TEST REPORT 592

Shock Tests on

1201117-0, 1201118-0 and 1201119-0

Parachute Release

FROM

PACIFIC SCIENTIFIC COMPANY

Manufacturing Facility

ANAHEIM, CALIFORNIA

On file USAF release instructions apply.

DATE PREPARED 9-27-62

PREPARED BY Robert F. Whitney
Test Engineer

APPROVED BY Verne Morgan
Engineering Manager

WITNESSED BY _____

CHECKED BY _____

_____

_____ AFQCR

REVISIONS

REV.	DATE	MADE BY	APPD. BY	PAGES AFFECTED	REMARKS

TABLE OF CONTENTS

PACIFIC SCIENTIFIC COMPANY
Manufacturing Facility, Anaheim, California

ADMINISTRATIVE DATA

PURPOSE OF TEST

To determine if 100 G's shock would cause parachute release to fire when altitude was maintained at 19,500 feet, and to see if the shock would affect the normal calibration setting.

MANUFACTURER

PACIFIC SCIENTIFIC COMPANY, 6280 Chalet Drive, Bell Gardens, California.
FACTORY: 1346 S. State College Boulevard, Anaheim, California.

MANUFACTURER'S TYPE OR MODEL NO.

1201117-0, 1201118-0 and 1201119-0

DRAWING, SPECIFICATION, OR EXHIBIT

Pacific Scientific Company drawings 1201117-0, 1201118-0 and 1201119-0.

QUANTITY OF ITEMS TESTED

Three.

SECURITY CLASSIFICATION OF ITEMS

None.

DATE TEST COMPLETED

25 September 1962.

TEST CONDUCTED BY

R. F. Whitney, Test Engineer.

DISPOSITION OF SPECIMENS

The three test units were returned to the customer.

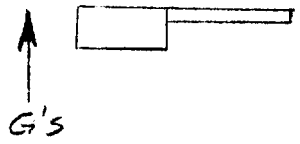
TESTING

One parachute release at a time was placed in the altitude chamber and mounted on the shock table, Photograph 1.

The shock machine was calibrated by using a Columbia Research Accelerometer Model 304, a Tektronix Oscilloscope Type 531, and a Coleman-Beattie camera attachment. A typical record at 100 G's is shown in Photograph 2.

Test No. 1

P/N 1201119-0, Main Deploy, S/N 109



Calibration before test 15,000.

Armed and dropped at 19,500.

30 G	= No fire	No slippage of trigger
50 G	= No fire	No slippage of trigger
75 G	= No fire	No slippage of trigger
100 G	= No fire	Slight slippage of trigger

Under static condition chamber altitude was lowered and unit fired at 14,900.

Unit was reloaded and test repeated at:

100 G = No fire	No slippage of trigger
100 G at 18,000 = No fire	Slight slippage of trigger
100 G at 16,000 = Fire	(Could have been trigger displacement or gear train/aneroid)

Unit was reloaded and test repeated at:

100 G at 16,000 = Fire	(Could have been trigger displacement or gear train/aneroid)

Unit was reloaded and test repeated at:

100 G at 16,000 = Fire	Aneroid had released

Calibration check following tests:		
	15,100	15,000
	15,000	15,000
	*15,800	15,100
	15,100	15,800
	15,000	15,100

*15,800 firings possibly due to wear on 1 or 2 teeth. Will be checked during overhaul.

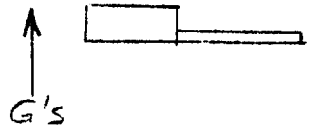
PACIFIC SCIENTIFIC COMPANY

Manufacturing Facility, Anaheim, California

Test No. 2

P/N 1201118-0, Drogue Release, S/N 111

Calibration before test 15,900 to 16,100.



Armed and dropped at 19,500.

30 G	=	No fire	No slippage of trigger
50 G	=	No fire	No slippage of trigger
75 G	=	No fire	No slippage of trigger
100 G	=	No fire	Slight slippage of trigger

Altitude lowered in chamber - fired at 16,000 (static).

Armed and dropped at 19,500 with cover plate up.

30 G	=	No fire	No slippage of trigger
50 G	=	No fire	No slippage of trigger
75 G	=	No fire	No slippage of trigger
100 G	=	No fire	No slippage of trigger

Altitude lowered in chamber - fired at 16,000 (static).

Armed and dropped at 19,500 with cover plate down.

30 G	=	No fire	No slippage of trigger
50 G	=	No fire	Slight slippage of trigger
75 G	=	No fire	Slight increase of slippage
100 G	=	No fire	Slight increase of slippage almost to the firing point

Altitude lowered in chamber - fired at 15,800 (static).

Armed and dropped at 100 G with cover plate down at:

18,000 No fire Slight slippage of trigger

Altitude lowered in chamber - fired at 15,900 (static).

Armed and dropped at 100 G with cover plate down at:

17,000 No fire Slippage of trigger almost to firing point

Altitude lowered in chamber - fired at 16,000 (static).

PACIFIC SCIENTIFIC COMPANY

Manufacturing Facility, Anaheim, California

Test No. 3

P/N 1201117-0, S/N 114

Calibration before test NF 16,200, F 17,000.

Armed and dropped at 15,200 cover plate up at:

30 G	=	No fire	No slippage
50 G	=	No fire	No slippage
75 G	=	No fire	Slipped half way
100 G	=	No fire	Slight increase in slippage

Calibration check (static): 16,200 NF
16,400 NF
16,500 NF
16,600 F

CONCLUSIONS

Test No. 1 - 1201119-0, Main Deploy, S/N 109

100 G's in plane of a straight drogue deployment at 18,000 feet did not cause inadvertent firing or damage unit that would cause unit to fail to fire at a lower than programed altitude.

Test No. 2 - 1201118-0, Drogue Release, S/N 111

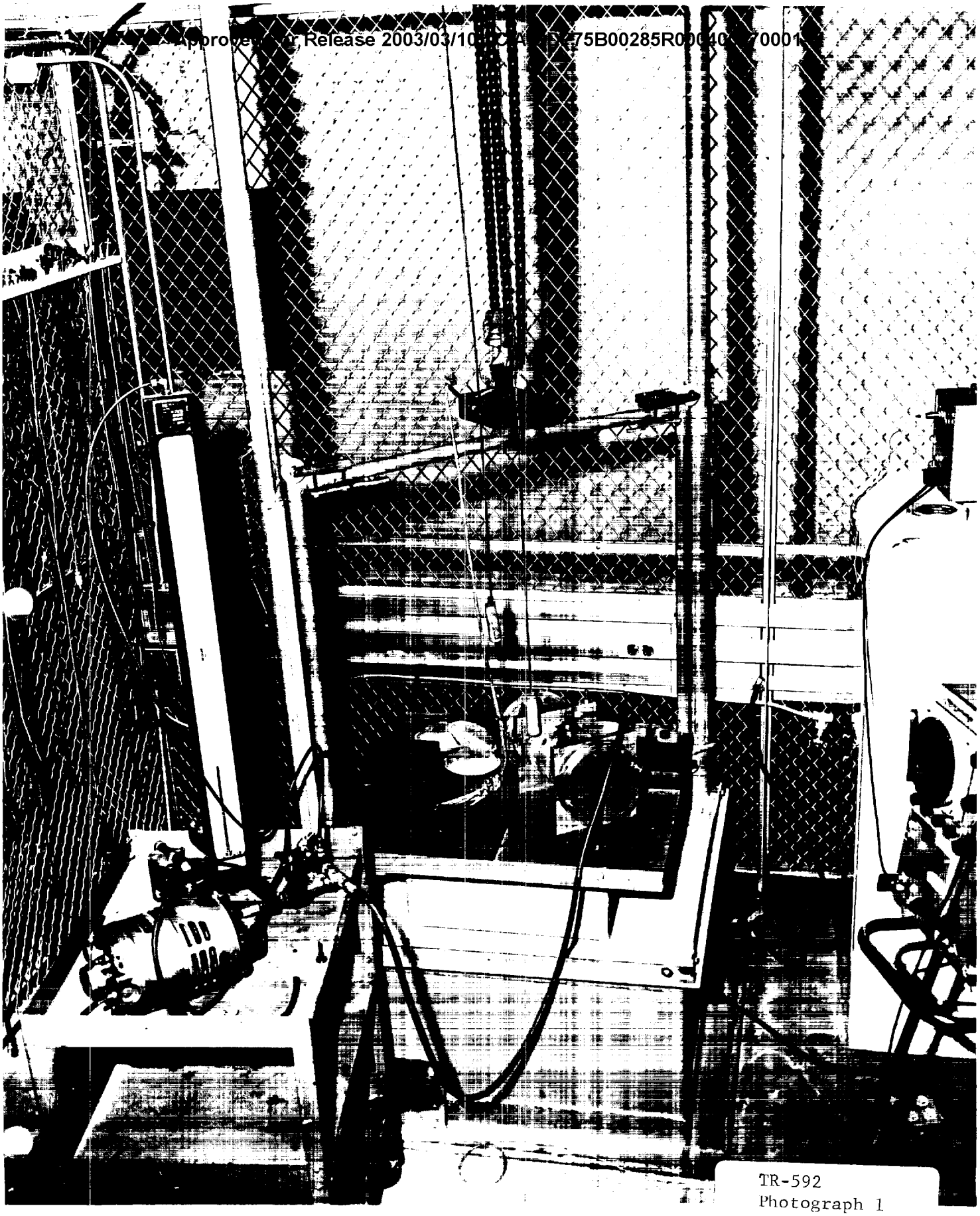
a. Before subjecting units to high G shock tests all units calibrated with at least a 400' interval between drogue release and main deploy.

b. After subjecting the main deploy unit to 100 G's - 2 firings out of 10 were out of tolerance by 400' on the high side. This unit will be dismantled and inspected in an effort to establish cause of firings to go out of tolerance after 100 G's of shock.

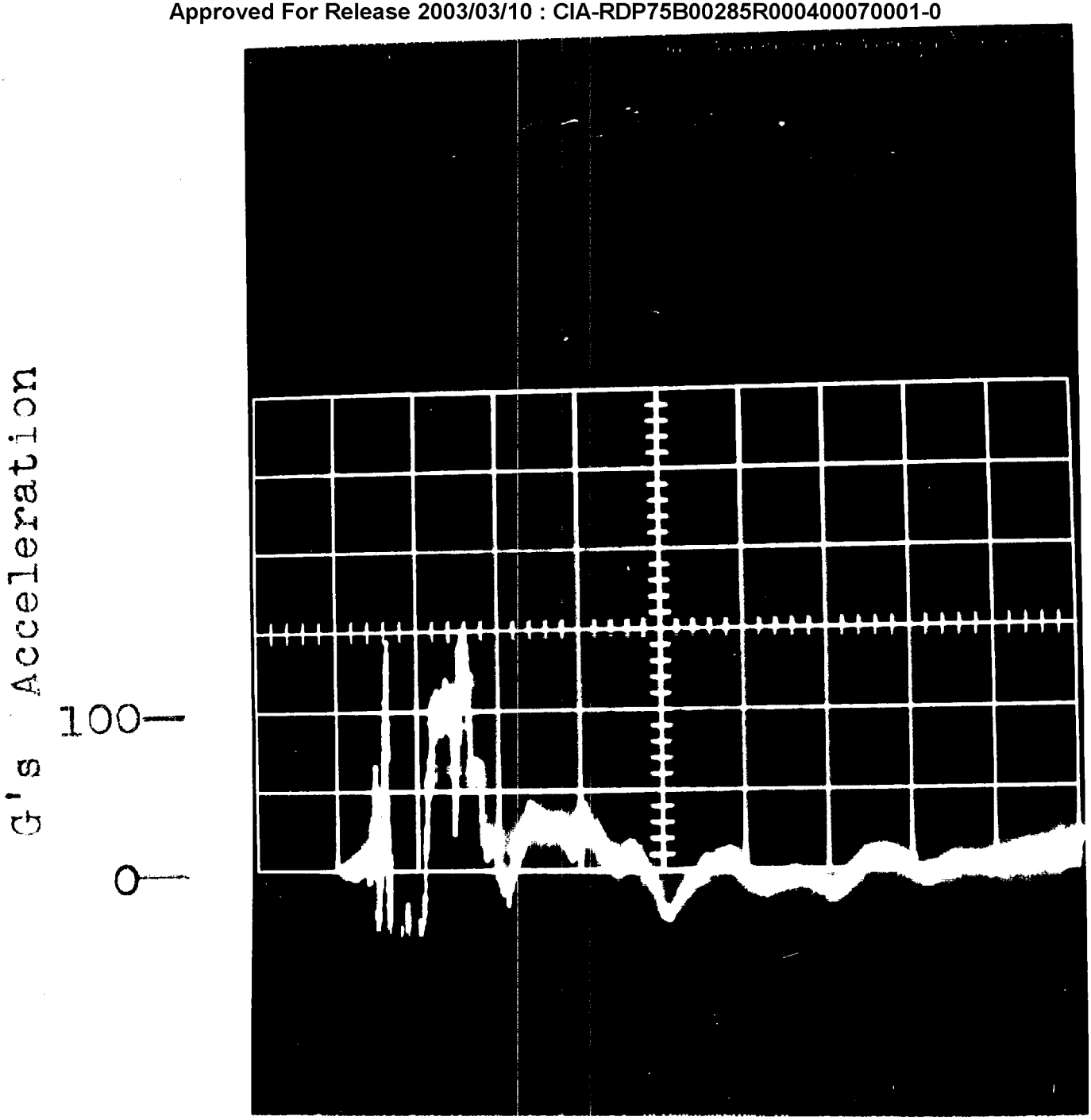
Test No. 3 - 1201117-0, S/N 114

a. The unit in question fired within tolerances.

b. 100 G's in the 3 critical planes at 19,500' did not cause inadvertent firings or cause unit to go out of tolerance.



TR-592
Photograph 1



Time = 10 ms/cm

SHOCK PULSE

TR-592
Photograph 2

13 February 1963

SUBJECT: Transmittal of Technical Memorandum Report ASNP-TM-63-1

STAT TO: [redacted]

Enclosed is a cover letter and a copy of ASD Technical Memorandum Report ASNP-TM-63-1 concerning Lab tests of the paratimers. Please note the Lab has furnished copies of the report to Firewel and Pacific Scientific. I am sending two copies to [redacted] at LAC to speed distribution as you were TDY. STAT

Mr. Shepardson does not consider the deficiencies serious enough for disqualification, but good Maintenance and Inspection Manuals and procedures will be required.

