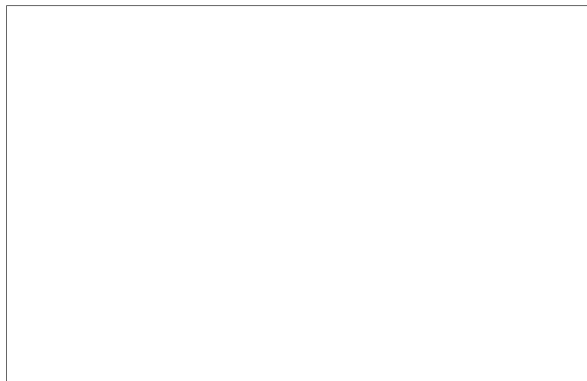
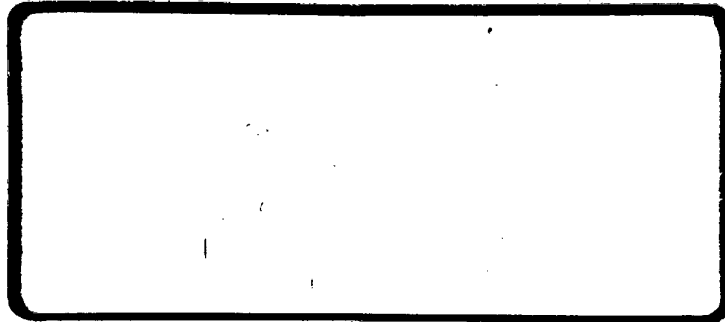


11038



STAT

STATUS REPORT

for Period

1 December through 31 December 1968

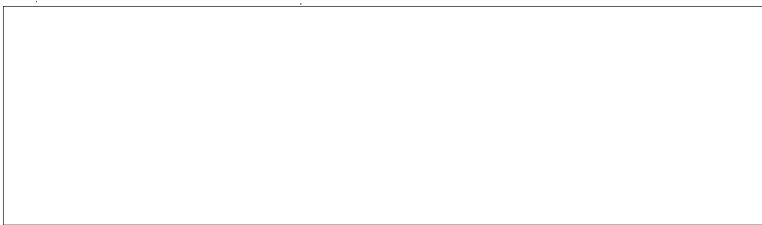
Submitted under Contract to

U. S. Government



File No. 11038

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This document is presented as the Monthly
Status Report under Contract to the U. S.

Government,

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The report period represented herein covers the
period of 1 December through 31 December 1968.

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APPENDICES

Trip Report - [redacted]
Tasks 16, 17, 18

Appendix I

STAT

[redacted] Progress Report
Task 24

Appendix II

STAT

[redacted] Progress Report
Task 43

Appendix III

STAT

Some Clarifications of Non-Real
Time Computations dated 11/10/67
Task 43

Appendix IV

PROGRAM STATUS

Summary as of December 31, 1968.

Scheduled percentage of program completed - 42.2%

Actual percentage completed this date - 40.1%

Overall progress during this report period has been substantially in accordance with the Program Plan.

The optical procurement has, however, suffered a schedule slippage of an estimated two months.

This has been integrated into the program schedule which now shows completion of acceptance testing at the customer's site by June 11, 1970.

Task 01 Statements of Work, Specifications,
 Report Preparation

Scheduled percentage of completion 42%

Actual percentage of completion 42%

 Data is being prepared and published as required. As of
this writing, all required reports and specifications have been written
and published.

 No new specification was prepared during this report
period.

Task 02

Scheduling and Planning

Scheduled percentage of completion 42%

Actual percentage of completion 42%

As reported in trip report (Tasks 16, 17 and 18), the optical subcontractor is predicting an additional two-month delay in shipment. This impact of this delay on the overall program is being evaluated.

STAT

Task 03

Test and Inspection Procedures

Scheduled percentage of completion 26%

Actual percentage of completion 23%

No work was performed on this task during the current report period.

Task 04 Management, Administration and Supervision

Scheduled percentage of completion 42%

Actual percentage of completion 42%

Program Management has been mainly concerned during this report period with Tasks 16,17,18 - Optics, and Task 43 - Computer Programming.

These tasks are not only critical to the successful performance of the Stereocomparator, but are also vital to the maintenance of the delivery schedule.

Additional details are included in the individual task discussions.

Task 05

Meetings

Scheduled percentage of completion 42%

Actual percentage of completion 42%

During the first week of December, the customer visited the [] facilities to review the progress on the fabrication of the Stereocomparator.

STAT

Following is the program agenda for the series of meetings:

December 3, 1968

9:00 a.m.	Meet in [] office. (4 customer representatives, [])	STAT STAT
9:15 a.m.	Meet in Conference Room. Review of schedules - []	STAT
9:45 a.m.	Plant tour and visit to electronic checkout operations - []	STAT
10:30 a.m.	Review of keyboard functions of the Stereo-comparator - []	STAT
1:30 p.m.	Review of computer program progress - []	STAT
2:00 p.m. til end of day	Review of computer program objectives - []	STAT

December 4, 1968

9:00 a.m.	Meet in Conference Room to discuss objectives of test target design - []	STAT
10:00 a.m.	Review of Instruction Manual objectives and general formats - []	STAT
1:30 p.m. til end of day	Discussion of project details as required - []	STAT

Task 06

Facilities

Scheduled percentage of completion 60%

Actual percentage of completion 50%

All air conditioning equipment was received during this report period. is currently in the process of scheduling the various contractors - ductwork, electrical, etc. - to complete the installation and start-up.

STAT

Scheduled start-up date is now February 15, 1969.

Task 07

Main Frame and Structural Elements

Scheduled percentage of completion 98%

Actual percentage this date 93%

No additional work was scheduled for this task during the month of December.

Task 08

Skin

Scheduled percentage of completion 35%

Actual percentage this date 30%

As reported previously, the aluminum skin for the various subassemblies already installed on the Stereocomparator has been fabricated and mounted in place.

As additional subassemblies are completed, their protective aluminum coverings will be fabricated by the Shop.

STAT

Task 09

Granite and Ways Assembly for Stages

Scheduled percentage of completion 88%

Actual percentage this date 79%

The two "T" sections that control stage movement were received from the vendor during the month of December. The granite supplier is experiencing some difficulty in fabricating the remaining sections, but has promised delivery the beginning of January.

The drilling and tapping of the holes and brass plugs for the two "T" sections is scheduled to begin in January.

Task 10

Air Bearings

Scheduled percentage of completion 50%

Actual percentage this date 50%

The installation of the air bearings used to support and guide the two stages is scheduled to begin the middle of February.

This coincides with the completion of the Clean Room facilities.

Task 11

Stage Drives

Scheduled percentage of completion 58%

Actual percentage this date 44%

The stage drive assemblies are completed and in storage awaiting installation on to the stages.

No work was scheduled on this task for the month of December.

Task 12

Film Drive and Transport System

Scheduled percentage of completion 50%

Actual completion this date 50%

The film drive and transport system is complete with the exception of minor modifications. These modifications are required to control the vacuum clamping and lift-off systems which are being worked on by the shop in connection with Task 13.

STAT

Task 13

Film Platen and Film Clamping

Scheduled percentage of completion 34%

Actual percentage this date 30%

The shop is continuing to test the film clamping assembly in order to resolve difficulties associated with the clamping device.

STAT

It is anticipated that this testing will be completed within the month of January.

Task 14

Film Cooling

Scheduled percentage of completion 22%

Actual percentage this date 24%

[] has performed an experiment with reference to the above task, to determine if the heat generated in a 3.0 density film would be sufficient to crack or locally spall the glass platen.

STAT

The experiment indicated that there should be no adverse effect on the glass platen.

[] work is described in Appendix I of this status report.

STAT

Tasks 16, 17, 18 Viewing Optics, Viewing Illumination
and Reticle Projector and Illumination

Scheduled percentage of completion 18%

Actual percentage this date. 29%

A monitoring trip was made in December to [redacted] STAT
various fabricating plants in France.

A detailed trip report covering discussions held with
[redacted] personnel is included with this status report as Appendix I. STAT
[redacted] has received [redacted] System Report, and has STAT
transmitted copies to the customer's technical monitor.

Task 20

General Platen Illumination

Scheduled percentage of completion 55%

Actual percentage this date 41%

The general platen illumination assembly has been completed.

Testing of this unit will be accomplished during the month of January.

We anticipate no problems regarding the operation of this assembly.

Task 21

Optical Bridge and Supports

Scheduled percentage of completion 90%

Actual percentage this date 90%

The optical bridge and installation tooling fixtures were shipped to the optical subcontractor for installation of the optics during the month of December.

Task 22

Interferometer Assembly

Scheduled percentage of completion 54%

Actual percentage this date 55%

The mechanical portions of this unit have been assembled. The electronic circuitry required to operate the interferometer assembly is nearly complete.

Testing will begin as soon as the stage drives are installed. This work is scheduled for the middle of February 1969.

Task 23

Optics Drive Assembly

Scheduled percentage of completion 38%

Actual percentage this date 38%

Approximately two-thirds of the electronic chassis required to operate the optics drive assembly have now been received.

The vendor reports that the balance of the chassis which are due in January will be on schedule.

Task 24

Image Analysis System

Scheduled percentage of completion 29%

Actual percentage this date 27%

Progress on this task is detailed in Progress
Report for period ending November 30, 1968 which is included
as Appendix II.

STAT

Task 26 Digitizing Logic Subassembly

Scheduled percentage of completion 79%

Actual percentage this date 80%

The digitizing logic subassembly is ready to be installed into the Stereocomparator.

No work was scheduled on this task for the month of December.

Task 27

Metric Readout

Scheduled percentage of completion 82%

Actual percentage this date 92%

As reported previously, the metric readout system is complete.

No work was scheduled on this task during the month of December.

Task 28

Output Logic and Interfaces

Scheduled percentage of completion 80%

Actual percentage this date 65%

The punch control section of the output interface chassis has been completed. Partial testing has been conducted by punching out information on the IBM card punch #526.

In order to completely test the chassis, it will be necessary to use both the console and control panel. These units will be available in about a month, at which time the testing of the output interface will be completed.

Plugs are now being installed on the internal computer interface chassis, and punch testing will begin as soon as this work has been completed.

