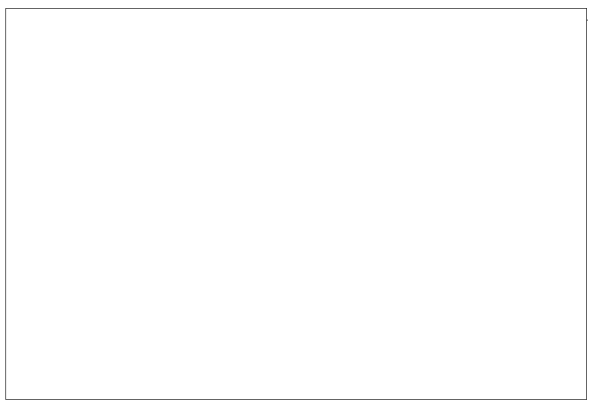
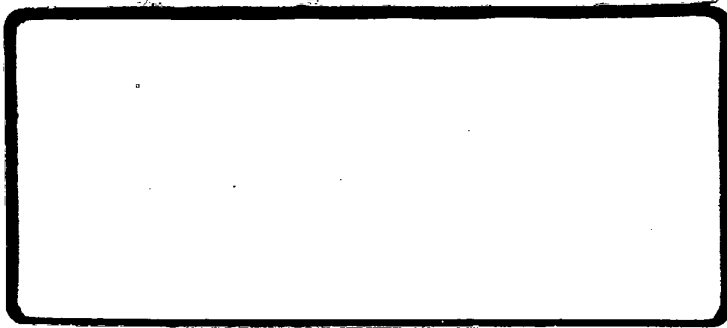


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STATUS REPORT
for Period
1 DECEMBER through 31 DECEMBER 1969
U. S. Government



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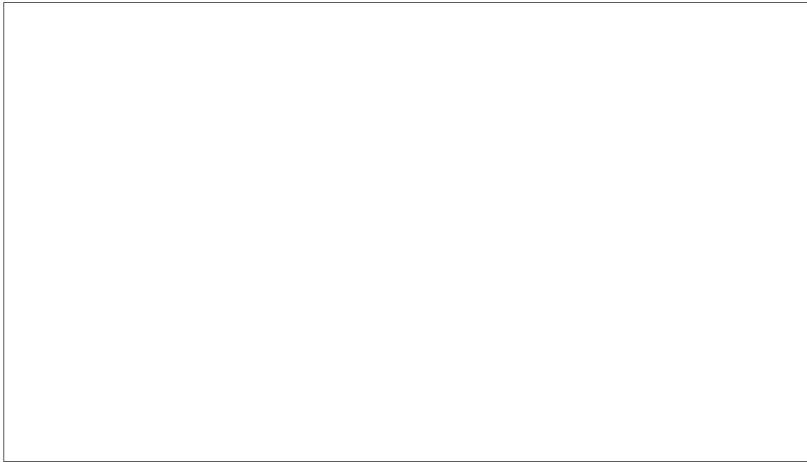
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This document is presented as the Monthly
Status Report under Contract to the U. S.

Government,

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The report period represented herein covers
the period 1 December through 31 December 1969.



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INDEX

	<u>Page</u>
Program Status Summary	1
Task 1 Statements of Work, Specifications, Report Preparation	T1 - 1
Task 2 Scheduling and Planning	T2 - 1
Task 5 Meetings	T5 - 1
Task 11 Stage Drives	T11 - 1
Task 12 Film Drive and Transport System	T12 - 1
Task 13 Film Platen and Film Clamping	T13 - 1
Tasks 16, 17 & 18 Viewing Optics, Viewing Illumination, Reticle Projector and Illumination	T16, 17 & 18
Task 22 Interferometer Assembly	T22 - 1
Task 23 Optics Drive Assembly	T23 - 1
Task 24 Image Analysis System	T24 - 1
Task 29 Cabling	T29 - 1
Task 34 Utilities, Vacuum and Air Systems	T34 - 1
Task 36 Overall Assembly	T36 - 1
Task 37 Electrical Noise Suppression	T37 - 1
Task 42 Breadboards and Test Devices	T42 - 1
Task 43 Computer Programming and Services	T43 - 1

