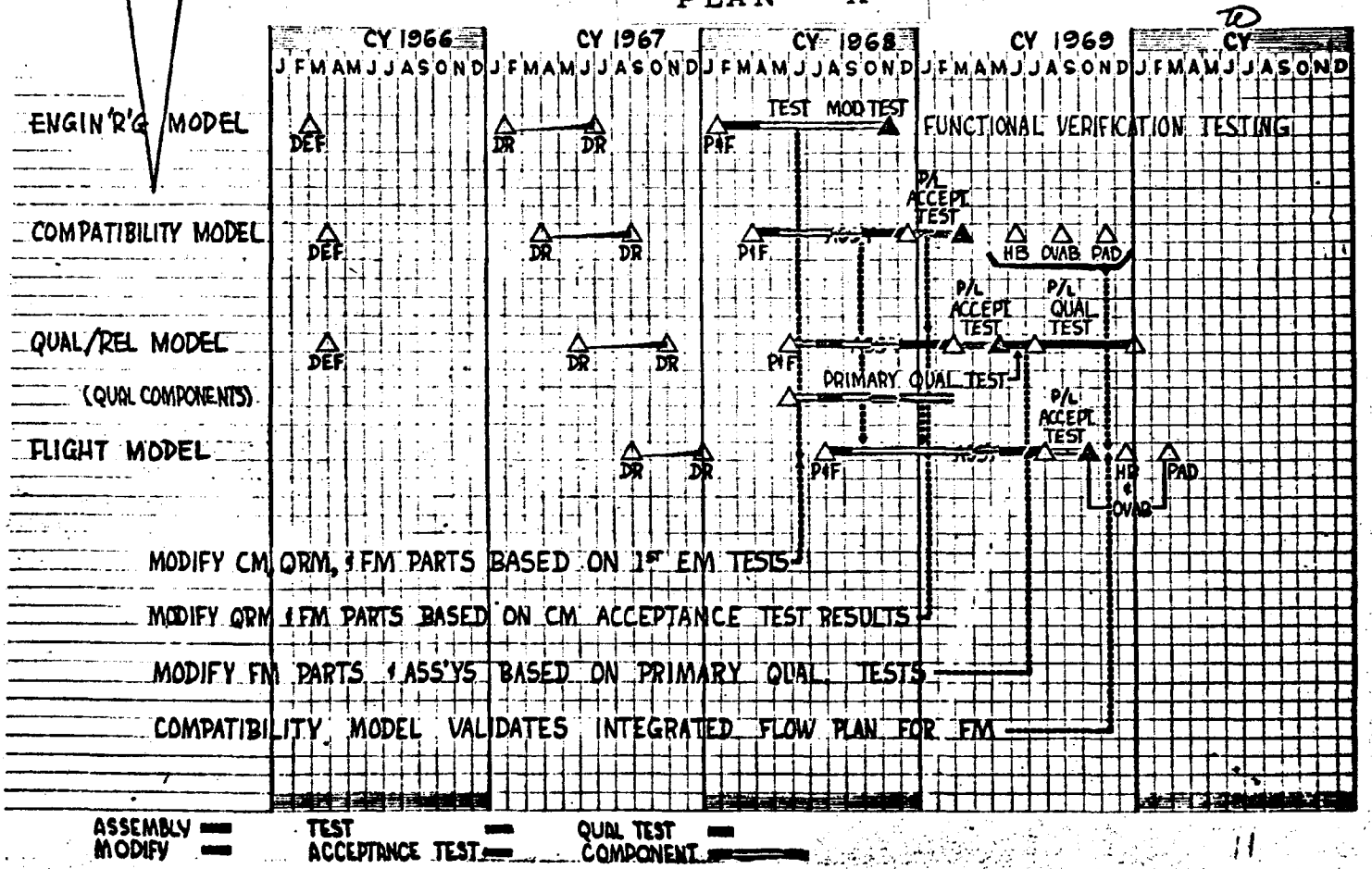
~~SECRET~~ SPECIAL HANDLING

PHOTO DOCUMENTATION

SPECIAL HANDLING

FM DEVELOPMENT PROGRAM

PLAN "A"



BYE-66692-65

Handle via BYEMAN Control System

EASTMAN KODAK CO.