Task 29

Cabling

Scheduled percentage of completion 82%

Actual percentage this date 80%

The percent progress of the cabling required to inter-connect the various electrical and electronic elements being assembled in the shop is as follows:

STAT

Cabinet #1 (Stage drives, film drive and transport system)	100%
Cabinet #2 (Optics drive, interface with Image Analysis System)	99%
Cabinet #3 (Metric Readout, output logic and interfaces)	87%
Electrical arrangement (floor inter-connection of all cables)	75%
Control Console	97%
Display Panel	10%
Optical Bridge	30%
Stage Assembly	73%

Task 30

Control Console and Chair

Scheduled percentage of completion 69%

Actual percentage this date 52%

The power supply required for the control console was delivered to by an outside vendor during the month of December. STAT

We anticipate that the wiring of the control console will begin during the month of January.

The operator's chair was ordered from an outside vendor during the month of December. Delivery is scheduled for next month. Upon receipt, the chair will be reworked by the shop to include STAT customer requirements not available from commercial chair suppliers.

Task 32

Computer

Scheduled percentage of completion 95%

Actual percentage this date 95%

No work was scheduled on this task during the
month of December.

Task 33

Electronic Racks and Control Cabinets

Scheduled percentage of completion 66%

Percentage completed this date 70%

Work is now in progress by an outside vendor on the finishing and installation of doors on the electronic racks and cabinets.

Delivery of the finished racks and cabinets is expected within the next report period.

Task 34

Utilities, Vacuum and Air Systems

Scheduled percentage of completion 39%

Actual percentage this date 30%

The utilities cabinet which is being finished by an outside vendor is virtually complete.

The electronic chassis required to operate the utilities has been completed, and is ready for inspection by personnel at the vendor's facilities.

STAT

Task 35

Vibration Absorption and Leveling

Scheduled percentage of completion 90%

Actual percentage this date 85%

A representative from [] visited the [] facilities the middle of December as scheduled, and determined that there were certain problems with the installation relative to the response time of the vibration absorption system.

STAT

[] is presently providing a modification for their vibration sensing elements which will be installed on the Stereocomparator prior to any further checkout. It is expected that the modified control equipment will be shipped to [] by the end of January 1969.

STAT

STAT

Task 36

Overall Assembly

Scheduled percentage of completion 19%

Actual percentage this date 7%

Overall assembly will begin again approximately the middle of February upon completion of the Clean Room facilities.

No work was scheduled for this task during the month of December.

Task 37

Radio Frequency Noise Suppression

Scheduled percentage of completion 0%

Actual percentage this date 0%

No work was scheduled on this task during the month
of December.

Task 38

Environmental Control

Scheduled percentage of completion 46%

Actual percentage this date 45%

No further work was accomplished on this task during the month of December.

We are presently awaiting details of the customer-designed air conditioning system.

Task 35 Vibration Absorption and Leveling

Scheduled percentage of completion 90%

Actual percentage this date 85%

A representative from [] visited the [] STAT
facilities the middle of December as scheduled, and determined
that there were certain problems with the installation relative to
the response time of the vibration absorption system.

[] is presently providing a modification for STAT
their vibration sensing elements which will be installed on the
Stereocomparator prior to any further checkout. It is expected that
the modified control equipment will be shipped to [] by the end STAT
of January 1969.

Task 36

Overall Assembly

Scheduled percentage of completion 19%

Actual percentage this date 7%

Overall assembly will begin again approximately the middle of February upon completion of the Clean Room facilities.

No work was scheduled for this task during the month of December.

Task 37

Radio Frequency Noise Suppression

Scheduled percentage of completion 0%

Actual percentage this date 0%

No work was scheduled on this task during the month
of December.

Task 38 Environmental Control

Scheduled percentage of completion 46%

Actual percentage this date 45%

No further work was accomplished on this task during the month of December.

We are presently awaiting details of the customer-designed air conditioning system.

Task 39

Reliability Analysis

Scheduled percentage of completion 0%

Actual percentage this date 0%

No work was scheduled on this task for the month of
December.

Task 40

Installation

Scheduled percentage of completion 6%

Actual percentage this date 6%

No additional work was performed on this task during the month of December.

Task 42

Breadboards and Test Devices

Scheduled percentage of completion 21%

Actual percentage this date 12%

Bench tests continue to be performed on the film
platen for the Stereocomparator (see Task 13).

Task 43 Computer Programming and Services

Scheduled percentage of completion 29%

Actual percentage this date 35%

 [] personnel have been working closely with [] STAT
personnel in the development and preparation of the programming
data for the Stereocomparator.

 A progress report of [] activities for the month STAT
of December is attached as Appendix III.

 An additional report detailing clarifications of the previously
supplied computer specifications is included as Appendix IV. The input
format shown is for use by [] in checking the [] program. STAT
It will be modified as needed before final delivery of the Stereocomparator.

Task 44

Preacceptance Test in Fabrication Plant

Scheduled percentage of completion 0%

Actual percentage this date 0%

No work was scheduled for this task during the month
of December.

Task 45

Acceptance Test in Fabrication Plant

Scheduled percentage of completion 0%

Actual percentage this date 0%

No work was scheduled for this task during the month of December.

Task 46

Acceptance Test after Installation

Scheduled percentage of completion 0%

Actual percentage this date 0%

No work was scheduled for this task during the month
of December.

Task 47 Instruction Manual and Drawing Submittal

Scheduled percentage of completion 9%

Actual percentage this date 6%

Work is continuing on the preparation of the Instruction Manual. Drawings are being revised to cover the "as built" status for various subassemblies.

Representative sections of the Instruction Manual will be submitted with the status report for January 1969.

Task 48

Spare Parts List

Scheduled percentage of completion 0%

Actual percentage this date 4%

Work is continuing on the compilation of the Spare
Parts List.

A representative section of this list will be submitted
with the status report for January 1969.

Task 49

Operator Training

Scheduled percentage of completion 0%

Actual percentage this date 0%

Work is continuing on the preparation of the Operator Training Manual which will be used to aid in training operators to use the Stereocomparator.

A representative section of this manual will be submitted with the status report for January 1969.

APP. I

TRIP REPORT

Company Contacted: [] STAT

Date Contacted: December 9-13, 1968

Contacted by: [] STAT

Job Number: #342, Tasks 16, 17 and 18

The first two days of the week were spent in review at [] with the STAT
 customer consultant, [] of Rochester, New York. [] STAT
 visit was stated to be for the purpose of providing an independent view of the
 status of the [] optical contract on behalf of our customer. STAT

[] expressed an interest in: STAT

1. Reviewing technical details of the optical design and the
 technical capabilities of [] STAT
2. The physical manufacturing facilities of [] related to the STAT
 optical and mechanical components.
3. The kind of work that [] was doing, whether or not it was STAT
 related to the Stereocomparator contract.
4. The broad capabilities of the [] designers and fabrication STAT
 groups from the point of view of recovering from defective design or
 execution in as rapid and competent way as possible.
5. The quality of the [] manufacturing work. STAT
6. The status of the schedule.
7. The effectiveness with which [] is monitoring the contract. STAT

Trip Report

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STAT

The optical design and optical parameters were first reviewed at the [redacted] plant where [redacted] and his assistants presented their design concepts, described the optical system, and answered many questions by [redacted]

STAT

STAT

STAT

A tour of the [redacted] operations was provided which showed various complex optical devices which [redacted] had under construction. The testing and assembly areas for the tank range finders and the nuclear submarine periscopes were visited, together with the miscellaneous optical and mechanical production areas.

STAT

STAT

[redacted] was taken to the French Nuclear Institute and to the French Geographical Institute and shown the various [redacted] plotters and stereo instruments in use.

STAT

STAT

[redacted] was taken to the [redacted] plant and shown the many [redacted] glass elements in process of fabrication. In addition, he was taken to the [redacted] where he asked questions regarding the performance of the computer work done by [redacted]

STAT

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In addition to the foregoing, [redacted] was present at the [redacted] plant when [redacted] made a presentation to [redacted] concerning the requirements and use of the tooling for the optical bridge installation which must be performed at [redacted] After acceptance testing at [redacted] the optical bridge will be transferred with the optical components mounted within it, back

STAT

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Trip Report

[redacted]

12/68

STAT

to the [redacted] plant for installation into the Stereocomparator.

STAT

The special tooling allows the bridge elements to be located in an exact position to within .001" of their actual position as used by the Stereocomparator instrument.

The [redacted] mock-up of the Stereocomparator is a concrete fixture which provides for holding the optical elements in the optical bridge so that the proper acceptance testing procedures can be performed in France prior to the delivery of the optical system to [redacted]

STAT

STAT

An additional presentation was made by [redacted] in the presence of [redacted] [redacted] as a guide concerning the general approach that would be used to establish the detailed procedures for acceptance testing. The procedures involve the use of certain special targets for testing the various optical elements and the electro-mechanical control modes required for the operation of the various optical sub-assemblies.

STAT

STAT

In essence, the test procedures will utilize high-contrast resolution targets with the proper size reduction so that the resolution can be directly determined at certain specified magnifications. A similar system of targets with the necessary size reductions will be provided for testing the anamorph system including anamorph rotation. The image rotation system will be tested using a rotation target contained in an eyepiece reticle arranged to read 0 to 360 degrees. These latter targets were obtained from [redacted] and were provided

STAT

Trip Report

[redacted]
12/68

STAT

to [redacted] for their consideration.

STAT

The anamorph targets would consist of a special measured grid pattern, linear in one direction and successively compressed in the perpendicular direction.

Simple perpendicular grid targets would be provided for checking distortion in connection with a graduated eyepiece. In addition, the reticle optical system whose function is to maintain a round reticle under various setting conditions of the main anamorph lenses would be tested by means of a graduated eyepiece where the graduations consisted of a series of concentric rings.

As time goes on, some of these testing concepts will require modification and, in any event, there are many details to be worked out.

[redacted] was in general agreement with the testing objectives outlined. STAT

They pointed out that the resolution targets were not of a uniform contrast ratio for all indicated resolutions. At the higher resolution indication, the contrast ratio fell off very rapidly due to the photographic media employed in preparing the targets. The customer is acquainted with this problem and is presently developing more accurate targets through the services of the National Bureau of Standards.

Trip Report

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STAT

After [] had left [] the routine monitoring procedures were followed whereby [] evaluates [] progress in the performance of their contract.

STAT

STAT

The progress of the job was reviewed with [] of the [] Planning Department. A percent completion schedule projection had been prepared in October 1968 for ten types of work by months, representing the job as a whole. A new document was prepared, bringing up to date the accomplishments of the previous two months, and this was compared with the October 1968 prediction for the two months.

