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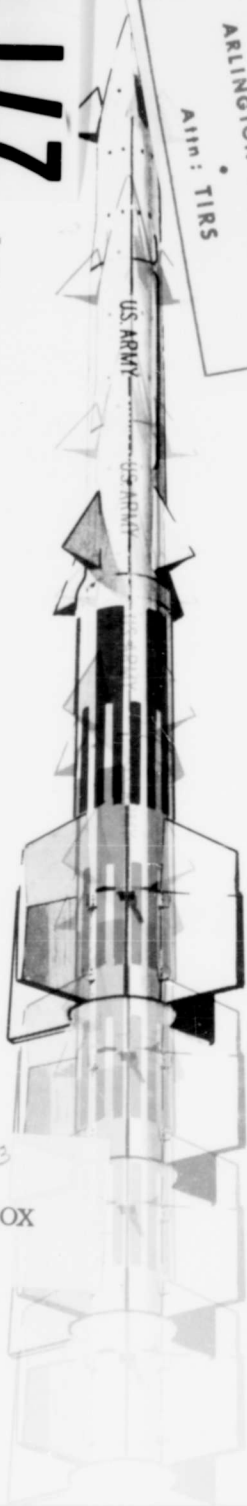
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ALLISTIC CAMERA SYNCHRONIZATION & CONTROL SYSTEM

CONTRACT NUMBER DA-30-069-ORD-3291

Progress Report No. 10

N-62-2-3
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LINK DIVISION
GENERAL PRECISION, INC.

AD Accession No.
Link Division, General Precision, Inc., Palo Alto, Calif.
UNCLASSIFIED
BALLISTIC CAMERA SYNCHRONIZATION
AND CONTROL SYSTEM Progress Report No. 10
(January 1, 1962 to January 31, 1962) (Unclassified)

15 pages and 1 illustration
Contract No. DA-30-069-ORD-3291
OAS 5210.11.13506.05.55
DCN 110.095.006.006.1
Ser. No. 06-61173
No Distribution Limitations
Report is Unclassified

The Tape Reader and the Camera Control Unit were received during the month of January. The review of the specifications with the WSMR Technical Representative is included in the report. The effect of the delivery date of the prototype by Technical Exhibit C is discussed.

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**BALLISTIC CAMERA SYNCHRONIZATION
& CONTROL SYSTEM**

Contract Number DA-30-069-ORD-3291

Progress Report No. 10

Link Division
General Precision, Inc.

February 15, 1962

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FOREWORD

This progress report is submitted in accordance with Article I, paragraph c(1) of Contract No. DA-30-069-ORD-3291. This tenth report documents the period from 1 January 1962 to 31 January 1962.

SUMMARY

The Tape Reader and the Camera Control Unit were received during the month of January. The review of the specifications with the WSMR Technical Representative is included in the report. The effect of the delivery date of the prototype by Technical Exhibit C is discussed.

1.0 Introduction

This is the tenth in a series of monthly reports covering the progress of the Ballistic Camera Synchronization and Control System. These reports will provide a technical record of the development program. The work completed in the previous month will be covered, and an outline given of the work to be done for the next reporting period. Major problems that arise will also be reported.

2.0 Present Program Status

Operation of

~~During the last month, the phase-shift servo has been operated as an open-loop system. This has~~ made it possible to check out the alarm circuit and the in and out of synchronization inputs to the recorder. The Camera Simulator has been synchronized by the manual mode. The Camera Control Panel has been received and the electrical interface problems resolved.

3.0 Minutes of Meeting Contract DA-30-069-ORD-3291, 16 January 1962

TECHNICAL REVIEW MEETING, WHITE SANDS MISSILE RANGE AND
LINK DIVISION

ATTENDING:

LINK DIVISION

WHITE SANDS MISSILE RANGE

R. Peters
T. Harding

John Davies

SUBJECT: Technical Exhibit requirements for Ballistic Camera Synchronization and Control System for White Sands Missile Range.

PURPOSE: The purpose of the meeting was to review the technical requirements of the subject exhibit and to make record of all changes, corrections, etc., which are required to update the exhibit and make it compatible with the equipment being developed by Link Division, Palo Alto under the cognizance of the White Sands Missile Range technical representatives.

Page 1 - Para. 3

(T. E.) & (A) Although called out in the exhibit that "acceptance of the prototype (Phase III, Part C) by the technical supervisor must be obtained before proceeding to Phase IV," Link Division has previously been authorized and has proceeded to buy some long lead items for Phase IV.

