

REPORT NO.

TR-592

Page

27 September 1962

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 PREPARE	-	27-6	3/1	1	
PREPARED BY	Test	Engi	neer	May	
CHECKED BY					

APPROVED BY Detne Monager day

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REPORT NO.

TR-592

PAGE 2 OF

OF 6

PACIFIC SCIENTIFIC COMPANY

Manufacturing Facility Anaheim California

TABLE OF CONTENTS

Page

TESTING

4 - 1

ENCLOSURES

Photograph 1 - Shock Test Set-Up

Photograph 2 - Oscillogram of Shock Waveform



REPORT NO. TR-592

PAGE 3 OF

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.



REPORT NO. TR-592

PAGE 4 OF 6

PACIFIC SCIENTIFIC COMPANY

Manufacturing Facility, Anaheim, California

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	3	No	fire	No slippage of trigger
50	G	138	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 15,100 15,000 15,000 15,000 15,100

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

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



REPORT NO.

TR-592

PAGE 5 OF

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:

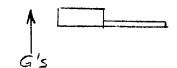
18,000 No fire Slight slippage of trigger

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).





REPORT NO. TR-592

PAGE 6 OF

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

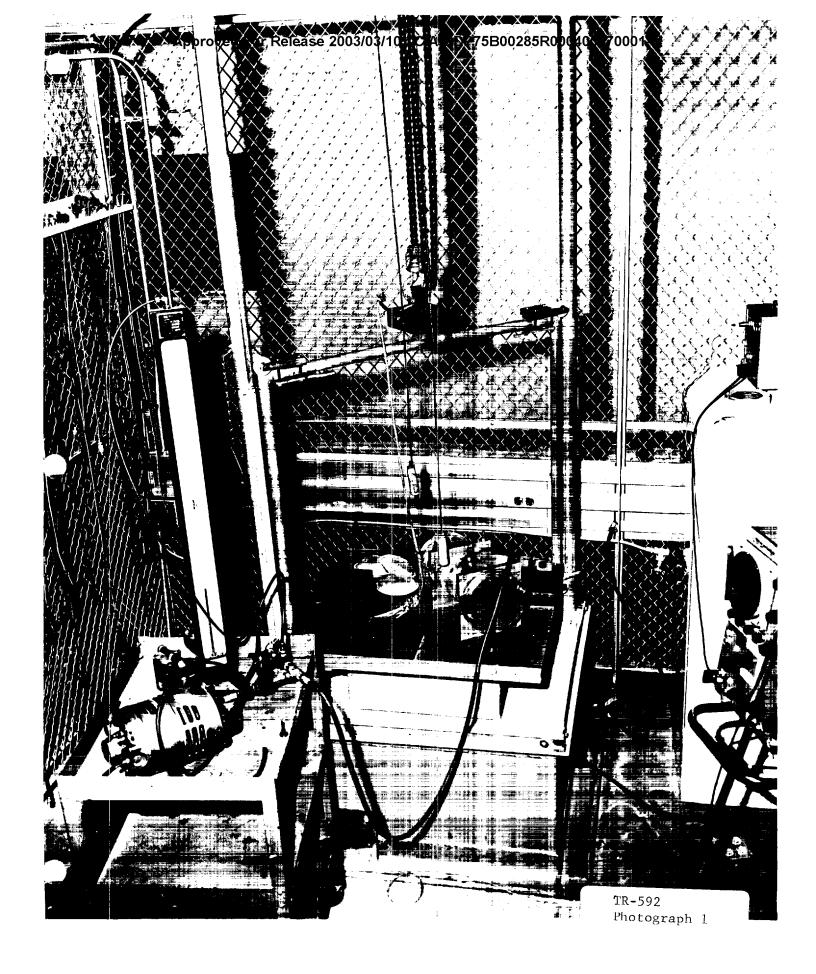
100 G's in plane of a straight drogue deployment at 18,000 feet did not cause inadvertent firing or damage unit that would cause unit to fail to fire at a lower than programed altitude.

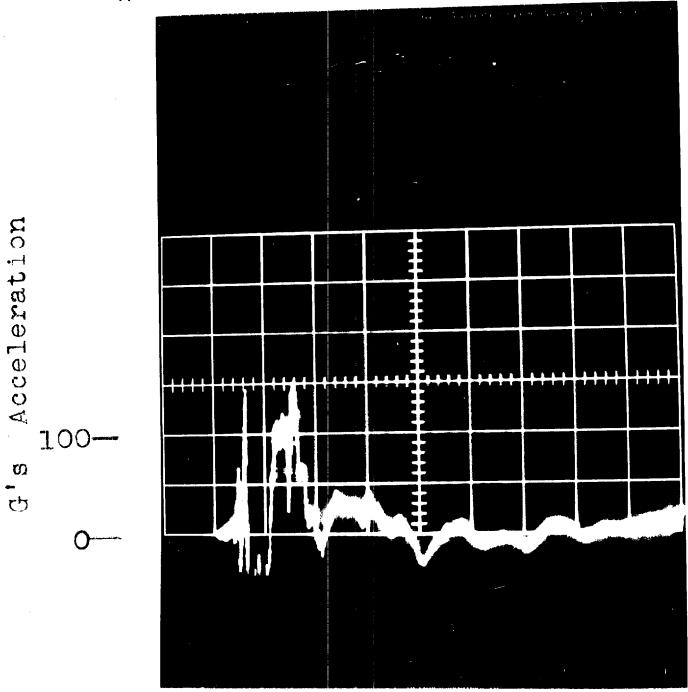
Test No. 2 - 1201118-0, Drogue Release, S/N 111

- 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.





Time = 10 ms/cm SHOCK PULSE

TR-592 Photograph 2 STAT

STAT

SUBJECT:	Transmittal of Technica ASNP-TM-63-1	l Memorandum Report	
TO:			
Please no and Pacif	ort ASNP-TM-63-1 concern	nd a copy of ASD Technical Memoing Lab tests of the paratimers copies of the report to Fireweling two copies to atwere TDY.	1
enough for	Shepardson does not const r disqualification, but a nd procedures will be re-	lder the deficiencies serious good Maintenance and Inspection quired.	
			STAT
2 Atch			

13 February 1963

STAT

STAT

SUBJECT: Transmittal of Technical Memorandum Report	
TO:	
Enclosed is a cover letter and a copy of ASD Technical Memorandum Report ASSP-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 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 Mamuals and procedures will be required.	
2 Atoh	STAT

13 February 1963

HEADQUARTERS

Aeronautical Systems Division

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

MERLY TO AMILES (Ar. Shepardson/90151/820/R125)

- 6 February 1969

summer: Technical Memorandum Report SNP-14-3-1

10. LSLCB (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. Cut-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.