STAT [redacted]

2 Atch
a/s

STAT [redacted]

13 February 1963

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STAT TO: [redacted]

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2 Atch
a/s

[redacted] STAT

STAT [redacted]

HEADQUARTERS

Aeronautical Systems Division

AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

REPLY TO ATTN. OF: ASLPS (Mr. Shepardson/36139/522/R125) 6 February 1969

SUBJECT: Technical Memorandum Report ASLMP-TM-69-1

TO: ASZCB (Mr. Redding)

1. Inclosed herewith are four copies of subject report, separate copies of which have been sent to both the Firewell Corporation and the Pacific Scientific Company as indicated in Appendix ., Distribution List.

2. It is the opinion of the undersigned that the deficiencies noted i. e., out-of-calibration operation after vibration, out-of-tolerance time delay at temperature extremes and excessive rusting during humidity cycling are not considered to be sufficiently serious to render the devices unsuitable for use for the following reasons:

a. Out-of-calibration operation after vibration. This is the most serious of the deficiencies found and efforts should be continued to isolate the cause and correct this deficiency if at all possible. Potentially this could lead to a change in the sequential operation of the parachute. For example, the main canopy could deploy before release of the first stage parachute. It is believed that with a proper technical order type of document and procedures incorporating periodic calibration checks, such a deficiency should be discovered in releases installed in parachutes.

b. Out-of-tolerance time delay at temperature extremes. If it is assumed that the low temperature will cause all time delays to increase, there is no adverse effect except for the very low altitude escape operation. In this instance, the added delay of as much as .2 seconds could be significant.

d. Excessive rusting during humidity cycling. It is believed that this deficiency should result in no operational penalties. With a properly written technical order and inspection procedures, releases should be removed from service long before there could be any degradation in performance of the release.

W. P. Shepardson

W. P. SHEPARDSON
Chief, Crew Equipment Division
Directorate of Operational
Support Engineering

1 Atch
ASLMP-TM-69-1 Rpt 24Jan69 (4 cys)

Aeronautical Systems Division
Air Force Systems Command
United States Air Force
Wright-Patterson Air Force Base, Ohio

Technical Memorandum
ASNP-TM-63-1
24 January 1963

Directorate of Operational
Support Engineering
Account: 921A-97142

TESTING OF THE PACIFIC SCIENTIFIC COMPANY'S ALTITUDE SENSITIVE ACTUATORS, NOS. 207, 209, 211, 217, 222 and 228

I. PURPOSE

To evaluate three types of altitude sensitive actuators for possible use in an Air Force multi-stage parachute system.

II. FACTUAL DATA

1. Test Items:

   a. Six altitude sensitive actuators, two each of Type 1201117-0 (main deploy), 1201118-0 (Drogue release), and 1201119-0 (Drogue deploy), (respective Serial Nos. 207 and 217, 209 and 222, 211 and 228), manufactured by the Pacific Scientific Company and submitted by the Firewell Corporation, Buffalo, New York, were subjected to qualification testing in accordance with the appropriate requirements as outlined in Item 2, Section II of this report.

   b. The actuators were designed to exert a force in excess of 100 pounds after a time delay of from 0.08 to 0.13 seconds after actuation. Actuators S/N 207, 209 and 211 were precalibrated to fire at any altitude under 15,000 feet, under 16,500 feet, and over 19,000 feet, respectively. Actuators S/N 217, 222, and 228 were precalibrated to fire at any altitude under 15,000 feet, under 15,800 feet, and over 16,600 feet, respectively.

2. Test Requirements: The actuators were tested in accordance with requirements outlined in Appendix "B". These requirements were derived from the following Pacific Scientific Company data reports:

   a. Numbers 655, 656, and 657 dated 4 October 1961.

   b. Number 642 (as amended by conference of 19 September 1961).

3. Test Procedure: A description of the testing appears in Appendix "C".

4. Test Results: The individual test results appear in Appendices "D" through "K".

5. Summary of Test Results: The test results are summarized in Appendix "K".

III. CONCLUSIONS

1. The original set of actuators did not meet all of the test requirements (reference Appendix "L").

2. The actuators, after modification by the manufacturer, Pacific Scientific Company, passed the following tests:

   a. Humidity

   b. Sand and Dust

   c. Acceleration

   d. Shock

   e. High Temperature

   f. Aneroid Hysteresis

   g. Aneroid Accuracy

   h. Timer Accuracy

3. The discrepancies listed in Appendix "C", which were not corrected during subsequent testing, are not considered significant enough to warrant a complete retest, unless full qualification is being considered.

IV. RECOMMENDATIONS

1. That the Drogue deploy actuator, Type 1201119-0, be assigned a service life of 100 escapement operations.

2. That the actuators not be considered a fully qualified item for general personnel parachute usage.

Prepared by:

Ronald C. Lineback

RONALD C. LINEBACK
1LT, USAF

Publication Review

This report has been reviewed and is approved.

W. P. Shepardson

WARREN P. SHEPARDSON
Chief, Crew Equipment Division
Directorate of Operational Support Engineering

APPENDIX A

DISTRIBUTION LIST (24)

Firewel Corporation (5)
3695 Broadway Avenue
Buffalo, New York

Pacific Scientific Company (5)
10242 Placentia Avenue
Anaheim, California

6511th Test Gp (FTLTGM) (2)
Naval Air Fclty
El Centro Calif

ASNPS (Reproducible)

ASNPSP-3 (12)

REPORT NOTICE

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government hereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

APPENDIX B

TEST REQUIREMENTS

Note: The numbers in parenthesis refer to the pargraph numbers of Appendix "A" to WADC Exhibit WCLSJ-1-23075, dated 26 November 1957, titled "Automatic Parachute Ripcord Release".

1.0 (1.0) PURPOSE

To outline the test procedure.

2.0 (4.0) TEST PROCEDURE

The tests shall be conducted as follows:

3.0 (4.1) EXAMINATION OF PRODUCT

All actuators shall be inspected to determine compliance with the referenced specification and applicable drawing.

3.1 (4.3) ANEROID CYCLING

The actuator shall be subjected to an aneroid accuracy test which shall be conducted prior to the start of the cycling test. With the arming pin inserted, the release shall be subjected to continuously varying altitude cycles at room temperature, from sea level to 35,000 feet and return to sea level. Upon completion of 1,000 cycles, and aneroid accuracy check shall again be made. The accuracy shall be within plus or minus 500 ft. of the units calibrated altitude.

3.2 (4.4) OVERPRESSURE

The actuator shall be subjected to an absolute pressure of 50 inches Hg for a period of one hour. For a period of not less than six hours following this overpressure, the actuator shall not be subjected to any operation other than atmospheric pressure. An accuracy test shall then be made on the actuator and the accuracy shall be within plus or minus 500 ft. of the units calibrated altitude.

3.3 (4.6) POWER ACTUATION AND LIFE TEST

The three actuators used in test 4.5 shall be loaded and operated 50 times with a resisting force of 30 pounds. The actuators shall then be mounted on a test fixture with the cable end down and a 100-pound weight attached to the terminal swaging. The actuator shall lift the 100-pound wieght two (2) inches each time. These tests will be conducted at room temperature.

15 hours. While at this temperature, the actuator shall be subjected to a timer accuracy, an aneroid accuracy, and a pull test simultaneously. The aneroid accuracy shall not exceed plus or minus 1000 feet.

5.3 (4.8.3) VIBRATION

The actuator, cocked and with the arming pin inserted, shall be subjected to linear vertical vibration for a period of 30 minutes in each of three mutually perpendicular planes on a suitable vibration stand. When mounted in the horizontal plane, the actuator shall be mounted upside down. In one of the positions, the actuator shall be so mounted that the pawl for the reel actuator shall have the additional force of gravity tending to trip out this pawl. During this period of vibration, the frequency shall be varied continuously from 10 to 55 cps with a double amplitude (total excursion) of 0.030 inch. The actuator shall not operate the ripcord power cable during the period of vibration. The actuator shall then be placed in an altitude chamber and subjected to a pressure corresponding to plus or minus 1000 feet as applicable. The actuator shall be vibrated for at lease 30 minutes in each plane. Upon completion of the vibration in each plane, the arming pin shall be pulled and the altitude brought up or down as applicable to ascertain the altitude at which the actuator operates. After the vibration tests, the actuator shall undergo the tests specified in paragraphs 4.2 and 4.3, noting particularly whether the timer runs down without operating the ripcord. No looseness in the mechanism nor damage to any part of the actuator shall result from this test.

5.4 (4.8.4) SHOCK

The actuator shall be mounted on sufficient mass and dropped from such a height that when decelerated by resiliant impact a deceleration of 30 g shall be obtained. The actuator cocked and with the arming pin inserted shall be tested with the axis mounted in three different planes. The actuator shall not pull the power cable during these tests. The actuator shall be mounted in a horizontal plane with a mounting side of the timer down on a shock testing machine in an altitude chamber. At an altitude of 1,000 feet above the elevation at which the actuator should theoretically trip, the arming pin shall be removed. While still at this altitude, the actuator shall be subjected to a 30 g shock and shall not trip the power cable. The test shall be repeated with the timer turned over 180° for a 30 g shock under the same conditions. The actuator shall then be subjected to a shock of 30 g in each of two additional planes at right angles to the first plane and at right angles to each other. The device shall be shocked under the same conditions in two different positions reversed to each other for each plane or a total of six different positions in all. A mechanism conforming to Specification JAN-S-44 may be used for conducting these tests, except that the calibrated spring shall have a constant (K) of 1,590 ±100 pounds per inch in lieu of a spring rate of 5,000-5,500 pounds per inch. After the shock test, the actuator shall undergo the tests specified in paragraphs 4.2 and 4.3. No looseness in the mechanism nor damage to any part of the actuator shall result from this test.

5.5 (4.8.4.1) SHOCK LIFE TEST

One type 1201147-0 actuator shall be mounted on sufficient mass and dropped from such a height that when decelerated by resiliant impact a deceleration of 30 g's shall be obtained. The actuator uncocked (but with the arming pin in and the selector arm in the "A" position) shall be mounted in a horizontal plane with the cover up on a shock machine in an altitude chamber. The chamber shall be raised to an altitude of 20,000 feet and then lowered to 1000 feet below the actuators set firing altitude and after removing the arming pin shall be subjected to a 30 g shock and shall not trip the triggering mechanism. The actuator shall then be mounted in a fixture capable of inserting and removing the arming pin by remote control. The mounted actuator shall then be placed in an altitude chamber, uncocked, with the selector arm in the "A" position and with the pin inserted. The chamber altitude shall then be raised to 20,000 feet at which time the arming pin shall be removed and the escapement mechanism allowed to run. The chamber altitude shall then be lowered to 15,000 feet and the arming pin shall be inserted. The insertion and subsequent removal of the arming pin shall be considered one cycle. Twenty-five cycles shall be made following each shock test until the actuator prematurely actuates when subjected to the 30 g shock load. The actuator shall successfully complete 200 cycles and accompanying shock tests before failure occurs.

5.6 (4.8.5) ACCELERATION

The actuator shall be mounted on the apparatus (centrifuge) and the apparatus shall be operated at a speed that will produce 30 g. The actuator shall be mounted first in a position parallel to the escapement assembly (usually horizontal) on the center of the turntable which is secured to the mounting platform of the centrifuge. The applied acceleration of 30 g shall be attained, stabilized, and maintained for a period of not less than one minute for each successive position. At the end of the one minute period, the arming pin shall be pulled. The actuator shall operate under these conditions and the apparatus (centrifuge) slowed. The actuator shall then be checked and reset for the next test. The release shall be subjected to tests where the release is mounted in positions that will allow a 30 g force to be applied in the plus or minus direction along the x, y and z axes and the actuator set in six different positions for these axes. The actuator shall operate satisfactorily on all tests.

5.7 (4.8.6) SAND AND DUST

The actuator mounted in a parachute pack, or equivalent, shall be subjected to the sand and dust tests in accordance with Procedure I of Specification MIL-E-5272. The actuator shall then be subjected to the tests specified in paragraphs 4.2 and 4.3. There shall be no evidence of sand or dust within the actuator.

5.8 (4.8.7) HUMIDITY

The actuator mounted in a parachute pack, or reasonable engineering facsimile, shall be subjected to humidity tests in accordance with Procedure I of Specification MIL-E-5272, for five cycles. At the completion of the test, the release shall be inspected for collection of moisture in the interior of the case, corrosion of metal parts, or other damage. At the completion of the fifth cycle, the actuator shall undergo the tests specified in paragraphs 4.2 and 4.3.

APPENDIX C

PROCEDURE

1. The testing was carried out in six phases, as follows:

a. Two actuators, one each of Type 1201117 (S/N 207) and 1201118 (S/N 209), were tested in accordance with paragraphs 5.3, 5.4 and 5.6 of the requirements outlined in Appendix "B".

b. Following the above testing, actuator S/N 207 was tested in accordance with paragraphs 5.7 and 5.8 of the requirements outlined in Appendix "B".

c. Simultaneously with the above testing, actuator S/N 211 (Type 1201119) was tested in accordance with paragraph 4.3 of the requirements outlined in Appendix "B".

d. Actuator S/N 209 was concurrently tested with the above in accordance with paragraphs 4.1, 4.2, 4.3, 5.1, 5.2 and 5.2 of the requirements outlined in Appendix "B".

e. Actuator S/N 207 was resubmitted following investigation and modification by the Pacific Scientific Company and was again tested in accordance with paragraph 5.8 of the requirements outlined in Appendix "B".

f. Three new actuators, one of each type (S/N 217, 222 and 228) were submitted following the failure of the original units to pass the vibration requirement and were tested in accordance with paragraphs 5.3 and 5.5 of the requirements outlined in Appendix "B".

2. The following discrepancies were noted during the tests:

a. The test sample Serial No. 207 would not operate after being subjected to the humidity test (reference Appendix "B", paragraph 5.8). Extensive rust was visible on several parts, and this is believed to have been the cause of failure. The actuator was returned to the Pacific Scientific Company for evaluation and modification. This was accomplished and the unit was returned to the Aeronautical Systems Division for a rerun of the humidity test. The device marginally passed the humidity test the second time as it was firing from 300 to 500 feet above the allowable altitude limit.

b. The Belleville washers and their guide shafts had to be replaced prior to beginning the testing as the guide tubes furnished were reportedly not hardened and caused loading difficulties.

c. Pacific Scientific Company Actuator Serial No. 209 was adversely affected by the vibration test. The actuator would not fire consistently within the assigned altitude limits of 16,500 feet ±500 feet. There were four firings recorded outside of the assigned range. The actuator fired twice following the vibration test at 17,400 feet. Testing was continued and eleven firings later, during the overpressure test, the actuator fired

at 17,500 feet. The unit was retested five additional times for aneroid accuracy with the following results: 16,500, 17,600, 16,400, 16,600, and 16,600 feet.

d. The leak indicators on two of the three units failed to indicate within limits. Actuator Serial No. 211, after the vibration test, would remain at the sea level indication until the altitude chamber passed through 15 M and would indicate 6 - 8 M at 35 M. The leak indicator of actuator Serial No. 209 was first observed to malfunction during the overpressure test. The leak indicator was not observed following vibration and prior to overpressure due to chamber mounting difficulties; however, it is considered probable that the failure occurred as a result of the vibration test.

e. Actuator Serial No. 209 failed to pass the timer accuracy test following the high altitude, low temperature test. The timer required 0.29 seconds to actuate (requirement 0.08 to 0.13 seconds).

f. Actuator Serial Nos. 222 and 228 failed to pass the vibration requirements; however, Serial No. 222 did fire within the allowable tolerance of $\pm$400 feet, but the initial calibration was incorrect and, therefore, several firings were out of the assigned altitude range. Serial No. 228 would not fire within $\pm$400 feet of the initial calibration firing altitude.