Page 3, Para. 3.1c

(T. E.) "Provide circuitry for local generation of pulse trains of various frequencies corresponding to the camera shuttering rates, which are synchronized with either a one- or two-pulse-per-second incoming time signal."

(A) Link will furnish a diagram to show the means of accepting a two-pulse-per-second instead of a one-pulse-per-second.

Page 4, Para. 4.1a

(T. E.) "A frequency tolerance of 0.1 parts per million shall apply to the 500 cycle/second signal"

(A) The Hewlett-Packard Model 101A - One Megacycle Oscillator has been approved as the frequency standard.

Page 5, Para. 4.2

(T. E.) & (A) The diagram under this item is in error. Signal shown in the diagram is 180° out of phase (inverted).

Page 5, Para. 4.2c

(T. E.) "A panel switch is to be provided so that the operator may simulate a continuously open 'slow' shutter during testing periods to permit observation of the complete pulse train from the 'fast' shutter."

(A) This switch is redundant and has been eliminated, as it is covered under Para. 4.2b.

Page 5, Para. 4.3a, b, c

(T. E.) The displacement called out in the exhibit is 20 milliseconds advance plus or minus 5 microseconds.

(A) The displacement is 21 milliseconds plus or minus 5 microseconds due to the detailed design considerations.

Page 6, Para. 4.4

(T. E.) Exhibit called out for 20 millisecond advance pulse trains with allowance for delay from 0 to 20 milliseconds in steps of 10 microseconds.

(A) The locally generated advanced pulse train is 21 milliseconds. The delay unit permits the selected pulse train to be delayed from 0 to 20 milliseconds in steps of 5 microseconds.

Page 6, Para. 4.6b

(T. E.) The exhibit calls out that "Automatic synchronization time shall not exceed 10 seconds timed from receipt of the first range timing one or two pulse-per-second signal."

(A) This item has been covered by previous correspondence and it was noted that the timing limitation is imposed by the camera motor. As a result the time is anticipated to exceed the 10-second requirement.

Page 7, Para. 4.8d, e, f

(T.E.) & (A) The requirements of d, e, f have been deleted by revision of Technical Exhibit B.

Page 7, Para. 4.9, 4.10 and 4.10a

(T.E.) & (A) The requirements of these paragraphs are being met by the equipment which is on order from the Fred C. Henson Company.

Page 8, Para. 4.10b (2) (b)

(T.E.) The exhibit calls out "provide unlimited programming time."

(A) The programming time is limited by the size of the reel of tape on the tape reader or approximately 400 foot of 4-mil tape.

Page 8, Para. 4.10b (2) (e)

(T.E.) Exhibit calls for "provide programming through use of a 7-channel punched paper tape reader."

(A) The tape reader selected and being incorporated into the equipment is an 8-channel tape reader.

Page 8, Para. 4.10b (3) (b)

(T.E.) Exhibit calls for "Three channels of the tape reader shall be assigned independent functions. Of these, one shall be assigned the function of capping shutter control, one shall be assigned the function of strip-chart paper feed control, and one shall be unassigned."

(A) Three channels are assigned for the control of the Ballistic Camera Synchronization and Control System and the eighth channel is unassigned.

Page 9, Para. 4.10b (4) (c)

(T.E.) The Exhibit calls for either manual control or the presence of the P1000Z signal shall effect forward motion of the tape.

(A) The presence of P1000Z and the arm switch in the arm position shall effect forward motion of the tape.

Page 9, Para. 4.10b (5) (a)

(T.E.) The exhibit calls for "a 40 to 100 millisecond (variable) pulse of 500-cycle-per-second power at two-per-second-rate."

(A) Pending receipt of information from the Fred C. Henson Company, pulse width is unknown.

Page 9, Para. 4.10d

(T.E.) The exhibit calls for "The tape reader must be capable of a reading rate of not less than ten samples per second."

(A) Ten frames per second is too slow for the equipment as designed. The Digitronics Tape Reader, Model No. 3500, as previously approved by WSMR is to be used in the equipment.

Page 10, Para 4.12

(T.E.) The exhibit calls out the following channel assignments for channels 6, 7, and 8:

Channel 6: Capping Shutter drive input signal

Channel 7: Capping Shutter drive output signal

Channel 8: Capping Shutter operate signal

(A) Link recommends the following changes in channel assignment for channels 6, 7, and 8:

Channel 6: Cap shutter open command

Channel 7: Cap shutter closed command

Channel 8: Position of the capping shutter as indicated by the switch in the camera.

Page 10, Para. 4.14

(T.E.) & (A) The requirements of this section will be handled by equipment on purchase from the Fred C. Henson Company.