My. Alexan

Chief, Crew Equipment Division

Directorate of Operational

Support Engineering

l .tch .J.F-1.-63-1 Atd 24Jan63 (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 120119-0 (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 E/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. <u>Test Requirements</u>: 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. <u>Test Results</u>: The individual test results appear in Appendices "D", through "K".

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

III. CONCLUSIONS

- The original set of actuators did not meet all of the test requirements (reference Appendix "L").
- The actuators, after modification by the manufacturer, Pacific , Scientific Company, passed the following tests:
 - Humidity a.
 - Sand and Dust
 - Acceleration
 - Shock
 - High Temperature
 - .f. Ameroid Hysteresis
 - g. Ameroid Accuracy
 - Timer Accuracy h.
- 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

- That the Drogue deploy actuator, Type 1201119-0, be assigned a service life of 100 escapement operations.
- That the actuators not be considered a fully qualified item for general personnel parachute usage.

Prepared by:

RONALD C. LINEBACK

1LT. USAF

Publication Review

This report has been reviewed and is approved.

WARREN P. LHEPARDSON

Chief. Crew Equipment Division

Directorate of Operational Support

Engineering

Technical Memorandum ASNP-TM-63-1

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

ALNPS (Reproducible)

ASNPSP-3 (12)

REPORT NOTICE

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Technical Memorandum ASNP-TM-63-1

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APPENDIX B

TEST REQUIREMENTS

Note: The numbers in perenthesis 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) <u>PURPOSE</u>

To outline the test procedure.

2.0 (4.0) TEST PROCEDURE

The tests shall be conducted as follows:

3.0 (4.1) EVAMINATION OF PRODUCT

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

3.1 (4.5) 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.

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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) <u>VIBRATION</u>

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 gulled and the altitude brought up or down as applicable to ascertain the altitude at which the actuator operatés. 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 1201117-0 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. Twentyfive 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 5/N 209 was concurrently tested with the above in accordance with paragraphs 4.1, 4.2, 4.3, 5.1, 5.2 and 3.2 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 (5/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 5.5 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 ±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 ±400 feet of the initial calibration firing altitude.

. APPENDIX D

SAND AND DUST

Report No.

Page 12-13

Technical Memorandum ASNP-TM-63-1

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT DEPUTY FOR TEST AND SUPPORT (See ASDR 30-1) TEST TITLE Sand and Dust Test of an Automatic Dent. NR. 18-R Pareshute Actuator OBJECTIVE AND SUMMANY a. INTRODUCTION: The objective of this test was to determine the resistance of the setuator 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 Firewal Corporation. The actuator was identified as part ar. 1201117-0, serial nr. 207, Drouge Deploy. (2) The actuator was cooked and placed inside of a parachute pack and the pack was subjected to sand and dust test conditions conforming to Procedure I of Specification MILL—5/272. (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 15-11. The actuator, which was preset at 19,000 feet altitude, actuated at 19,000 feet and was satisfactory. Test Hours completed Test Hours successfully Completed 12 On the Report of the Starting Adency ASTRA - 1 Cy Test Hours completed Test Hours successfully Test Hours remaining Department page) Test Hours completed Test Hours successfully Test Hours remaining Department page) Test Hours completed Test Hours successfully Test Hours remaining Department page) Test Hours completed Test Hours successfully Test Hours remaining Department page) Test Hours completed Test Hours successfully Test Hours remaining Department page) Test Hours completed Test Hours successfully Test Hours remaining Department page) Test Hours completed Test Hours successfully Test Hours remained Department page) Test Hours completed Department Department Department Page) Test Hours completed Department Dep			2. AST NR.	
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ASD FORM 153

Test report Nr. ASTEVS-62-la-R

- (4) The cover plate of the actuator was removed and the interior was visually examined. No said and dust had penetrated into the actuator.
- c. CONCLUSION: The actuator withstood the test conditions to which it was exposed.
- d. <u>RECOMENDATIONS</u>: 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
Test Project Engineer

CONCURRED IN:

DWIGHT C. KENNARD, JR.

Chief, Environmental Division Directorate of Engineering Test Deputy Commander/Test and Support

APPROVED BY

CARL E. REICHERT

Technical Director

Directorate of Engineering Test Deputy Commander/Test and Support

APPENDIX E

HUMIDITY

Report No. ASTEVS-62-1b-R

Page 15-16

Technical Memorandum ASNP-TM-63-1

14

SECURITY CLASSIFICATION

FLIGHT AND ENGINEERING TEST REPORT TEST AND SUPPORT	ORT		PART		FINAL
(See ASDR 80-1)	AST kVS-62-	3. DAT	7	MAR	1964
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(1) The parachute actuator was man and submitted by the Firewel Corporation)EL •				
(2) The actuator was exposed to the accordance with Appendix K. Technical in	Manto Latter on 1-2012				
(3) At the end of the test period in an eltitude chamber, Facility Nr. 4 Branch.		a aut i	entad to	o funct heric l	ional testa Deterioratio
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ASD FORM 153

REPLACES ASD-0 FORM 667 WHICH IS OBSOLETE.

PAGE 1 OF 2 PAGES

Test Report Nr. ASTEVS-62-1b-R

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.
- e. 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.

PREPARED BY:

MENDEL P. ORNSTEIN Test Project Engineer

CONCURRED IN: DWIGHT C. KENNARD, JR.

Chief, Environmental Division Directorate of Engineering Test Deputy Commander/Test and Support

del P. arnstim

APPROVED BY:

CARL E. REICHERT

Technical Director

Directorate of Engineering Test Deputy Commander/Test and Support

APPENDIX F

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

Report No.

<u>Page</u>

ASTEVS-62-2-R

18-21

SECURITY CLASSIFICATION

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b. FACTUAL DATA:							
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PAGE 1 OF 4 PAGES