APPENDIX D

SAND AND DUST

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL

3. DATE 21 FEB 1962

1. TEST TITLE
Sand and Dust Test of an Automatic Parachute Actuator

IDENT. NR. ASTEVS-62-1a-R

4. TASK, PROJECT, OR SYSTEM NR. 5778

5. PRIORITY & AF IMPORTANCE CATEG. NR. 18E

6. OBJECTIVE AND SUMMARY

a. INTRODUCTION: The objective of this test was to determine the resistance of the actuator to sand and dust test conditions. Efforts to achieve this objective were started and completed 6 February 1962.

b. TEST RESULTS AND DISCUSSION:

(1) The parachute actuator was manufactured by the Pacific Scientific Company and was submitted by the Firewel Corporation. The actuator was identified as part nr. 1201117-0, serial nr. 207, Drouge Deploy.

(2) The actuator was cocked and placed inside of a parachute pack and the pack was subjected to sand and dust test conditions conforming to Procedure I of Specification MIL-E-5272.

(3) At the end of the test period the release was removed from the pack and subjected to functional tests in an altitude test facility, number 45-11. The actuator, which was preset at 19,000 feet altitude, actuated at 19,000 feet and was satisfactory.

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
12	12	0	100%

8. REQUESTING AGENCY
ASNPSP3

9. TEST STARTING DATE
6 February 1962
☐ INSTRUMENTATION INSTALLATION ☐ TEST PLANNING

11. TEST FACILITY
45-6

21. DISTRIBUTION
ASTA - 1 Cy
ASNPSP3 - 1 Cy
ASTEVS - Brig, File (1)

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☒ NO REPORT NR. *(If Known)*

12. TEST LOCATION(S)
Bldg. 45

	ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT: N/A		
14. DIRECTORATE TEST ENGINEER: Manfel P. Ornstein	ASTEVS	25290
15. INSTRUMENTATION ENGINEER: N/A		
16. PROGRAM MANAGER: 2/Lt. R. C. Linebaek	ASNPSP3	22113

22. ATTACHMENTS
☐ APPENDICES
☐ TABLES
☐ FIGURES

	TITLE	ORGN SYMBOL	EXTENSION
17. PREPARED BY: Manfel P. Ornstein	Metallurgist	ASTEVS	25290
18. DIRECTORATE CONCURRENCE			
19. TECHNICAL DIRECTOR CONCURRENCE: Carl E. Reichert	Technical Director	ASTE	21177
20. AST DEPUTY APPROVAL			

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

SECURITY CLASSIFICATION

(4) The cover plate of the actuator was removed and the interior was visually examined. No sand and dust had penetrated into the actuator.

c. CONCLUSION: The actuator withstood the test conditions to which it was exposed.

d. RECOMMENDATIONS: It is recommended that the actuator be considered resistant to sand and dust as represented by the above described test.

PREPARED BY: Mendel P. Ornstein
MENDEL P. ORNSTEIN
Test Project Engineer

CONCURRED IN: Dwight C. Kennard, Jr.
DWIGHT C. KENNARD, JR.
Chief, Environmental Division
Directorate of Engineering Test
Deputy Commander/Test and Support

APPROVED BY: Carl E. Reichert
CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy Commander/Test and Support

APPENDIX E

HUMIDITY

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT

DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL

3. DATE 8 MAR 1962

4. TASK, PROJECT, OR SYSTEM NR. 5778

5. PRIORITY & AF IMPORTANCE CATEG. NR. 1BE

1. TEST TITLE

Automatic Parachute Actuator

IDENT. NR. ASTEVS-62-1b-R

6. OBJECTIVE AND SUMMARY

a. INTRODUCTION: The objective of this test was to determine the resistance of the actuator to humidity test conditions conforming to Procedure I of Specification Nr. MIL-E-5272. Efforts to achieve this objective were started 7 February 1962 and completed 14 February 1962.

b. FACTUAL DATA AND DISCUSSION:

(1) The parachute actuator was manufactured by the Pacific Scientific Company and submitted by the Firewel Corporation.

(2) The actuator was exposed to the prescribed test conditions for 120 hours in accordance with Appendix K, Technical Memorandum ASNP-TM-61-28.

(3) At the end of the test period the actuator was subjected to functional tests in an altitude chamber, Facility Nr. 45-12, in the Space and Atmospheric Deterioration Branch.

(4) The actuator, which was a drogue deploy type and preset to energize at 19,000 feet, failed to function while the altitude was raised from ground level to 20,000 feet. A second trial was conducted. The altitude was raised from ground

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
120	120	0	100%

8. REQUESTING AGENCY: ASNPSP3

9. TEST STARTING DATE: 7 February 1962 — ☒ INSTRUMENTATION INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED: ☐ YES ☒ NO REPORT NR. *(If Known)*

11. TEST FACILITY: 45-4

12. TEST LOCATION(S): Bldg. 45

21. DISTRIBUTION: ASNPSP3, ASTA, ASTEVS

22. ATTACHMENTS: ☐ APPENDICES ☐ TABLES ☐ FIGURES

		ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT	N/A		
14. DIRECTORATE TEST ENGINEER	Mendel P. Ornstein	ASTEVS	25290
15. INSTRUMENTATION ENGINEER	N/A		
16. PROGRAM MANAGER	2/Lt R. C. Lineback	ASNPSP3	22113
17. PREPARED BY	Mendel P. Ornstein	Metallurgist / ASTEVS	25290
18. DIRECTORATE CONCURRENCE			
19. TECHNICAL DIRECTOR CONCURRENCE	Carl E. Reichert	Technical Director / ASTE	21177
20. AST DEPUTY APPROVAL			

SECURITY CLASSIFICATION

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

level to 35,000 feet. The actuator failed to energize.

(5) The cover of the actuator was removed and the interior was visually examined. Rust was observed on the release pin, the latch, a gear, and a sliding component. The failure of the test item to function was attributed to the rust.

c. CONCLUSION: The parachute actuator did not withstand the test conditions to which it was exposed.

d. RECOMMENDATIONS: It is recommended that:

(1) The actuator be considered nonresistant to humidity as represented by this test.

(2) The components that rusted be fabricated of rust resistant materials.

Mendel P. Ornstein

PREPARED BY: MENDEL P. ORNSTEIN
Test Project Engineer

for J. Edmund Clark

CONCURRED IN: DWIGHT C. KENNARD, JR.
Chief, Environmental Division
Directorate of Engineering Test
Deputy Commander/Test and Support

Carl E. Reichert

APPROVED BY: CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy Commander/Test and Support

APPENDIX F

TIMER AND ANEROID ACCURACY, ANEROID CYCLING, ANEROID HYSTERESIS, HIGH ALTITUDE-LOW TEMPERATURE, HIGH TEMPERATURE, AND OVERPRESSURE

Report No.	Page
ASTEVS-62-2-R	18-21

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL

3. DATE 12 MAR 1962

1. TEST TITLE
Automatic Parachute Actuators

IDENT. NR. ASTEVS-62-2-R

4. TASK, PROJECT, OR SYSTEM NR. 5778

5. PRIORITY & AF IMPORTANCE CATEG. NR. 18E

6. OBJECTIVE AND SUMMARY

a. INTRODUCTION: To obtain operational data on two automatic parachute actuators when subjected to various test conditions.

b. FACTUAL DATA:

(1) The actuators were manufactured by the Pacific Scientific Company and submitted for testing by the Firewel Corporation. Two models were submitted, one designated as a drogue release, part nr. 1201118-0, serial nr. 209, the other designated as a main deploy, part nr. 1201119-0, serial nr. 211. The actuators are designed to pull the ripcord of a parachute after a preset time delay provided they are within a preset pressure altitude. Allowable operational tolerances for both releases are ±500 feet at normal ambient temperature and ±1000 feet at low or high ambient temperatures (-65°F and 160°F).

(2) Testing of the actuators was conducted in accordance with a suborder submitted by ASNPSP3. This suborder outlined the testing procedures in accordance with Appendix K of Technical Memorandum ASNP-TM-61-28. Additional operational criteria for these tests were furnished by the project engineer. Each testing procedure covered by this report will contain the appropriate heading and respective paragraph number referenced in Appendix K.

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
120	N/A	0	100%

8. REQUESTING AGENCY
ASNPSP-3

9. TEST STARTING DATE
5 February 1962
☐ INSTRUMENTATION ☒ INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☒ NO REPORT NR. *(If Known)*

11. TEST FACILITY

12. TEST LOCATION(S)

21. DISTRIBUTION
ASNPSP-3 - 1 Cy
ASTA - 1 Cy
ASTEVS - (Orig, File)

	ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT: N/A		
14. DIRECTORATE TEST ENGINEER: Anthony Civetz	ASTEVS	25290
15. INSTRUMENTATION ENGINEER: N/A		
16. PROGRAM MANAGER: Lt. R. C. Linebaek	ASNPSP-3	22113

22. ATTACHMENTS
☒ APPENDICES ☐ TABLES ☐ FIGURES

	TITLE	ORGN SYMBOL	EXTENSION
17. PREPARED BY: Anthony Civetz	Engr. Technician	ASTEVS	25290
18. DIRECTORATE CONCURRENCE			
19. TECHNICAL DIRECTOR CONCURRENCE: Carl E. Reichert	Technical Director	ASTE	21177
20. AST DEPUTY APPROVAL			

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

SECURITY CLASSIFICATION

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL
3. DATE 12 MAR 1962
4. TASK, PROJECT, OR SYSTEM NR. 5778
5. PRIORITY & AF IMPORTANCE CATEG. NR. 18E

1. TEST TITLE
Automatic Parachute Actuators
IDENT. NR. ASTEVS-62-2-R

6. OBJECTIVE AND SUMMARY

a. INTRODUCTION: To obtain operational data on two automatic parachute actuators when subjected to various test conditions.

b. FACTUAL DATA:

(1) The actuators were manufactured by the Pacific Scientific Company and submitted for testing by the Firewel Corporation. Two models were submitted, one designated as a drogue release, part nr. 1201118-0, serial nr. 209, the other designated as a main deploy, part nr. 1201119-0, serial nr. 211. The actuators are designed to pull the ripcord of a parachute after a preset time delay provided they are within a preset pressure altitude. Allowable operational tolerances for both releases are ±500 feet at normal ambient temperature and ±1000 feet at low or high ambient temperatures (-65°F and 160°F).

(2) Testing of the actuators was conducted in accordance with a suborder submitted by ASNPSP3. This suborder outlined the testing procedures in accordance with Appendix K of Technical Memorandum ASNP-TM-61-28. Additional operational criteria for these tests were furnished by the project engineer. Each testing procedure covered by this report will contain the appropriate heading and respective paragraph number referenced in Appendix K.

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
120	N/A	0	100%

8. REQUESTING AGENCY: ASNPSP-3

9. TEST STARTING DATE: 5 February 1962 — ☐ INSTRUMENTATION ☒ INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED: ☐ YES ☒ NO REPORT NR. *(If Known)*

11. TEST FACILITY

12. TEST LOCATION(S)

21. DISTRIBUTION: ASNPSP-3 - 1 Cy; ASTA - 1 Cy; ASTEVS - (Orig, File)

	ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT: N/A		
14. DIRECTORATE TEST ENGINEER: Anthony Civetz	ASTEVS	25290
15. INSTRUMENTATION ENGINEER: N/A		
16. PROGRAM MANAGER: Lt. R. C. Linebaek	ASNPSP-3	22113

22. ATTACHMENTS: ☒ APPENDICES ☐ TABLES ☐ FIGURES

	TITLE	ORGN SYMBOL	EXTENSION
17. PREPARED BY: Anthony Civetz	Engr. Technician	ASTEVS	25290
18. DIRECTORATE CONCURRENCE			
19. TECHNICAL DIRECTOR CONCURRENCE: Carl E. Reichert	Technical Director	ASTE	21177
20. AST DEPUTY APPROVAL			

SECURITY CLASSIFICATION

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

e. TEST RESULTS AND DISCUSSIONS:

(1) Operational testing of the actuators was started on 5 February 1962 and was completed on 9 February 1962. As requested by the project engineer, both actuators were subjected to the timer accuracy and aneroid accuracy test phases. Actuator nr. 211 was then subjected to the aneroid cycling test phase while actuator nr. 209 was subjected to aneroid hysteresis, high altitude - low temperature, high temperature, and overpressure. Operational discrepancies noted during these tests were as follows. The aneroid leakage indicators on both actuators were defective resulting in inaccurate altitude indications at simulated altitude conditions. The timer mechanism on actuator nr. 209 operated above the operational requirements in the low ambient temperature. Aneroid operation on actuator nr. 209 did not satisfy the requirements of the overpressure test phase.

(2) Upon completion of testing the actuators were returned to the project engineer. A description of all tests is presented as Appendix A of this report.

f. CONCLUSION: It is concluded that:

(1) With the exception of the aneroid leakage indicator failure, actuator nr. 211 operated as required during the timer accuracy, aneroid accuracy and aneroid cycling test phases.

(2) Actuator nr. 209 operated as required during the timer accuracy, aneroid accuracy, aneroid hysteresis and high temperature test phases but did not meet the operational requirements of the high altitude - low temperature and overpressure test phases. Failure of the aneroid leakage indicator was also evident on this actuator.

g. RECOMMENDATION: It is recommended that both automatic parachute actuators be considered unsatisfactory for service use under the conditions imposed by this test.