APPENDICES

Progress Report - for period ending
November 30, 1969

STAT

Appendix I

Minutes of Customer Meeting

Appendix II

Trip Report

STAT

Appendix III

PROGRAM SUMMARY

Scheduled Percentage of Completion	81.8%
Actual Percentage this Date	77.1%

The lasers have been received back from STAT
 and final installation for the stage drives can now STAT
proceed.

The film drive and transport system has been found to meet the Stereocomparator specifications.

Coordination with the Image Analysis System subcontractor concerning certain unacceptable facets of their proposed acceptance test procedure continues. The version STAT
of the test procedure has now been sent to Itek.

Testing of the digital logic interface and the IBM 526 Card Punch is nearly complete, and all results thus far have been satisfactory.

TASK 1

STATEMENT OF WORK, SPECIFICATIONS,
REPORT PREPARATION

Scheduled percentage of completion 89%

Actual percentage this date 89%

This Status Report has been prepared and submitted

o on schedule.

Specifications for the Image Analysis System acceptance
tests have been written by and sent to (see Task 24).

STAT

TASK 2

SCHEDULING AND PLANNING

Scheduled percentage of completion	89%
Actual percentage this date	89%

The optical fabrication effort has been rescheduled by the optical vendor. Their testing activities are now planned for completion of February 25, 1970. During January and February 1970, the various subassemblies are to be installed in the optical bridge, with checkout and alignment complete by the middle of February 1970.

The delivery of the optical system is presently the critical element relative to the delivery schedule for the Stereocomparator as a whole.

TASK 5
MEETINGS

Scheduled percentage of completion	89%
Actual percentage this date	89%

The Contracting Officer's Technical Representative held a review meeting at the plant.

STAT

During this meeting the schedule and technical status of the Stereocomparator program were discussed.

A method of performing preventive maintenance and routine calibration tests, for the Stereocomparator, was suggested and discussed. It is proposed to use diagnostic computer programs in connection with previously standardized photography. This approach to the problem of minimizing service time and downtime appears quite feasible, however no suitable diagnostic computer programs presently exist.

The minutes of the meeting appear in Appendix II.

TASK 11

STAGE DRIVES

Scheduled percentage of completion	100%
Actual percentage this date	90%

The servo loop compensation for the stage drives had proceeded as far as was possible without the installation of the laser systems.

The repaired lasers have now been received and work can be continued.

Please see Task 22 report.

TASK 12

FILM DRIVE AND TRANSPORT SYSTEM

Scheduled percentage of completion	100%
Actual percentage this date	85%

Final compensation for the capstan rate loops has been completed. Tests on the film drive system indicate that all applicable Stereocomparator specifications have been met.

One final area of work remains in connection with the film drives; this involves replacing the microswitch assemblies on the dancer arm with a more reliable unit.

TASK 13

FILM PLATEN AND FILM CLAMPING

Scheduled percentage of completion 98%

Actual percentage this date 93%

Checkout of the film platen and film clamping system is continuing in conjunction with the associated utilities mentioned under Task 34 in this report.

TASKS 16, 17 & 18
VIEWING OPTICS, VIEWING ILLUMINATION,
RETICLE PROJECTOR and ILLUMINATION

Scheduled percentage of completion	92%
Actual percentage this date	92%

Please see the Task 2 report and the Trip Report
in Appendix III.

Assembly, checkout and calibration is proceeding.

The system performance is successfully meeting
the requirements for the completed subassemblies.

Presently, there are no known optical difficulties,
and the electrical and mechanical problems are solved as they
arise.