SECURITY CLASSIFICATION

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(See ASDR 80-1) 1. TEST TITLE	ruk I	<u> </u>	PAR	<u> </u>	T FINAL
	A CORPORATION A -	3. 0/		12	MAR 1962
·	ASTEVS-62- Ent. nr. <u>R</u>	i	9	778	
Automatic Parachute Actuators	EN 1. NR	8. PF	HORITY &	FIMPOR	TANCE CATEG. NR.
A OR POTIVE AND BUSINABLY				.8B	
a. INTRODUCTION: To obtain operation	nel date on two	aut.cme	tic name	achute	actuators
when subjected to various test conditi		Cital a Carrier	oro bare	P. (1787 A. 6)	200421015
b. FACTUAL DATA:					
(1) The actuators were manufacture mitted for testing by the Firewel Corp designated as a drogue release, part is nated as a main deploy, part nr. 12011 designed to pull the ripcord of a part are within a preset passaure altitude releases are 1500 feet at normal ambie ambient temperatures (-65°F and 160°F) (2) Testing of the actuators was mitted by ASNPSP3. This suborder cutt Appendix K of Technical Memorandum ASE for these tests were furnished by the	poration. Two man. 1201118-0, a light of the after a p. Allowable operature). conducted in aclined the testing NP-TM-61-28. Address of the project engines	models merial in 211. Preset in and ±1. Secondan in ground it ion in East Control in East Cont	vere submr. 209. The actime delation del toler 000 feet ce with edures : al opere	omitte the tunto lay pr rances t at l a sub in acc ations	other designates are covided they for both ow or high corder sub-cordance with a criteria coedure
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7. TEST HOURS COMPLETED TEST HOURS SUCCESSFULLY COMPLETED N/A	TEST HOURS RE	MAINING	DATA	REDUC	TION % COMPLETE
8. REQUESTING AGENCY			L		
ASNPSP-3					
9. TEST STARTING DATE INSTRUMENTATION	11. TEST FACILITY		1	21. DIS	TRIBUTION
5 February 1962 Installation Test planning				∆ dn:	SP-3 - 1 Cy
10. TECHNICAL DOCUMENTARY REPORT TO BE ISSUED	12. TEST LOCATION(S	3)		ruditi	
YES NO REPORT NR. (II Known)				AST/	4 - 1 Cy
13. FLIGHT TEST PILOT	ORGN SYMBOL	EXTENSIO	H	A CONTRA	ivo /a-4-
B/A				A.SI'I	SVS - (Orig. File)
14. DIRECTORATE TEST ENGINEER	1	EXTENSIO	1		/
Anthony Civetz	ASTEVS ORGN SYMBOL	25290 EXTENSION		22. AT	TACHMENTS
An ALLEGE CONTROL OF THE PROPERTY OF THE PROPE	ORGH STMBUL	-A E ROIC			
15. INSTRUMENTATION ENGINEER N/A					APPENDICES
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N/A 16. PROGRAM MANAGER	! !				TABLES
N/A 16. PROGRAM MANAGER Lt. R. C. Lineback	ORGN SYMBOL ASNPSP-3	22113			TABLES
N/A 16. PROGRAM MANAGER Lt. R. C. Lineback 17. PREPARED BY	ASNPSP-3	22113	}		TABLES FIGURES
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N/A 16. PROGRAM MANAGER Lt. R. C. Lineback 17. PREPARED BY Anthony Civetz 18. DIRECTORATE CONCURRENCE	ASNPSP-3 TITLE Engr. Technic	22113 ian	ORGN SYME ASTEVS ORGN SYME	IOL.	FIGURES EXTENSION 25290 EXTENSION

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 ameroid accuracy test phases. Astuator nr. 211 was then subjected to the ameroid eyeling test phase while actuator ar. 209 was subjected to emercia hysterisis, high altitude - low temperature, high temperature, and overgressure. Operational discrepancies noted during these tests were as follows. The ameroid leakage indicators on both actuators were defective resulting in inaccurate altitude indications at simulated altitude conditions. The timer mechanism on setuator nr. 209 operated above the operational requirements in the les embient temperature. Ameroid 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.

4. COMPLUSION: It is concluded that:

- (1) With the exception of the emercia leakage indicator failure, actuator nr. 211 operated as required during the timer accuracy, ameroid assuracy and smeroid eyeling test phases.
- (2) Actuator nr. 209 operated as required during the timer ascureey, ameroid assuresy, emercia hysterisis and high temperature test phases but did not meet the eporational requirements of the high altitude - low temperature and overpressure test phases. Failure of the eneroid leakage indicator was also evident on this astuator.
- e. ECOMMUNICATION: It is recommended that both automatic parachute actuators be considered unsatisfactory for service use under the conditions imposed by this test.

PREPARED BY: Inthony Civety
Test Project Engineer

Owifet C Kamare 2 CONCURRED IN: DWIGHT C. KROMARD, JR.

Chief, Revironmental Division Directorate of Engineering Test Deputy Commander/Test and Support

APPROVED BY:

CARL E. REICHERT

Technical Director

Directorate of Engineering Test Deputy Commander/Test and Support

Tagivarania Pr

APPENDIX "A"

- 1. Timer Accuracy (Para. 4.7.2). Four timer operational shecks 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. Ameroid 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 ameroid release point was noted. Actuator ar. 211 operated at 15,000 feet which was within the operational requirement of 15,0002500 feet. Actuator ar. 209 operated at 16,300 feet which was within the operational requirement of 16,5002500 feet.
- 3. Ameroid Cycling (Para. 4.3). Actuator mr. 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 eyele and 1000 such cycles were imposed on the actuator. Upon completion of the 1000 cycles an ameroid 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 ameroid 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. He 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. Ameroid Hysteresis (Para. 4.7.4). Actuator mr. 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 ameroid release point was noted to be at 16,800 feet. This operation was within the operational requirement of 16,5002500 feet.
- 5. High Altitude-Lew Temperature (Para. 4.8.1). Actuator ar. 209 was subjected to an embient temperature of -65°12°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 embient temperature of -65°12°F at station pressure for an additional period of full hours. Upon completion of this exposure, and while still at -65°12°F, an emerciá accuracy and timer accuracy check was made on the actuator. The amerciá operated at 15,700 feet which was within the operational requirement of 16,50011000 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 .06 and .13 seconds.
- 6. High Temperature (Para. 4.8.2). Actuator ar. 209 was subjected to an embient temperature of 160°12°F for a period of 15 hours. Upon completion of this exposure, and while still at that temperature, an amercia accuracy and timer accuracy check was made on the actuator. The amercia operated at 17,000 feet which was within the operational requirement of 16,500:1900 feet. The time delay on five timer operations were .13, .11, .12, .11 and .09 accords. These timer operations were within the operational requirement of between .08 and .13 seconds.

Test Report Nr. ASTEVS-62-2-R

7. Overpressure (Para. 4.4). Actuator nr. 209 was subjected to an absolute pressure of 50 inshes 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 ameroid 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 to 500 feet. Prior to six operational checks the ameroid 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 ameroid 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.

4

APPENDIK G

ACCELERATION

Report No.