PREPARED BY: Anthony Civetz
ANTHONY CIVETZ
Test Project Engineer

CONCURRED IN: Dwight C. Kennard, Jr.
DWIGHT C. KENNARD, JR.
Chief, Environmental Division
Directorate of Engineering Test
Deputy Commander/Test and Support

APPROVED BY: Carl E. Reichert
CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy Commander/Test and Support

APPENDIX "A"

1. Timer Accuracy (Para. 4.7.2). Four timer operational checks were made on each actuator. The time delay, after pulling the arming pin, varied between .10 and .12 seconds for each actuator. These timer operations were within the operational requirements of between .08 and .13 seconds.

2. Aneroid Accuracy (Para. 4.7.3). Each actuator was subjected to a simulated altitude of 20,000 feet and the arming pin was pulled. The test chamber altitude was lowered at a rate of 200 feet per second and each aneroid release point was noted. Actuator nr. 211 operated at 15,000 feet which was within the operational requirement of 15,000±500 feet. Actuator nr. 209 operated at 16,300 feet which was within the operational requirement of 16,500±500 feet.

3. Aneroid Cycling (Para. 4.3). Actuator nr. 211 was subjected to continuously varying altitude cycles at room temperature (+75°F) from station pressure to 35,000 feet and return to station pressure. This constituted one complete cycle and 1000 such cycles were imposed on the actuator. Upon completion of the 1000 cycles an aneroid accuracy check was made on the actuator. With an altitude descent rate of 200 feet per second the actuator operated at 15,300 feet, which was within the operational requirement of 15,000±500 feet. The aneroid leakage indicator on the actuator was checked during the first of the 1000 cycles and periodically during the 1000 cycles and the same malfunction was noted each time. No movement of the indicator was noted until the test chamber was at 15,000 feet and only indicated 5,000 feet with the test chamber at 35,000 feet.

4. Aneroid Hysteresis (Para. 4.7.4). Actuator nr. 209 was subjected to a simulated altitude of 30,000 feet and the arming pin was pulled. The test chamber altitude was lowered at a rate of 200 feet per second and the aneroid release point was noted to be at 16,800 feet. This operation was within the operational requirement of 16,500±500 feet.

5. High Altitude-Low Temperature (Para. 4.8.1). Actuator nr. 209 was subjected to an ambient temperature of -65°±2°F and a simulated altitude of 50,000 feet for a period of four hours. Upon completion of this exposure the actuator was subjected to an ambient temperature of -65°±2°F at station pressure for an additional period of four hours. Upon completion of this exposure, and while still at -65°±2°F, an aneroid accuracy and timer accuracy check was made on the actuator. The aneroid operated at 15,700 feet which was within the operational requirement of 16,500±1000 feet. The time delay on five timer operations were .30, .32, .32, .25 and .25 seconds. These timer operations were in excess of the operational requirement of between .08 and .13 seconds.

6. High Temperature (Para. 4.8.2). Actuator nr. 209 was subjected to an ambient temperature of 160°±2°F for a period of 15 hours. Upon completion of this exposure, and while still at that temperature, an aneroid accuracy and timer accuracy check was made on the actuator. The aneroid operated at 17,000 feet which was within the operational requirement of 16,500±1000 feet. The time delay on five timer operations were .13, .11, .12, .11 and .09 seconds. These timer operations were within the operational requirement of between .08 and .13 seconds.

7. Overpressure (Para. 4.4). Actuator nr. 209 was subjected to an absolute pressure of 50 inches Hg for a period of one hour. Upon completion of this one hour overpressure the actuator was returned to atmospheric pressure and subjected to this condition for a period of 20 hours. Six aneroid accuracy checks were then made with the actuator operating at 17,500 feet, 16,500 feet, 17,600 feet, 16,400 feet, 16,600 feet and 16,600 feet. Two of the six checks made were not within the operating requirements of 16,500 ± 500 feet. Prior to six operational checks the aneroid leakage indicator on the actuator was checked. No movement of the indicator was noted until the test chamber altitude was at 12,000 feet and only indicated 6,000 feet with the test chamber at 20,000 feet. Another leakage indicator check was made after the six aneroid checks. No movement of the indicator was noted until the test chamber altitude was at 18,000 feet and only indicated 5,000 feet with the test chamber at 25,000 feet.

APPENDIX G

ACCELERATION

Report No.	Page
ASTLVE-62-3c-R	23-27

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL

3. DATE 18 MAR 1962

1. TEST TITLE
AUTOMATIC PARACHUTE ACTUATOR IDENT. NR. 62-30-R

4. TASK, PROJECT, OR SYSTEM NR.
5778

5. PRIORITY & AF IMPORTANCE CATEG. NR.
18E

6. OBJECTIVE AND SUMMARY

a. Introduction:

The purpose of this test project is to evaluate the operational response and the post test effects of sustained 'g' (acceleration) on two automatic parachute actuators.

b. Test Results and Discussion:

(1) The two devices submitted for testing are used in a multistage parachute operation. The design of both is nearly identical and differ substantially only in the altitude at which each unit is set to trigger.

(2) The actuator identified as the drogue deploy (serial Nr. 207) is adjusted to function at 19,000 ft ±500 ft, (room temp). It will not trip at sea level.

(3) The actuator identified as the drogue release (serial Nr. 209) is adjusted to function at 17,000 ft ±500 ft, (room temp). This unit will trip at sea level if the locking pin is removed and the safety lever is on 'release'.

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
16	16	0	100%

8. REQUESTING AGENCY
ASNPSP3

9. TEST STARTING DATE
2 Feb 62
☐ INSTRUMENTATION ☐ INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☐ NO REPORT NR. (If Known)

11. TEST FACILITY
Centrifuge Nr. 69

12. TEST LOCATION(S)
Bldg 93

21. DISTRIBUTION
ASTEVD (original)
ASNPSP3 (vellum)
ASTA (1 cy)

	ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT		
14. DIRECTORATE TEST ENGINEER — Richard C. McKendry	ASTEVD	34245
15. INSTRUMENTATION ENGINEER		
16. PROGRAM MANAGER — 2/Lt. R.C. Linshaek	ASNPSP3	22113

22. ATTACHMENTS
1 ☐ APPENDICES
☐ TABLES
1 ☐ FIGURES

	TITLE	ORGN SYMBOL	EXTENSION
17. PREPARED BY — Richard C. McKendry	Test Project Engr.	ASTEVD	34245
18. DIRECTORATE CONCURRENCE			
19. TECHNICAL DIRECTOR CONCURRENCE — CARL A. REICHERT	Technical Director	ASTE	21177
20. AST DEPUTY APPROVAL			

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE. SECURITY CLASSIFICATION AF-WP-B-DEC 62 30

(4) For the acceleration tests, the specimens were mounted on a suitable fixture and secured to the test platform of the instrument centrifuge. Some deviations from the requirements stated in Paragraph 4.8.5 of the specification (Technical Memorandum ASNP-TM-61-28) were requested by the project engineer. The operation of tripping under altitude conditions during acceleration was waived for both specimens.

(5) The test procedure pursued in the case of the drogue deploy, consisted of loading and locking the specimen, then subjecting the unit to an acceleration of 30 g for one minute, followed by a test run in an altitude chamber to determine the firing altitude. This routine was repeated for each of six mounting positions along X, Y, and Z axes. Figure I, Appendix A indicates the tripping altitudes.

(6) In accordance with the changes required by the project engineer, the drogue release was initially loaded, locked and maintained in this manner while being subjected to the specified acceleration in both directions, along the X, Y, Z axes. At the completion of all the acceleration tests, the specimen was installed in an altitude chamber and tested to determine the tripping altitude. This occurred at 16,000 feet. Figure 1, previously referenced, includes this figure.

(7) It should be noted that the principle purpose of applying sustained 'g' to an assembled mechanism is to seek out the unbalance at every fulcrum. Producing this unbalance in an automatic parachute actuating device may represent the difference between inadvertent firing or a critical mechanical suspense, which in turn may cause a malfunction under service conditions. The factor of safety indicated in the proper application of sustained 'g' was entirely voided in the test procedure requested by the project engineer.

c. Conclusions:

As far as can be determined from the results of an extremely modified test procedure, the specimens submitted for test were not appreciably affected by the applied 'g'.

d. Recommendations:

It is recommended that any test program concerned with the operation of automatic parachute actuating devices include, functional operation at the specified altitude and sustained 'g' applied, in the + and - direction of the X, Y and Z axes.

PREPARED BY: Richard C. McKendry
RICHARD C. McKENDRY
Test Project Engineer

CONCURRED IN: for J. C. Chamberlain
DWIGHT C. KENNARD, Jr.
Chief, Environmental Division
Directorate of Engineering Test
Deputy Commander/Test and Support

APPROVED BY: Carl E. Reichert
CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy Commander/Test and Support

APPENDIX "A"

Figure I

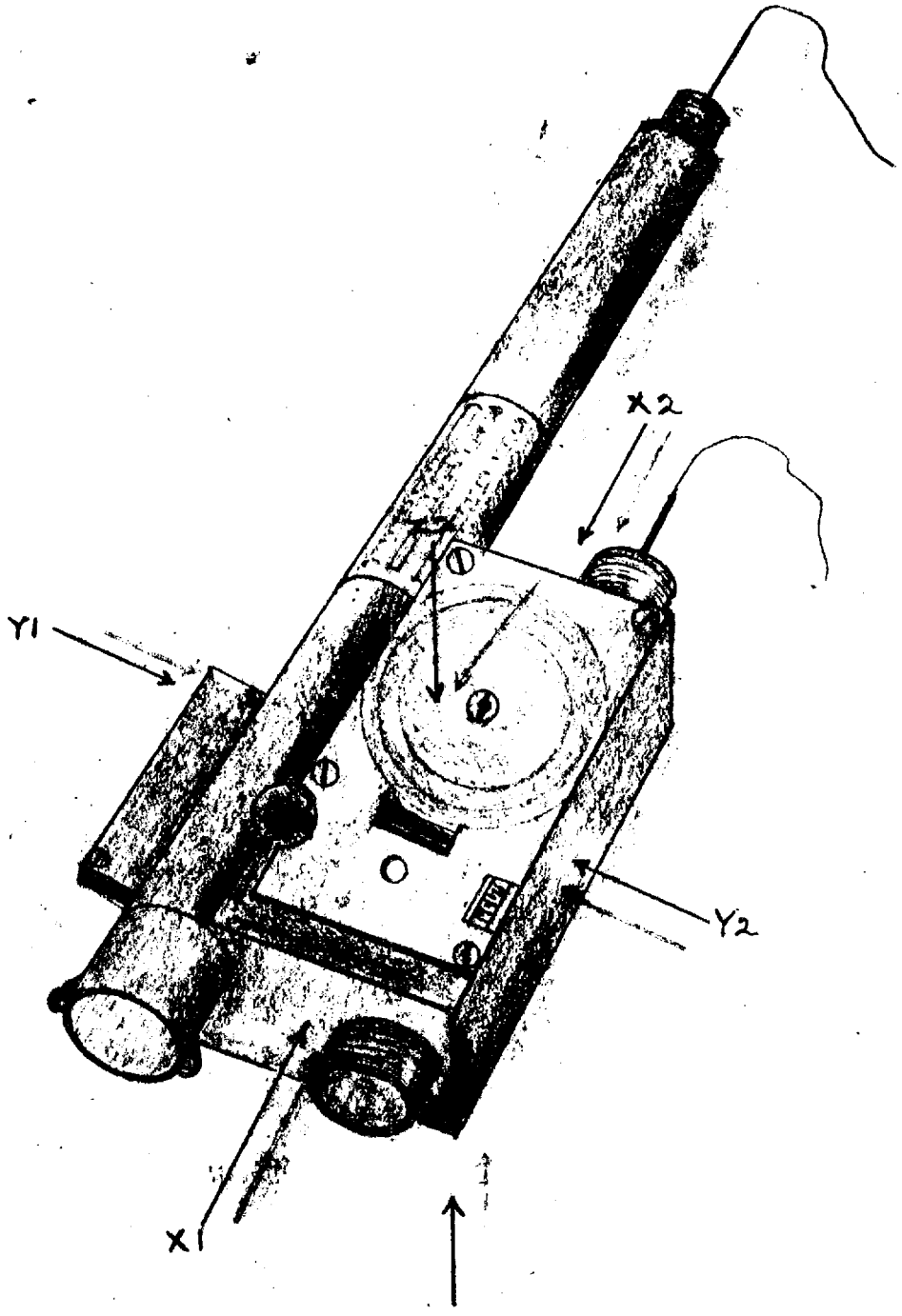


FIG 1

AXIS	DROGUE DEPLOY ALT.	AXIS	DROGUE RELEASE ALT.
X1	19,200	X1	—
X2	18,950	X2	—
Y1	19,100	Y1	—
Y2	18,800	Y2	—
Z1	19,250	Z1	—
Z2	19,650	Z2	—
			−16,800

SUBJECT.	AUTOMATIC PARACHUTE ACTUATORS
TEST NO.	62-3C-R
PROJECT NO.	5778
DATE.	5 FEB. '62

APPENDIX H

SHOCK AND VIBRATION

Report No.	Page
ASTEVD-62-3a-R	29-40

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL

3. DATE 20 MAR 1962

1. TEST TITLE
AUTOMATIC PARACHUTE ACTUATORS

IDENT. NR. 62-3a-R, 62-3b-R

4. TASK, PROJECT, OR SYSTEM NR.
5778

5. PRIORITY & AF IMPORTANCE CATEG. NR.
Precedence 18E

6. OBJECTIVE AND SUMMARY

a. Introduction:

The purpose of this report is to evaluate automatic parachute actuators under conditions of shock and altitude simultaneously and vibration and altitude simultaneously. Specific requirements are contained in ASNP-TM-61-28. Tests began on the 15 Jan 62 and were completed on 31 Jan 62.

b. Test Results and Discussion:

(1) Actuator S/N 207 is the device within a parachute system which releases the deploy parachute automatically at 19,000 feet or above. Primary design of this actuator is for use with man-carrying capsules of high altitude aircraft or space craft. Significant chatacteristics of this actuator are contained in Table Nr. I, Appendix A of this report. Photograph Nr. 62-651, Appendix B of this report shows this physical actuator.

