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#1

Attachment 1 of F-5 Trip Report 10 Dec 58

SUMMARY OF ACTIVITY

29 Oct. - 5 Dec. 58

The following tests were completed:

T4 - Autobalance

Purpose: determine if autobalance is needed.
Conclusion: autobalance is needed, according to the subcontractor. Actually, the test proved only that the configuration goes out of balance if there is no pitch autobalance. It did not ascertain if the cause of imbalance could be removed nor that the autobalance was adequate to correct imbalance.

T5 - Position Servo

Purpose: test position servo over range 35 - 110°F.
Conclusion: performance satisfactory, according to H.

T6 - IMC

Purpose: determine if IMC command voltage is distorted, and locate distortion cause if existant.
Conclusion: IMC command voltage is not distorted, according to the subcontractor.
Actually, raw data shows voltage distortion, the test method was poor, and the entire test should be rerun. (A check in Ground Run #1 shows distortion exists.)

T7 & T8 - Entire Film Drive Mechanism & System

Purpose: inspect for wear.
Conclusion: only the vacuum solenoid slug showed wear, and this was slight.
At the present time, the film drive no longer operates satisfactorily -- it throws a film loop frequently. The entire film drive was retested by the subcontractor.

T9, T15 & T16 - Shutters

Purpose: for three different shutter modifications, determine vibration levels and frequencies, double exposure character and parts subject to wear.
Conclusions: all modifications showed similar characteristics. 30,000 cycles with few double exposures now is possible. Vibration data needs comparison with previous data. A modification is now being made to four shutters so all will be alike.

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Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

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Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

T17 - Ground Acoustics

Purpose: determine if acoustically coupled vibrations contribute significantly to observed inflight vibrations.
Conclusion: accoustic excitation creates negligible harmful vibration inflight.

T18 - Temperature Control

Purpose: learn how temperature affects resolution and focal length.
Conclusion: better test conditions are required to perform this test. However, increasing configuration temperature while holding lens temperature constant appears to slightly decrease focal length; and increasing lens temperature while holding configuration temperature constant greatly increases focal length. It is apparent that good control of the lens barrel temperature is required.

T21 - Vibration

Purpose: determine what causes 30 cps vibration in scanning flat during programmer steps 8 & 11, and determine vibration transmission along axis of pitch stabilization solenoid.
Conclusion: vacuum solenoid causes vibration in scanning flat and its mount; and an improved solenoid is needed. The pitch flexture transmits negligible vibration along axis of the plunger.

T22 - Autobalance Malfunction

Purpose: determine why autobalance will not compensate for alt end low condition.
Conclusion: potentiometer R23 was accidently mis-adjusted.

T23 - Optical Elements

Purpose: locate optical elements causing poor image as evidenced on photographic plates.
Conclusion: poor image results from distortion of collimated source because of air layering and turbulence. Also, project collimators should be tested in normal operating position with an auxiliary flat, not by rotating collimator's own flat.

T24 - Cager

Purpose: determine cause of cager solenoids' failure to recage when configuration is turned to standby.
Conclusion: a short circuit in instrumentation wiring held power on the solenoids.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

T25 - Autocollimate configuration

Purpose: ascertain system's optical quality.
Conclusion: image has flare on hard core; entire image was approximately 20μ (from a source of approximately 10μ). Optical limitation is well above present system performance.

T26 - Ground Run #1

Purpose: determine if configuration operates for entire mission; learn instrumentation required to ascertain if configuration operates correctly.
Conclusions: configuration did not operate correctly, since the pitch flexure broke twice, the follow-up potentiometer in the oblique drive servo broke down, and there is some variation in the IMC command voltage. Also, to photographically check performance, a shuntfield d.c. motor is needed on the collimator, and the room should have a stable temperature, which should be about 65°F if the lens barrel heaters are also to be checked. (Two other checks were made: The modified vacuum solenoid did not reduce transient vibrations in the scanning flat; and the data recorder was in good focus.)