ASTAVE-62-3c-R

Page

23-27

Technical Memorandum ASNP-TM-63-1

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SECURITY CLASSIFICATION

	ENGINEERING TEST RE Y FOR TEST AND SUPPORT (See ASDR 80-1)	POR	T		DATE		T FINAL 1962
1. TEST TITLE AUTOMATIC PARACHUT	E ACTUATOR 10	ENT.	_{NR.} 62-30-F	! <u></u>	TASK, PROJ 5778	ECT, OR	SYSTEM NR.
					18E		
The purpose of post test effects of actuators.	this test project i	is to	evaluate ration) on	the ope	rational	resp parac	onse and the
(1) The two desperation. The desin the altitude at	vices submitted for				a multis	itage	parachute
	or identified as the	e dr	ogue releas	will n	ial Nr.	at sea 209) i ip st	a level. is adjusted sea level
7. TEST HOURS COMPLETED	TEST HOURS SUCCESSFULL	4	TEST HOURS	REMAINING			TION % COMPLETE
16	COMPLETED 16		0			100%	
ASTROP3					· · · · · · · · · · · · · · · · · · ·		
. TEST STARTING DATE	INSTRUMENTATION	11.	TEST FACILITY			21. DIS	TRIBUTION
2 Feb 62	INSTALLATION TEST PLANNING		rifuge Nr.				
. TECHNICAL DÖCUMENTARY			TEST LOCATION	(S)		RAMER	D (original) P3 (vellum)
S. FLIGHT TEST PILOT	19	ORG	N SYMBOL	EXTENS	ON	ASTA	(1 cy)
DIRECTORATE TEST ENGIN	EER	ORG AST	N SYMBOL	EXTENSI	_		
8. INSTRUMENTATION ENGINE	ER	ORG	N SYMBOL	EXTENS	ION		TACHMENTS APPENDICES
6. PROGRAM MANAGER L/LA. R.G. Lineback		ORG	N SYMBOL SP3 2	EXTENSI	ON		TABLES FIGURES
LICHARED BY		Test	E Project Br	ør.	ORGH SYMI	OL	EXTENSION
. DIRECTORATE CONCURRED		TITL			ORGH SYM	BOL	EXTENSION
9. TECHNICAL DIRECTOR CON LANG. A. RETCHERT	CURRENCE	TITL	E mical Dire	at a	ORGN SYM	3OL	EXTENSION
O. AST DEPUTY APPROVAL		TITL		eror 1	ORGN SYMBOL		21177 EXTENSION
	S ASD-O FORM 667 SECURI IS OBSOLETE.	TY CL	ASSIFICATION	AF-WP-B-I	DEC 62 30		4 GE 1 OFPAG

Test Report ASTEVD Nr. 62-30-R

- (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 leaded, 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, X and Z axes.

Report ASTEVD Mr. 62-30-R

PREPARED BY:

Richard CM=Kendry RICHARD C. McKENDRY Test Project Engineer

CONCURRED IN:

Chief, Environmental Division Directorate of Engineering Test Deputy Commander/Test and Support

APPROVED BY:

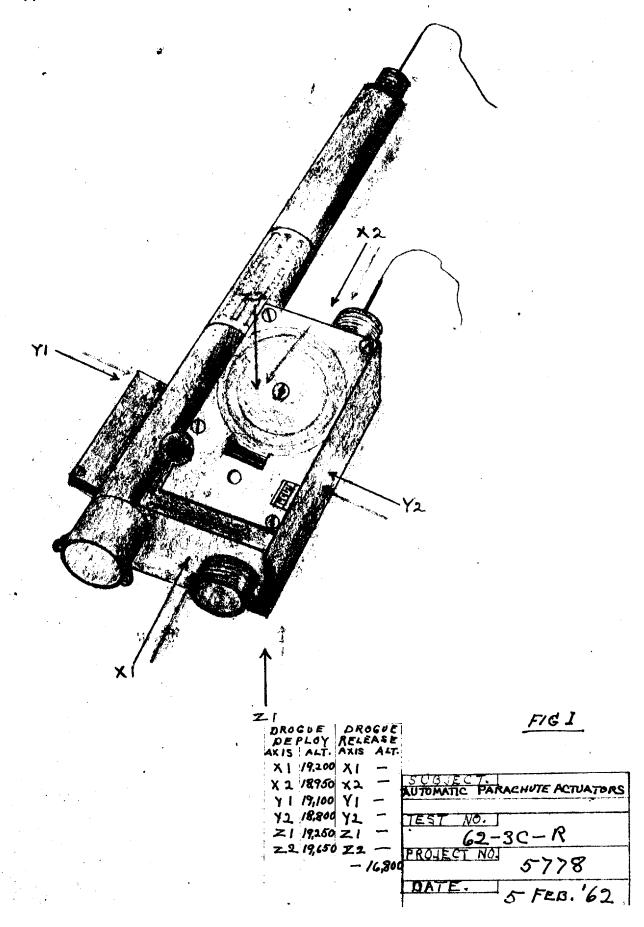
CARL E. REIGHERT Technical Director

Directorate of Engineering Test Deputy Commander/Test and Support

Test Report ASTEVD Nr. 62-30-R

APPENDIX "A"

Figure I



APPENDIX H

SHOCK AND VIBRATION

Report No.

ASTEVD-62-3a-R

29-40

Technical Memorandum A:NP-63-1

SECURITY CLASSIFICATION

	ENGINEERING TE		er fange de seguente, er en sky de resident met dersje en sky er en sk I	2.)	IST NR.	T.	(X) FINAL
DEPUTY FOR TEST AND SUPPORT (See ASDR 80-1)				3. 0	DATE Of	HAM:	1962
1. TEST TITLE	(555 555 555 555 555 555 555 555 555 55	7	52-3a-R	4. 1	ASK, PROJE		
		IDENT. N	R. 62-36-R		5778		
AUTOMATIC PARACHUTE	ACTUATORS			1			TANCE CATEG. NR.
6. OBJECTIVE AND SUMMARY					recedenc	e 18E	
a. Introduction:							
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b. Test Results and	Discussion:						
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parachute automatica characteristics of t report. Photograph actuator. The vibra	his actuator at Mr. 62-554A, A tion-altitude	re contai ppendix B evaluation	as reached ned in Tab of this re n procedur	le Nr. eport s	II, Appe hows thi	ndix A	of this
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16. PROGRAM MANAGER	6. PROGRAM MANAGER		N SYMBOL	EXTENS	NSION 4		TABLES
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19. TECHNICAL DIRECTOR CON	NCURRENCE	TITL	. E		ORGN SYMBOL		EXTENSION
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NOV 61 153 WHICH IS OBSOLETE.

PAGE 1 OF PAGES

Report Nr. ASTEVD 62-3e-R - 62 and 62-3b-R

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 telerance 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 fellowing 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 1500 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 astuators 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, Baragraph 4.6.3 are much more severe and apply to such equipment being shipped for installation.
 - (5) For the shock-altitude evaluation, actuator 8/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".

Report Nr. ASTEVD 62-3e-R and 62-3b-R

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 consistently within telerance 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. Recommendationsi

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. PREPARED BY: HOWARD R. KINGE

Test Project Engineer

Devijul C. Kennard. In CONCUPRED IN: DWIGHT C. KERNARD, Jr.

