AN INVESTIGATION OF WING BUFFETING RESPONSE AT SUBSONIC AND TRANSONIC SPEEDS: PHASE II F-111A FLIGHT DATA ANALYSIS

VOLUME II: PLOTTED POWER SPECTRA

(NASA-CR-152113) AN INVESTIGATION OF WING BUFFETING RESPONSE AT SUBSONIC AND TRANSONIC SPEEDS. PHASE II: F-111A FLIGHT DATA ANALYSIS. VOLUME II: PLOTTED POWER SPECTRA

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for

AMES RESEARCH CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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SUMMARY

A detailed investigation of the flight buffeting response of the F-111A was performed in two phases. In Phase I stochastic analysis techniques were applied to wing and fuselage responses for maneuvers flown at subsonic speeds and wing leading-edge sweep of 26 degrees. Power spectra and rms values of response were obtained for:

1. vertical accelerations at the wing tips, the center of gravity and the pilot's seat,
2. lateral accelerations at the center of gravity and the pilot's seat,
3. vertical shear, bending moment and torsional moment at 4 spanwise locations on the right variable sweep wing panel.

In Phase II the analyses were extended to include maneuvers flown at wing leading-edge sweep values of 50 and 72.5 degrees at subsonic and supersonic speeds and the responses examined were expanded to include vertical shear, bending moment, and hingeline torque of the left and right horizontal tails.

This volume presents plotted power spectra for all of the flight points examined during the Phase II flight data analysis. Detailed descriptions of the aircraft, the flight instrumentation and the analysis techniques are given.
Measured and calculated vibration mode frequencies are also presented to assist in further interpretation of the PSD data.

The major conclusions of the investigation are:

(1) The structural response to buffet during moderate to high-g maneuvers is very complex. Many natural symmetric and antisymmetric natural vibration modes (and perhaps asymmetric modes) can be excited to significant levels of response.

(2) An array of different types of sensors and locations of the sensors is needed to adequately describe the structural response during buffet investigations.

(3) The modal content of the response varies with sensor type and location and also can vary with angle of attack, wing sweep and Mach number. The variations in modal content are attributed to the variations in the spatial extent and phase relationships of the separated flows.

(4) At low wing sweep there are significant differences in the variations of rms response with angle of attack for different Mach numbers. The largest magnitudes of response were measured during flight
conditions where shock induced flow separations were present.

(5) In general, the rise in rms response with angle of attack becomes smaller as wing leading edge sweep is increased.

(6) The buffeting loads on the wing are small relative to the maneuver loads at the most inboard measuring station but become larger near the wing tip. The larger relative rms values of response near the tip are attributed to higher frequency modes and thus should be considered important from a fatigue standpoint with respect to secondary structure.

The data obtained in this investigation were used to help formulate and evaluate a method of predicting buffeting response which uses wind tunnel measurements of the fluctuating pressures on a "rigid" wing as the input forcing function.

The entire investigation is documented in eight reports which are listed below.


Volume III - Tabulated Power Spectra, NASA CR-152111
Benepe, D. B., Cunningham, A. M., Jr., Traylor, S., Jr., and Dunmyer, W D. • An Investigation of Wing Buffeting Response at Subsonic and Transonic Speeds • Phase II F-111A Flight Data Analysis.


SYMBOLS

Note: Quantities are presented in the International System of Units (U.S. customary units in parenthesis). The work was performed using U.S. customary units.

b wheel span - m, (ft)
B.M.DES design value of wing bending moment, N-m, (in - lb)
c.g., C.G. "center of gravity"

f frequency, hertz
f₀ spectral base frequency or analysis bandwidth, hertz
Fz wing vertical shear as measured by strain gages - N, (lb)
g gravitational acceleration
M Mach number

Mx Wing Bending Moment as measured by strain gages N-m, (in - lb)

My Wing torsional moment - N-m, (in - lb)

Nmax maximum maneuver load factor - g's
S theoretical wing area (leading and trailing edges of swept panel extended to airplane centerline m², (ft²)
T length of input frame in spectral analysis - seconds

T₁ start time of interval for spectral analysis - seconds

T₂ stop time of interval for spectral analysis - seconds

ΔT time interval used for spectral analysis = T₂ - T₁, sec

VDES design value of wing vertical shear, N, (lb)
y lateral acceleration g's
z vertical acceleration g's
SYMBOLS (Continued)

 α  indicated angle of attack referenced to wing manufacturing chord plane

 α_{max}  maximum indicated angle of attack - deg.