~~SECRET~~

SPECIAL HANDLING

PHOTO DOCUMENTATION

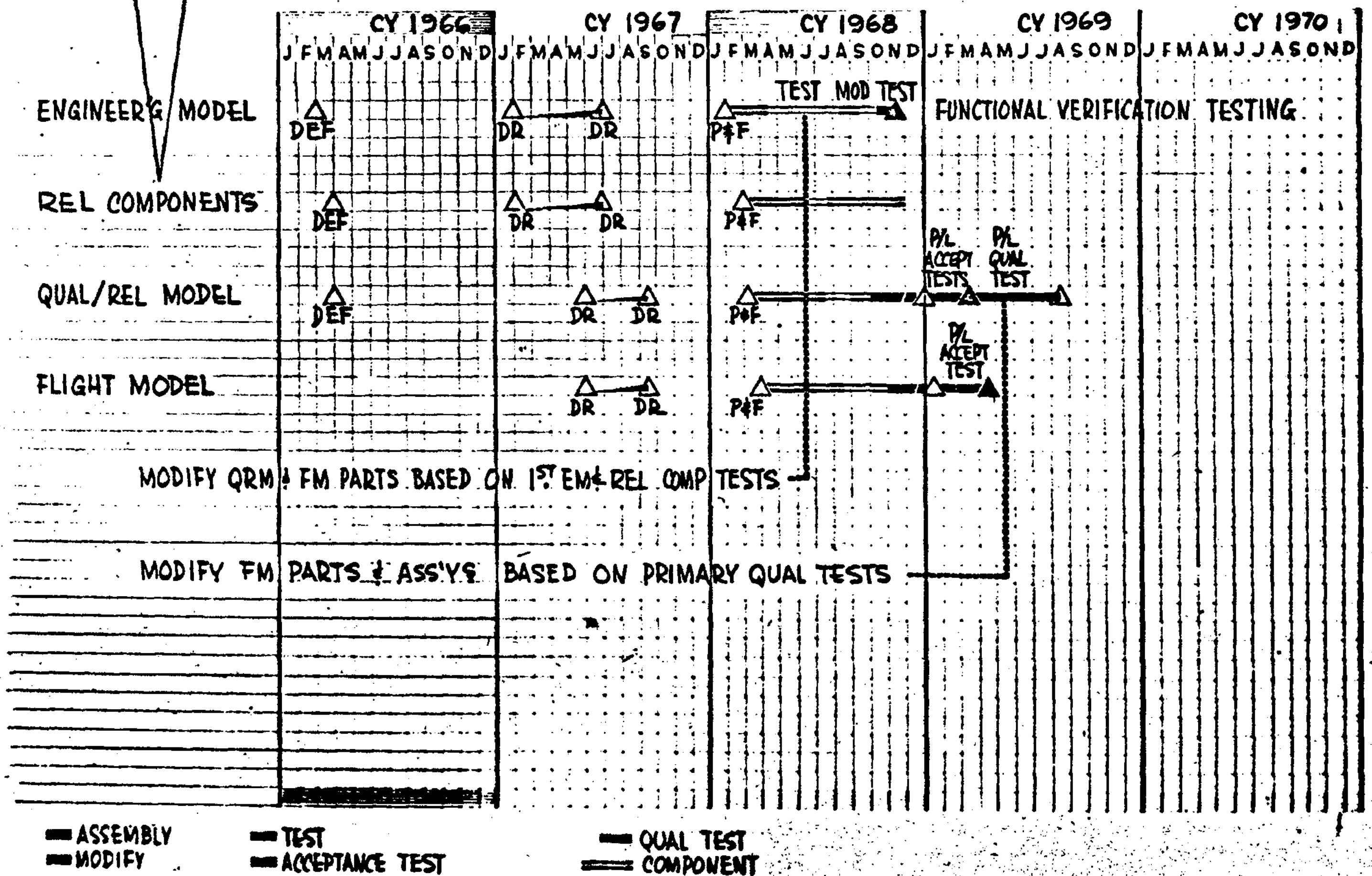
SPECIAL HANDLING

~~SECRET~~

[redacted]

Jan 27 1966

FM DEVELOPMENT PROGRAM
PLAN B



BYE-66692-66

Handle via BYEMAN Control System

EASTMAN KODAK CO.

