REPORT NUMBER 155
MARCH 1965

NOSE LANDING GEAR
DROP TEST REPORT

LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM

CONTRACT NUMBER DA44-177-TC-715

GENERAL ELECTRIC

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REPORT NUMBER 155

NOSE LANDING GEAR DROP TEST REPORT

XV-5A Lift Fan
Flight Research Aircraft Program

March 1965

ADVANCED ENGINE AND TECHNOLOGY DEPARTMENT
GENERAL ELECTRIC COMPANY
CINCINNATI, OHIO 45215
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1.0 GENERAL:
The 1511L.100 Nose Landing Gear Shock Strut was tested on 26 July 1963, in accordance to the H. W. Loud Test Procedure 1511LTP-4, Revision "A". This report presents the successful completion of the established test requirements.

The tests were witnessed by Ryan and H. W. Loud Quality Control and Mr. Fred Doring, F. A. A. Western Regional Headquarters.

2.0 APPLICABLE DOCUMENTS:
2.1 1511LTP-4, Revision "A", H. W. Loud Drop Test Procedure
2.2 SCDL0002, Ryan Nose Gear Specification
2.3 Wire dated July 25, 1963 confirming test requirement deviation.

3.0 SUMMARY:
The results of the tests demonstrate satisfactory energy absorption characteristics of the shock absorber.

The first test condition results meet the requirements of the deviation allowance. (see Appendix B). The vertical reaction exceeds the original requirements for approximately .05 seconds at a strut stroke of 4.15 inches with a maximum of 6600 pounds.
3.0 SUMMARY: (con't)

The second condition results meets the test requirements.

The official test for condition three was run with an additional 200 pounds on the jig that was anticipated to correct for friction in the drop tower. The results indicate, however, excessive energy input. A prior run is also included with the correct jig weight and with insufficient energy input to show the effect of the weight change. Both runs are well within the maximum allowable vertical reaction.

4.0 DISCUSSION:

The shock strut was mounted in the drop tower (See Figure I). The ground reactions were measured with a reaction platform (See Figure II). The strut was serviced with hydraulic fluid and extended with 154 psig air pressure. The tire was inflated to 155 psig.

The tests were performed in accordance with the 1511LTP-4 Test Procedure. See Appendix A for a copy of the test requirements taken from the procedure.
4.0 DISCUSSION: (con't)

A deviation was granted by Ryan (See Appendix B) on condition number one allowing for an increase in vertical reaction to 7000 pounds after the first four inches of strut stroke.

Figure III shows the configuration of the metering pin and orifice.
5.0 RESULTS:

The test results are given in Table I. The curves of vertical load vs stroke are given in Figures IV, V, VI, and VII. The actual test records are fold out pages.

<table>
<thead>
<tr>
<th>Record No.</th>
<th>9691</th>
<th>9687</th>
<th>9685</th>
<th>9680</th>
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<tr>
<td>Results *</td>
<td>Cond. 1</td>
<td>Cond. 2</td>
<td>Cond. 3</td>
<td>Cond. 3 **</td>
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<tr>
<td>Wheel Speed</td>
<td>2200</td>
<td>-</td>
<td>2570</td>
<td>2550</td>
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<td>Max. Vertical Reaction</td>
<td>6600</td>
<td>8270</td>
<td>4070</td>
<td>3800</td>
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<tr>
<td>Max. Drag Reaction</td>
<td>2060</td>
<td>-</td>
<td>1760</td>
<td>1360</td>
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<tr>
<td>Jig Contact Velocity</td>
<td>10.02</td>
<td>10.0</td>
<td>6.1</td>
<td>6.1</td>
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<td>Total Strut Stroke</td>
<td>6.44</td>
<td>7.42</td>
<td>5.84</td>
<td>5.86</td>
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<tr>
<td>Total Mass Travel</td>
<td>8.07</td>
<td>9.92</td>
<td>7.35</td>
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<tr>
<td>Strut Efficiency</td>
<td>83.6</td>
<td>75.5</td>
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<td>Energy Absorbed</td>
<td>3670</td>
<td>5004</td>
<td>2190</td>
<td>1440</td>
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<td>Max. Vertical Reaction 0-4&quot; Strut Stroke</td>
<td>6140</td>
<td>-</td>
<td>-</td>
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* See Appendix A for drop test requirements.
** Drop made prior to official tests not witnessed by required agencies.
*** See Appendix B.
FIGURE I
DROP TEST TOWER
XV5A NOSE LANDING GEAR
FIGURE II