 α_{nom}  nominal angle of attack representing time interval \( \Delta T \).

 α\textsuperscript{T1}  indicated angle of attack at time \( T_1 \), deg

 Δα  increment in indicated angle of attack during time interval \( \Delta T \), deg

 β  indicated sideslip angle, deg

 \( \sigma_a \)  rms value of acceleration fluctuations - g, rms

 \( \sigma_{v_{max}} \)  maximum rms value of wing vertical shear fluctuations - N, rms, (lb, rms)

 \( \sigma_{BM_{max}} \)  maximum rms value of wing bending moment fluctuations - N-m, rms, (in - lb, rms)

 \( \psi_T \)  average rms value determined from power spectral analysis
ABBREVIATIONS

Alt     altitude
Asym    antisymmetric
B.M.    bending moment
Cross-PSD, XPSD  Cross power spectral density
dB      decibel
Dyn Press  dynamic pressure
FM      frequency modulation
Hz      hertz
hor, hori  horizontal
in-lb, IN-LB  inch-pound
inb'd    inboard
L       left
lb, LB    pound
L/H     left hand
LWT     left wing tip
m       meter
N       newton
N-m, N-M  newton-meter
outbd   outboard
P.S.    pilot seat
PSD     power spectral density
R       right
R/H     right hand
<table>
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<tr>
<td>rms</td>
<td>root-mean-square</td>
</tr>
<tr>
<td>RWT</td>
<td>right wing tip</td>
</tr>
<tr>
<td>Sym</td>
<td>symmetric</td>
</tr>
<tr>
<td>TOR</td>
<td>torsion</td>
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<td>W.S.</td>
<td>Wing Station for strain gage measurements</td>
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SECTION 1
INTRODUCTION

A detailed investigation of the structural response of an F-111A aircraft to buffet during moderate to high-g maneuvers was accomplished in two phases. In Phase I (References 1, 2, 3) the response characteristics with the variable sweep wings set at a nominal leading-edge sweep of 26 degrees were examined for the seven maneuvers described in Table 1.

Power spectra and rms values of response were determined for 19 different measurement items consisting of vertical accelerations at the wing tips, the center of gravity and the pilot's seat, lateral accelerations at the center of gravity and the pilot's seat and vertical shear, spanwise bending moment, and torsional moment at 4 different spanwise stations on the right wing.

The conclusions reached from the Phase I Study were:

1. The structural response during buffet is very complex. Many natural vibration modes both symmetric and antisymmetric can be excited during a maneuver in which flow separation occurs on the wings.

2. The spectral content of the response varies with the type of sensor, the location of the sensor and in some cases with angle of attack.
# Table 1

## PHASE I FLIGHT MANEUVERS

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<th>GROSS WEIGHT</th>
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<td>48</td>
<td>6</td>
<td>Windup Turn</td>
<td>26.6</td>
<td>.70</td>
<td>7,559 m</td>
<td>294,472 N</td>
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<td></td>
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<td></td>
<td></td>
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<td>(26,800 ft)</td>
<td>(66,200 lb)</td>
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<td>77</td>
<td>S&amp;C-R</td>
<td>Windup Turn</td>
<td>25.6</td>
<td>.80</td>
<td>6,035 m</td>
<td>266,004 N</td>
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<td></td>
<td></td>
<td></td>
<td>(19,800 ft)</td>
<td>(59,800 lb)</td>
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<td>78</td>
<td>5</td>
<td>Pullup</td>
<td>26.2</td>
<td>.80</td>
<td>3,780 m</td>
<td>327,389 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(12,400 ft)</td>
<td>(73,600 lb)</td>
</tr>
<tr>
<td>79</td>
<td>9R</td>
<td>Pullup</td>
<td>26.7</td>
<td>.80</td>
<td>1,494 m</td>
<td>323,386 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(4,900 ft)</td>
<td>(72,700 lb)</td>
</tr>
<tr>
<td>60</td>
<td>10</td>
<td>Roller Coaster</td>
<td>26.6</td>
<td>.87</td>
<td>8,382 m</td>
<td>307,617 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(27,500 ft)</td>
<td>(69,200 lb)</td>
</tr>
<tr>
<td>78</td>
<td>4</td>
<td>Pullup</td>
<td>26.3</td>
<td>.87</td>
<td>3,688 m</td>
<td>330,503 N</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>(12,100 ft)</td>
<td>(74,300 lb)</td>
</tr>
<tr>
<td>70</td>
<td>2</td>
<td>Pullup</td>
<td>26.8</td>
<td>.86</td>
<td>1,494 m</td>
<td>328,800 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(4,900 ft)</td>
<td>(73,800 lb)</td>
</tr>
</tbody>
</table>
(3) The variations of rms values of response with angle of attack can be quite different for different values of Mach number. The largest measured responses occurred under conditions where shock-induced flow separations occurred on the wing. In particular the torsional response was significantly higher than anticipated on the basis of previous buffet studies.