(2) Actuator S/N 209 is the device within this system which releases the main parachute automatically when the altitude has reached 16,500 feet. Significant characteristics of this actuator are contained in Table Nr. II, Appendix A of this report. Photograph Nr. 62-554A, Appendix B of this report shows this physical actuator. The vibration-altitude evaluation procedure was

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
160	160	0	100%

8. REQUESTING AGENCY
ASNPSP-3

9. TEST STARTING DATE
15 January 1962
☐ INSTRUMENTATION ☐ INSTALLATION ☐ TEST PLANNING

11. TEST FACILITY
Cold-Hold Alt Chamber and JAN-S-44 Shock Machine

21. DISTRIBUTION
ASTEVD (Original)
ASNPSP3 (Vellum)
ASTA (Copy)

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☒ NO REPORT NR. *(If Known)*

12. TEST LOCATION(S)

	ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT		
14. DIRECTORATE TEST ENGINEER — Howard R. Kimm	ASTEVD	34245
15. INSTRUMENTATION ENGINEER		
16. PROGRAM MANAGER — Lt. R.C. Linebaugh	ASNPSP-3	2-2113

22. ATTACHMENTS
2 ☐ APPENDICES
4 ☐ TABLES
☐ FIGURES

17. PREPARED BY	TITLE	ORGN SYMBOL	EXTENSION
HOWARD R. KIMUM	Test Project Engr.	ASTEVD	34245
18. DIRECTORATE CONCURRENCE	TITLE	ORGN SYMBOL	EXTENSION
19. TECHNICAL DIRECTOR CONCURRENCE — CARL E. REICHERT	Technical Director	ASTEVD	21177
20. AST DEPUTY APPROVAL	TITLE	ORGN SYMBOL	EXTENSION

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

SECURITY CLASSIFICATION

accomplished first. Each actuator was mounted on the Calidyne Model 44 shaker within the Kold-Hold altitude chamber as shown in Photograph Nr. 62-554, Appendix "B" of this report. An MB Model 124 velocity type pickup and an MB Model M-3 vibration meter were used to measure the double amplitude of vibration. An electric motor was used to change the control lever from the reset position to the armed position remotely while the actuator was at a simulated altitude.

(3) S/N 207 actuator was vibrated for a total of 3 hours as follows: (a) longitudinally for 1/2 hour at room ambient pressure, cocked with the arming pin in and the control lever in the reset position; (b) longitudinally for 1/2 hour at a simulated 17,500 feet altitude with arming pin removed and the control lever set in the armed position, (c) Vibration was stopped and the altitude brought up until the actuator operated, (d) the altitude of operation was recorded, (e) the altitude was returned to room ambient.

(4) The actuator was reset and vibrated similarly along the lateral and vertical axes, in sequence, for one hour along each axis, and the altitude of operation was also recorded in each case. The frequency of vibration was continuously varied between 10 and 55 cycles per second with a double amplitude of 0.030 inch applied as required by Technical Memorandum Nr. ASNP-TM-61-28, Paragraph 4.8.3. S/N 209 was vibrated for a total of 3 1/2 hours with the following conditions differing from those applied to S/N 207 (all room ambient altitude conditions being the same): (a) the control lever was set in the armed position remotely at 18,000+ feet simulated altitude after the room altitude vibration, (b) the simulated altitude vibration was conducted at 18,000+ feet (instead of 17,500 feet), (c) after vibration altitude was reduced until the actuator operated, (d) an additional 1/2 hour of lateral vibration at 18,000 feet was applied to S/N 209 because this specimen had operated at the end of the first 1/2 hour of lateral vibration at 18,000 feet, (e) there was no visable damage inflicted on either specimen resulting from vibration. Neither specimen malfunctioned during vibration except for the possibility of S/N 209 operating out of tolerance during lateral vibration during the first half hour at altitude. S/N 207 operated at 19,100 feet after longitudinal vibration; at 19,500 feet after lateral vibration; at 20,200 feet after vertical vibration. When a recheck without additional vibration was made on S/N 207 following its operation at 20,200 feet, it operated at 19,300 feet. The tolerance is ±500 feet from the set value of 19,000 feet. S/N 209 operated at 16,400 feet after longitudinal vibration; at 16,400 feet after lateral vibration; and at 17,400 feet after vertical vibration. When a recheck without additional vibration was made on S/N 209 following its operation at 17,400 feet, it operated at 17,350 feet and was witnessed by the project engineer. The tolerance is ±500 feet from the set value of 16,500 feet, (f) the project engineer asserted that there has been excessive variation in the altitude of operation of the actuators previously. It is very possible that the very mild vibration requirements had no effect upon the actuators. Transportation vibration requirements outlined in Specification MIL-E-4970, Paragraph 4.6.3 are much more severe and apply to such equipment being shipped for installation.

(5) For the shock-altitude evaluation, actuator S/N 207 was mounted on a shock machine (JAN-S-44) within an altitude chamber as shown in Photograph Nr. 62-650. Calculations for the shock value (30 g) are found in Table No. IV of Appendix "A".

Remote control was used to raise and release the carriage of the shock machine. The test procedure was as follows:

Actuator was reset
Arming pin was removed
Control lever set in the armed position
Chamber brought to 17,000 ft altitude
Shock applied to actuator
Increased altitude in chamber until actuator operated, record altitude
Repeat entire procedure for each direction of the mutually perpendicular axes.

Data and results are contained in Table III, Appendix A. The actuator operated satisfactorily within the required altitude limits. There was no visible damage.

c. Conclusions:

Even though the actuator failed to operate consistantly within tolerance after vibration, the cause is not necessarily vibration since pre-vibration trials had not been consistent according to the project engineer. The actuator operated satisfactorily within the requirements of ASNP-TM-61-2F in relation to the required shock inputs.

d. Recommendations:

It is suggested that the shock and vibration requirements of specification MIL-E-4970, "Environmental Testing, Ground Support Equipment, General Specification", paragraph 4.6.3 and 4.12.3 be considered as an additional requirement for all actuators. This is based upon the possibility of greater dynamic inputs during transportation and handling phases.

Howard R. Kinum

PREPARED BY: HOWARD R. KINUM
Test Project Engineer

Dwight C. Kennard Jr.

CONCURRED IN: DWIGHT C. KENNARD, Jr.
Chief, Environmental Division
Directorate of Engineering Test
Deputy Commander/Test and Support

Carl E. Reichert

APPROVED BY: CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy Commander/Test and Support

APPENDIX "A"

Table Nr. I

General Characteristics of Specimen

Manufacturer: Pacific Scientific Company, Los Angeles, Calif.
Nomenclature: Drogue Deploy
Part Nr: 1201117-0
Serial Nr: 207
Weight: 1.65 lb
Operation: Set to operate at or above 19,000 feet altitude
Tolerance - ±500 feet
Cable Pulled - 2 inches

Dimensions:

Length - 9 5/8 inches
Width - 3 inches
Height - 1 1/2 inches
Cable (extended) - 12 3/4 inches
2 Mounting Holes for 1/8 inch bolts, 5 inches on centers

APPENDIX "A"
Table Nr. II

General Characteristics of Specimen

Manufacturer: Pacific Scientific Company, Los Angeles, Calif.
Nomenclature: Drogue Release
Part Nr: 1201118-0
Serial Nr: 209
Weight: 1.65 lb
Operation: Set to operate at or below 16,500 feet altitude
Tolerance - ±500 feet
Cable pulled - 2 inches

Dimensions:

Length - 9 5/8 inches
Width - 3 inches
Height - 1 1/2 inches
Cable extension (extended) - 12 3/4 inches
2 Mounting Holes for 1/8 inch bolts, 5 inches on centers

APPENDIX "A"

Table Nr. III

Results of Shock and Altitude Test

Automatic Parachute Actuator, Serial Nr. 207
Shock 30 g

Direction of Shock	Shock Altitude	Actuating Altitude
Longitudinal, cable up	17,200 feet	19,300 feet
Longitudinal, cable down	17,400	19,000
Lateral-cable below arming-pin socket	17,400	19,000
Lateral-Cable above arming pin socket	17,400	19,100
Vertical upright	17,400	18,750
Vertical inverted	17,400	19,100

APPENDIX "A"

Table Nr. IV

Sample Calculations

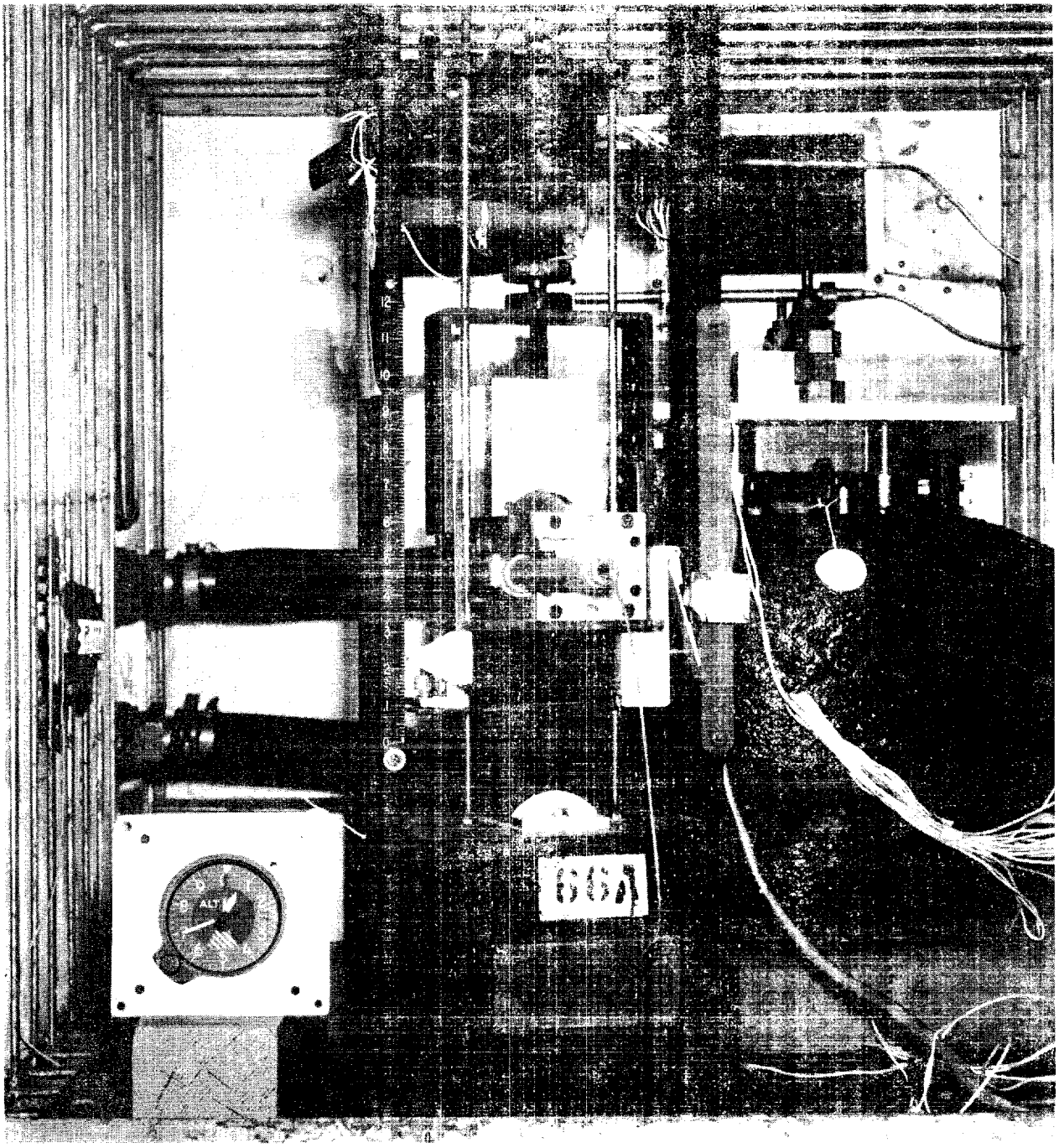
JAN-S-44 Shock Machine

Spring Constant - 1590 Pounds per inch = K
Total Carriage weight including specimen - 15 pounds = W
Shock Required - 30 g = g

Drop Height = H $=(g)^2 \times W/2K$
H = 30 x 30 x 15/2 x 1590
H =13,500/3180=4 1/4 inches

APPENDIX "B"

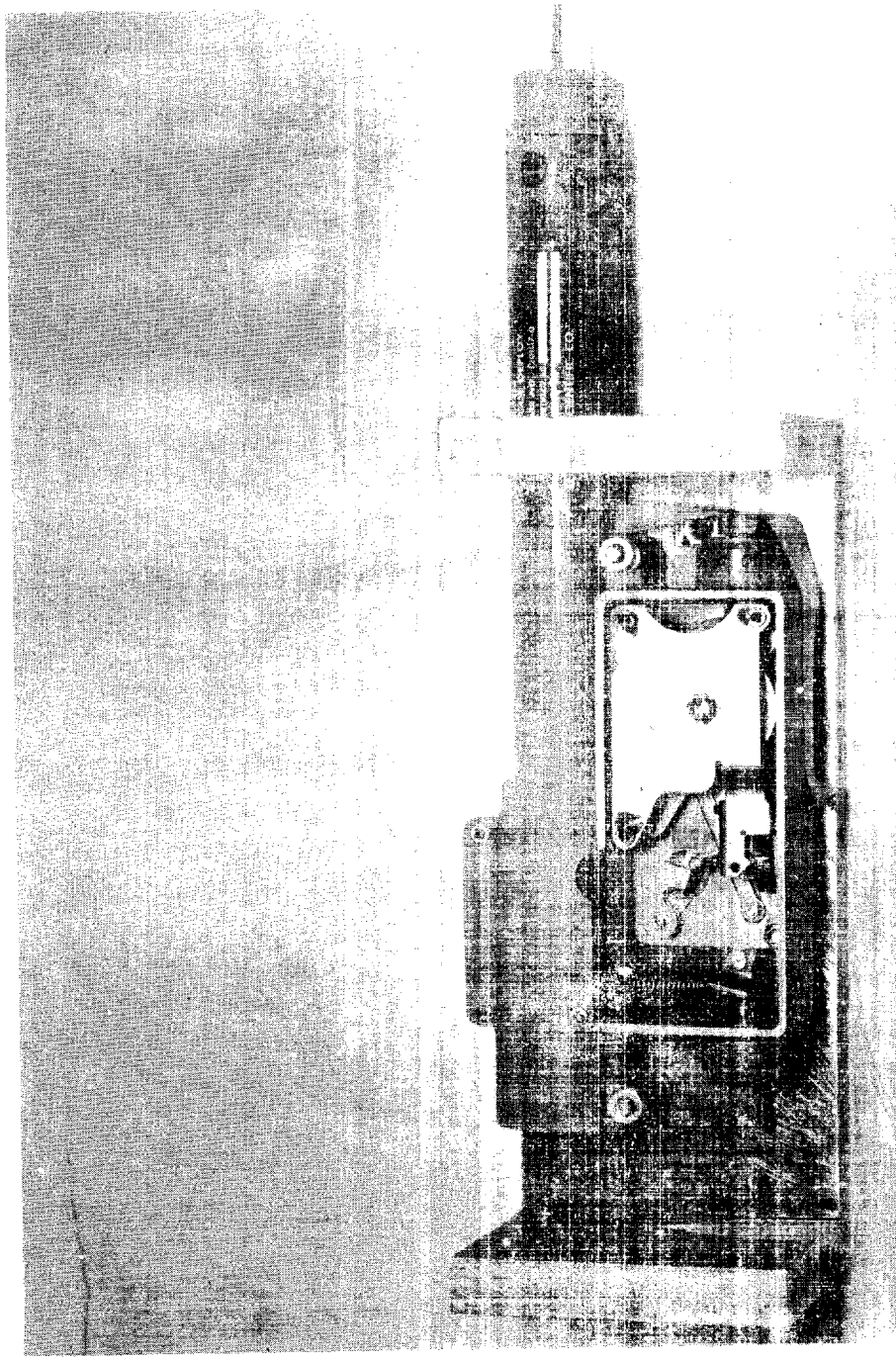
Photographs Nrs. 62-650 - 651
62-554 and 554A