Chief, Environmental Division

Directorate of Engineering Test Deputy Commander/Test and Support

APPROVED BY:

Callederbut CARL E. REICHERT

Technical Director

Directorate of Engineering Test Deputy Commander/Test and Support

Report Mr. ASTEVD 62-3a-R and 62-3b-R

APPENDIX "A"

Table Mr. I

General Characteristics of Specimen

Manufacturer: Pacific Scientific Company, Los Angeles, Calif. Homenclature: Dregue Deploy

Part Mr: 1201117-0 Serial Nr: 207 Weight: 1.65 lb

Operation: Set to operate at or above 19,000 feet altitude

Tolerance - 1500 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 Heles for 1/8 inch belts, 5 inches on centers

Report Mr. ASTEVD 62-3a-R and 62-3b-R

APPENDII "A" Table Nr. II

General Characteristics of Specimen

Manufacturer: Pacific Scientific Company, Los Angeles, Calif.

Homenclature: Drogue Release

Part Mr: 1201118-0

Serial Mr: 209

Weight: 1.65 lb

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

Telerance - ±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 Meunting Holes for 1/8 inch belts, 5 inches en centers

Report Nr. ASTOVD 62-3a-R and 62-3b-R

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 Longitudinal, cable down Lateral-cable below arming-pin socket Lateral-Cable above arming pin socket Vertical upright Vertical inverted	17,200 feet 17,400 17,400 17,400 17,400 17,400	19,300 feet 19,000 15,000 19,100 18,750 19,100

Report Nr. ASTEVD 62-3e-R and 62-3b-R

APPENDIX "A"

Table Nr. IV

Sample Calculations

JAN-S-44 Shock Mechine

Spring Constant - 1590 Founds per inch = K

Total Carriage weight including specimen - 15 pounds = W

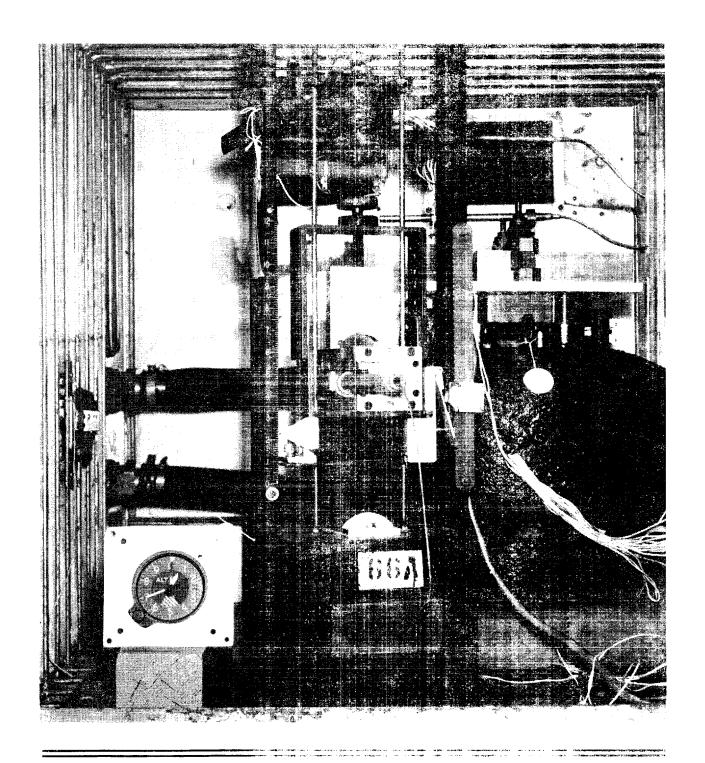
Shock Required - 30 g = g

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

Report Nr. ARTWD 62-3e-R and 62-3b-R

VobaWDIX "B"

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



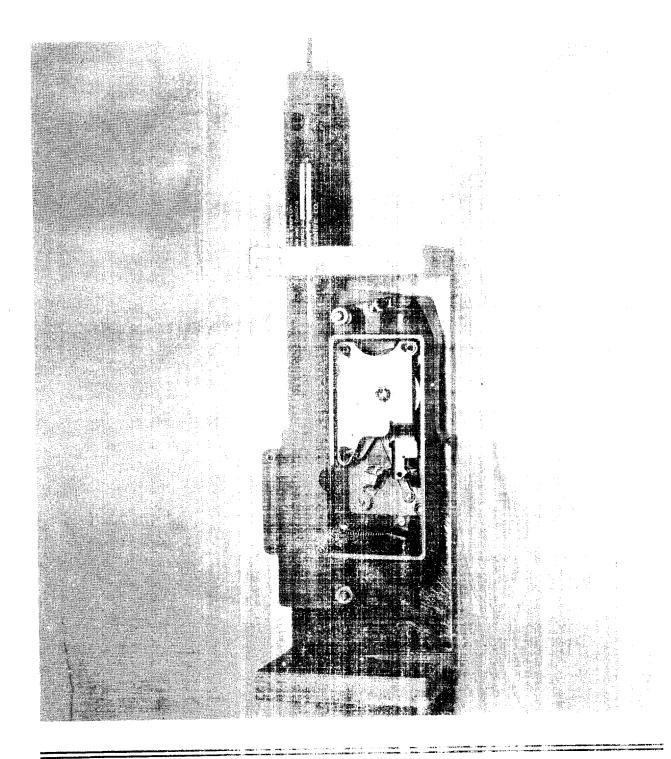
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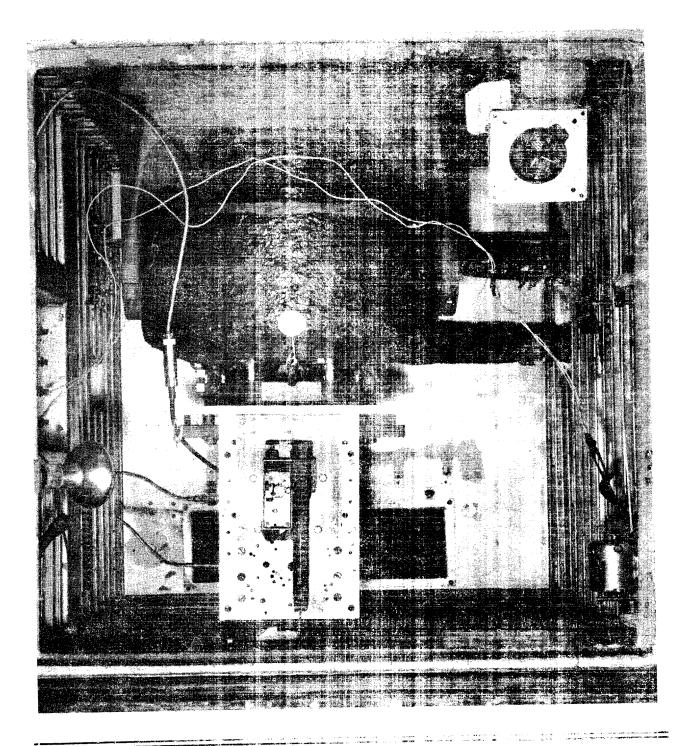
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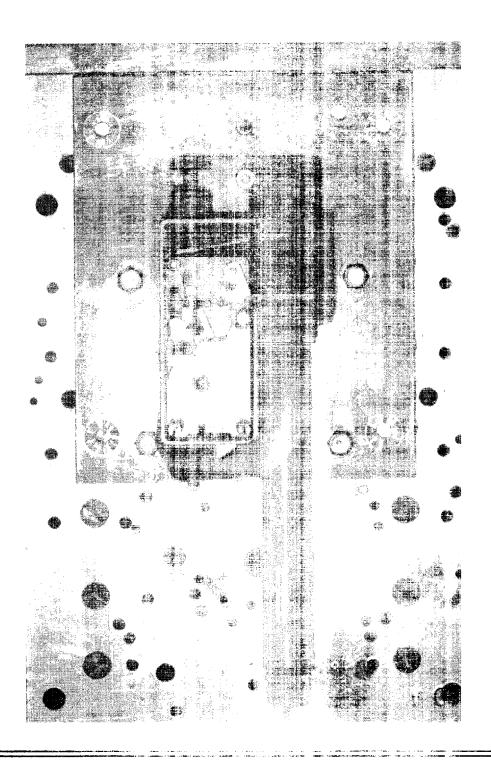
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REPORT ASTEVD-62-3B-R