STAT

As predicted, all the mechanical and optical materials had been received. In addition, all the castings were on hand. Some of the individual optical glass blanks had been damaged in the grinding operations, and therefore had to be re-ordered. These re-ordered items were not on hand.

In general, the work completed was not as much as had been predicted two months earlier. The mechanical effort had been predicted to be 56% complete, and was actually only 32%. This represents a time slippage of approximately two months. The optical work had been predicted to be 55% completed, and was found to be 31% complete. This represents a time slippage of approximately one month. The overall performance of the contract was found to be approximately two months behind schedule.

Trip Report

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STAT

The [] management was advised that this performance was unsatisfactory. STAT

[] explained that the fabrication effort was presently being carried out STAT

in four separate [] plants - [] STAT

[] STAT

One of the worst causes of the optical schedule slippage was stated by

[] to be due to breakage of glass and the necessity for re-ordering. STAT

There were not a large number of pieces involved in this situation; however, a small number of missing key elements holds up several of the basic assembly operations, and some glass had been re-ordered twice.

The slippage of the mechanical schedule appeared to be due to the fact that there was simply too much work and too many pieces to be machined all at the same time. Most of the many castings have been rough machined and have been marked out for finish machining.. The majority of this finish machining will be completed by January 8, 1969.

[] is apparently controlling the [] job in a special detailed manner. STAT

All documentation in the production and planning areas is rubber-stamped in large red letters with the letters [] This work is being processed in a STAT
priority and special handling manner. This may be instrumental in slowing up the actual production effort; however, it should, in the long run, result in a thorough and more satisfactory job.

Trip Report

[redacted]

12/68

STAT

Evidence was presented in the form of detailed documentation of the many in-process inspections. The effort expended in this area was very impressive, and presumably will result in properly acceptable mechanical parts.

Seven of the major sub-assemblies are to be made at the [redacted]

STAT

[redacted] These consist of:

STAT

1. Ensemble gauche prisme rotation image (branche exploration).
2. Ensemble droit prisme rotation image (branche exploration).
3. Ensemble gauche prisme rotation image (du projecteur de spot).
4. Ensemble droit prisme rotation image (du projecteur de spot).
5. Eclairage projecteur de spot.
6. Vehicules, éclairage du film.
7. Condenseur lampe, éclairage du film.

The [redacted] was visited by the [redacted] monitor. This is a large production optical facility, with production machining, assembly and test facilities, in addition to the optical glass fabrication equipment. It is a very complete plant and is engaged in the manufacture of microscopes, range finder optics, periscope optics and optical elements for the [redacted] scanners and plotters. [redacted] is building the entire illumination and condensor systems for the [redacted] job. Approximately 50% of the work has been completed with a balance of the work expected to be complete by January 1, 1969.

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Trip Report

[redacted]

12/68

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The [redacted] operation was impressive, and the manager and his assistants appeared aggressive and eager to get the work completed. The persons contacted at this plant were: [redacted]

STAT

STAT

[redacted]

STAT

The work of this plant was essentially on schedule. The [redacted] representative did not visit the [redacted] partly because of lack of time, but most

STAT

STAT

specifically, because this operation is primarily concerned with assembly

and the assembly work was not yet significantly in evidence. The [redacted]

STAT

management stated that it would be logical to review the [redacted]

STAT

in February 1968.

The [redacted] was having a problem in connection with [redacted] Sketch 509A

STAT

which showed four bosses on the end of the large castings associated with the illumination systems. The bosses were to be used for mounting the ignitors for starting the Xenon main illumination lamps. Unfortunately the dimensions of the mounting holes for the ignitors caused two of the through holes to run into the side wall of the casting. Permission was given to [redacted] to drill and tap the holes rather than drill through.

STAT

[redacted] asked to be sent the motors, gear boxes, potentiometers, etc.

STAT

so that the various driving gears could be fitted to the respective shafts of the servo system. This request was denied on the grounds that it was not desirable to individually fit the shafts to their mating parts since interchangeability and later possible replacement of defective components would

Trip Report

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STAT

be seriously affected. Most of the components in question had shaft tolerances of the order of 0.002". [] was therefore instructed to utilize clamp collet type attachments which would provide flexibility for interchanging components.

STAT

There are many parts to be provided for the optical assembly by [] and [] has asked that each part be properly tagged and marked as to the item name, assembly drawing number, and any special requirements for installation. [] asked in addition that they receive these parts as soon as possible so that any mechanical interferences or other incompatibilities can be found prior to final assembly.

STAT

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STAT

[] has completed the final report for the optical system design, and it will be sent to [] in the course of the next few days.

STAT

STAT

The factory problems relative to improving the present schedule were discussed with [] the production scheduler, and [] the manager of the fabrication plant at []. There was no immediate answer as to how to solve the production delay problem.

STAT

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[] agreed to study the situation and advise [] in the immediate future.

STAT

Trip Report

[redacted]
12/68

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When [redacted] had undertaken to provide the platen glass there had been a question relative to the friability of the platen material.

STAT

An experiment was therefore set up by [redacted] using a section of the same glass material of the same thickness and about 3" X 3" in width. An equivalent light path was provided with a 3.0 density film in contact with the glass surface. The light passed through two cold mirrors and one infra-red filter duplicating the illumination system of the Stereocomparator.

STAT

After one hour with the light turned on, there was no deterioration or noticeable cracking in the platen glass from the heat generated by the film. The illuminated spot was approximately 1/32" in diameter and air jets cooled the film.

The experiment was repeated with the air cooling jets turned off. Again the glass platen did not crack.

The experiment was repeated without the two cold mirrors. The film incinerated without the two cold mirrors and without the cooling air, but still the glass did not crack. On the basis of the experiment, [redacted] was told to go ahead and use the glass material from [redacted] for the [redacted] platens.

STAT

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Trip Report

12/68

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The manager of the optical fabrication department at [redacted] discussed with the [redacted] representatives the reasons for the slow down in this plant of the optical fabrication effort. Most of the difficulty apparently was due to breakage or other dimensional problems with the glass during the preliminary grinding operations. Some of the glass blanks have been rejected twice over. The total amount of glass rejected represents about 10% of the items to this date.

STAT

STAT

The [redacted] glass is being fabricated on the basis of 47-1/2 hours per week. All of the work in the rough grinding department at [redacted] material, 25% of the manufacturing operation in the polishing department is [redacted] work. In general, about 30% of the shop activity is [redacted] work.

STAT

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Because of the stringent standards set for the [redacted] glass blanks, many of the pieces are found to be non-homogenous, containing stria, etc. In order to maintain the quality demanded by the [redacted] optical designers for the [redacted] job, it is quite likely that additional delays are indicated and that the present one month slippage in the schedule could very likely extend to two months. This in itself does not represent a change over the presently predicted schedule delay overall of approximately two months. The two months delay is primarily set by the slippage in the mechanical fabrication effort.

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12/68

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One additional lens or mirror of each type is made over and above that required for the job. This provides for breakage of at least one element in each category.

The status of the work is approximately as follows:

Approximately 81 lenses completed.

27 lenses completed through rough grinding.

Re-ordered material, not on hand yet, for 10 lenses.

13 mirrors in final polishing.

36 prisms in process of roughing out.

In passing, it was noted at [] that the [] production records are very complete and it is possible to ascertain the status of every single element of glass.

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APP. II

PROGRESS REPORT FOR PERIOD ENDING NOVEMBER 30, 1968

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1.0 Progress During Reporting Period

Design modifications were started on the modulator which consists of changes to both the card itself and the modules used on the card. The module changes were physical alterations to pin usage and internal layout simplification. Subsequent updating of the modulator card also absorbed the module changes.

The layout work continued on the time base generator and sum and difference assemblies. Since this work included the standardization of practices to be followed throughout subsequent designs, checking and rechecking delayed the completion of these assemblies until the next period.

Layout changes to the image dissection assembly were investigated to prepare for repackaging its sub-assemblies. The desired result will be to improve accessibility to the internal sub-assemblies. Physical dimensions of the exterior are expected to remain constant.

The percentage of work completed cannot be related to end points during this period but will be so stated in the next report. The work is approximately 20% in progress.

2.0 Plans for Next Period

Assembly releases and procurements are expected in December on the sum and difference, time base, and modulator assemblies.

Since the image dissector assembly design is best performed from an overall view of its contents, a slight change of emphasis is planned. Modifications to the designs of the video amplifiers, deflection amplifiers and dynode regulators

will be considered during the next period, instead of interspersing the efforts on the correlator and image dissector assemblies.

3.0

Topics During [] Visit

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During the initial visit by [] led the discussion for [] He described the organization as it related to

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the project, the program plans, and the content of test slides. The content was unresolved during the meeting and deferred for further discussion. Also discussed was the air flow within the [] equipment. The need for forcing circulation in the image analysis assembly led to an exchange of TWX's in which the normal flow was declared to be right to left. As an aside, the height of the assembly was reestablished at 14.0 inches (nominally).

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APP. III




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MONTHLY PROGRESS REPORT


December, 1968

This technical report is for the reporting period from December 1 to December 31, 1968. This report is prepared according to 

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 Specification number DB-1001 (as modified).

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1. During this month extensive preliminary work on the non-real time portion of the final system has been completed. This work has uncovered some inadequacies in the existing specifications and an effort to resolve these problems has resulted in the generation of modified procedures by  cognizant personnel. The subprograms affected include CAMATS, T2PAN and TMAT.

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A new subprogram to be named RDCOR (read correlator) has been suggested and preliminary design work has been undertaken. The function of this subprogram is to input the correlator corrections and to modify the output commands to the stage and optical element servos. This routine will work with the subprogram TMAT in processing the correlator corrections.

Included in this report are flowcharts of the following subprograms:

- a. EXEC2
- b. TRK
- c. CAMATS

New flowcharts of the completed routines have not been generated

when there has been no change in the indicated procedure.

The subprograms in general are small enough not to require the generation of detailed flowcharts to complete the coding. When any exceptions are encountered detailed flowcharts will be produced and included in this report.

The subprograms of the final system which have been coded this month are:

- a. CVB
- b. MTS
- c. TRK

The subprogram TRK has been debugged this month.

Considerable work in the design and implementation of software to simulate uncompleted hardware has been undertaken. This will allow the performance of preliminary acceptance tests of the "Calibration System", and will facilitate the debugging of all of the hardware dependent subprograms.