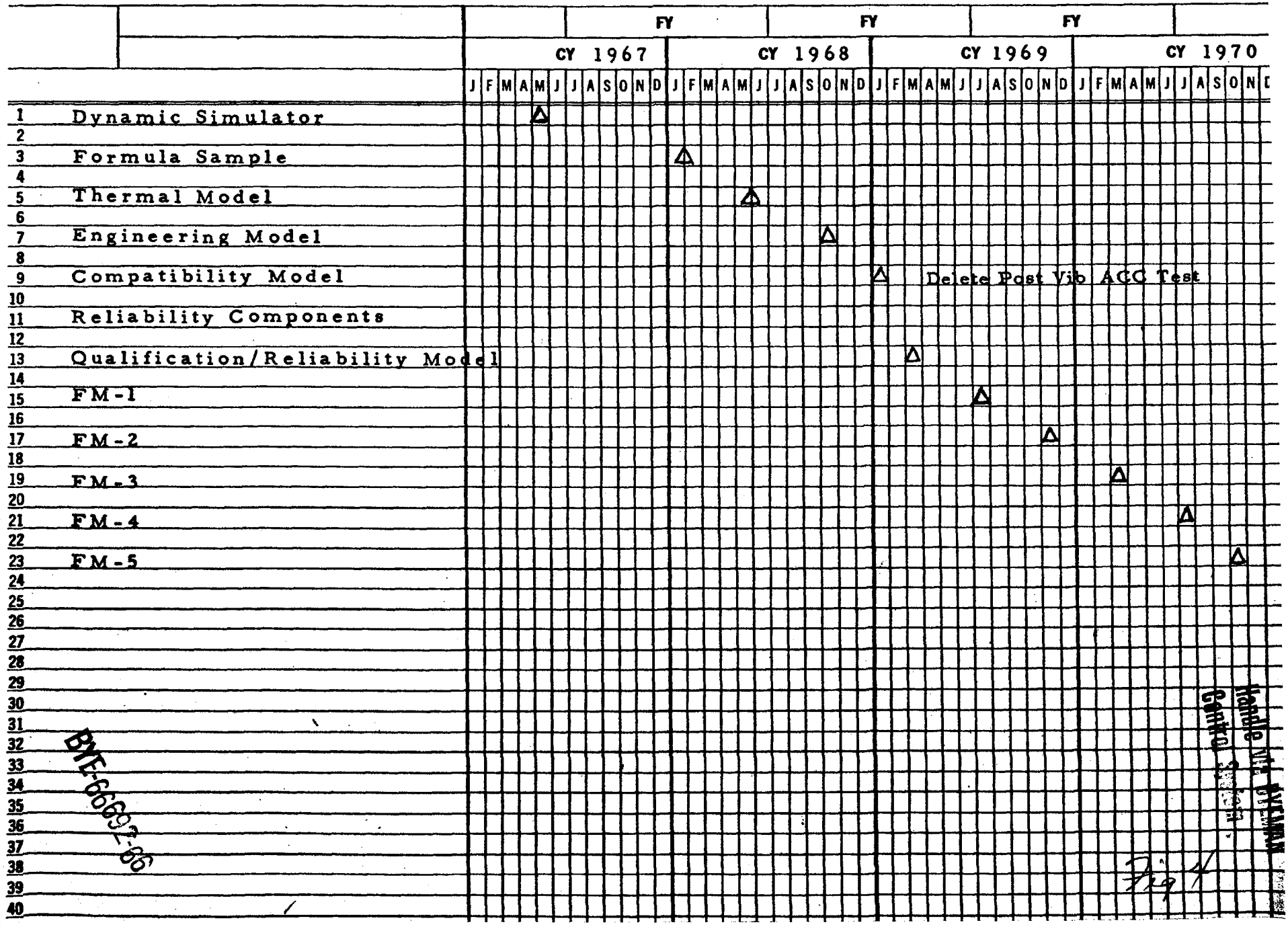
~~SECRET~~ Fig 3

SPECIAL HANDLING

BOOK