(4) The magnitudes of the wing bending and wing shear responses at the most inboard measurement station are small relative to the maneuver loads. Near the wing tip the buffet loads are a much larger percentage of the maneuver loads.

(5) Horizontal tail vibration modes appear to make significant contributions to the fuselage responses.

In Phase II the structural responses at nominal wing leading-edge sweeps of 50 and 72.5 degrees were analyzed. Vertical shear, bending moment and hingeline torque at the root of the left and right horizontal tails were analyzed in addition to the 19 measurement items examined in Phase I. All 25 items were studied for six maneuvers listed in Table 2. In addition the horizontal tail responses were analyzed for two wind up turn maneuvers from the Phase I Study as listed in Table 2.

Volume I (NASA CR-152112) summarizes the Phase II investigation in detail. This Volume (NASA CR-152113) presents plotted power spectra for all of the flight points and instrumentation items analyzed in the Phase II study. Sufficient information about the aircraft, the flight instrumentation and the analysis techniques is presented to allow the reader to perform additional
Table 2

**PHASE II FLIGHT MANEUVERS**

<table>
<thead>
<tr>
<th>Flight</th>
<th>Run</th>
<th>Maneuver</th>
<th>Wing Sweep</th>
<th>Mach</th>
<th>Altitude</th>
<th>Gross Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(27,500 ft)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(74,400 lbs)</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>R227</td>
<td>Windup Turn</td>
<td>49.1</td>
<td>.80</td>
<td>8,382 m</td>
<td>330,948 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(27,500 ft)</td>
<td>(74,400 lbs)</td>
</tr>
<tr>
<td>51</td>
<td>S38/150</td>
<td>Slowdown Turn</td>
<td>49.5</td>
<td>1.25-1.13</td>
<td>10,912 m</td>
<td>278,903 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(35,800 ft)</td>
<td>(62,700 lbs)</td>
</tr>
<tr>
<td>48</td>
<td>4</td>
<td>Windup Turn</td>
<td>49.8</td>
<td>1.20</td>
<td>9,053 m</td>
<td>261,111 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(29,700 ft)</td>
<td>(59,700 lbs)</td>
</tr>
<tr>
<td>48</td>
<td>7R1</td>
<td>Windup Turn</td>
<td>72.2</td>
<td>.89</td>
<td>7,559 m</td>
<td>265,559 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(24,800 ft)</td>
<td>(59,700 lbs)</td>
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<tr>
<td>48</td>
<td>5</td>
<td>Windup Turn</td>
<td>72.2</td>
<td>1.20</td>
<td>9,083 m</td>
<td>274,455 N</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(29,800 ft)</td>
<td>(61,700 lbs)</td>
</tr>
<tr>
<td>59</td>
<td>S132R</td>
<td>Slowdown Turn</td>
<td>72.2</td>
<td>1.31-0.96</td>
<td>8,382 m</td>
<td>274,900 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(27,500 ft)</td>
<td>(61,800 lbs)</td>
</tr>
<tr>
<td>77</td>
<td>S6CR*</td>
<td>Windup Turn</td>
<td>25.6</td>
<td>.80</td>
<td>6,035 m</td>
<td>266,004 N</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>(19,800 ft)</td>
<td>(59,800 lbs)</td>
</tr>
<tr>
<td>48</td>
<td>6*</td>
<td>Windup Turn</td>
<td>26.6</td>
<td>.70</td>
<td>7,559 m</td>
<td>294,472 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(24,800 ft)</td>
<td>(66,200 lbs)</td>
</tr>
</tbody>
</table>