TASK 22

INTERFEROMETER ASSEMBLY

Scheduled percentage of completion	100%
Actual percentage this date	70%

The lasers have been returned to after replacement of the plasma tubes by the manufacturer

STAT
STAT

It was found that due to cable capacitance, the 10,000 volt starting potential for the units was not being transmitted by the cables.

A circuit analysis of this system was performed and it was found that the requirements for capacitance per unit length of the high voltage lead in the laser connecting cables were extremely stringent.

The laser power supplies have therefore been moved adjacent to the lasers, to brackets at the rear of each measuring engine. The system performance is expected to be fully satisfactory in this new location.

Electrical connectors have been ordered for the recabling necessary in connection with this change.

TASK 23

OPTICS DRIVE ASSEMBLY

Scheduled percentage of completion	98%
Actual percentage this date	90%

Checkout of the complete servo power supply system is complete. All components in the system appear to be performing satisfactorily. This Task is complete until the optics are received from the optical subcontractor.

TASK 24

IMAGE ANALYSIS SYSTEM

Scheduled percentage of completion 95%

Actual percentage this date 95%

During the report period, the five pairs of stereo slides for qualitative testing of the instrument were delivered [redacted]

STAT

Also submitted was the [redacted] formal test procedure which was judged by [redacted] to be unsuitable in several critical areas. A draft of a test procedure satisfactory to [redacted] has been prepared and sent to [redacted]

STAT

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It is clear that the Image Analysis System acceptance testing will have to be rescheduled [redacted]

STAT

[redacted] progress report for the period ending November 30, 1969, appears as Appendix I.

STAT

TASK 29

CABLING

Scheduled percentage of completion 98%

Actual percentage this date 97%

Work is commencing on the few remaining cables associated with the illumination system for the Stereocomparator.

It is expected that this task will be essentially complete by the end of the next report period.

TASK 34

UTILITIES, VACUUM AND AIR SYSTEMS

Scheduled percentage of completion 95%

Actual percentage this date 93%

The testing of the vacuum clamping and lift-off air systems is proceeding.

TASK 36

OVERALL ASSEMBLY

Scheduled percentage of completion	90%
Actual percentage this date	65%

Systematic testing of the digital logic interface is essentially complete. The computer link to the customer's external equipment is being thoroughly checked out in order to remove some extraneous noise in the digital logic associated with this system.

The work performed on the IBM 526 Card Punch has been found thus far to be satisfactory.

The work remaining on this task consists mainly of final debugging and testing of the stage drives and measuring systems. When the final stage drive loop compensation has been determined, the Stereocomparator will be ready for installation of the optical assemblies and also for checkout with the computer tracking program.

TASK 37

ELECTRICAL NOISE SUPPRESSION

Scheduled percentage of completion	80%
Actual percentage this date	75%

The systematic elimination of internally generated cross-talk and spurious switching signals continued as part of the debugging technique for the various electronic subsystems.

TASK 42

BREADBOARDS AND TEST DEVICES

Scheduled percentage of completion	95%
Actual percentage this date	85%

The servo test panel to be used in the optical acceptance tests has been received by them and is in use.

STAT

The switching panel and servo amplifier are also at Soplelem, and with this equipment they are proceeding to make the final adjustment of the limit switch cams, the phasing of the position feedback potentiometers and the polarity settings for the motors and tachometers.

TASK 43

COMPUTER PROGRAMMING AND SERVICES

Scheduled percentage of completion	90%
Actual percentage this date	80%

No further work has been performed by the Informatics programmer during this report period.

is continuing to evaluate the transfer function of the correlator outputs through the computer processing to the optics drives. The results obtained thus far are still not conclusive, but the requirement for a software automatic gain control subroutine is indicated.

STAT

STAT

This implies that an additional amount of computer programming will be required for the Stereocomparator.


App. I

PROGRESS REPORT FOR PERIOD ENDING 30 NOVEMBER 1969



STAT




PROGRESS DURING REPORTING PERIOD

The acceptance test plan was revised and submitted to  for approval.