PROGRAM SCHEDULE

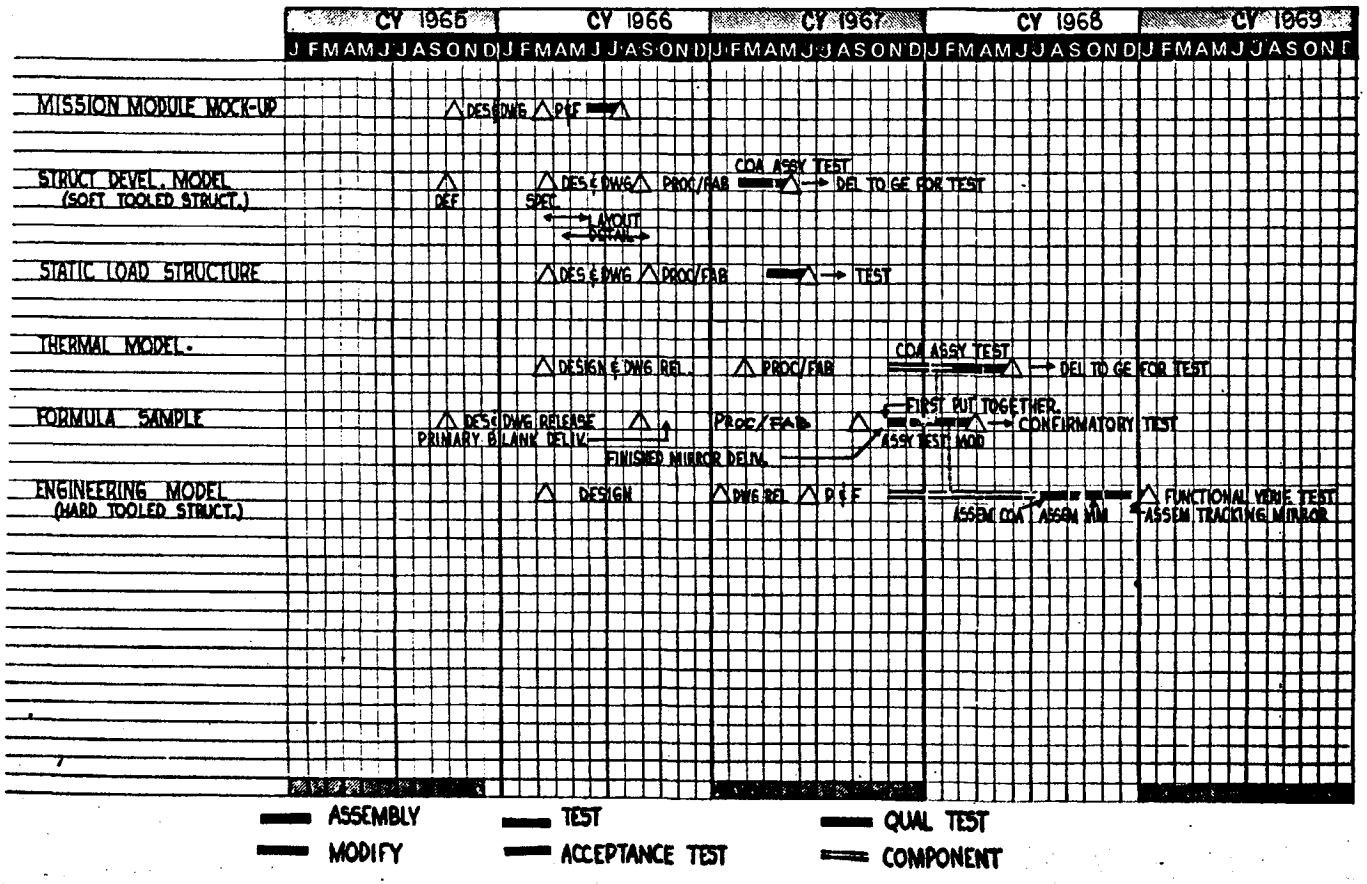
SCHEDULE - PLAN "C"