The revised procedure for the subprogram T2PAN has been examined and work on the flowchart and coding has begun. The percentage of the total work completed is about 35%.

2. Next month we plan to continue work in the non-real-time portion of the final system and attempt to resolve all of the associated problems. Work will begin on the parameter input routines DATAIN, PARMOD, NOCAM, and STAGIN.

Coding and debugging of the routines CAMATS and T2PAN should be completed next month.

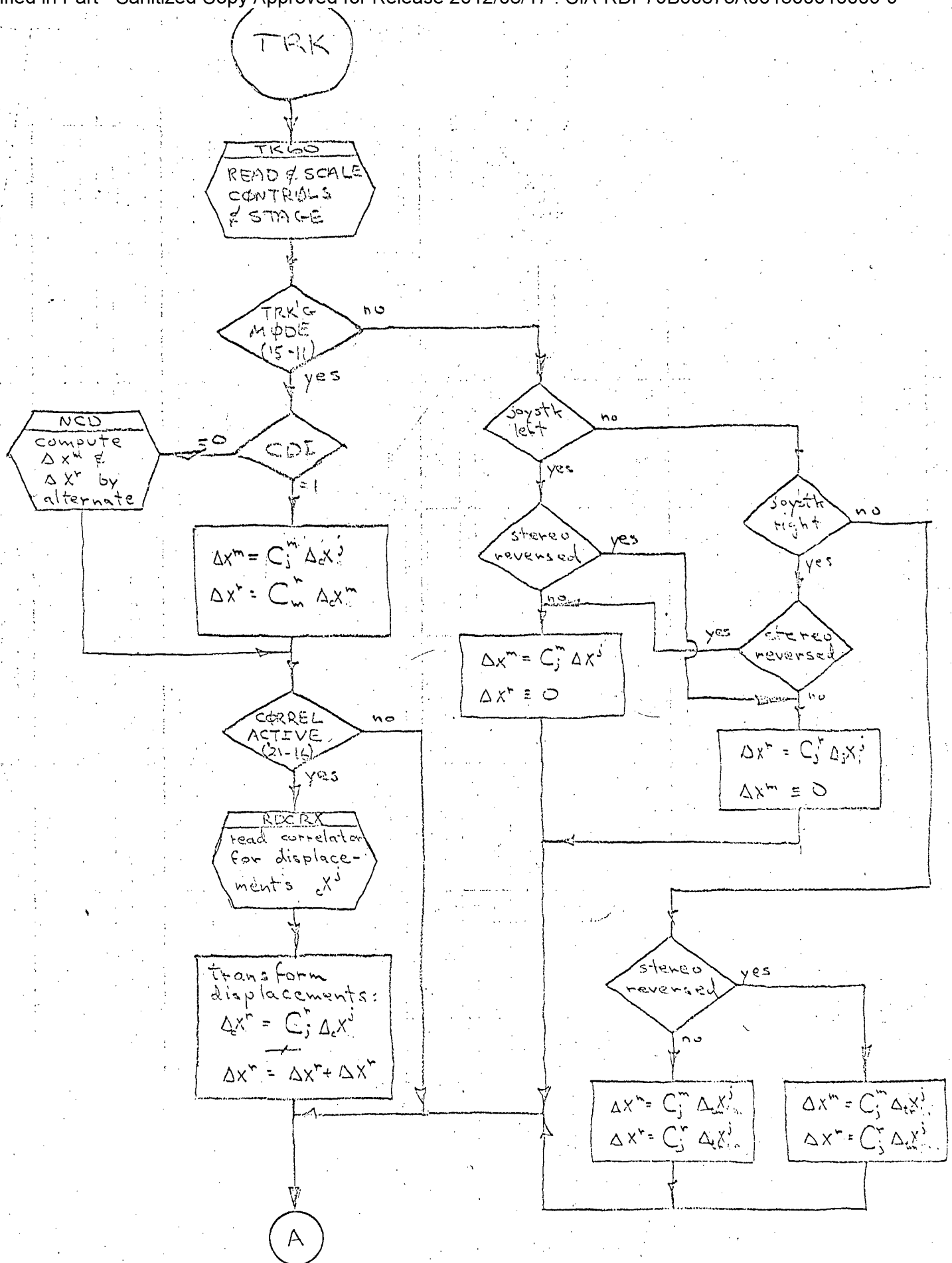
3. The problem of handling the "no camera data" case described last month still remains unresolved.

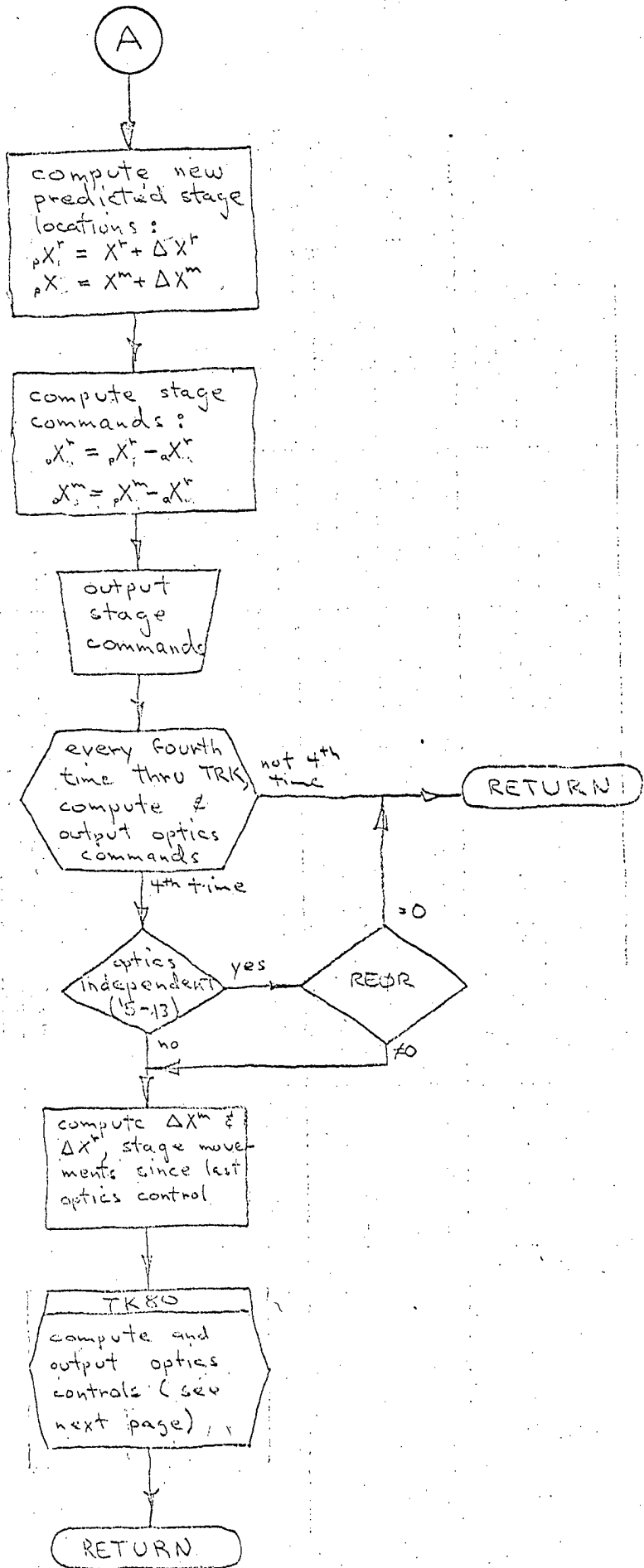
The method of processing the correlator corrections in the real-time program (contained in RDCOR) and the non-real-time program (contained in TMAT) has been under considerable discussion and investigation. At the present time no final decision has been made as to the method of implementation.

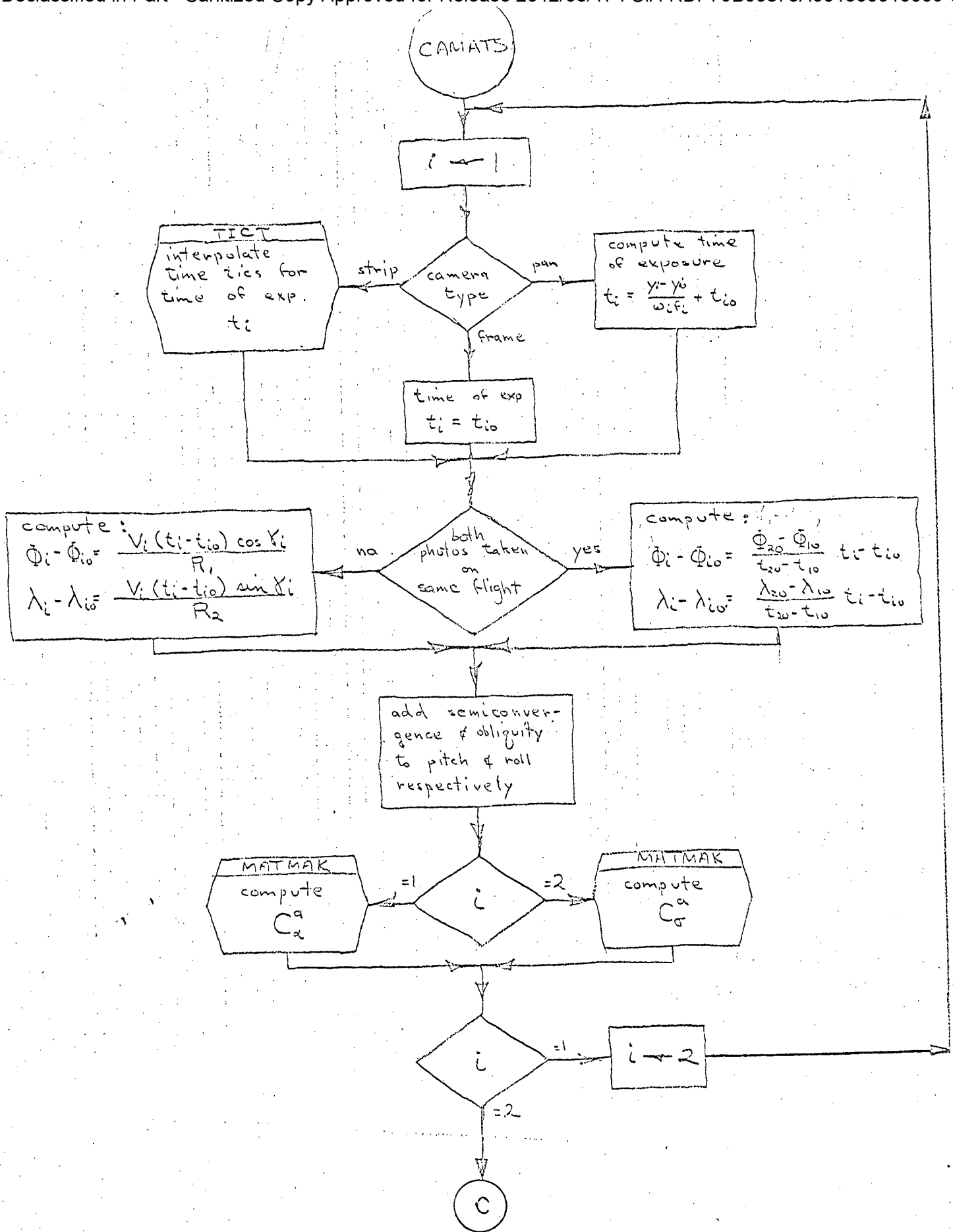
One model of an alternate method is under investigation and its adequacy is being determined. A final decision will include the comparisons of the estimates of storage and execution times of the machine language code for all models considered. The estimated code will be that which must be included in the real-time programs TRK and RDCOR.