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



FACIFIC SCIENTIFIC AUTOMATIC PARACHUTE ACTUATOR; REPORT ASTEVU-C-38-H

ASD ASTDP MG NR 62-554



PACIFIC SCIENTIFIC - HIYOMATIC SUB-ACHETE ACG., \H; BEFORT ASTENDARY BURK

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APPENDIX I

- HUMIDITY

Report No.

Page

ASTEVS-62-35-R

42-44

Technical Memorandum ASNP-TM-63-1

SECURITY CLASSIFICATION

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FLIGHT AND ENGINEERING TEST RE DEPUTY FOR TEST AND SUPPORT	PORT		PAR	τ	FINAL
(See ASDR 80-1)		3. 0	ATE 1	Ο ΜΔ	Y 1962
1. TEST TITLE	astevs-62	_ 4. T	ASK, PROJE	CT, OR S	YSTEM NR.
Automatic Parachute Actuators	ENT. NR. <u>35-R</u>	 	PIORITY &	778	TANCE CATEG. NR.
		" '		.8E	
6. OBJECTIVE AND SUMMARY					
a. <u>INTRODUCTION</u> : The purpose of this automatic parachute actuators to humid			e the re	sis te	nce of two
b. FACTUAL DATA:					
(1) The actuators were manufacture mitted for testing by the Firewel Corporated as a drogue release, part nr. 1: as a drogue deploy, part nr. 1:201117-(to pull the ripcord of a parachute after the preset pressure altitude. Allowed 1:500 feet at normal ambient temperature (2) Testing of the actuators was mitted by ASNPSP3 dated 2 March 1962. ditions to conform to Procedure I of followed by a visual inspection and actuators was	poration. Two: 201118-0, serial 0, serial nr. 2 ter a preset ti ble operational re. conducted in a This suborder Specification N	models 1 nr. 2 07. The me dels tolers coorder outling r. MIL.	were sub 209, the is actual by provid- inces for ace with ied the i	mitter other ors a led the both a sub	d, one designed designed ey are within releases are order sub-
c. TEST RESULTS AND DISCUSSIONS:					
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8. REQUESTING AGENCY					
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16 April 1962 Installation test planning	#4			ASNP	SPa
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13. FLIGHT TEST PILOT	ORGN SYMBOL	EXTENSI	ON		
M/A					
14. DIRECTORATE TEST ENGINEER	ORGN SYMBOL	EXTENS	ON		
	ASTEVS	2525	20		
Anthony Civetz 18. INSTRUMENTATION ENGINEER	ORGN SYMBOL	EXTENS		22. AT1	FACHMENTS
				[X]	APPENDICES
N/A	ORGN SYMBOL	EXTENS	ON	سيسب	TABLES
16. PROGRAM MANAGER	ļ	l		L	FIGURES
Lt. R. C. Lineback	ASNPSP3	221	· · · · · · · · · · · · · · · · · · ·		
7. PREPARED BY	TITLE		ORGN SYME		EXTENSION
Anthony Civetz	Engr. Techni	A 191	ASTEV		25290 EXTENSION
16. DIRECTORATE CONCURRENCE	TITLE		ORGH SYME	.VL	EVIENSION
19. TECHNICAL DIRECTOR CONCURRENCE	TITLE		ORGN SYME	OL	EXTENSION
Carl E. Reichert	Technical Di	rector	ASTE	,	21177
20. AST DEPUTY APPROVAL	TITLE		ORGN SYME		EXTENSION
SD FORM 153 REPLACES ASD-0 FORM 667 SECURI	ITY CLASSIFICATION	<u> </u>		PAG	E 1 OF 3 PA

Test Report Nr. ASTEVS-62-35-R

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 eyele, 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 ameroid accuracy test was them 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 ameroid release point was noted to be at 16,300 feet. This was within the operational requirement of 16,5001500 feet. The drogue deploy astuator, containing a reverse action amercia, 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 ameroid release point was noted to be 20,600 feet, which was not within the operational requirement of 19,0001500 feet. No further testing was conducted and the actuators were returned to the project engineer.

4. QONGLUSIONS: It is concluded that:

- (1) The drogue release actuator, serial ar. 209, satisfactorily met the test conditiens.
- (2) The drogue deploy actuator, serial nr. 207, did not meet the test conditions due to the rust fermation and unsatisfactory ameroid operation.
- . RECOMMENDATIONS: It is recommended that:
- (1) The drogue release actuater, serial nr. 209, be considered satisfactory for service use under the conditions impeced by this test.
- (2) The drogue deploy actuator, serial mr. 207, be considered unsatisfactory for service use under the conditions imposed by this test.
- (3) Both actuators be completely disassembled and inspected for internal must formation. All parts found to be rusted should be fabricated of rust resistant meterial.

PREPARED BY:

Test Project Engineer

CONCURRED IN DWIGHT G. KENNARD. JR.