STAT

The equipment was checked out with the revised procedures. Corroborative tests were made on the multiple error correspondence and pulsed response time measurements described in the revised test plan.


CHANGE OF PERSONNEL

Beginning December 15,  as Project Engineer on the  Image Analysis System.  a capable electrical engineer, will supply a fresh approach to the remaining work to be done on the system.

STAT

STAT

PLANS FOR NEXT PERIOD

 will require a small amount of time to become acclimated to the system. Subsequently, attention will be given to reducing the abnormal noise level on the X parallax output and towards fine tuning the system adjustments. Additional study of the implementation of the acceptance test may be necessary as well.

STAT

App. II

MINUTES OF CUSTOMER MEETING

JOB 342

December 2, 1969

Attendees:

[Redacted]

STAT

Contracting Officer's Technical Representative

Purpose: Discussion of progress on the Ultra High Precision Stereocomparator

During the meeting several topics were discussed. Various methods for transporting the optical assembly from Paris to the [Redacted] facility were suggested.

STAT

The Operating Instructions Manual outline, and a portion of the draft were reviewed by the Contracting Officer's Technical Representative. In addition, he discussed the Preventive Maintenance Service Manual, and the possibility of providing two diagnostic computer programs.

The results of the meeting were:

1. That military air transport might be the most feasible method for transporting the optical system to Berkeley from Paris.
2. The Contracting Officer's Technical Representative agreed with the general tone of the Operating Instructions Manual after reviewing the proposed outline and portions of the draft. He also agreed with [Redacted] suggestion that specific operations explained in the Manual be condensed and printed separately on easy-reference plastic laminate sheets.
3. The suggested scope and form of the Preventive Maintenance Service Manual also seemed acceptable to those present.

STAT

Minutes of Customer meeting
Job 342
December 2, 1969

4. The [] staff proposed diagnostic computer programs as part of the preventive maintenance procedure, and for calibration testing. The Contracting Officer's Technical Representative reviewed the [] suggestions, and concluded that appropriate proposals should be prepared []
- STAT
- STAT
- STAT

App. III

JOB #342

TRIP REPORT

Company Contacted:

STAT

Contacted by:

Contact Date:

December 5, 1969, through
December 17, 1969

Purpose:

Technical review of
Stereocomparator optical fabrication

A. Agenda for Visit to The Stereocomparator Optical Subcontractor

STAT

1. Review status of optical system hardware part by part.
2. Review all elements of the plan and schedule.
3. Review test procedures for Acceptance and Pre-Acceptance.
4. Review the Assembly Plan and the schedule for mounting
in the Test Fixture. STAT
5. Gather technical problems requiring solution. STAT
6. Present technical problems requiring solution by STAT
7. Instruct engineers in connection with the use of STAT
electronic servo test equipment.
8. Review completely the interface, with emphasis STAT
on anticipating and preventing contract postponements.
9. Review optical system packing design.
10. Review shipping plan.
11. Determine possibility of a partial delivery of the optical
subsystem.
12. Discuss acquiring up-to-date assembly drawings.

- B. 1. determined that the drive motors for both units of
the illumination system provided insufficient control of
acceleration. For instance, it required 20 seconds to stop
the system from full speed. To remedy this situation,
 increased the motor gear ratio by 8:1. This
arrangement allows sufficient control of acceleration,

STAT

STAT

Trip Report - Job 342 (cont'd.)

but unfortunately the motors are still badly overloaded and will have to be replaced with larger units.

2. One of the 4X ratio zoom systems was found to be mechanically inadequate. The entire guide system for it is being rebuilt. The other 4X ratio zoom system was satisfactory.
3. The air cooling and the electrical insulation for the lamp mountings in both main lamphouses were found to be inadequate. [] found that the present system for air cooling does not cool the condensers sufficiently, while it over-cools the lamps.