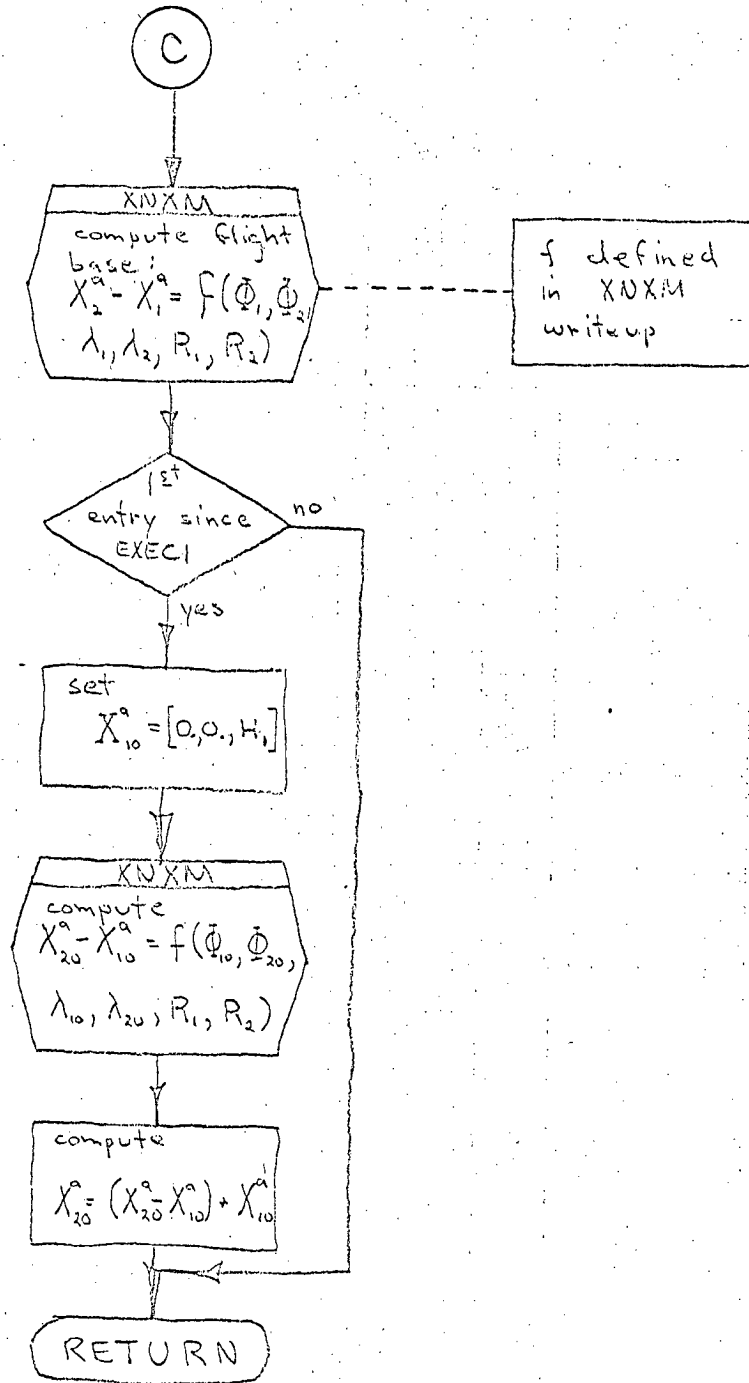
4. There exist no pending, unresolved contractual problems.
5. There have been no oral agreements or understandings reached during this reporting period.
6. The procedures contained in the subprograms CAMATS and T2PAN have been modified by These modified procedures will be flowcharted and final approval sought before coding is begun.
7. No other unresolved matters are known to exist.

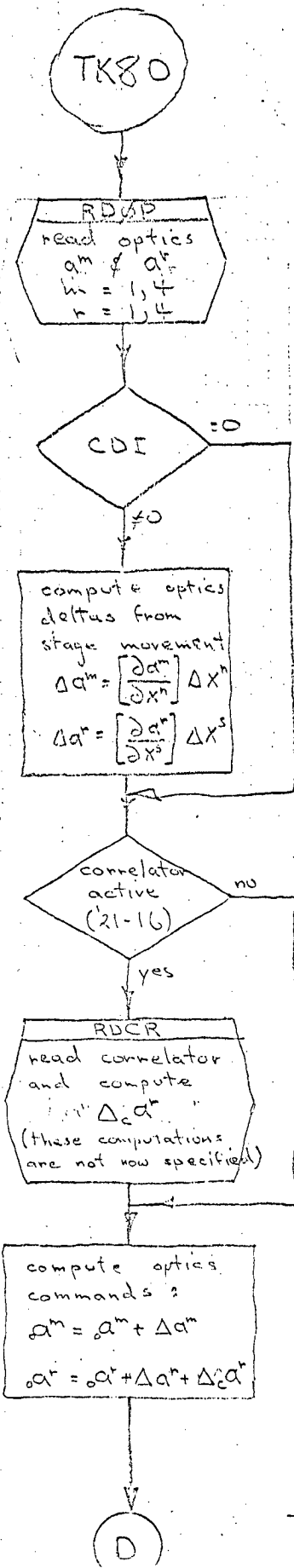
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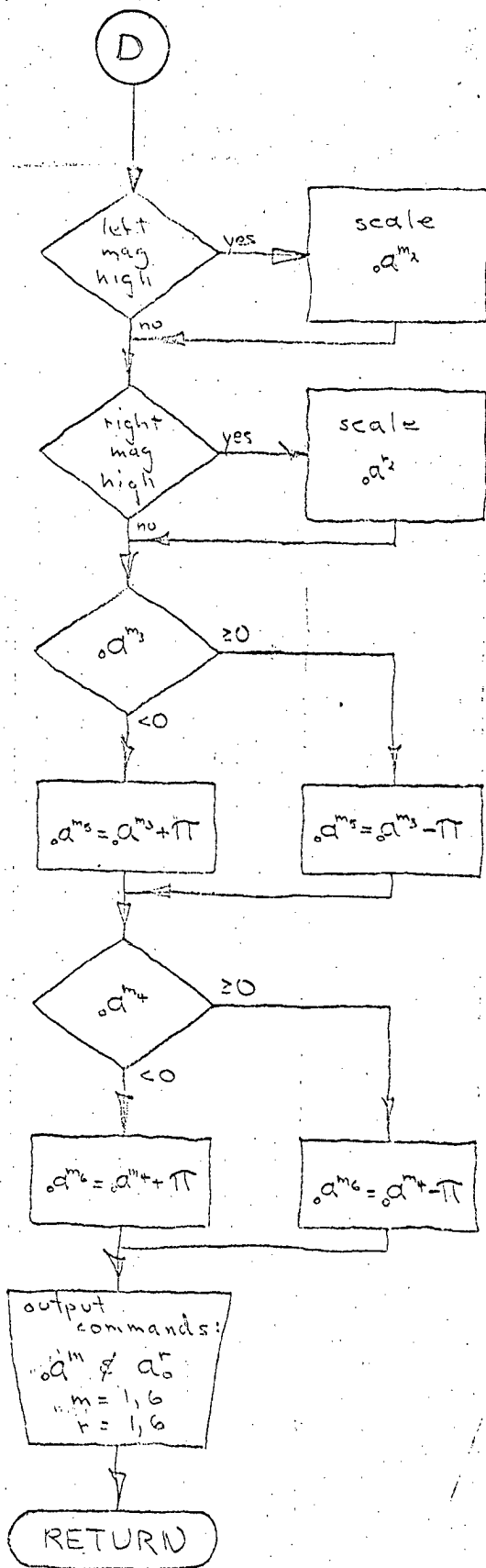