SPECIAL HANDLING
~~SECRET~~

[redacted]
March 31 1966

EM DEVELOPMENT PROGRAM
MARCH 31,1966



EASTMAN KODAK CO.

~~SECRET~~ 7195

SPECIAL HANDLING

BOOK 07 18

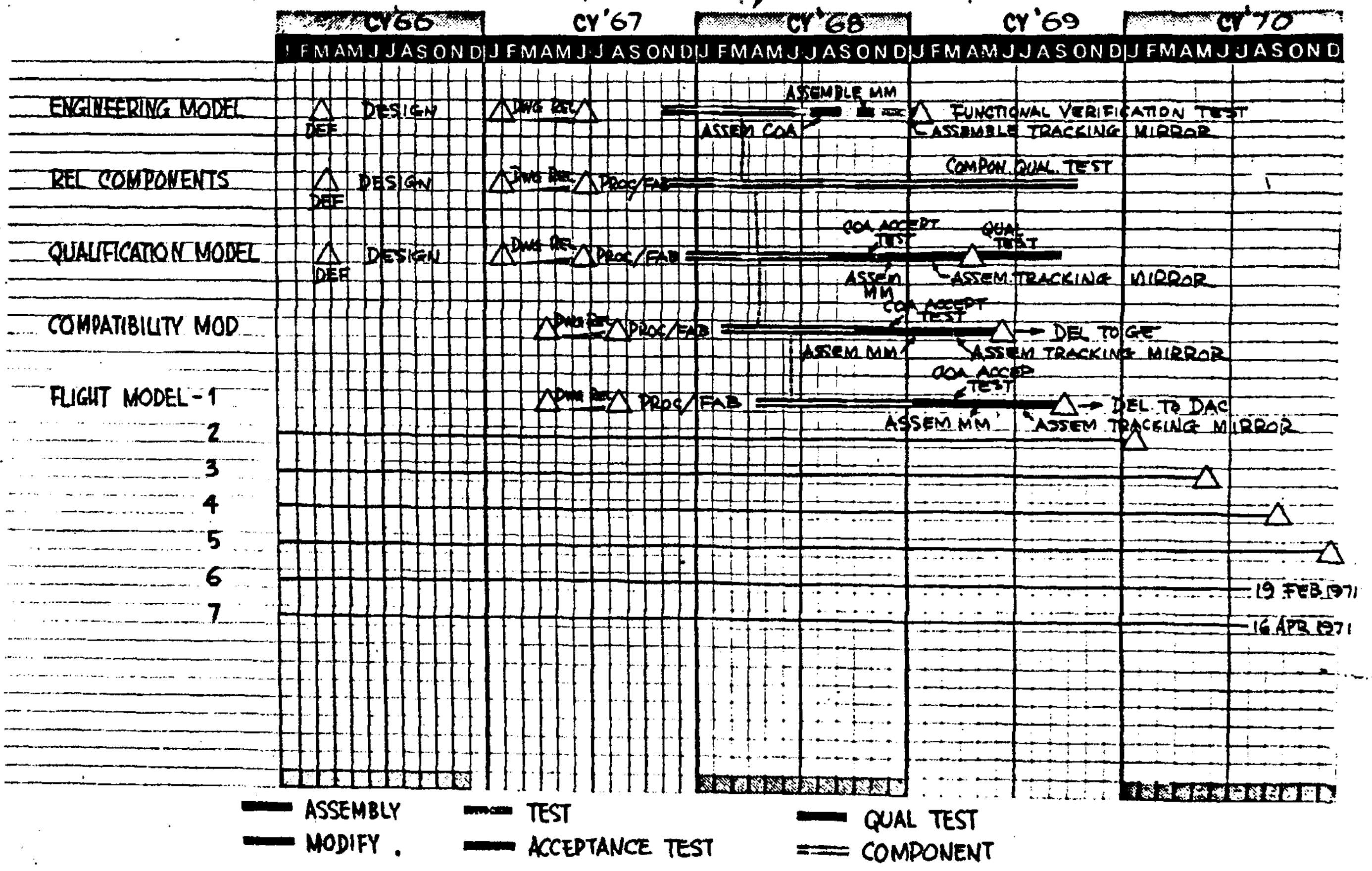
SPECIAL HANDLING

~~SECRET~~

[redacted]

March 31 1966

FM DEVELOPMENT PROGRAM
MARCH 31, 1966



BYE-66692-66

BOOK 07

EASTMAN KODAK CO.

~~SECRET~~ Fig 6

SPECIAL HANDLING

Handle via BYEMAN
Control System

DEVELOPMENT MODELS FOR THE DORIAN PROGRAM

Based on the experience gained from previous programs, six development models have been planned for the DORIAN Program prior to delivery of Flight Model #1; these are:

1. Dynamic Simulator
2. Thermal Model
3. Formula Sample
4. Engineering Model
5. Compatibility Model
6. Qualification/Reliability Model

In addition to these six models there is a Wood Mockup produced during the initial phases of the program. The purpose of these various models is as follows:

Dynamic Simulator

As a result of the difficulties encountered in attempting to analyze the complete dynamic behavior of the optics support structure to vibration for ground handling, boost and on orbit vibrations it is necessary to develop experimental data to allow system design to proceed. Thus the dynamic simulation must duplicate mass, inertia, and structural rigidity of the actual flight model. Early tests of this structure uncover resonance problems, structural magnification factors and produce data for component design requirements.

Thermal Model

The overall complexity of the Thermal Control Analysis and the inability to analytically predict installation effects result in a need for a thermal model. In general this model must duplicate the thermal characteristics of the prime hardware. The mass, thermal time constants of the structure, insulation effectiveness, and surface radiation characteristics must be duplicated. Previous programs have demonstrated that without an extensive test program it is impossible to design an acceptable system. The DORIAN Program is much larger and is more sensitive than previous systems.

Formula Sample