Page 11, Para. 4.15

(T.E.) Exhibit requires "The Contractor shall be responsible for the complete system integration in a fashion suited to the existing WSMR facilities."

(A) In view of the lack of information concerning the existing WSMR facilities at the site where the integration is to take place, there are areas of question concerning the responsibility of interfacing the Link and WSMR equipment. (See further comments under Para. 6.3, Acceptability.)

Page 11, Para 5.5

(T.E.) While this paragraph does make provision for the spare requirements at the completion of the contract, it does not make allowances for standby spares during installation of the prototype unit.

(A) In view of this, Link Division recommends that an agreement be reached between the parties whereby parts from the production units will be taken from stock and used if needed during acceptance of the prototype unit. Amended shipping instructions required will be issued by N. Y. Ordnance.

Page 12, Para. 6.1

(T.E.) Exhibit specifies that "the installation be performed by the contractor."

(A) As specified under Para. 4.16 above, there are areas of question concerning the existing facilities and as such the above mentioned interfacing problems exists under this paragraph as well. (See Para. 6.3, Acceptability, for further comments.)

Page 12, Para. 6.3 - Acceptability

(T.E.) & (A) The paragraph as written imposes no definite acceptance requirement on the Link portion of the system. WSMR and Link Division are in process of preparing an acceptance specification which will allow a preliminary acceptance of the Link-developed equipment prior to integration with the WSMR facilities.

With the performance characteristics of the Link Division supplied equipment defined the responsibility for integration and interfacing problems which may be encountered will be clear and appropriate action can be taken. This will allow a "truer" base for acceptance of the Link Division equipment and will expedite acceptance and/or rework of the equipment as required to facilitate completion of the subject contract.

Page 12, Para. 6.3b

(T.E.) Exhibit calls out "After initial synchronization, the camera shutter must remain within the plus or minus 100 micro-second synchronization tolerance for not less than fifteen minutes after the range timing 1 pps (G-4) has disappeared."

(A) The frequency standard being used by Link Division (Hewlett-Packard Model 101A) will meet this specification provided standby power is available. Tests at WSMR will determine if the frequency standard can be used with interrupted power.

Page 12, Para. 6.4b

(T.E.) The exhibit calls out "Reliability of each subassembly developed or employed shall be assured by environmental tests conducted and certified by the contractor or a testing laboratory."

(A) Link Division is designing the equipment to meet the environmental requirements of the contract. However, to facilitate and expedite completion of the contract and to effect a cost saving to the Government, it is recommended that the environmental tests be conducted at the White Sands Missile Range and be considered as part of the Final Acceptance Procedure.

Page 12, Para. 7.1

(T.E.) The exhibit calls out "The Ballistic Camera Synchronization System shall be capable of operating within an ambient temperature range from 10°F to 120°F, and a relative humidity range of 0% to 95%."

(A) See comment and Link recommendation under Para. 6.4b above.

4.0 Technical Exhibit C

Link did not receive authorization to work on Technical Exhibit C during the month of January, 1962. The control system wiring has not been wired. All testing has been done with temporary wiring. When the control panel, as called out in Technical Exhibit C, is in the system all tests that were done with temporary wiring will be repeated.

5.0 Interface and Installation

Link Palo Alto has worked out the electrical interface between the units in the Astrodome and the electrical enclosures in the equipment building. The mechanical interface (the routing of the cable and their length) is not known at this time. Before the cables can be determined, White Sands Missile Range must furnish to Link the cable routing. If necessary, a member of the Link Engineering Department will travel to White Sands Missile Range to work with the technical representative to obtain the needed information.

6.0 Program for the Subsequent Reporting Period

Since the Tape Spooler did not arrive during the month of January, 1962, the Tape Reader will be installed and checked out during the month of February, 1962. If Technical Exhibit C is approved during the month of February, 1962, work will be started on it. If Technical Exhibit C is not approved during the month of February, testing will continue using temporary wiring.