*Phase I Selections*
analyses if desired. Volume III (NASA CR-152114) presents tabulated PSD data.
SECTION 2

AIRCRAFT DESCRIPTION

The test aircraft was F-111A Number 13. A drawing showing the general features of the aircraft is presented in Figure 1. Detailed geometry associated with the aircraft and its components appears in Table 3. The aircraft has a variable sweep wing and a convention was adopted early in the development program that all aerodynamic coefficients would be referenced to geometric characteristics at a specific wing sweep, namely, $\Lambda_{LE} = 16$ degrees. The variations of some key geometric characteristics of the wing with wing leading-edge sweep angle are presented in Figure 2.

Although the aircraft is fitted with a high-lift system consisting of multisegment leading-edge slats and multisegment double-slotted trailing-edge flaps, these devices were in their retracted positions for all maneuvers analyzed in this study.

Two-segment upper surface spoilers on each wing are used at low wing sweeps in addition to differentially controlled all-movable horizontal tails to achieve roll control.

The aircraft has a three-axis stability augmentation system which was operational on all maneuvers analyzed in this investigation.
Figure 1  F-111A THREE-VIEW
### TABLE 3

**PHYSICAL CHARACTERISTICS OF THE J-111 AIRPLANE**

<table>
<thead>
<tr>
<th>Wing</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Airfoil section, at pivot</td>
<td>NACA 64A210 (modified)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sweep, deg (leading edge)</td>
<td>16 to 71.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incidence, deg</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dihedral, deg</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Span, ft (aerodynamic chord)</td>
<td>(See Fig 2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leading-edge slats</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Area (planoform projected), ft² (m²)</td>
<td>60.7 (9.64)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Span, percent of exposed wing-panel span</td>
<td>94.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deflection, maximum, deg</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Trailing-edge flaps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>Double Slotted Fowler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Area (planoform projected), ft² (m²)</td>
<td>25.6/2.06</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Span, ft (m)</td>
<td>17.8 (5.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deflection, maximum, deg</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wing pivot</td>
<td>Distance from airplane nose, ft (m)</td>
<td>40.6 (12.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distance from airplane centerline, ft (m)</td>
<td>5.86 (1.79)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Horizontal tail (all movable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airfoil section</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incidence, deg</td>
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<tr>
<td></td>
<td>Dihedral, deg</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Sweep at leading edge, deg</td>
<td>37.5</td>
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<tr>
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<td>Span, ft (m)</td>
<td>29.3 (9.0)</td>
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<tr>
<td></td>
<td>Area (exposed), ft² (m²)</td>
<td>176.3 (15.74)</td>
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<tr>
<td></td>
<td>Area (movable), ft² (m²)</td>
<td>194.2 (17.93)</td>
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<tr>
<td></td>
<td>Aspect ratio</td>
<td>1.42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean aerodynamic chord (exposed), in (cm)</td>
<td>137.5 (344.3)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Deflection, maximum, deg</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trailing-edge up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>As elevators</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Trailing-edge down</td>
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<td></td>
<td>Surface stops</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Vertical tail (all movable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airfoil section</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Span at leading edge, deg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Area, ft² (m²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aspect ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean aerodynamic chord, in (cm)</td>
<td>139.5 (404.5)</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Rudder</td>
<td></td>
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<td>Span, ft (m)</td>
<td>7.9 (2.4)</td>
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<td>Area, ft² (m²)</td>
<td>29.1 (2.65)</td>
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<td></td>
<td></td>
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<td></td>
<td>Deflection, maximum, deg</td>
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<td>Verticals</td>
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<tr>
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<td>Area (total), ft² (m²)</td>
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</tr>
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<td>Power plants</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>P &amp; V T730-P-3 engines</td>
<td></td>
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</tbody>
</table>

* Alg = 146
Figure 2  F-111A WING GEOMETRY AS A FUNCTION OF WING-SWEEP ANGLE
SECTION 3
AIRCRAFT INSTRUMENTATION

The instrumentation system installed in the aircraft consisted of two 30 track and one 14 track FM analog magnetic tape recorders and various transducers throughout the airplane. IRIG B time reference signals were recorded on each tape recorder to provide time correlation. The general locations of the accelerometers pertinent to the buffet study are shown in Figure 3. The actual locations in terms of aircraft geometry references are listed in Table 4.