T27 - Pitch Stabilizer Failure

Purpose: determine cause of lack of output from stabilizer.
Conclusion: cleaning connections on printed circuit boards restored operation.

T28 - Film Drive Check

Purpose: determine cause of tendency to throw loop on left side.
Conclusion: looping caused by one or more of: faulty microswitch, incorrect shimming, and gum on platen.

T29 - Overload caused by shutter

Purpose: determine why circuit breakers actuate when shutter is installed.
Conclusion: massive short circuit in shutter, probably caused by careless rework of shutter.

T30 - Oblique Drive

Purpose: determine why oblique drive goes to left limit stop without a command signal.
Conclusion: there was an open circuit in the follow up potentiometer, caused by a mechanical breakage.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

The following changes were completed:

C2 - Scan Balance

Purpose: balance scan assembly about scan axis.

C3 & C12 - Temperature Sensor and Control

Purpose: package components and install new (proper) sensor in lens barrel.
Putting the sensor in the lens barrel has proven to be unsatisfactory. The control system will be returned to its status of August until an improved system can be prepared and tested.

C5 - Focus Data Recorder

Purpose: focus data recorder properly.

C6 - Optical Alignment

Purpose: align system, square platen and focus.

C7 & C8 - Noisy Covers

Purpose: dampen and stiffen covers which are noisy.

C10 & C11 - Shutters

Purpose: prepare two shutters for comparative tests. One used steel belvillesprings instead of brass; the other used a flexible drive shaft instead of a gear train.

C13 - Oblique Drive Motor

Purpose: repair damaged terminals on oblique drive motor. (Terminals were broken in handling.)

C14 & C19 - Heaters

Purpose: disconnect and remove the heaters between I mirror and platen, and on the invar rods.

C15 - Relay K23

Purpose: remove relay K23, which was shorting ground to one side of phase A power during programmer steps 11, 1, 2, and 3. (Note: Relay K23 was supposedly not in active circuitry.)

C16 - Metering Motor Shaft

Purpose: replace broken flexible shaft with new one of same type.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

C17 - Autobalance Repair

Purpose: adjust potentiometer R23 to proper setting.

C18 - Levels

Purpose: reset levels to proper indication. (Levels had been improperly adjusted in C8.)

C20 - Temperature Controller

Purpose: install test jacks to permit easy calibration check.

C21 - Oblique Brake Release

Purpose: remove oblique brake release circuit, since it prevented cager solenoids from caging.

C22 - Programmer

Purpose: install programmer with properly adjusted tension on the off-normal contacts. Of four supposedly adjusted programmers, only one was functional. The remaining three being misadjusted. The adjustment requires a Graham Gage which has never been procured.

C23 - Lens Barrel Temperature Control

Purpose: reinstall control sensor used on FTFs 297 & 298, since an attempt to improve the control was unsatisfactory, and, perhaps, unnecessary.

C24 - Film Drive Power Supply and Chopper

Purpose: install modified circuit in configuration.

C25 - Take-up Motor

Purpose: install new motor. It was considered possible that take-up motor was causing film looping.

C26 - Film Drive Microswitches

Purpose: replace faulty microswitches

C27 - Vacuum Solenoid

Purpose: replace faulty solenoid. The new solenoid was modified and installed without approval of the prime contractor. The action was taken because it was "easy to do at the time," and was intended to reduce the transient vibration in the scanning flat. Results of the ground run (T26) indicate that the transient still exists.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

C28 - .030" Platen Shims

Purpose: remove washers to improve film transport.

C29 - Shutter Wiring

Purpose: remove shorted wiring and replace it with new wiring.

C30 & C31 - Pitch Flexure

Purpose: replace the broken pitch flexures. The two flexures broke at different times during the course of ground run #1.

C32 - Oblique Drive Servo

Purpose: replace the open circuited follow-up potentiometer. This broke during the course of ground run #1.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

ABSTRACT

It is proposed to substitute a very thorough evaluation of reliability for the present inefficient program. The proposed evaluation would be made with the combined engineering talents of the prime contractor and the subcontractor.