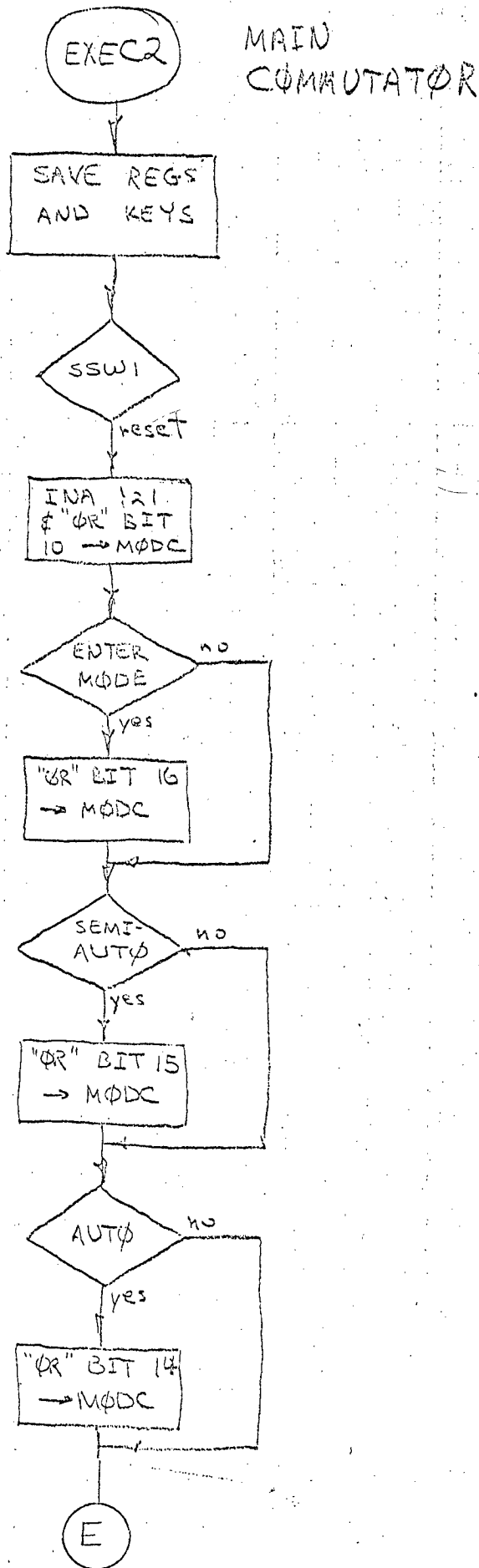


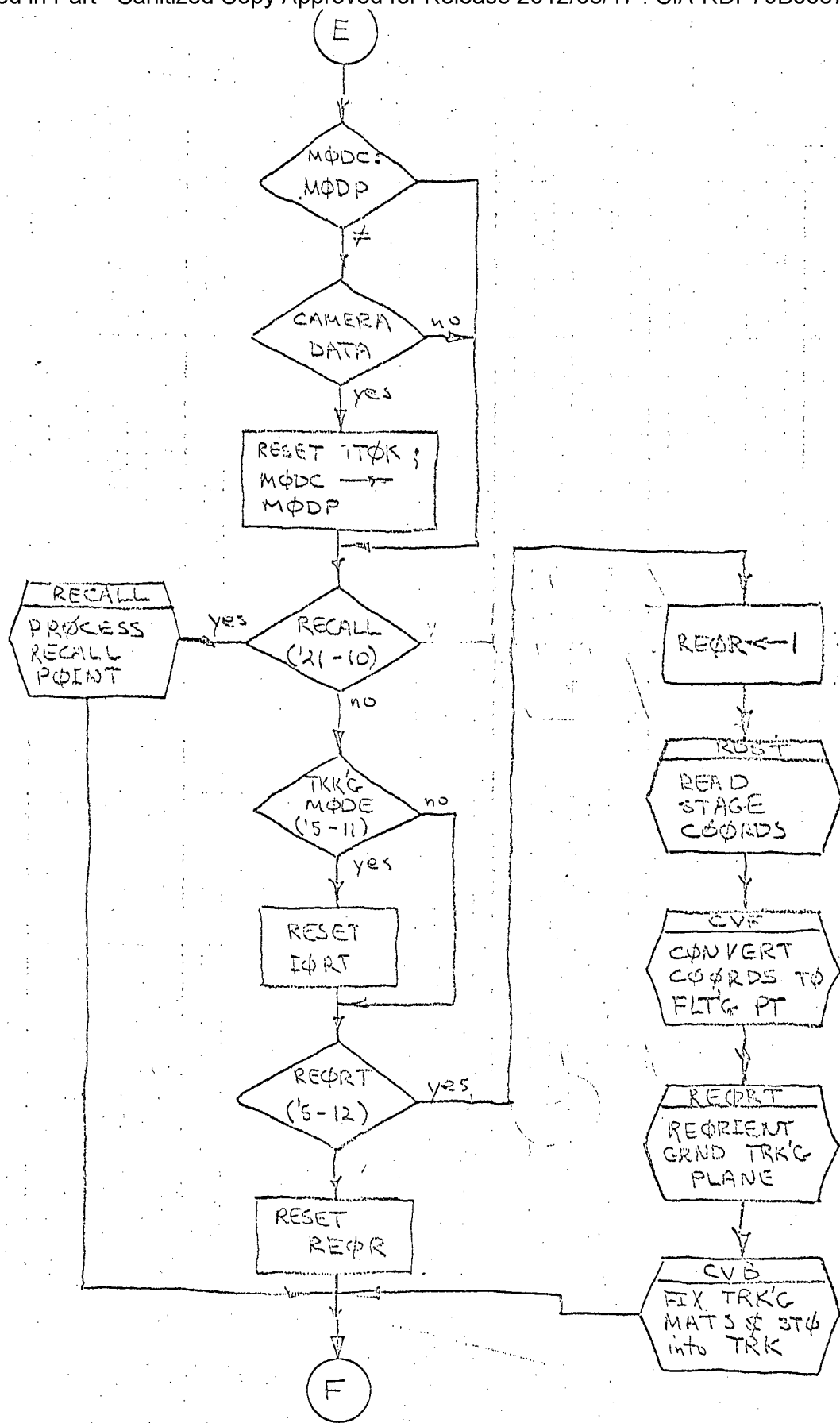


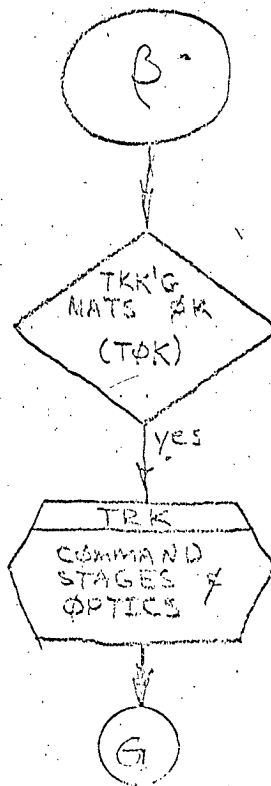
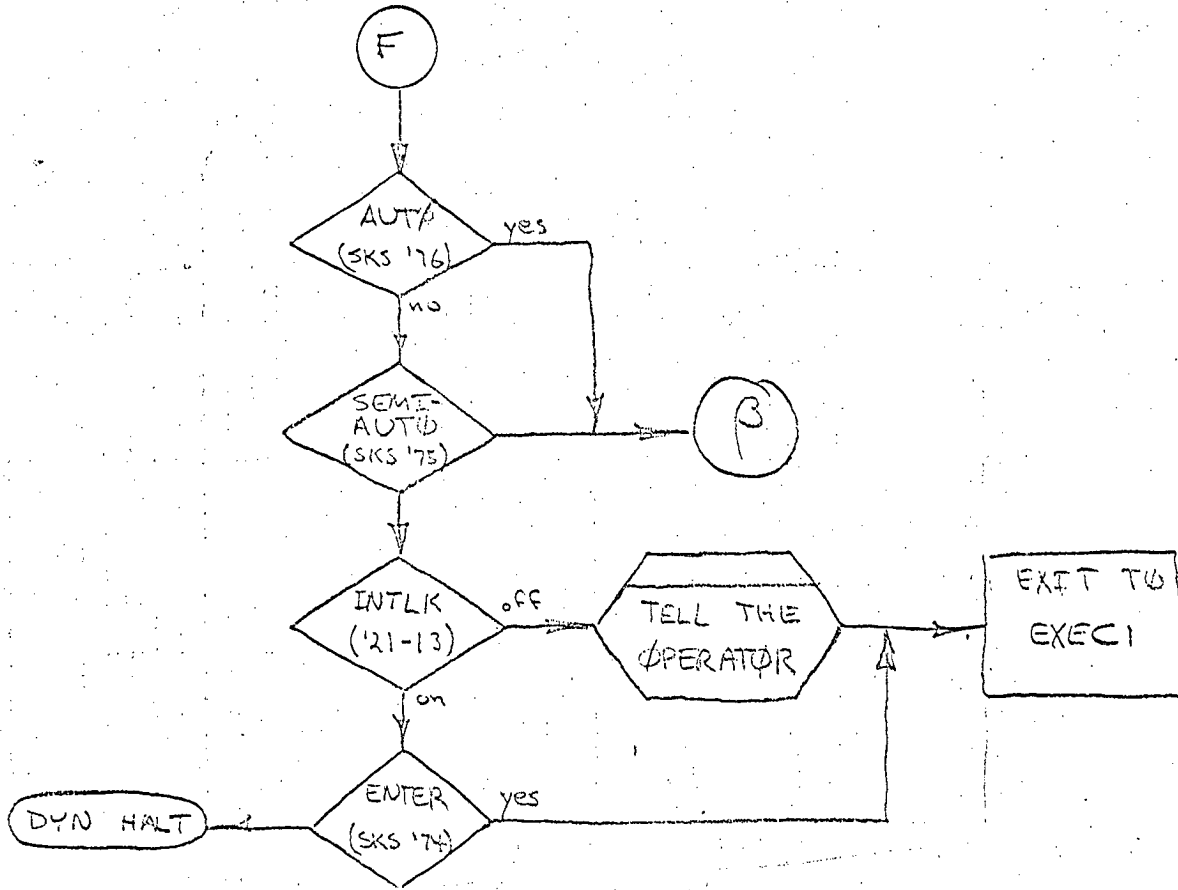