The characteristics of the accelerometers most of which were commercially available units are indicated in Table 5. The accuracies quoted refer to the nominal flat frequency response up to the limit frequency quoted. No calibration data exist above the quoted limit of flat frequency response, however, the natural resonant frequencies are well beyond 100 hertz for all of the accelerometers.

The locations of the wing strain gage sensors pertinent to the buffet study are shown in Figure 4. Shear, bending moment and torque were measured at each of the four indicated wing stations on the right wing.

The locations of the strain gage sensors for the horizontal tail loads measurements are shown in Figure 5. Vertical shear bending moment and hingeline torque were measured at the
Figure 3. ACCELERATION MEASUREMENTS
### Table 4

**ACCELEROMETER LOCATIONS**

<table>
<thead>
<tr>
<th>ITEM CODE</th>
<th>MEASUREMENT</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FUSELAGE STATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>METERS</td>
</tr>
<tr>
<td>ABO10</td>
<td>c.g. vertical</td>
<td>12.996 (511.64)</td>
</tr>
<tr>
<td>ABO19</td>
<td>c.g. vertical</td>
<td>12.996 (511.64)</td>
</tr>
<tr>
<td>ABO20</td>
<td>c.g. lateral</td>
<td>12.996 (511.64)</td>
</tr>
<tr>
<td>AF009</td>
<td>Pilot seat vertical</td>
<td>6.462+1.127 (254.40+5.0)</td>
</tr>
<tr>
<td>AF010</td>
<td>Pilot seat lateral</td>
<td>6.462+1.127 (254.40+5.0)</td>
</tr>
<tr>
<td>ANW01</td>
<td>Left wing tip vertical</td>
<td>Front spar station 9.500 meters (374 inches)</td>
</tr>
<tr>
<td>ANW02</td>
<td>Right wing tip vertical</td>
<td>Wing span station 9.157 meters (360.5 inches) (\theta_{\text{A}_L}=16^\circ)</td>
</tr>
</tbody>
</table>
Table 5

ACCELEROMETER CHARACTERISTICS

<table>
<thead>
<tr>
<th>ITEM CODE</th>
<th>MEASUREMENT</th>
<th>NOMINAL FULL SCALE RANGE(^\star)</th>
<th>SPECIFIED ACCURACY (%) FULL SCALE**</th>
<th>SPECIFIED FLAT FREQUENCY RESPONSE TO 60 HZ</th>
<th>RESONANT FREQUENCY MAX. FREQ/60 HZ</th>
<th>WEIGHTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG018</td>
<td>G.G. Vertical</td>
<td>(-3.5 \text{ to } 46.5)</td>
<td>(\pm 5)</td>
<td>25</td>
<td>Not Available</td>
<td>40, 60</td>
</tr>
<tr>
<td>AG019</td>
<td>G.G. Vertical</td>
<td>(+15)</td>
<td>(\pm 3)</td>
<td>42</td>
<td>530</td>
<td>70, 77, 78, 79</td>
</tr>
<tr>
<td>AG020</td>
<td>G.G. Lateral</td>
<td>(+7.5)</td>
<td>(\pm 4)</td>
<td>325</td>
<td>--</td>
<td>ALL</td>
</tr>
<tr>
<td>AG009</td>
<td>Pilot Seat Vertical</td>
<td>(-40)</td>
<td>(\pm 3)</td>
<td>275</td>
<td>--</td>
<td>ALL</td>
</tr>
<tr>
<td>AG010</td>
<td>Pilot Seat Lateral</td>
<td>(-7.5)</td>
<td>(\pm 4)</td>
<td>325</td>
<td>--</td>
<td>ALL</td>
</tr>
<tr>
<td>AG001</td>
<td>Left Wing Tip Vertical</td>
<td>(-25)</td>
<td>(\pm 5)</td>
<td>500</td>
<td>--</td>
<td>ALL</td>
</tr>
<tr>
<td>AG002</td>
<td>Right Wing Tip Vertical</td>
<td>(-25)</td>
<td>(\pm 5)</td>
<td>500</td>
<td>--</td>
<td>ALL</td>
</tr>
</tbody>
</table>