STAT

A quartz plate is being inserted to separate the condenser and lamp. Baffles will also be installed to limit the air flow to the lamp.

The present mounting insulation for the lamps is not adequate to withstand the starting voltage and must be redesigned.

4. Certain cams for operating the microswitches in the main illumination system main casting assembly, must be modified. They are the cams for auxiliary and first limit operation together for the afocal switching (40 vs. 80mm), and the fixed diaphragm plus field lens switching (also 40 vs. 80mm).

There are left and right systems, with 4 sets of cams each to be modified.

5. The reticle, objective and main zoom components of the left and right main optics systems are partly assembled. In the right system, the 4X zoom, 10X zoom, anamorph and Pechan, all for the reticle, are not installed. The

Trip Report - Job 342 (cont'd.)

50:1 afocal telescope reducer and the main 10X zoom are installed and appear operationally satisfactory. The objectives have been installed but not the air cooling attachment. (NOTE: The objective switching requires changing cams for the microswitch "dual" type operation.) Generally, for the right system, all wiring has been completed, but the potentiometers have not been phased and the microswitches have not been adjusted.

The left system is less complete. As of this visit, the 50:1 reducer, main 10X zoom and objective turret have been installed. (NOTE: Cams have yet to be changed on the objective switch assembly.)

6. Concerning the Reticle Pechans, one appears operational. The other is still exhibiting image wander, and is in the laboratory and assembly rework departments.
7. The left reticle lamp system is mechanically complete, including the light filter discs, the "red" filter switch system, and the condenser. The electrical parts are installed but not yet wired.
8. The three systems for the optical bridge have been installed in their final position on the test fixture. They are the housings for, (1) all optical elements for the left reticle and left viewing subassemblies, (2) the same for the right, and (3) the subassembly containing electronics for control of light level, scanning, and eyepieces.
9. Concerning the left and right main anamorph systems, work on the left system was stopped while extensive revisions were made on the right. These revisions are now essentially complete, with these results: the

STAT

Trip Report - Job 342 (cont'd.)

right system is optically complete. Mechanically, the potentiometers have yet to be oriented, the prisms are operationally satisfactory, and the rotation of the system is as balanced as it can be without extensive revision.

Work on the left system is now beginning.

10. The right reticle anamorph system is being wired. Optically and mechanically the system appears operational. Image wander approximates 10 seconds of arc.

The left system is complete including wiring. Image wander is presently being determined in the optical laboratory.

For both systems no potentiometers have been oriented or microswitches set.

11. Guidance systems for the left and right reticle 10X zoom systems are being rebuilt using the same optical elements, cams, etc. [] has decided that the original triangular internal guidance system was a fundamental design error on their part. They are redesigning it using external guide rods as in the main 10X zoom.

STAT

12. The main image relay telescopes located ahead of the eyepiece block are finished and appear operationally satisfactory.

13. [] has determined that the non-gear head 136A100-14 motors will not drive the main illumination condensers. The gears in the system have far too large an inertia, and the .08 amp motors slip in the gear hubs. [] proposes to make an epoxy joint for the motor gear. This will mean a spare part assembly.

STAT

STAT

It should be noted that [] has not yet computed the drive characteristics and inertia for this new arrangement, which will certainly affect the mechanical system including

STAT

Trip Report - Job 342 (cont'd.)

the [] electronic servo compensation subsystem. Subsequent to this report it was decided to provide new, larger motors and a different drive train.,

STAT

- 14. The right eyepiece block is optically operational.
- 15. The local shipping test of the right objective assembly was completed with positive results. Complete details of how the system was prepared for shipment appear in Tooling Drawing #008300401 (assembly) and Part Drawings #008300403, -4, -5, -6, -7, -8, -9.

The detailed test results report is dated December 5, 1969,

[]

STAT

A brief summary follows.