The optical system performance is obtained from very detail comprehensive analysis of the performance of each optics element. These analysis cannot include all the random effects of manufacture, installation and alignment. It is possible to use other than flight weight glass since the primary purpose is to demonstrate an acceptable optics formula and evaluate alignment tolerances and methods for aberration balancing. The actual demonstration of the optics system performance is an essential part of the development of the optics formula.

Engineering Model

The purpose of the Engineering Model is to develop a complete set of flight type hardware. Actual functional tests of all the

systems and processes proposed are shaken down prior to manufacture of the first flight model. All flight type equipment and systems must be used.

Compatibility Model

The primary purpose of this model is to uncover any interface difficulties in the entire flow plan. The shipment, integration in the mission module, compatibility with the laboratory, Titan III-M and all of the AGE is accomplished with this model.

Qualification/Reliability Model

This model serves to demonstrate the capability of all of the flight hardware to survive the intended environment and in addition demonstrate that adequate life exists.

The relationship of the above development models is shown graphically in the attached Figure. In general the development models are typical of the G & G^3 development, although some of the earlier model designations were not necessarily identical with D designations. The February change in roles and responsibilities has changed the designation of the dynamic simulator. The functions required of the dynamic simulator as described above will be met by a Static Load Structure (SLS) and a Structural Development Model (SDM). After use by EKC, the SDM will be refurbished and modified as necessary to be used by GE as the

Acceptance Test Simulator (ATS) for the camera optical assembly. Past experience has shown that each of the proposed models has been essential to an orderly development.