Chief. Mayironmental Division Directorate of Engineering Test

Deputy Commander/Test and Support

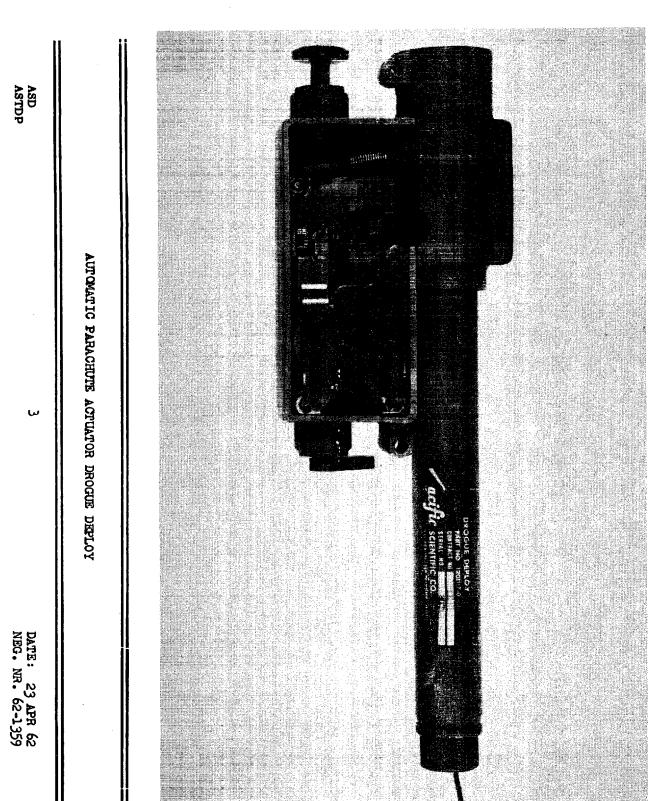
APPROVED BY

CARL E. REICHERT Technical Director

Directorate of Engineering Tout Deputy Commander/Test and Support

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APPENDIX J

VIBRATION

Report No.

Page

ASTEVD-62-105-R

46-49

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a. Introductions						
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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 recorded and subjected to a simulated altitude of 22,500 feet. It operated immediately when the arming pin was pulled at that altitude. It was recorded 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 Er. 1

Hannfesturer: Pacific Scientific Company, Los Angeles, California

Nemenclature: Brogue Release

Part Hr: 1201118-0

Serial Hr: 209

Weight: 1.65 lb

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

Telerance 5500 feet

Cable Pulled - 2 inches

Bimonglous e

Length - 9 5/8 inches

Width - 3 inches

Height - 1 1/2 inches

Cable Extended - 12 3/k inches

2 Mounting Heles for 1/8 inch belts, 5 inches on centers.

ASTEVD Test Report 62-1052

PREPARED ET:

Chief, Bevirenmental Mivision Directorate of Engineering Test Dougly for Tost and Support

Seage M. myron for CARL H. REIGHNET Technical Director

Directorate of Engineering Test Deputy Commender/Test and Support

APPENDIX K

VIERATION AND SHOCK LIFE TEST

Report No.

Page

ASTEVD-62-175-R

51-61

Technical Memorandum

FLIGHT AND ENGINEERING TEST REPORT DEPUTY FOR TEST AND SUPPORT (See ASDR 80-1)		2. AST NR. PART 3. DATE 77 (1)	FIX FINAL
1. TEST TITLE AUTOMATIC PARACHUTE ACTUATORS	ASTEVD- IDENT, NR. 62-175-R	4. TASK, FROJECT, O 5778-(576) 5. PRIORITY & AFIMP	R SYSTEM NR.
6. OBJECTIVE AND SUMMARY		162	

a. Mitroduction:

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 ASEP-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 end 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 or	n separate page)
7.	TEST HOURS COMPLETED	TEST HOURS SUCCESSFULLY	TEST HOURS	REMAINING	DATA	REDUCTION & COMPLETE
	120	COMPLETED 120	0			100%
В.	REQUESTING AGENCY					
	ASSpSP-3 (Lt. Line	eback)				
9,	TEST STARTING DATE	INSTRUMENTATION	11. TEST FACILIT	Kold	Hold 411	21 DISTRIBUTION
	2 Nov 62	INSTALLATION TEST PLANNING	Chamber Mod	44 Shak	or & JA	ASTEVD (orig.)
10.	TECHNICAL DOCUMENTARY	REPORT TO BE ISSUED	12. TEST LOCATIO	N(S)		ASMPSP-3 (vel cy
	YES NO REPORT	T NR.	Ra. 1, Bldg	993, Are	e B	ASTA (cy)
13.	FLIGHT TEST PILOT	-	ORGN SYMBOL	EXTENS		ASTEV (Cy)
14.	DIRECTORATE TEST ENGIN	IEER	ORGN SYMBOL	EXTENS	ion	
	Howard R. Kimm		ASTEVD	3.6	215	
15.	INSTRUMENTATION ENGINE	ER	GRGN SYMBOL	EXTENS	ON	ZZ. ATTACHMENTS
						APPENDICES
16.	PROGRAM MANAGER		ORGN SYMBOL	EXTENSI	ON	TAHLEY
	Lt. R.C. Lineback		ASNPSP-3	22113	; ;	FIGURES
17.	PREPARED BY		TITLE	k iz iz	ORGH SYMP	OL EXTENSION
	Howard R. Kimma		Test Project	t Boere.	ASTEVD	3/.2/5
18.	DIRECTORATE CONCURRE	NCE	TITLE		ORGH SYMB	OL EXTENSION
19.	TECHNICAL DIRECTOR COM	NCURRENCE	TITLE		ORGN SYME	OL EXTENSION
	Carl E. Reichert		Technical D	Lreator	ASTE	21177
20.	AST DEPUTY APPROVAL	The state of the s	TITLE		ORGN SYME	



- (3) Actuator S/N 217 is a device within the assembly which deploys the high altitude drogue chute if the altitude is at least 16,600 feet. The color code is blue. Significant characteristics are contained in Table Nr. 3, Appendix B. It was submitted for a special shock-altitude-excapement-operation test.
- (4) Actuators 8/H 222 and 8/H 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.
- (e) Vibration was stopped and the simulated altitude was reduced until the actuator operated. This altitude was recorded.
- (d) The actuator was recorded 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 eps and the total excursion was 0.030 inch.
- (f) Logs of the vibration tests are contained in Tables Brp. 4 and 5, Appendix B.
- (5) Both actuators were near the altitude tolerance limits before vibration. Neither actuator remained within the tolerance of \$400 ft. S/H 222 was \$600 ft and S/H 228 was \$900 ft.
- (6) Actuators such as S/W 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 cutlined 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 ascapement mechanism.
- (7) A total of seventeen vertical shocks in the direction tending to expand the believe 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 them, failure was in the marginal region.
 - (8) There was no visible damage to any actuators.
- (9) Mr. Mike Dougherty of ASEPSP-3 essisted throughout the test on S/E 217 and recorded all pertinent date.
 c. Conclusions:
- (I) More demage appears to have been done to 2/2 222 and 8/2 226 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-SIO, "Environmental Test Nethods for Aerospace and Ground Equipment", method 514, equipment Class 6 and method 516, Procedure III, be considered as an additional requirement for all getuators. 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

CONGURRED IN:

JOHN B. DIANDERA

Chief, Environmental Division
Directorate of Engineering Test
Deputy for Test and Support

APPROVED BY:

GARL E. REICHERT Technical Director

50 Thomas

Mirectorate 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 comking 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 JAS-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 15,600 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 Mr. 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 - $1 \frac{1}{2}$ inches

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

Cable Extension (Extended) - 6 5/8 inches

AFPENDIX "B"

Table Mr. 2

Significant Characteristics of Specimen

Nomenclatures Main Deploy

Manufacturer: Pacific Scientific Company

Pert Nr: 1201119-0

Serial Er: 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 boles for 1/8 inch bolts, 5 inches on centers



APPENDIX "B"

Sable Mr. 3

Significant Characteristics of Specimen

Homenclature: Drogue Deploy

Manufacturer: Pacific Scientific Company

Peart Br: 1201117

Sorial Mr: 217

Weight: 1.65 lb.