PACIFIC SCIENTIFIC AUTOMATIC
PARACHUTE ACTUATOR
REPORT ASTEVD-62-3B-R

ASD
ASTDP

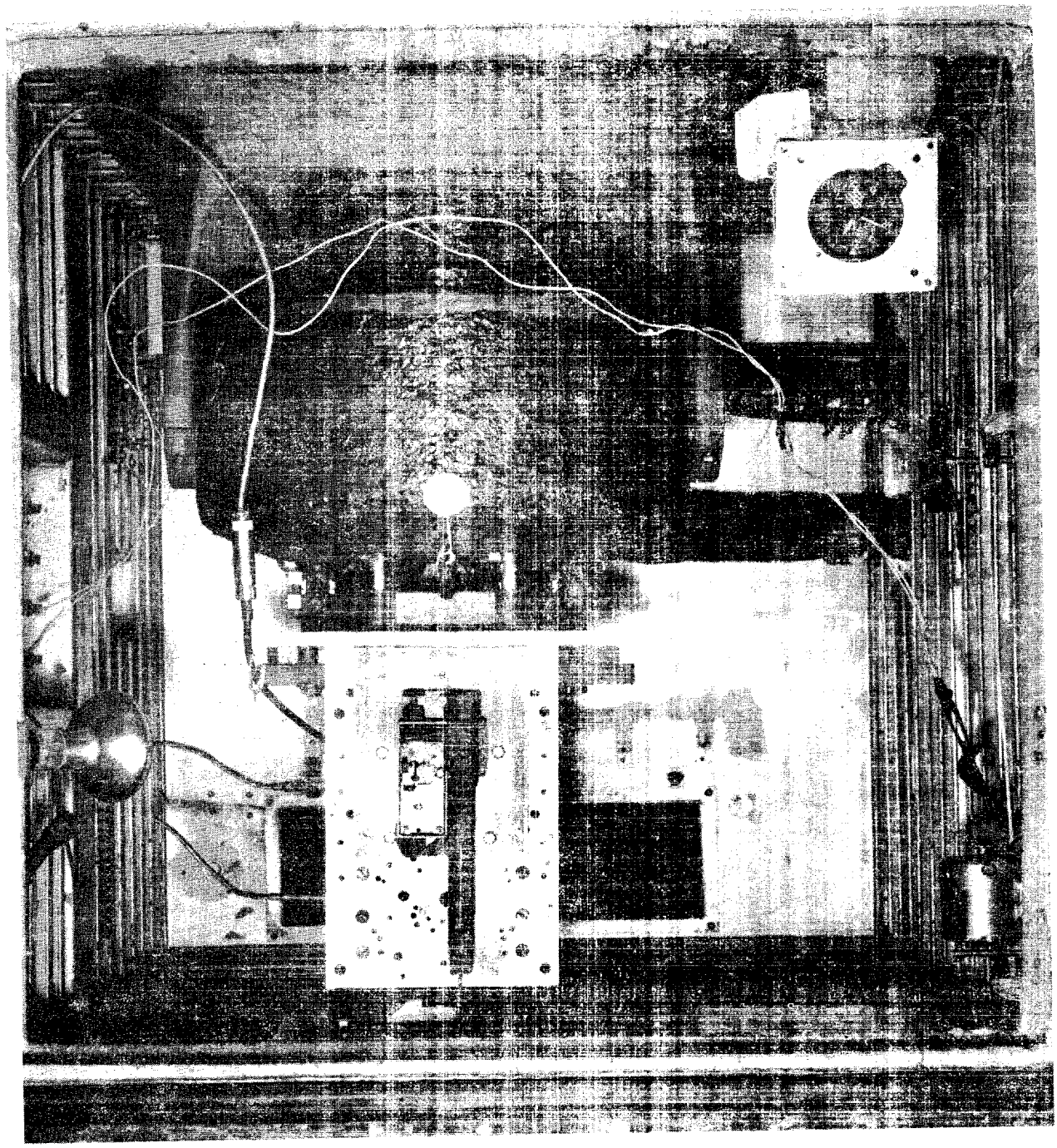
DATE: 31 JAN 62
NO. HR. 62-650



PACIFIC SCIENTIFIC AUTOMATIC
PARACHUTE ACTUATOR
REPORT ASTEVD-62-3B-R

ASD
ASTDP

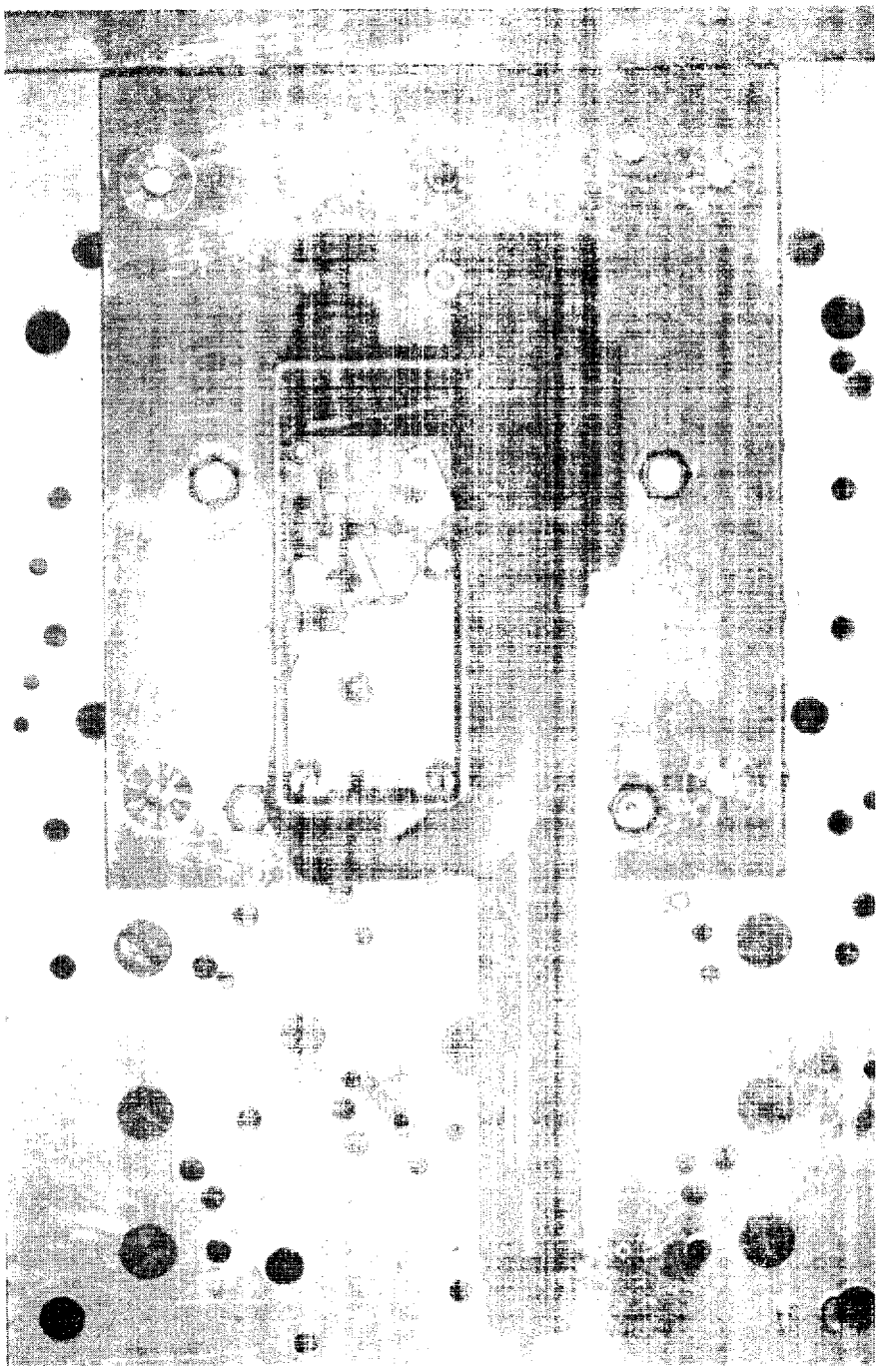
DATE: 31 JAN 62
NEG. NR. 62-651



PACIFIC SCIENTIFIC AUTOMATIC
PARACHUTE ACTUATOR;
REPORT ASTEVU-6[illegible]-3a-M

ASD
ASTDP

DATE: 27 JAN 62
ENG. NR. 62-554



PACIFIC SCIENTIFIC AUTOMATIC
MAGNETIC ACTIVITY
REPORT ASTDP-62-R

ASD
ASTDP

21 JAN 62
No. 62-554A

APPENDIX I

HUMIDITY

Report No.	Page
ASTEVS-62-35-R	42-44

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL
3. DATE 10 MAY 1962
4. TASK, PROJECT, OR SYSTEM NR. 5778
5. PRIORITY & AF IMPORTANCE CATEG. NR. 18E

1. TEST TITLE
Automatic Parachute Actuators
IDENT. NR. ASTEVS-62-35-R

6. OBJECTIVE AND SUMMARY

a. INTRODUCTION: The purpose of this test was to determine the resistance of two automatic parachute actuators to humidity test conditions.

b. FACTUAL DATA:

(1) The actuators were manufactured by the Pacific Scientific Company and submitted for testing by the Firewel Corporation. Two models were submitted, one designated as a drogue release, part nr. 1201118-0, serial nr. 209, the other designated as a drogue deploy, part nr. 1201117-0, serial nr. 207. The actuators are designed to pull the ripcord of a parachute after a preset time delay provided they are within the preset pressure altitude. Allowable operational tolerances for both releases are ±500 feet at normal ambient temperature.

(2) Testing of the actuators was conducted in accordance with a suborder submitted by ASNPSP3 dated 2 March 1962. This suborder outlined the humidity test conditions to conform to Procedure I of Specification Nr. MIL-E-5272 for five cycles followed by a visual inspection and an aneroid accuracy test.

c. TEST RESULTS AND DISCUSSIONS:

(1) With both actuators packed within a parachute pack, the actuators were

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
122			100%

8. REQUESTING AGENCY: ASNPSP3

9. TEST STARTING DATE: 16 April 1962
☐ INSTRUMENTATION ☒ INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☒ NO REPORT NR. *(If Known)* _____

11. TEST FACILITY: #4

12. TEST LOCATION(S): Bldg. 45

21. DISTRIBUTION: ASNPSP3, ASTA, ASTEVS

22. ATTACHMENTS: ☒ APPENDICES ☐ TABLES ☐ FIGURES

		ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT	N/A		
14. DIRECTORATE TEST ENGINEER	Anthony Civetz	ASTEVS	25290
15. INSTRUMENTATION ENGINEER	N/A		
16. PROGRAM MANAGER	Lt. R. C. Linebeck	ASNPSP3	22113

		TITLE	ORGN SYMBOL	EXTENSION
17. PREPARED BY	Anthony Civetz	Engr. Technician	ASTEVS	25290
18. DIRECTORATE CONCURRENCE				
19. TECHNICAL DIRECTOR CONCURRENCE	Carl E. Reichert	Technical Director	ASTE	21177
20. AST DEPUTY APPROVAL				

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

SECURITY CLASSIFICATION

subjected to the humidity test conditions prescribed in Procedure I of Specification Nr. MIL-E-5272 for the required five cycles (120 hours). The test conditions were started on 16 April 1962 and were completed on 20 April 1962. On 23 April 1962, 56 hours after the completion of the last humidity cycle, a visual inspection and an operational test were made on each actuator after removal from the parachute pack. The cover on each actuator was removed and the interior of each actuator was visually inspected. No visible adverse conditions were noted on the drogue release actuator but rust formation was noted on the arming latch of the drogue deploy actuator. This rust formation is shown in a photograph, nr. 62-1359, attached to this report.

(2) An aneroid accuracy test was then conducted on each actuator. The drogue release actuator was subjected to a simulated altitude of 20,000 feet and the arming lever was moved to the armed position. The altitude was then lowered at a rate of 200 feet per second and the aneroid release point was noted to be at 16,300 feet. This was within the operational requirement of 16,500±500 feet. The drogue deploy actuator, containing a reverse action aneroid, was subjected to a simulated altitude of 23,000 feet. The altitude was then lowered to 15,000 feet and the arming lever was moved to the armed position. The altitude was raised and the aneroid release point was noted to be 20,600 feet, which was not within the operational requirement of 19,000±500 feet. No further testing was conducted and the actuators were returned to the project engineer.

d. CONCLUSIONS: It is concluded that:

(1) The drogue release actuator, serial nr. 209, satisfactorily met the test conditions.

(2) The drogue deploy actuator, serial nr. 207, did not meet the test conditions due to the rust formation and unsatisfactory aneroid operation.

e. RECOMMENDATIONS: It is recommended that:

(1) The drogue release actuator, serial nr. 209, be considered satisfactory for service use under the conditions imposed by this test.