\(^\star\)The actual range calibrated varied from these nominal values.
\(^\star\)Over range of flat frequency response and at all temperatures between \(-70^\circ\) and \(+250^\circ\) F.
Figure 4. R/H WING-BOX LOADS MEASUREMENTS
Figure 5. HORIZONTAL TAIL LOADS MEASUREMENTS
root of both the left and right horizontal tails. The sensitivities of the wing and tail loads measurements were governed by the fact that the loads were to be measured during maneuvers at load factors up to the maximum capability of the aircraft. As a consequence the signal-to-noise ratios for the present buffet studies were lower than is desirable. The calibration slopes for each channel of information are shown in Table 6.

In several cases the frequency response upper limit for the measurements was set by the subchannel characteristics of the flight recording system. Table 7 lists the appropriate nominal limit frequency of subchannel arrangements for each flight selected for detailed analysis.

Other pertinent measurements such as angle of attack, Mach number, altitude, fuel remaining, horizontal tail position and spoiler position were also recorded on the FM tapes.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>MEASUREMENT</th>
<th>S.I. UNITS</th>
<th>O.R. UNITS</th>
<th>S.I. Unit</th>
<th>S.I. Unit</th>
<th>S.I. Unit</th>
<th>S.I. Unit</th>
<th>S.I. Unit</th>
<th>S.I. Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM01</td>
<td>LMT-Vert</td>
<td>g's</td>
<td>g's</td>
<td>50304</td>
<td>50304</td>
<td>33578</td>
<td>33578</td>
<td>33578</td>
<td>33578</td>
</tr>
<tr>
<td>AM02</td>
<td>RMT-Vert</td>
<td>g's</td>
<td>g's</td>
<td>50232</td>
<td>50232</td>
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<tr>
<td>AM010C</td>
<td>CG-Vert</td>
<td>g's</td>
<td>g's</td>
<td>130</td>
<td>130</td>
<td>10690</td>
<td>10313</td>
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Table 6 (Concluded)
Table 7

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During the Loads Demonstration Flight Program, the FM analog magnetic tapes containing raw flight test data were processed by automated processing techniques. The data were first played out on strip chart recorders for instrumentation verification. Next, the data were digitized at sample rates of up to 20 samples per second under computer control. Either 10 or 20 samples per second were used for the data pertinent to this study. The digitized data were then scaled, calibrated and output in computer listings and computer tapes for additional processing on an IBM System/360. Second generation computer runs were made to obtain corrected flight condition data such as gross weight, Mach number, altitude, dynamic pressure and fuel distribution at 1-second intervals.

Microfilm records of the computer listings from the original flight program data reduction were used in the present program to make plots of angle of attack, normal load factor, Mach number and dynamic pressure as functions of flight time and to identify the gross weights and altitudes for the selected flight maneuvers. The Mach number, altitude and dynamic pressure data include corrections for position error. The angles of attack from the basic reduction are indicated angles and do not include the effect of
upwash at the nose boom. A correction formula to account for the upwash is

$$\alpha_T = 0.318 + 0.931 \alpha \text{ (degrees)}.$$ 

It was not considered fruitful to apply this correction in the various plots presented in this report because corrections to the wing angle of attack due to structural flexibility are much larger in magnitude and can only be approximated. Both corrections were considered in selecting the time intervals for the stochastic analysis in Phase II in order to obtain agreement with existing wind tunnel model data insofar as possible.

Time histories were made of about 30 items of instrumentation measurements which were considered pertinent to the buffet study. Examples of each of the strip chart records have been previously presented in the Phase I report (Reference 1). These records were used to aid in the process of selecting the maneuvers for the Phase II Study. The records for the Phase II Study maneuvers were in general too large to be legibly reproduced on an unfolded page.
SECTION 5

FLIGHT CONDITIONS FOR DETAILED ANALYSIS

In the Phase II Study the major criterion for selecting the particular flight maneuvers was matching insofar as possible conditions of wing sweep, Mach number and angle of attack for which wind tunnel data already existed. It was considered important to use maneuvers for at least two additional wing sweeps and at both subsonic and supersonic speeds. The four wind up turn maneuvers listed in Table 2 were selected on that basis.