REACTION PLATFORM

10,000 # VERTICAL REACTION
5,000 # HORIZONTAL REACTION
FIGURE III

1511L116 ORIFICE CONFIGURATION (FULL SIZE)

1511L125 METERING PIN CONFIGURATION (HALF SIZE)
VERTICAL REACTION
VS. STRUT STROKE

VERTICAL REACTION
VS. MASS TRAVEL AFTER CONTACT

DROP SERIES 1
NORMAL LDG. (9200# WT.)
CONTACT VEL. 10.02
JIG WT. 2360#
OLEO EFFICIENCY 83.6%
ENERGY ABSORBED BY
SYSTEM 3670FT. LB.

RECORD # 6591

STRUT STROKE OR MASS TRAVEL ~ INCHES

FIGURE IV
VERTICAL REACTION VS. STRUT STROKE

VERTICAL REACTION VS. MASS TRAVEL AFTER CONTACT

DROP SERIES 3
NORMAL LENGTH: 1200 ft
CONTACT VELOCITY: 60 ft/sec
JIG WEIGHT: 3200 lb
OLL EFFICIENCY: 74.5%
ENERGY ABSORBED BY SYSTEM: 1440 ft-lb

RECORD #: 9650

FIGURE VII
APPENDIX A

DROP TEST PROCEDURE 1511LTP-4, REVISION "A"
TABLE II DROP TEST REQUIREMENTS PAGE 13
# Table II

## Drop Test Requirements

<table>
<thead>
<tr>
<th>Drop Series</th>
<th>Condition</th>
<th>A/P Weight (lbs)</th>
<th>Est Jig Weight (lbs)</th>
<th>Contact Velocity / 2% (ft/sec)</th>
<th>Est. Drop Height (in)</th>
<th>Input Energy / 5% (ft/lbs)</th>
<th>* Wheel Speed (rpm)</th>
<th>Static Weight For Inflation (lbs)</th>
<th>Tire Press (psi)</th>
<th>Max Vertical Ground Reaction (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal Ldg.</td>
<td>9,200</td>
<td>2,360</td>
<td>10</td>
<td>19.7</td>
<td>3,690</td>
<td>2,190</td>
<td>* *</td>
<td>155</td>
<td>6230</td>
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<tr>
<td>2</td>
<td>VTOL Ldg.</td>
<td>9,200</td>
<td>3,210</td>
<td>10</td>
<td>19.7</td>
<td>5,000</td>
<td>0</td>
<td>* *</td>
<td>155</td>
<td>8480</td>
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<tr>
<td>3</td>
<td>Normal Ldg.</td>
<td>12,500</td>
<td>3,200</td>
<td>6</td>
<td>7.8</td>
<td>1,800</td>
<td>2,540</td>
<td>* *</td>
<td>155</td>
<td>6230</td>
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</tbody>
</table>

* Based on 18" tire diameter.

** Use extend air pressure of 154 psig
APPENDIX B

WIRE CONFIRMING TEST REQUIREMENT DEVIATION
CALL YOUR CONNECTION AT YOUR LOCATION WITH XXX SERVICE TO
SAN DIEGO CALIF 7-19-63 MSG NO. 23
H. W. LOUD MACHINE WORKS
POMONA, CALIF
ATT. - MR. IRA SMITH

REF - TELEPHONE CONVERSATION BETWEEN MATCHFIELD AND SMITH 7/20/63
REGARDING TEST REQUIREMENT DEVIATION FOR XV5A-4E HANGING CAN.
THIS DEVIATION PERTAINS TO DROP TEST SERIES NO. 1, NORMAL HANGING
AND 9,300 LBS. APPLIED WEIGHT AT 10 FEET PER SECOND AND ALLOWS
A VERTICAL GROUND REACTION NOT TO EXCEED 7,000 LBS TO OCCUR AFTER
4 INCHES OF STROKE, OR THE CONDITION THAT THE REACTION IS NOT
CONCURRENT WITH THE MAXIMUM SPIN-UP OR MAXIMUM SPRING-BACK REACTION.
DEVIATION GRANTED AS REF ABOVE.

RYAN AERONAUTICAL CORP., TWIN C. ROSE