In the test the [] frame containing the entire objective system was mounted in the [] optical bridge. The moving parts of the optical system were clamped in special tooling which prevented either rotational or focusing movement, as follows: fiber washers were arranged so the upper peripheral thrust bearings were separated by 0.27mm, and the system clamped in this raised position, which prevented rotation. Focusing movement was prevented by 2 bolts screwed into the nose sections of the objective lenses. The bolts were supported by tooling from the [] casting and were mounted in their support plate by fiber washers, which are quite hard material.

STAT
STAT

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The [] optical bridge containing the objective system was then placed in an inner shipping crate and blocked in position with wood blocks covered with 5mm thick felt. This inner crate was encased in air bags (inflated to 100gms/cm², or 1.422 psi), and the whole placed in an outer shipping crate. The system was shipped by truck 25km outside of Paris over a badly surfaced road. Accelerometers set at 5 and 10g with

STAT

Trip Report - Job 342 (cont'd.)

time minimum sensing at 60cps were placed inside and outside the outer shipping crate. Neither accelerometer showed a reading after transit. The maximum truck speed was estimated at 40km/hr.

The test results indicated that this manner of packing and shipping caused a rotational deviation of 2 seconds of arc, or the equivalent of 3mm backlash. Prior to shipping the image wander was 1 second of arc. Other characteristics were unaffected.

In addition, the system was rechecked by passing an image from the objectives through the 10X zoom system and the deviation was found to be approximately $\pm 0.25\mu\text{m}$, a value within tolerance.

Additional data on backlash are being determined.

has suggested that it might be prudent for to determine if this method of clamping, used several times (as it must be in actuality), will increase the backlash each time.

STAT

16. Review of the main illumination filter disk system shows that the 24 volt printed circuit motors are underloaded. The electric system rotates the filters 360° from stop to stop in 3 seconds at 2.6v and with a current of less than 1.0 amp starting and 0.6 amp running.

Under these conditions the tachometer has an output of approximately 2.0v, and is operating at the same RPM as the motor which approximates 300 RPM maximum.

has determined that the 24v servo system will operate properly under these conditions.

STAT

It was also found that the MS plug called for in Drawing C8584A for the motor could not be used because of the space available. On their own, substituted

STAT

Trip Report - Job 342 (cont'd.)

a Continental Connector Corporation SM20-20H for the motor, tachometer, and microswitches. This plug is rated at approximately 2.0 amp per pin.

The [] Representative requested that all the extra pins in the plugs be used in parallel, which will make the connector good for about 6.0 amps.

STAT

17. [] has encountered technical difficulties with the microswitch mounting on the main anamorph. The pre-limit switches present no difficulties, and the first limit can be set exactly at 2:1, but the second limit cannot be set 2% further on because the potentiometer drive quadrant will hit the drive shaft on one of the prism mounts.

STAT

[] will either have to demount the quadrant and cut a notch in it, or reduce the range of the anamorph below 2:1. [] engineers are reluctant to cut the notch because the re-work may throw the system out of optical adjustment. The problem was not resolved at the time.

STAT

STAT

The main anamorph rotation and the image rotation operate microswitches which are required to indicate in which 180° sector of the full 360° the systems are. The micro-switch tolerance is approximately 3°. [] will examine this situation carefully to determine its possible effect.

STAT

C. [] was requested to perform the following work []

STAT

1. Compute the drive moment of inertia and required motor torque for the new gear systems in the main condenser and the adjustable diaphragms. Check the computed values with those provided originally in the [] Inertia Report.

STAT

Trip Report - Job 342 (contd.)

2. In connection with preparing the objective system for shipment, the clamping operation should be repeated 2 or 3 times using the tooling for the objective lens system. Check the backlash after each time. STAT
3. Design clamping and shipping fixtures for the other optical subassemblies, and test their effect by optical checks, as necessary.
4. Determine size and weight of the shipping containers.
5. Produce a test plan and detailed schedule, annotated to show how can fit in. STAT
6. Produce a schedule for the completion of the Stereocomparator.