7.0 Program Schedule

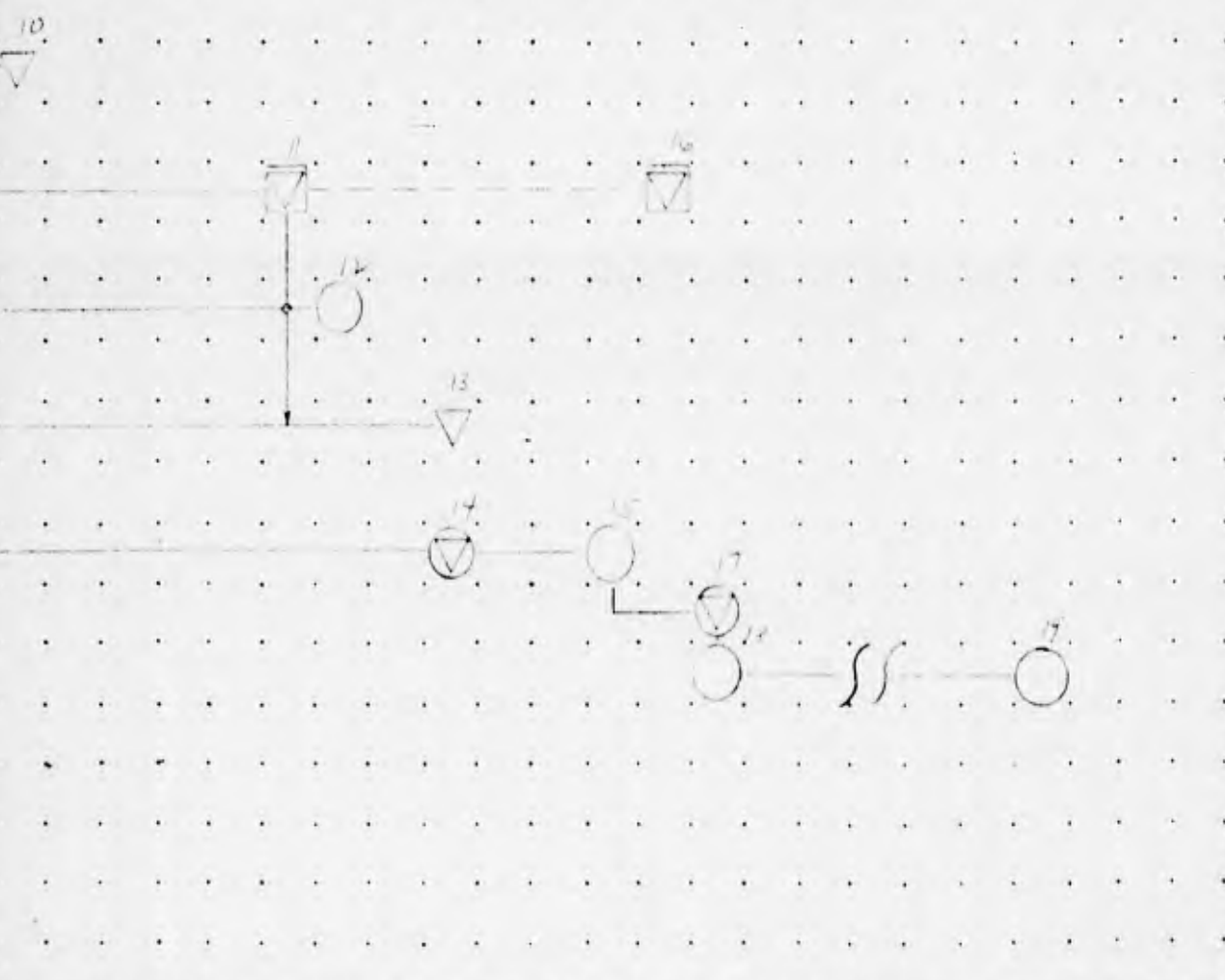
The Line of Balance Delivery Schedule indicates that 2 March 1962 is to be the delivery date. The schedule takes into account Technical Exhibit B (minus controls) but does not consider Technical Exhibit C. The delivery date that includes Technical Exhibit C will be determined when the "go-ahead" is received by Link for Technical Exhibit C.

3

6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

BALLISTIC CAMERA (Revised 12-7-61)
PLAN (Includes Tech. Exhibit B)

- LEGEND**
-  DELIVERY TO CUSTOMER
 -  CUSTOMER SUPPORT
 -  CUSTOMER ACTION
 -  VENDOR OR SUB-CONTRACT ACTION
 -  CONTRACTUAL ACTION
 -  PROCUREMENT ACTION
 -  FABRICATION OR ASSEMBLY
 -  PURCHASE PARTS
 -  COMPANY MADE PARTS
 -  REPORT TO CUSTOMER
 -  TEST OR INSPECT
 -  STUDY OR ANALYSIS
 -  SYSTEMS DESIGN OR DEVELOPMENT
 -  DETAIL DESIGN
 -  INTERNAL TRANSFER
 -  RAW MATERIAL



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WORKING PERIOD PRIOR TO SHIPMENT

GENERAL PRECISION, INC.



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