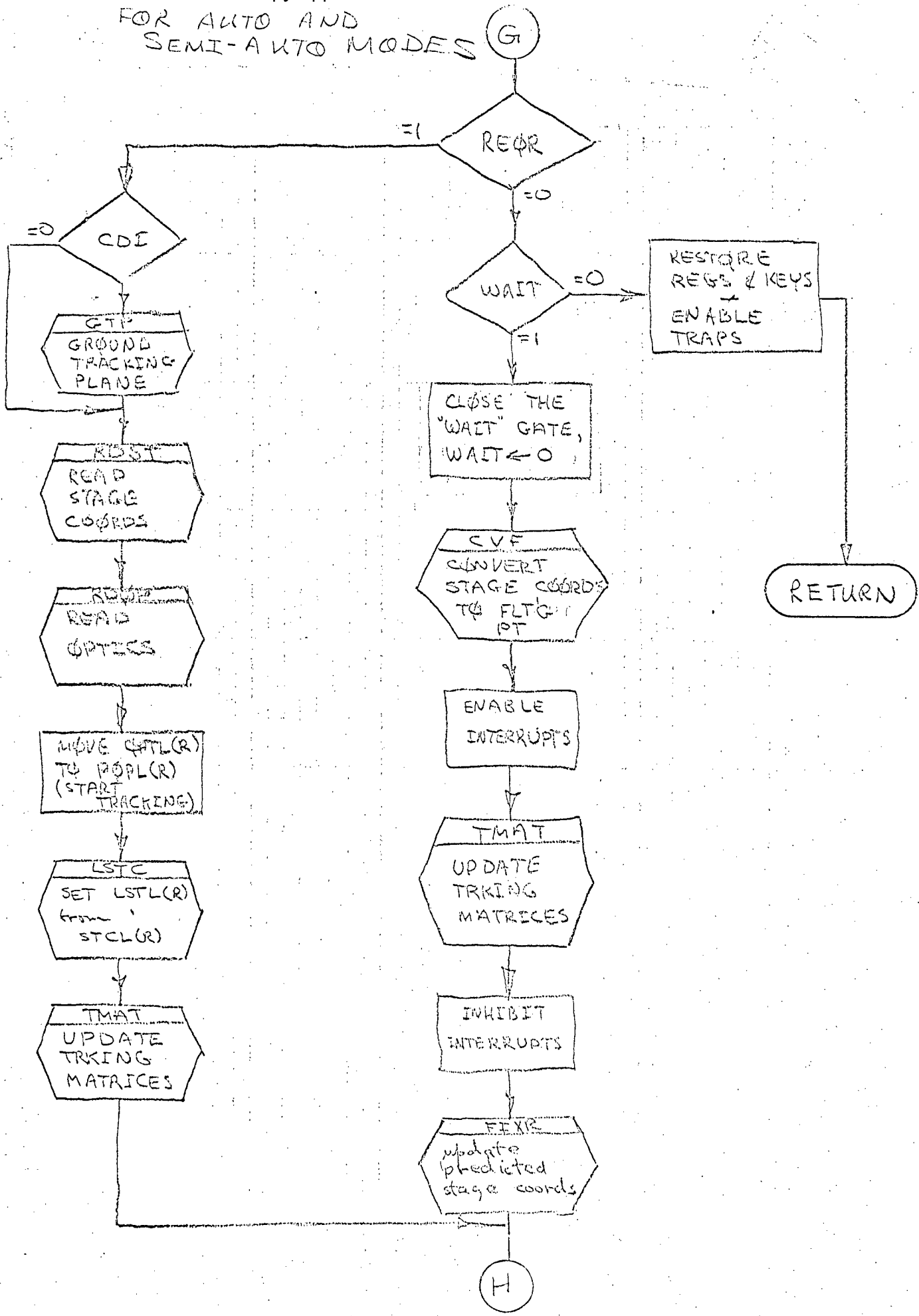


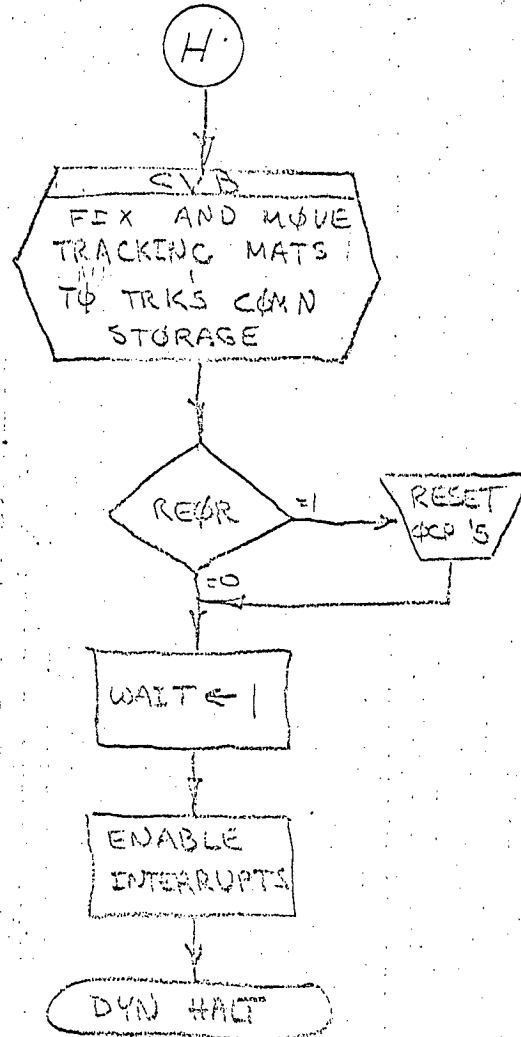


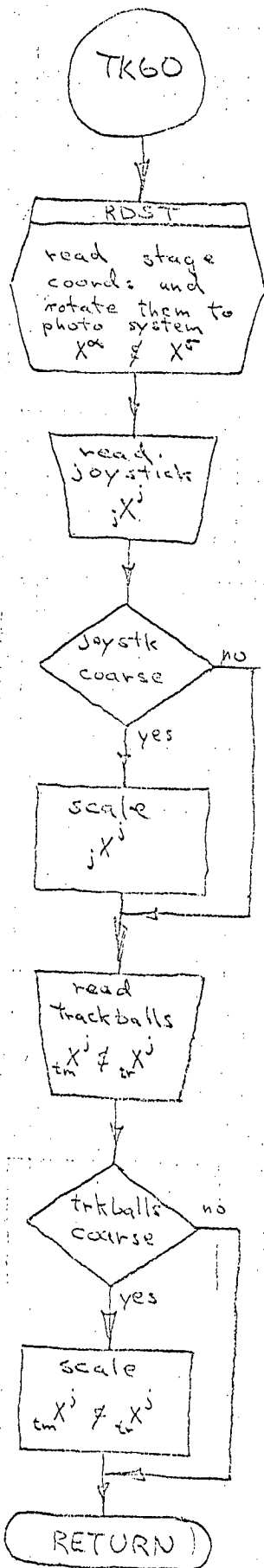




FOR AUTO AND SEMI-AUTO MODES (G)







APP. IV

SOME CLARIFICATIONS OF
NON-REAL TIME COMPUTATIONS DATED 11-10-67

1.1 It is suggested that the items called for be typed as follows:

For each item the computer types the name of the item and the required format (12 column field - left justified - filled out with blanks on the right). The operator then types the data in the specified format (12 column field) and terminates with a carriage return. Units are not specified. The computer should check the data for correct format and call for a repeat if an error is detected. Format symbols are as follows:

- S = algebraic sign
- X = decimal digit
- Z = alphabetic letter
- . = decimal point
- = separator

The following dummy format table and list of units is designed to be suitable for acceptance testing of the program by even though it may subsequently be modified by personnel for final delivery to the ultimate customer. Note that the program spec includes provision for such modification by providing table controlled entry to a section of memory reserved for insertion of code after the program is otherwise completed. Formats and unit conversion factors should therefore be kept separate for the three types of photography.

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1.1.10.1	Photo type F, S, or P	Z	
1.1.10.2	Stage L or R	Z	
1.1.10.3	If Z (in 1.1.10.1) = F		
1.1.10.3.1	Camera A or F	Z	
1.1.10.3.2	Focal Length	XXXX.XXXXXX	(in.)
1.1.10.3.3	Pitch	SXX-XX.XXXX	(deg.-min.)
1.1.10.3.4	Roll	SXX-XX.XXXX	(deg.-min.)
1.1.10.3.5	Yaw	SXX-XX.XXXX	(deg.-min.)
1.1.10.3.6	Latitude	XX-XX.XXXXZ	(deg.-min.)
1.1.10.3.7	Longitude	XXX-XX.XXXZ	(deg.-min.)
1.1.10.3.8	Altitude	XXXXXX.XXXX	(feet)
1.1.10.4	If Z (in 1.1.10.1) = S		
1.1.10.4.1	Camera A or F	Z	
1.1.10.4.2	Focal Length	XXXX.XXXXXX	(in.)
1.1.10.4.3	Pitch	SXX.XXXXXX	(degrees)
1.1.10.4.4	Roll	SXX.XXXXXX	(degrees)
1.1.10.4.5	Yaw	SXX.XXXXXX	(degrees)
1.1.10.4.6	Angle β	SXX.XXXXXX	(degrees)
1.1.10.4.7	IMC Velocity	XX.XXXXXXXX	(in./sec.)
1.1.10.4.8	Latitude	XX-XX.XXXXZ	(deg.-min.)
1.1.10.4.9	Longitude	XXX-XX.XXXZ	(deg.-min.)
1.1.10.4.10	Height	XXXXXX.XXXX	(feet)
1.1.10.4.11	Velocity	XXXXXX.XXXX	(ft./sec.)
1.1.10.4.12	Azimuth	XXX.XXXXX	(degrees)
1.1.10.4.13	Fl.Path Angle	SXX.XXXXXX	(degrees)
1.1.10.4.14	Same flight Y or N	Z	--
1.1.10.4.15	Time Tic Interval	XX.XXXXXX	(sec.)
1.1.10.4.16	Ref. Time	XX-XX.XXXXX	(min.-sec.)

1.1.10.4.17	No. T.T. Groups	XX	--
1.1.10.4.18	No. T.T.1st Grp.	XX	--
1.1.10.4.19	Time Ref. 1	XXXXX	--
1.1.10.4.20	No.T.T.2nd Grp.	XX	--
1.1.10.4.21	Time Ref. 2	XXXXX	--
1.1.10.4.XX	(continue for specified number of time tic groups.)		

1.1.10.5 If Z (in 1.1.10.1) = P

1.1.10.5.1	Camera A or F	Z	
1.1.10.5.2	Focal Length	XXXX.XXXXXX	(inches)
1.1.10.5.3	Latitude	XX-XX.XXXXZ	(deg.-min.)
1.1.10.5.4	Longitude	XXX-XX.XXXZ	(deg.-min.)
1.1.10.5.5	Altitude	XXXXXX.XXXX	(feet)
1.1.10.5.6	Velocity	XXXXXX.XXXX	(ft./sec.)
1.1.10.5.7	Azimuth	XXX-XX.XXXX	(deg.-min.)
1.1.10.5.8	Pitch	SXX-XX.XXXX	(deg.-min.)
1.1.10.5.9	Roll	SXX-XX.XXXX	(deg.-min.)
1.1.10.5.10	Yaw	SXX-XX.XXXX	(deg.-min.)
1.1.10.5.11	Scan Rate	SX.XXXXXX	(rad./sec.)
1.1.10.5.12	Fl.Path Angle	SXX.XXXXXX	(degrees)
1.1.10.5.13	Time Ref. 1	XXXXX	-
1.1.10.5.14	Time Ref. 2	XXXXX	-
1.1.10.5.15	Ref. Time	XX-XX.XXXXXX	(min.-sec.)
1.1.10.5.16	IMC Velocity	XX.XXXXXXXXXX	(in./sec.)
1.1.10.5.17	Same Flight Y or N	Z	

On some of the above items a carriage return with no data entered should produce a skip of the item.