For reasons of efficiency, both technical and financial, the work would be performed at the prime contractor's facility.

It is estimated that the proposed program will produce greater progress than the present program without increasing the existing commitment.

#2

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

INTRODUCTION

The goal of achieving performance comparable to that obtained in August, is not sufficient. It is apparent from recent work that the configuration is capable of short periods of operation with performance comparable to that obtained in August; but is also apparent that a complete mission without an electromechanical malfunction is extremely unlikely until some further work is done.

The proper objective at this time is to get the C configuration operating reliably. Lack of reliability arises from two areas; improper components, those basically incorrect for the intended function; and failure of components at the end of the normal service lifetime. We believe that reliability in the first area can be demonstrated by two successive, complete runs. Reliability in the second area can be achieved by determining and cataloging the normal service lifetime of every component in the configuration.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

PERSONNEL AND GENERAL PLAN

The present difficulties with the configuration should be removed in the same manner that the vibration problems were removed - by an engineering evaluation and minor modifications - since this is the most efficient and economical method. The list of required personnel (see figure I) shows that seven-ninths of the engineering effort will be made by the prime contractor and that over ninety percent of the personnel are employed by the prime contractor. It is obviously more economical to conduct this evaluation in the prime contractor's plant since the required talents are readily available as needed (instead of as available to travel) and since a much smaller travel effort is necessitated.

25X1 The prime contractor believes that two of the subcontractor's personnel, [redacted] should be available full time to provide the benefit of their familiarity with the present and past status of the configuration and its components. This should be extremely valuable for the expeditious completion of the proposed program. However, the prime contractor can visualize no value in retention of other subcontractor personnel for this proposed program. (The prime contractor would, however, plan to procure modified shutters from the subcontractor, and also such other components as the subcontractor is qualified to provide.)

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

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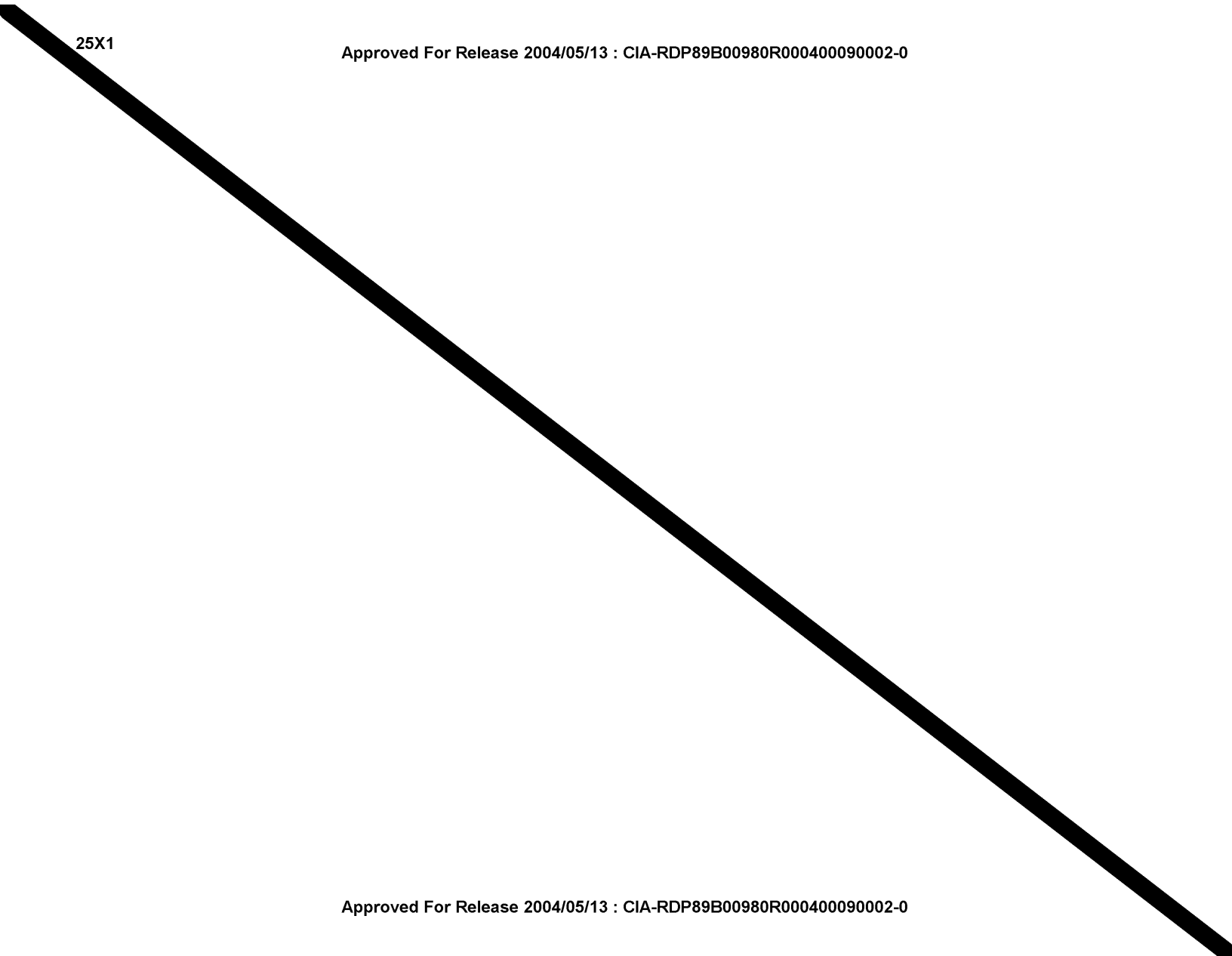
Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0



Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

PROPOSED PLAN

1. Modify existing contract immediately. Implement this proposed plan.

2. Airlift the configuration and associated equipment from the Test Site to Bridgeport, Connecticut.

3. Unpack, and set up the configuration in the existing laboratory room at the prime contractor's plant. Establish an orderly service lifetime control log for all parts.

4. Make those corrections presently known to be necessary.

5. Critically examine the operational requirements and components in each of the major functional groups (Film Drive, Stabilization-Positioning-IMC-Autobalance, Oblique Drive, Shutter, Focus Control, Programming, and Optics). This examination would result in the removal of unreliable features by modifications, where needed, and by determination of normal service lifetime where a modification is unneeded.

   All components would have their normal service lifetime evaluated.

   Perform at least six ground runs on the rocking table, two of which must be successive and complete.

6. Make all necessary preparations for flight testing. Return the configuration to test site. Make one complete ground run. Conduct flight tests.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

ESTIMATE OF SUCCESS

This program will clearly result in satisfactory reliability in that all improper components will be suitably modified.

However, some components, despite the extensive testing proposed herein, will not fail during test, so that their service lifetime will remain unknown. Until each component's lifetime is known, reliability will be less than 100%. Nevertheless, those components which do not fail in these proposed tests will be of normally long lifetime, so that the configuration will be capable of reliable operation.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