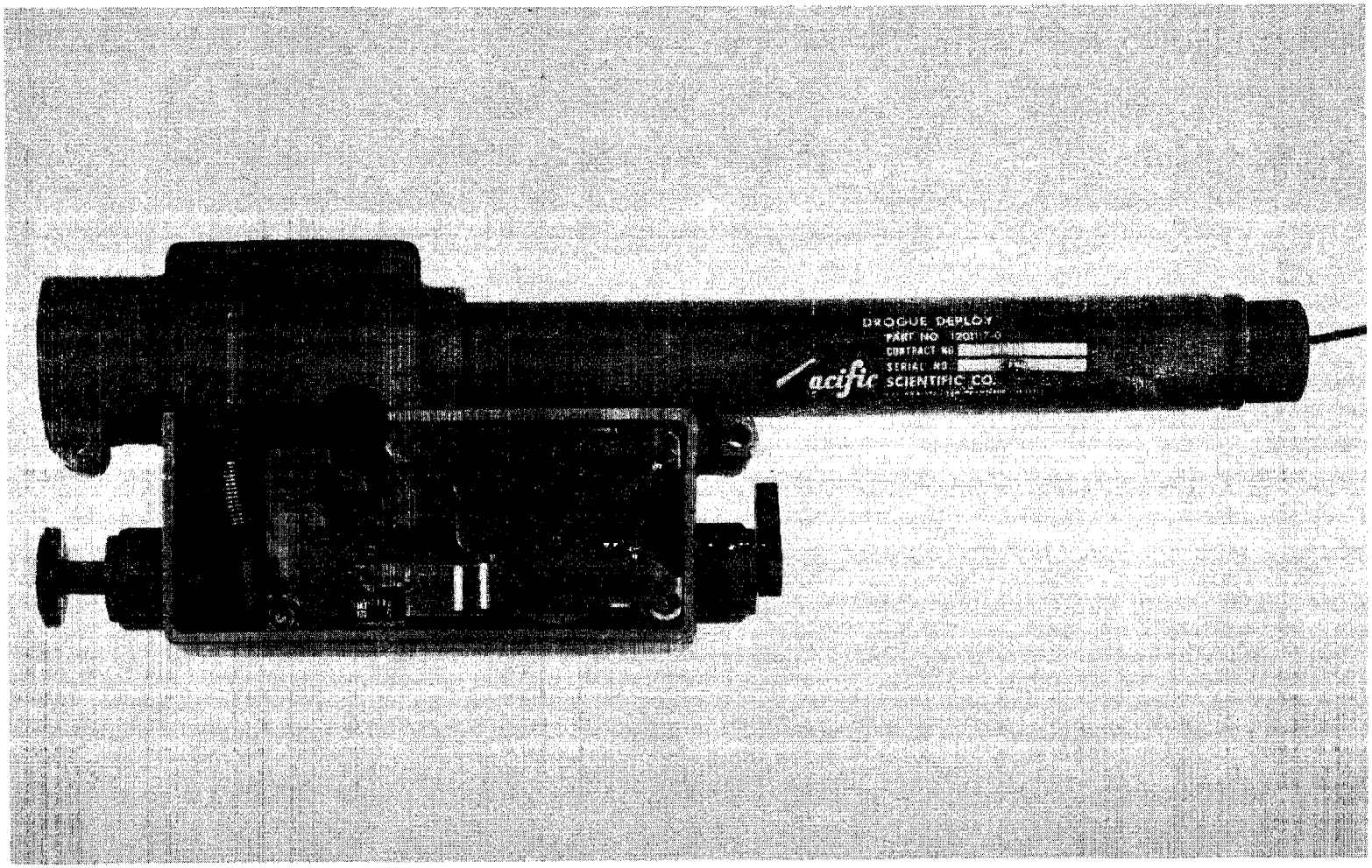
(2) The drogue deploy actuator, serial nr. 207, be considered unsatisfactory for service use under the conditions imposed by this test.

(3) Both actuators be completely disassembled and inspected for internal rust formation. All parts found to be rusted should be fabricated of rust resistant material.

PREPARED BY: Anthony Civetz
ANTHONY CIVETZ
Test Project Engineer

CONCURRED IN: J E Chamberlain for
DWIGHT C. KENNARD, JR.
Chief, Environmental Division
Directorate of Engineering Test
Deputy Commander/Test and Support

APPROVED BY: Carl E. Reichert
CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy Commander/Test and Support



AUTOMATIC PARACHUTE ACTUATOR DROGUE DEPLOY

Approved For Release 2003/03/10 : CIA-RDP75B00285R000400070001-0

APPENDIX J

VIBRATION

Report No.	Page
ASTEVD-62-105-R	46-49

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL

3. DATE 12 OCT 1962

1. TEST TITLE
AUTOMATIC PARACHUTE ACTUATOR
IDENT. NR. 62-105-R

4. TASK, PROJECT, OR SYSTEM NR. 5778-(575)

5. PRIORITY & AF IMPORTANCE CATEG. NR.
Precedence 18E

6. OBJECTIVE AND SUMMARY

a. **Introduction:**

The purpose of this report is to evaluate an automatic parachute actuator under conditions of vibration and altitude simultaneously. Specific requirements are contained in ASNP-TM-61-28. Test began 25 July 1962 and was completed 27 July 1962. The project engineer asked the manufacturer to furnish another test specimen which was to be evaluated also. On 1 October, it was decided to close out this test because the manufacturer did not respond in a reasonable time.

b. **Test Results and Discussion:**

(1) The actuator is the device within a parachute assembly which automatically releases the main parachute when the altitude is at or below 16,500 feet (±500 feet) and is used with man carrying capsules of high altitude aircraft or space craft. Significant characteristics of this actuator are contained in Table Nr. 1, Appendix A of this report.

(2) The actuator was cocked and operated at room altitude before being subjected to vibration. It was recocked and vibrated longitudinally for a half hour at room altitude and for another half hour at 17500 to 18,000 feet simulated

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
40	40	0	100%

8. REQUESTING AGENCY
ASNPSP-3

9. TEST/STARTING DATE
25 July 1962
☐ INSTRUMENTATION ☐ INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☒ NO REPORT NR. *(If Known)*

11. TEST FACILITY Kold Hold Alt Chamber & Calidyne Model 44 shaker.

12. TEST LOCATION(S)
Bldg 93, Room 1

21. DISTRIBUTION
ASTEVD (original)
ASNPSP-3 (copy)
ASTA (copy)

	ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT		
14. DIRECTORATE TEST ENGINEER — Howard R. Kinum	ASTEVD	34245
15. INSTRUMENTATION ENGINEER — Lt. R.C. Linebeck	ASNPSP-3	2-2113
16. PROGRAM MANAGER — Lt. R.C. Linebeck	ASNPSP-3	2-2113

22. ATTACHMENTS
☒ APPENDICES ☐ TABLES ☐ FIGURES

	TITLE	ORGN SYMBOL	EXTENSION
17. PREPARED BY — Howard R. Kinum	Test Project Engr.	ASTEVD	34245
18. DIRECTORATE CONCURRENCE — Carl E. Reichert	Technical Director	ASTE	21177
19. TECHNICAL DIRECTOR CONCURRENCE			
20. AST DEPUTY APPROVAL			

SECURITY CLASSIFICATION

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL

3. DATE 12 OCT 1962

1. TEST TITLE
AUTOMATIC PARACHUTE ACTUATOR
IDENT. NR. 62-105-R

4. TASK, PROJECT, OR SYSTEM NR. 5778-(575)

5. PRIORITY & AF IMPORTANCE CATEG. NR.
Precedence 18E

6. OBJECTIVE AND SUMMARY

a. **Introduction:**

The purpose of this report is to evaluate an automatic parachute actuator under conditions of vibration and altitude simultaneously. Specific requirements are contained in ASNP-TM-61-28. Test began 25 July 1962 and was completed 27 July 1962. The project engineer asked the manufacturer to furnish another test specimen which was to be evaluated also. On 1 October, it was decided to close out this test because the manufacturer did not respond in a reasonable time.

b. **Test Results and Discussion:**

(1) The actuator is the device within a parachute assembly which automatically releases the main parachute when the altitude is at or below 16,500 feet (±500 feet) and is used with man carrying capsules of high altitude aircraft or space craft. Significant characteristics of this actuator are contained in Table Nr. 1, Appendix A of this report.

(2) The actuator was cocked and operated at room altitude before being subjected to vibration. It was recocked and vibrated longitudinally for a half hour at room altitude and for another half hour at 17500 to 18,000 feet simulated

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
40	40	0	100%

8. REQUESTING AGENCY
ASNPSP-3

9. TEST/STARTING DATE
25 July 1962
☐ INSTRUMENTATION INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☒ NO REPORT NR. *(If Known)*

11. TEST FACILITY
Cold Hold Alt Chamber & Calidyne Model 441 Shaker.

12. TEST LOCATION(S)
Bldg 93, Room 1

21. DISTRIBUTION
ASTEVD (original)
ASNPSP-3 (copy)
ASTA (copy)

	TITLE	ORGN SYMBOL	EXTENSION
13. FLIGHT TEST PILOT			
14. DIRECTORATE TEST ENGINEER — Howard R. Kimm		ASTEVD	34245
15. INSTRUMENTATION ENGINEER — Lt. R.C. Linebeck		ASNPSP-3	2-2113
16. PROGRAM MANAGER — Lt. R.C. Linebeck		ASNPSP-3	2-2113
17. PREPARED BY — Howard R. Kimm	Test Project Engr.	ASTEVD	34245
18. DIRECTORATE CONCURRENCE — Carl E. Reichert	Technical Director	ASTE	21177
19. TECHNICAL DIRECTOR CONCURRENCE			
20. AST DEPUTY APPROVAL			

22. ATTACHMENTS
☒ APPENDICES ☐ TABLES ☐ FIGURES

SECURITY CLASSIFICATION

ASD FORM NOV 61 153 REPLACES ASD-O FORM 667 WHICH IS OBSOLETE.

altitude as required. After this vibration, the arming pin was pulled remotely at 18,000 feet simulated altitude.

(3) The actuator operated 1000 feet above tolerance. At the project engineer's request the actuator was recocked and subjected to a simulated altitude of 22,500 feet. It operated immediately when the arming pin was pulled at that altitude. It was recocked and subjected to a simulated altitude of 33,000 feet. When the arming pin was pulled, it did not operate until the simulated altitude was reduced to 22,800 feet.

(4) At the project engineer's request, the actuator was considered to have failed and the test on it was terminated. The specimen was returned to the project engineer.

c. Conclusion:

The actuator is unsatisfactory regarding vibration.

d. Recommendations:

None. Data are submitted for information.

APPENDIX "A"

Table Nr. 1

Manufacturer: Pacific Scientific Company, Los Angeles, California

Nomenclature: Drogue Release

Part Nr: 1201118-0

Serial Nr: 209

Weight: 1.65 lb

Operation: Set to operate at or below 16,500 feet altitude

Tolerance ±500 feet

Cable Pulled - 2 inches

Dimensions:

Length - 9 5/8 inches

Width - 3 inches

Height - 1 1/2 inches

Cable Extended - 12 3/4 inches

2 Mounting Holes for 1/8 inch bolts, 5 inches on centers.

PREPARED BY:

Howard R. Kinum
HOWARD R. KINUM
Test Project Engineer

CONCURRED IN:

John B. D'Andrea
JOHN B. D'ANDREA
Chief, Environmental Division
Directorate of Engineering Test
Deputy for Test and Support

APPROVED BY:

for George M. Myron
CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy Commander/Test and Support

APPENDIX K

VIBRATION AND SHOCK LIFE TEST

Report No.	Page
ASTEVD-62-175-R	51-61

FLIGHT AND ENGINEERING TEST REPORT
DEPUTY FOR TEST AND SUPPORT
(See ASDR 80-1)

2. AST NR. ☐ PART ☒ FINAL
3. DATE 27 DEC 62
4. TASK, PROJECT, OR SYSTEM NR. 5778-(576)
5. PRIORITY & AF IMPORTANCE CATEG. NR. 1BX

1. TEST TITLE
AUTOMATIC PARACHUTE ACTUATORS
IDENT. NR. ASTEVD-62-175-R

6. OBJECTIVE AND SUMMARY

a. Introduction:

The purpose of this report is to evaluate automatic parachute actuators under conditions of vibration and altitude simultaneously and shock and altitude simultaneously. Specific vibration requirements are contained in ASNP-TM-61-28. Shock requirements are special as outlined by the project engineer. Tests began 2 Nov 62 and were completed 15 Nov 62.

b. Test Results and Discussions:

(1) Actuator S/N 222 is a device within a parachute assembly which releases a drogue chute for stabilization. The color code is white. The actuator operates at or below 15,800 ft. Table No. 1, Appendix B contains its significant characteristics. It was submitted for vibration with altitude test only.

(2) Actuator S/N 228 is a device within the assembly which releases the main chute. The color code is yellow and the actuator operates at or below 15,000 ft. Significant characteristics are contained in Table Nr. 2, Appendix B. It was submitted for vibration with altitude test only.

(Continue on separate page)

7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY COMPLETED	TEST HOURS REMAINING	DATA REDUCTION % COMPLETE
120	120	0	100%

8. REQUESTING AGENCY
ASNPSP-3 (Lt. Lineback)

9. TEST STARTING DATE
2 Nov 62
☐ INSTRUMENTATION INSTALLATION ☐ TEST PLANNING

10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED
☐ YES ☒ NO REPORT NR. *(If Known)*

11. TEST FACILITY
Kold Hold Alt. Chamber, Mod 44 Shaker & Mil-S-27 Shock Machine

12. TEST LOCATION(S)
Rm. 1, Bldg 893, Area B

21. DISTRIBUTION
ASTEVD (orig.)
ASNPSP-3 (vel cy)
ASTA (cy)
ASTEV (Cy)

13. FLIGHT TEST PILOT	ORGN SYMBOL	EXTENSION

14. DIRECTORATE TEST ENGINEER	ORGN SYMBOL	EXTENSION
Howard R. Kimm	ASTEVD	34245

15. INSTRUMENTATION ENGINEER	ORGN SYMBOL	EXTENSION

16. PROGRAM MANAGER	ORGN SYMBOL	EXTENSION
Lt. R.C. Linebaek	ASNPSP-3	22113

22. ATTACHMENTS
3 APPENDICES
6 TABLES
FIGURES

17. PREPARED BY	TITLE	ORGN SYMBOL	EXTENSION
Howard R. Kimm	Test Project Engr.	ASTEVD	34245

18. DIRECTORATE CONCURRENCE	TITLE	ORGN SYMBOL	EXTENSION

19. TECHNICAL DIRECTOR CONCURRENCE	TITLE	ORGN SYMBOL	EXTENSION
Carl E. Reichert	Technical Director	ASTE	21177

20. AST DEPUTY APPROVAL	TITLE	ORGN SYMBOL	EXTENSION

ASD FORM NOV 61 153 REPLACES ASD-C FORM 667 WHICH IS OBSOLETE. SECURITY CLASSIFICATION AF-WP-B-DEC 61 2 400

(3) Actuator S/N 217 is a device within the assembly which deploys the high altitude drogue chute if the altitude is at least 14,600 feet. The color code is blue. Significant characteristics are contained in Table Nr. 3, Appendix B. It was submitted for a special shock-altitude-escapement-operation test.