1.1.10.6 All three types

1.1.10.6.1 Left Stage

- 1.1.10.6.1.1 #1 Recall X-Y SXXX-SXXX (mm.)
- 1.1.10.6.1.2 #2 Recall X-Y SXXX-SXXX (mm.)
- 1.1.10.6.1.3 #3 Recall X-Y SXXX-SXXX (mm.)
- 1.1.10.6.1.4 #4 Recall X-Y SXXX-SXXX (mm.)
- 1.1.10.6.1.5 #5 Recall X-Y SXXX-SXXX (mm.)
- 1.1.10.6.1.6 #6 Recall S-Y SXXX-SXXX (mm.)

1.1.10.6.2 Right Stage

- 1.1.10.6.2.1 #1 Recall X-Y SXXX-SXXX (mm.)
- .
- .
- .
- 1.1.10.6.2.6 #6 Recall X-Y SXXX-SXXX (mm.)

On items under 1.1.10.6 a carriage return with no data entered should produce a skip of the item and an EOM character should produce a skip of the remaining items for that stage.

Note that the X-Y Recall coordinates are basically in the photograph coordinate system (see 1.2 - 1.2.2) but for panoramic photographs the X and Y axes are interchanged.

In the following, one initial format is shown for all three types of photography. This should be handled so modifications may be made for each type separately.

1.1.10.7 Message Out: "Initialize one stage"

- 1.1.10.7.1 Measure origin reference
- 1.1.10.7.2 Measure 1st Fiducial
- 1.1.10.7.3 Measure 2nd Fiducial
- 1.1.10.7.4 Measure 3rd Fiducial
- 1.1.10.7.5 Measure 1st Time Ref.
- 1.1.10.7.6 Measure 2nd Time Ref.
- 1.1.10.7.7 (Strip type only) Measure all remaining specified Time Ref. (see 1.1.10.4.17)
- 1.1.10.7.8 (Strip type only) Measure all specified Time tics (see 1.1.10.4.17 - 1.1.10.4.XX).

1.1.10.8 Message Out: "Initialize other stage"

1.1.10.8.1 - 1.1.10.8.8 same as above.

1.6 It is necessary to slightly modify some of the formulae to allow for the fact that the altitudes (H_1 and H_2) are not always constant. For this purpose flight path angles (ν_1 and ν_2) (in vertical plane - with respect to horizontal - nose down = positive) are included in the input data (see 1.1.10.4.13 and 1.1.10.5.12). These changes are as follows:

1.6 Last item (H_1, H_2); change to read as follows:

H_{10}, H_{20}, H_1, H_2 = altitudes of two camera stations at times t_{10}, t_{20}, t_1, t_2 . Delete: (assumed constant unless other information given).

1.6 Additional items:

$\nu_{10}, \nu_{20}, \nu_1, \nu_2$ = flight path angle at times t_{10}, t_{20}, t_1, t_2 (nose down - positive).

1.6.1 Additional items:

$$H_i - H_{10} = [(H_{20} - H_{10}) / (t_{20} - t_{10})] (t_i - t_{10});$$

$$\nu_i - \nu_{10} = [(\nu_{20} - \nu_{10}) / (t_{20} - t_{10})] (t_i - t_{10});$$

$$\gamma_i - \gamma_{10} = [(\gamma_{20} - \gamma_{10}) / (t_{20} - t_{10})] (t_i - t_{10}); i = 1, 2$$

1.6.2 Change to read:

When the two camera stations occur on two different flights, or when the values for latitude and longitude are not given with sufficient precision to show significant difference for the two stations.

$$\phi_1 - \phi_{10} = [V_1 (t_1 - t_{10}) \cos \nu_1 \cos \gamma_1] / R_1$$

$$\lambda_1 - \lambda_{10} = -[V_1 (t_1 - t_{10}) \cos \nu_1 \sin \gamma_1] / R_2$$

$$H_1 - H_{10} = -[V_1 (t_1 - t_{10}) \sin \nu_1]$$

$$\phi_2 - \phi_{20} = [V_2 (t_2 - t_{20}) \cos \nu_2 \cos \gamma_2] / R_1$$

$$\lambda_2 - \lambda_{20} = - [V_2 (t_2 - t_{20}) \cos \nu_2 \sin \gamma_2] / R_2$$

$$H_2 - H_{20} = - [V_2 (t_2 - t_{20}) \sin \nu_2]$$

$$R_1 = N (1 - e^2 \cos^2 \phi_{10}) + H_{10}$$

$$R_2 = (N + H_{10}) \cos \phi_{10}$$

$$N = \frac{a}{[1 - e^2 \sin^2 \phi_{10}]^{1/2}}$$

1.6.4 Computation of air base (relative to system specified in 1.6.3).

Change to read as follows:

$\phi_1, \lambda_1, \phi_2, \lambda_2, H_1, H_2$ computed for corresponding times at which air base is evaluated. Use formulas in 1.6.1 or 1.6.2. Then:

$$X_1^a - X_{10}^a = (X_1 - X_{10}, Y_1 - Y_{10}, Z_1 - Z_{10})$$

$$X_1 - X_{10} = (R_1 [\sin (\phi_1 - \phi_{10})] + \frac{R_2}{2} (\lambda_1 - \lambda_{10})^2 \sin \phi_{10})$$

$$Y_1 - Y_{10} = - R_2 \sin (\lambda_1 - \lambda_{10}) [1 - (\phi_1 - \phi_{10}) \tan \phi_{10}]$$

$$Z_1 - Z_{10} = - \frac{N + H_{10}}{2} [(\phi_1 - \phi_{10})^2 + (\lambda_1 - \lambda_{10})^2 \cos^2 \phi_{10}] + H_1 - H_{10}.$$

The above formulas should be applied once with $i = 20$ to give $X_{20}^a - X_{10}^a$.

Thereafter they should be used twice (with $i = 1$ and with $i = 2$) each time

CAMATS is entered. Thus $X_2^a - X_1^a$ is calculated from $(X_2^a - X_{10}^a) - (X_1^a - X_{10}^a)$.

1.6.5.3 Rotate about new X axis by the angle of obliquity which is to be taken as the average value of roll.

1.7.1 Delete. (The values of pitch, roll and yaw specified for the two times t_{10} and t_{20} are to be taken as constants for the respective photographs.)

1.7.2 Delete. (See above.)

1.7.4 Delete "combined with semi-convergence."

1.7.5 Delete "combined with obliquity."

1.7.10 The direction cosines computed by the combined effect of all the rotations 1.7.3 - 1.7.9 will result in a 3 x 3 rotation matrix for each photograph. Provision should be made for both premultiplying and post-multiplying these matrices by 3 x 3 (different) matrices whose components will be obtained from the pre-processor section of the program. The resulting matrices will be labeled C_a^a for the first camera station and C_0^a for the second camera station.

2.2.2 Last item: separate the two equations which appear to be run together:

$$\frac{\partial t}{\partial x^a} = \frac{1}{v} \delta_a^{l'}; \quad v = v_m$$

2.2.4 Strip and Panoramic.

(Formula for v_M unchanged.)

$$V_1^a = (V_1 \cos v_1 \cos \gamma_1, V_1 \cos v_1 \sin \gamma_1, -V_1 \sin v_1)$$

$$V_2^a = (V_2 \cos v_2 \cos \gamma_2, V_2 \cos v_2 \sin \gamma_2, -V_2 \sin v_2)$$

These velocity components are then to be corrected by the rotations 1.7.7, 1.7.8, and 1.7.9.

(Formula for μ_a unchanged.)

Because the flight path is, in general, slightly curved the approximate formulae in 1.11.1, 1.11.3, and 1.12.2 should be used only when the increments involved are small enough so their curvature may be neglected. Thus t_{10} and t_{20} in these formulae do not refer to the same times as t_1 and t_2 in 1.6, but are rather corresponding fixed times close to the current values of t_1 and t_2 respectively. $X_{10}^a, X_{20}^a, x_{10}^m, x_{20}^r$ in these formulae refer to fixed coordinates at these values of t_{10} and t_{20} (hence are close to the current values of $X_1^a, X_2^a, x_1^m, x_2^r$). Thus it is proper that REORT calls CAMATS each time it's entered (i.e., 3 entries to REORT

results in 3 different sets of values for C_a^a , C_0^a , $X_2^a - X_1^a$, t_1 , and t_2 . The last set of these values then remains in common until the next time CAMATS is called (say by TMAT).

It appears, however, that when TMAT computes the tracking matrix X_m^r (as a transform of X_a^σ (see 1.11.6) it should use different values of C_a^a , C_0^a , $X_2^a - X_1^a$, etc., in the three successive calls to MTS. Hence these values cannot then come simply from unlabeled common. It is suggested that CAMATS return its results to the calling program which will put them in common if and only if the call was made for actual stage coordinates. In other cases the calling program will use the outputs of CAMATS for its own purposes.

CAMATS begins by computing values of t_1 and t_2 corresponding to (real or hypothetical) stage coordinates which are passed by the calling sequence. (These values of t_1 and t_2 are, properly speaking, part of the output from CAMATS.) When TMAT computes the tracking matrix, however, values are not known for the slave stage coordinates - hence it's necessary to find an iterative approximation - as is done in T2PAN for panoramic photography or in T2STRP (a subroutine not previously specified) for strip photography. The latter subroutines call YMR which uses results produced by CAMATS. Thus, strictly speaking CAMATS (as well as YMR) should be included in the iterative loop. It is assumed, however, that C_a^a and C_0^a do not change greatly during the iteration; hence YMR treats these matrices as constants but incorporates variations in $X_2^a - X_1^a$.

Thus it would appear that after MTS has used the above approximate iteration for slave stage coordinates it should produce a final call to YMR which uses updated outputs from CAMATS. One might then (in order to reduce the amount of handing variables around) make YMR part of CAMATS - but as a separate entry point. This would result in YMR being executed whenever CAMATS is called - which is not inappropriate. Similarly computation of V_1^a and V_2^a (2.2.4) might well be incorporated into CAMATS.