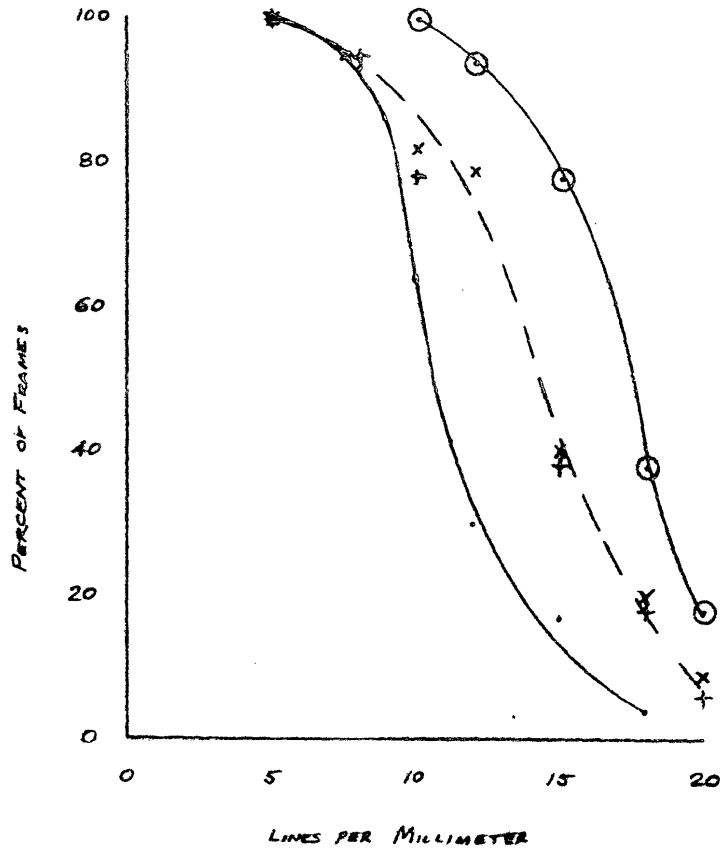
Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

COST AND SCHEDULE

With the money which is not yet expended under the present contract, this proposed program can run through January (or at least mid-January). This will permit accomplishment of items 1, 2, 3 and 4 in the plan. Item 5 should be underway, and possibly complete. At this time, consideration can be given to the desireability of proceeding further with this proposed program or with a modified program.

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0

Approved For Release 2004/05/13 : CIA-RDP89B00980R000400090002-0



• PTF 206 3 Oct 57
X PTF 297 13 Aug 58
+ PTF 298 14 Aug 58
⊙ PTF 298 (DISCONTINUE IMC ERROR)

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DOCUMENT NO.
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~~SYSTEM TEST PROGRAM~~

DP52853
COPY / OF 2

T = Planned Test To Acquire Data

A = Additional Alternate Test If Planned Test Fails To Acquire Data

TEST	DATE			
	31 July	7 August	14 August	?
Operational Focus	T	A	A	A
Resolution Capability At Best Focus			T	A
Temperature Structure Of Vehicle's Bay	T	T	A	
Acoustic Spectrum In Vehicle's Bay	T	T	A	
Vibration Levels On "C" And "C" Mounts	T	T	T	
Pressure Stability In "C" Bag	T	T	A	
Accuracy Of Position Servos	T	T	A	
Accuracy Of Gyros	T	T	A	
Effectiveness Of Brake On Oblique Scan	T	A		

Entire test program can be accomplished with three operations on dates shown. However, this assumes availability of vehicle No. 343, adequate performance by vehicle operators, absence of serious malfunctions in "C" system, and suitable weather. If any of these conditions are not satisfactory, an extension of the test program would be recommended. It is felt that an extension of the test program (if required) should be at the rate of one test per week.

MDR:hmm
7/18/58

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DPS 2853
COPY 2 OF 2

"C" SYSTEM TEST PROGRAM

T = Planned Test To Acquire Data

A = Additional Alternate Test If Planned Test Fails To Acquire Data

TEST	DATE			
	31 July	7 August	14 August	?
Operational Focus	T	A	A	A
Resolution Capability At Best Focus			T	A
Temperature Structure Of Vehicle's Bay	T	T	A	
Acoustic Spectrum In Vehicle's Bay	T	T	A	
Vibration Levels On "C" And "C" Mounts	T	T	T	
Pressure Stability In "C" Bag	T	T	A	
Accuracy Of Position Servos	T	T	A	
Accuracy Of Gyros	T	T	A	
Effectiveness Of Brake On Oblique Scan	T	A		

Entire test program can be accomplished with three operations on dates shown. However, this assumes availability of vehicle No. 343, adequate performance by vehicle operators, absence of serious malfunctions in "C" system, and suitable weather. If any of these conditions are not satisfactory, an extension of the test program would be recommended. It is felt that an extension of the test program (if required) should be at the rate of one test per week.

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