Code Color: Blue

Operations Set to operate at or above 16,600 feet

Tolerance \$00 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 belts, 5 inches on center

APPENDIX "B"

Sable Mr. 4

Log of Vibration Test for Drogue Release

(8/N 222)

AXIS OF	ALTITUDE OF YIEFATION	N.APORD TROE	ALTINDE OF	DIFFERENCE FROM
Pre-Vibration		0	16,140 ft.	*340 ft.
Longitudinal- Longitudinal	Room 17,000 to 17,500 ft.	1/2 hour 1/2 hour	16,1 2 0 ft.	*320 ft.
Perpendicular to	Roce	1/2 hour		
Mounting Base Perpendicular to Mounting Base	17,000 to 17,500 ft.	1/2 hour	16, 36 0 ft.	*560 st.
Lateral	Room	1/2 hour		
Lateral	17,000 to 17,500 ft.	1/2 hour	16,400 ft.	4600 st.

^{*} The drogue release was set at the factory to operate at 15,800 ft. The tolerance is 1400 ft.

APPRIDIX "B"

Table Er. 5

Log of Vibration Test for Main Deplay

(S/N 228)

AXIS OF VIERATION	ALTITUDE OF VIERATION	ELAPSED TOES	ALTITUDE OF OPERATION	DIFFERENCE FROM SECTION *
Pre-Vibration		0	15,400 ft.	hoo rt.
Longitudinal Longitudinal	Room -16,200 to 16,700 ft.	1/2 hour 1/2 hour	15,450 ft.	*450 ft.
Perpendicular to	Room	1/2 hour		
Mounting Base Perpendicular to Mounting Base	16,200 to 16,700 ft.	1/2 hour	15,400 ft.	400 rt.
Lateral Lateral	Room 16,200 to 16,700 ft.	1/2 hour 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"

Pable Br. 6

Log of Operational Altitudes for Drogue Release

TEST BUSINESS	SDSLATED ALEITHUS	NAME OF STREET
First Calibration	16,400 ft.	Operated
First Calibration	16,200 ft.	Did not operate
First 30 g Shock	15,400 ft.	Bid 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.	Pid not operate
Third 30 "g" Shock	15,400 st.	Did not operate
Altitude Raised	16,800 ft.	Operated
Fourth Calibration	16,400 ft.	Operated
Pourth Calibration	16,200 ft.	Did not operate
Fourth 30 "g" Shock	15,490 ft.	bid not operate
Altitude Reised	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 ,25 0 £t.	Operated
Sixth Calibration	16,000 ft.	Did not operate
Sixth Shock	15,400 ft.	hid 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.	Bid not operate
Altitude Raised	16,900 ft.	Operated
Eighth Calibration	'16,500 ft.	Operated
Righth Calibration	16,500 ft.	hid not operate
Righth 30 "g" Shock	15,400 ft.	hid not operate
Altitude Raised	16,900 ft.	Operated

Table Hr. 6 Continued

THE WINT	EDELATED ALTITUE	BANGS
Minth Calibration	16,600 ft.	Operated
Minth Calibration	16,400 st.	Did not operate
Winth 30 "g" Shook	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
Teath 30 "g" Shock	15,400 ft.	bid not operate
Altitude Raised	16,500 ft.	Operated.
Eleventh Calibration	16,200 ft.	Operated
Rieventh Calibration	16,100 ft.	Did not operate
Eleventh 30 "g" Shock	15,950 £t.	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
Welfth Calibration	16,000 ft.	Operated
Swelfth Calibration	15,900 ft.	hid 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"

	COTTO MAL TOP	O.T.I	2000 TO	RESULTS
,		1) M		RESULTS:
	つついれながけ	U.		

•				Serial Numbers					
Number		. Test Title	207	209	211	217	222	228	
3.0	(4.1)	Examination of Product	P	P	P	•	•	••	
3.1	(4.3)	Ameroid 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	٤	•	-	-	
. 4.2	(4.7.3)	Ameroid Accuracy	P	P	P	-	•	•	
4.3	(4.7.4)	Aneroid Hysteresis	- ·	P	-	-	488	-	
4.4	(4.7.5)	Arming Pin Pull	-	P	•		-	-	
5.1	(4.8.1)	High Altitude-Low Temperatur	re -	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	i 🚣	-	-	• =	· 🕶	

Notes:

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

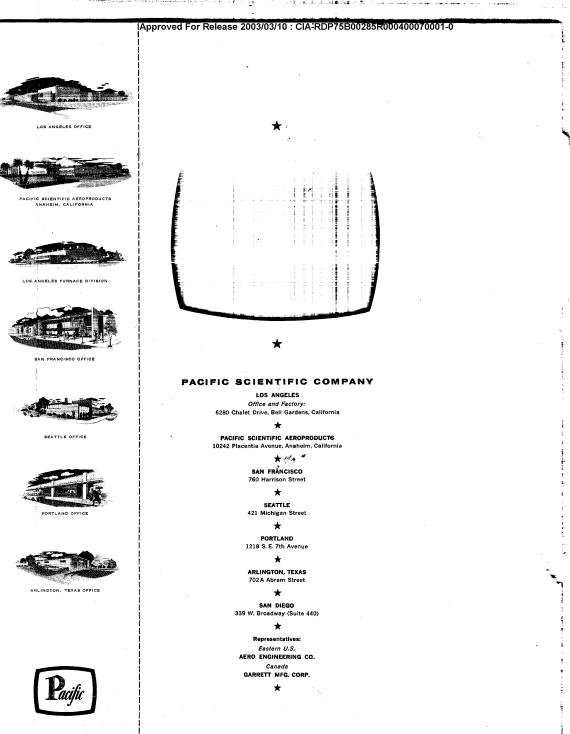
Approved For Release 2003/03/10 . CIA-RDF73B0020

AUTOMATIC PARACHUTE ACTUATION.
MICHEL SCIENTIFIC COMMONY





CREATIVE MANUFACTURING AND DEVELOPMENT



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