PROGRAM MILESTONES

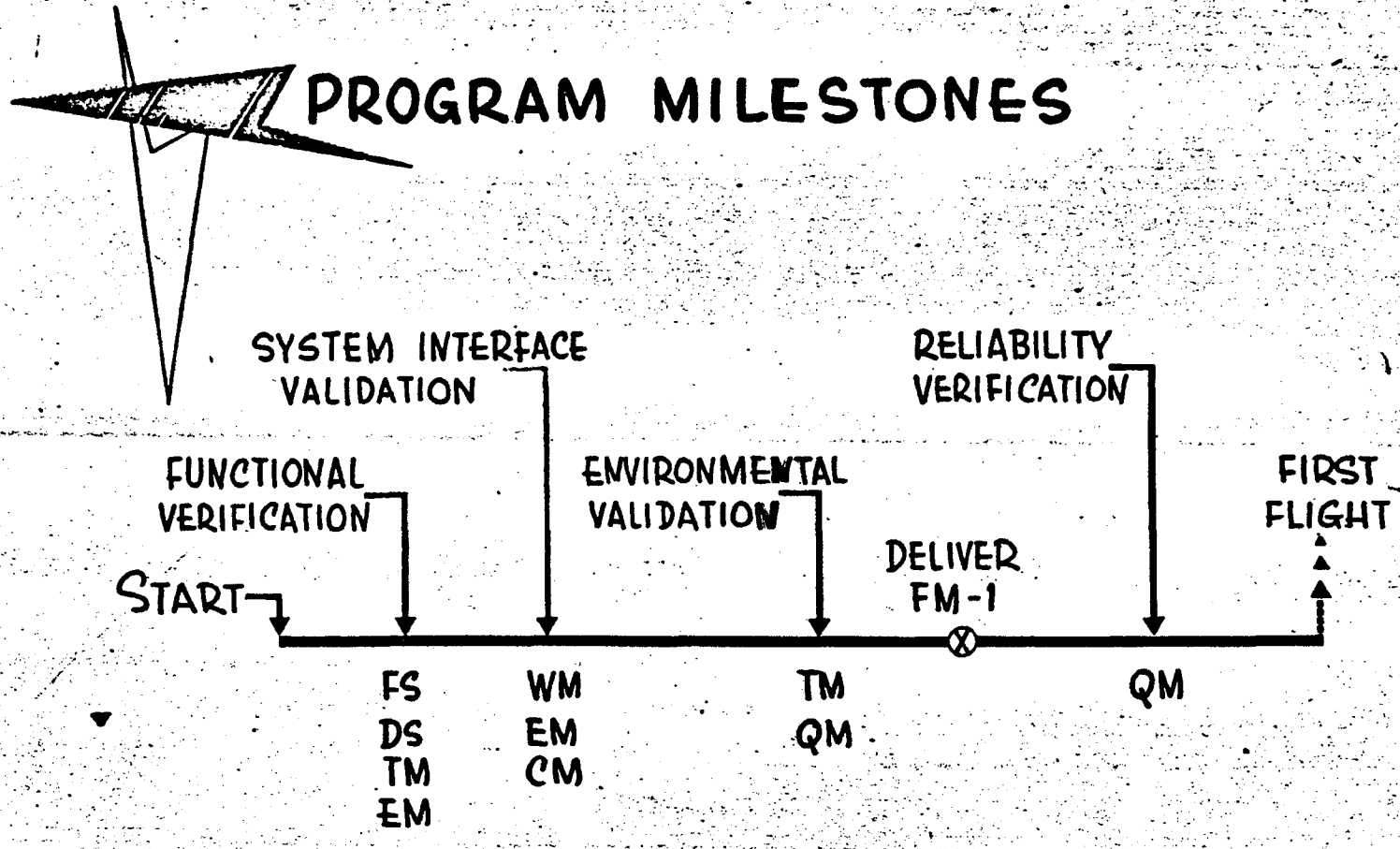


Fig. 26
PHOTO DOCUMENTATION