(4) Actuators S/N 222 and S/N 228 were calibrated for altitude of operation prior to vibration by pulling the pin remotely (the lever being in the armed position when the actuators were in the chamber at a simulated altitude of 20,000 ft) and by slowly reducing the simulated altitude until they operated. After calibration, each actuator (while cocked with the arming pin inserted) was vibrated for three hours as follows:

(a) Longitudinally for one half hour at room pressure with the control lever in the reset position.

(b) Longitudinally for one half hour at 1000 feet above the calibrated firing altitude with the control lever in the armed position.

(c) Vibration was stopped and the simulated altitude was reduced until the actuator operated. This altitude was recorded.

(d) The actuator was recocked and the procedure was repeated for vibration along the axis perpendicular to its mounting base and again for lateral vibration.

(e) The vibratory frequency was continuously varied between 10 and 55 cps and the total excursion was 0.030 inch.

(f) Logs of the vibration tests are contained in Tables Nrs. 4 and 5, Appendix B.

(5) Both actuators were near the altitude tolerance limits before vibration. Neither actuator remained within the tolerance of ±600 ft. S/N 222 was +600 ft and S/N 228 was +900 ft.

(6) Actuators such as S/N 217 are failing in service. It is believed that a combination of shock and operation is producing these failures. The project engineer outlined a special test to simulate conditions believed causing these failures. The procedure that was followed is outlined in Appendix A of this report. A log of this test is contained in Table Nr. 6, Appendix B. Photographs Nrs. 62-2631 and 62-2632 of Appendix C of this report show the remote operation device for the escapement mechanism.

(7) A total of seventeen vertical shocks in the direction tending to expand the bellows and eleven series of 25 escapement operations (275 operations) were applied before the calibration indicated that the equipment had failed to meet the specified tolerance. Even then, failure was in the marginal region.

(8) There was no visible damage to any actuators.

(9) Mr. Mike Dougherty of AEWPSP-3 assisted throughout the test on S/N 217 and recorded all pertinent data.

c. Conclusions:

(1) More damage appears to have been done to S/N 222 and S/N 228 during shipment than during the vibration test.

(2) The shock testing requirement appears to be too mild.

d. Recommendations:

It is suggested that the shock and vibration requirements of MIL-STD-810, "Environmental Test Methods for Aerospace and Ground Equipment", method 514, equipment Class 6 and method 516, Procedure III, be considered as an additional requirement for all actuators. This is based upon the possibility of greater dynamic inputs during transportation and handling phases.

PREPARED BY: Howard R. Kinum
HOWARD R. KINUM
Test Project Engineer

CONCURRED IN: E C Fabian for
JOHN B. DIANDREA
Chief, Environmental Division
Directorate of Engineering Test
Deputy for Test and Support

APPROVED BY: Carl E. Reichert
CARL E. REICHERT
Technical Director
Directorate of Engineering Test
Deputy for Test and Support

APPENDIX "A"

Procedure Followed for Special Shock Test for Drogue Release

Before applying shock or operating the trigger mechanism, the actuator was calibrated by cocking it and placing it in the altitude chamber with the lever in the armed position and with the pin in place while the altitude was brought up to 20,000 feet and then reduced to 16,400 feet. The actuator operated when the pin was pulled. This procedure was repeated except that the altitude was brought down to 16,200 feet before the pin was pulled. The actuator did not operate at the simulated altitude or 16,200 feet; hence, the calibration indicated operation between 16,200 and 16,400 feet.

After calibration the actuator (still cocked) was mounted in the JAM-S-44 shock machine with the lever set and taped in the armed position and the pin pulled. It was mounted to receive a 30 "g" shock in the direction tending to extend the aneroid bellows. The altitude was raised to 15,400 feet where the actuator was given a 30 "g" shock. The shock did not cause the actuator to operate. After the shock the altitude was raised to 16,800 feet where the actuator operated.

After shock the actuator was mounted on the special fixture designed and fabricated by Mr. Steve Alex of ASTEVD. This fixture was used to push the arming pin in and out with remote control while the actuator is being subjected to simulated altitude conditions. The actuator and fixture were placed in the altitude chamber with the lever taped in the armed position and the pin in place.

The altitude was raised to 20,000 feet then lowered to 17,500. The pin was pulled, allowing the trigger mechanism to operate. The altitude was lowered to 15,000 feet and the pin was pushed in. The altitude was raised to 20,000 feet again and this procedure repeated 24 times more.

After this the actuator was recalibrated as before and the entire procedure was repeated, as before, for 10 complete series of shock followed by 25 pin pullings. After the eleventh calibration the program manager decided to increase the severity of the test; therefore, the shock was applied at 15,950 feet instead of 15,400 feet. The actuator operated as a result of shock applied near to the normal operating altitude. The actuator was recorded and shocked at 15,800 feet. It operated as a result of shock. It was recorded and shocked at 15,400 feet. It remained cocked. It was shocked again at 15,600 feet. It operated after about a minute delay. Another series of 25 escapement operations were applied as before. Another calibration was made as before. Three more shocks were applied; one at 15,100 feet, one at 15,300 feet, and one at 15,500 feet. The actuator remained cocked after the first two but operated as a result of shock at 15,500 feet. The actuator was out of tolerance at this time. Altitudes of operation are recorded in Table Nr. 6, Appendix "B."

APPENDIX "B"

Table Nr. 1

Significant Characteristics of Specimen

Nomenclature: Drogue Release

Manufacturer: Pacific Scientific Company

Part Nr: 1201118-0

Serial Nr: 222

Weight: 1.65 lb.

Code Color: White

Operation: Set to operate at or below 15,800 feet

Tolerance ±400 feet

Cable Pulled - 2 inches

Dimensions:

Length - 9 5/8 inches

Width - 3 inches

Height - 1 1/2 inches

2 mounting holes for 1/8 inch bolts, 5 inches on centers

Cable Extension (Extended) - 6 5/8 inches

APPENDIX "B"

Table Nr. 2

Significant Characteristics of Specimen

Nomenclature: Main Deploy

Manufacturer: Pacific Scientific Company

Part Nr: 1201119-0

Serial Nr: 220

Weight: 1.65 lb.

Code Color: Yellow

Operation: Set to operate at or below 15,000 feet

Tolerance ±400 feet

Cable Pulled - 2 inches

Dimensions:

Length - 9 5/8 inches

Width - 3 inches

Height - 1 1/2 inches

Cable Extension (Extended) - 7 1/2 inches

2 mounting holes for 1/8 inch bolts, 5 inches on centers

APPENDIX "B"

Table Nr. 3

Significant Characteristics of Specimen

Nomenclature: Drogue Deploy

Manufacturer: Pacific Scientific Company

Part Nr: 1201117

Serial Nr: 217

Weight: 1.65 lb.

Code Color: Blue

Operation: Set to operate at or above 16,600 feet

Tolerance ±400 feet

Cable Pulled - 2 inches

Dimensions:

Length - 9 5/8 inches

Width - 3 inches

Height - 1 1/2 inches

Cable Extension (Extended) - 5 7/8 inches

2 mounting holes for 1/8 inch bolts, 5 inches on center

APPENDIX "B"

Table Nr. 4

Log of Vibration Test for Drogue Release

(S/N 222)

AXIS OF VIBRATION	ALTITUDE OF VIBRATION	ELAPSED TIME	ALTITUDE OF OPERATION	DIFFERENCE FROM SETTING *
Pre-Vibration		0	16,140 ft.	+340 ft.
Longitudinal-	Room	1/2 hour		
Longitudinal	17,000 to 17,500 ft.	1/2 hour	16,120 ft.	+320 ft.
Perpendicular to Mounting Base	Room	1/2 hour		
Perpendicular to Mounting Base	17,000 to 17,500 ft.	1/2 hour	16,360 ft.	+560 ft.
Lateral	Room	1/2 hour		
Lateral	17,000 to 17,500 ft.	1/2 hour	16,400 ft.	+600 ft.

* The drogue release was set at the factory to operate at 15,800 ft. The tolerance is ±400 ft.

APPENDIX "B"

Table Nr. 5

Log of Vibration Test for Main Deploy

(S/N 228)

AXIS OF VIBRATION	ALTITUDE OF VIBRATION	ELAPSED TIME	ALTITUDE OF OPERATION	DIFFERENCE FROM SETTING *
Pre-Vibration		0	15,400 ft.	±400 ft.
Longitudinal	Room	1/2 hour		
Longitudinal	16,200 to 16,700 ft.	1/2 hour	15,450 ft.	±450 ft.
Perpendicular to Mounting Base	Room	1/2 hour		
Perpendicular to Mounting Base	16,200 to 16,700 ft.	1/2 hour	15,400 ft.	±400 ft.
Lateral	Room	1/2 hour		
Lateral	16,200 to 16,700 ft.	1/2 hour	15,900 ft.	±900 ft.

* The main deploy was set at factory to operate at 15,000 ft. altitude. The tolerance is ±400 ft.

APPENDIX "B"

Table Nr. 6

Log of Operational Altitudes for Drogue Release

TEST EVENT	SIMULATED ALTITUDE	REMARKS
First Calibration	16,400 ft.	Operated
First Calibration	16,200 ft.	Did not operate
First 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	16,800 ft.	Operated
Second Calibration	16,600 ft.	Operated
Second Calibration	16,400 ft.	Operated
Second Calibration	16,200 ft.	Did not operate
Second 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	17,200 ft.	Operated
Third Calibration	16,600 ft.	Operated
Third Calibration	16,400 ft.	Did not operate
Third 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	16,800 ft.	Operated
Fourth Calibration	16,400 ft.	Operated
Fourth Calibration	16,200 ft.	Did not operate
Fourth 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	16,700 ft.	Operated
Fifth Calibration	16,400 ft.	Operated
Fifth Calibration	16,200 ft.	Did not operate
Fifth 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	16,700 ft.	Operated
Sixth Calibration	16,250 ft.	Operated
Sixth Calibration	16,000 ft.	Did not operate
Sixth Shock	15,400 ft.	Did not operate
Altitude Raised	16,700 ft.	Operated
Seventh Calibration	16,250 ft.	Operated
Seventh Calibration	16,150 ft.	Did not operate
Seventh 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	16,900 ft.	Operated
Eighth Calibration	16,500 ft.	Operated
Eighth Calibration	16,400 ft.	Did not operate
Eighth 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	16,900 ft.	Operated

Table Nr. 6 Continued

TEST EVENT	SIMULATED ALTITUDE	REMARKS
Ninth Calibration	16,600 ft.	Operated
Ninth Calibration	16,400 ft.	Did not operate
Ninth 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	17,250 ft.	Operated
Tenth Calibration	16,200 ft.	Operated
Tenth Calibration	16,100 ft.	Did not operate
Tenth 30 "g" Shock	15,400 ft.	Did not operate
Altitude Raised	16,300 ft.	Operated
Eleventh Calibration	16,200 ft.	Operated
Eleventh Calibration	16,100 ft.	Did not operate
Eleventh 30 "g" Shock	15,950 ft.	Operated
Twelfth 30 "g" Shock	15,800 ft.	Operated
Thirteenth 30 "g" Shock	15,400 ft.	Did not operate
Fourteenth 30 "g" Shock	15,600 ft.	Operated after 1 minute delay
Twelfth Calibration	16,000 ft.	Operated
Twelfth Calibration	15,900 ft.	Did not operate
Fifteenth 30 "g" Shock	15,100 ft.	Did not operate
Sixteenth 30 "g" Shock	15,300 ft.	Did not operate
Seventeenth 30 "g" Shock	15,500 ft.	Operated

APPENDIX "L"

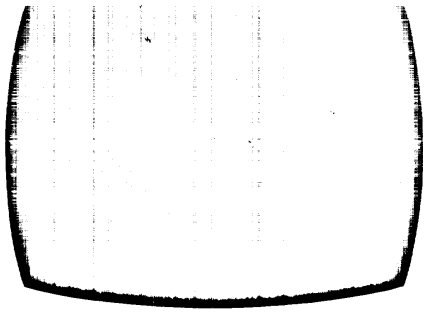
SUMMARY OF TEST RESULTS

Number	Test Title	Serial Numbers 207	209	211	217	222	228
3.0 (4.1)	Examination of Product	P	P	P	-	-	-
3.1 (4.3)	Aneroid Cycling	-	-	F-2	-	-	-
3.2 (4.4)	Overpressure	-	F-4	-	-	-	-
3.3 (4.6)	Power Actuation Life Test	F-5	F-5	F-5	-	-	-
4.1 (4.7.2)	Timer Accuracy	-	P	P	-	-	-
4.2 (4.7.3)	Aneroid Accuracy	P	P	P	-	-	-
4.3 (4.7.4)	Aneroid Hysteresis	-	P	-	-	-	-
4.4 (4.7.5)	Arming Pin Pull	-	P	-	-	-	-
5.1 (4.8.1)	High Altitude-Low Temperature	-	F-3	-	-	-	-
5.2 (4.8.2)	High Temperature	-	P	-	-	-	-
5.3 (4.8.3)	Vibration	F-4	F-4	-	-	F-6	F-4
5.4 (4.8.4)	Shock	P	-	-	-	-	-
5.5 (4.8.4.1)	Shock Life Test	-	-	-	P	-	-
5.6 (4.8.5)	Acceleration	P	P	-	-	-	-
5.7 (4.8.6)	Sand and Dust	P	-	-	-	-	-
5.8 (4.8.7)	Humidity	F-1	P	-	-	-	-
	Humidity (Retest)	F-4	-	-	-	-	-

Notes:

- \- Indicates release not subjected to this test.
- P Passed specified test procedure.
- F Failed to pass specified test procedure in the following area only.
- F-1 Would not actuate due to excessive interior rust; however, a rerun of this test produced reasonably successful results.
- F-2 Leakage indicator malfuctioning.
- F-3 Timing mechanism failed to fire within limits.
- F-4 Actuator firing not within applicable altitude limits.
- F-5 Actuator could not be cocked. It was modified by the Pacific Scientific Co.
- F-6 Actuator firing within tolerance; however, initial calibration was incorrect.

AUTOMATIC PARACHUTE ACTUATOR
PACIFIC SCIENTIFIC COMPANY



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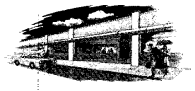

PORTLAND OFFICE

ARLINGTON, TEXAS OFFICE

Pacific

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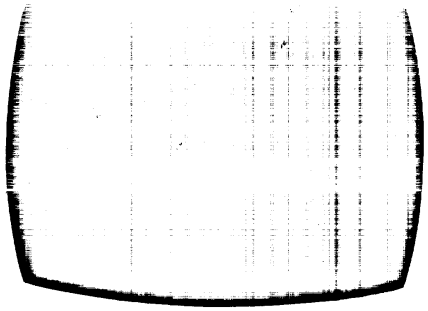

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