A question had arisen in the Phase I Study with respect to the character of the structural responses as deduced from relatively short time samples. The two slowdown turn maneuvers listed in Table 2 were chosen to examine whether or not short time samples and longer time samples gave consistent results.

Variations of angle of attack, load factor Mach number and dynamic pressure with flight time are presented in Figure for each of the selected maneuvers.

Table 8 lists the segments of each maneuver selected for detailed analysis. In most cases the time duration of the records (ΔT) is one second, but some longer records were used. The table also lists the indicated angle of attack at the start.
Figure 6. FLIGHT CONDITIONS FOR SELECTED MANEUVERS

a) FLIGHT 61, R227, WINDUP TURN.
b) FLIGHT 51, S38/150, SLOW DOWN TURN

Figure 6. Continued
c) FLIGHT 48, Run 4, WINDUP TURN

Figure 6. Continued
Figure 6. Continued

d) FLIGHT 48, RUN 7R1, WINDUP TURN
Figure 6. Continued

e) FLIGHT 48, Run 5, WINDUP TURN
Figure 6. Continued

f) FLIGHT 59, Run S132R, SLOW DOWN TURN
Figure 6. Continued

Figure 6. Concluded
Table 8
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<td>2.15</td>
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</table>

* Phase I selections used in Phase II for consistency
of each record (\(\alpha_1\)), at the end of each record (\(\alpha_2\)) and in a few cases the maximum angle of attack occurring during the record (\(\alpha_{\text{max}}\)). A nominal angle of attack (\(\alpha_{\text{nom}}\)) has been assigned to each data segment which is used later to plot trends in the variations of instrument responses with angle of attack. Also included in Table 8 is a key to the Figure numbers for the plotted power spectra for each flight point which are presented in Section 7.
SECTION 6

STOCHASTIC ANALYSIS TECHNIQUES

The analysis techniques used in this study are compatible with American National Standard (ANS S2.10-1971) recommended methods for analysis and presentation of shock and vibration data. A quick-look examination was performed on each time-history measurement to determine the data classification, degree of stationarity, record length and recoverability.

Measurements

Data reduction was performed on the following data:

1. Shear, bending moment and torsion at four wing stations, (12 measurements).

2. Shear, bending moment and hingeline torque at the root of both left and right horizontal tails (6 measurements)

3. Two wing tip accelerometers (verticals)

4. Two c.g. vertical and one c.g. lateral accelerometers.

5. Pilot's seat vertical and lateral accelerometer.

The stochastic analysis performed on these items was limited to power spectral densities (PSD) and average rms values for each data sample. A total of 660 PSD's were processed in Phase II.

In addition a few narrow band time histories were made for selected wing instrumentation items.
Special-Purpose Processing

A block diagram of the special-purpose stochastic equipment is shown in Figure 7. The FM signal is discriminated to recover the analog signal. Band-pass filters at 3 Hz and 100 Hz (48 dB per octave) were used to reject unwanted frequencies and to minimize aliasing effects on the sampled data. The data is calibrated at this point. The T/D 100 analyzer was used to compute the PSD's. The stochastic algorithm utilized by the T/D 100 to perform this function is discussed below.

Prior to the Phase II Study the equipment was modified to achieve a direct interface with an SEL-810A mini-computer which then permitted direct recording of the output of the T/D-100 on magnetic tape. The tapes were then used as input to a plotting routine.
Figure 7. STOCHASTIC SPECIAL-PURPOSE EQUIPMENT
Auto-Spectral Density (PSD)

The T/D 100 computes the PSD coefficients by first approximating the complex Fourier transform of the input signal. The Fourier transform of the time-domain input function x(t) is given by:

\[ G(jf) = \int_{-\infty}^{+\infty} x(t) (\cos 2\pi ft - j \sin 2\pi ft) \, dt \]  \hspace{1cm} (1)

where \( j = \sqrt{-1} \). Since the time-domain input is sampled and quantitized in the analyzer, and only a finite number of samples are available, the finite transform is used, and separated into its real \( P(f) \) and imaginary \( Q(f) \) components can be written as follows:

\[ P_T(f) = \int_{-T/2}^{T/2} x(t) \cos 2\pi ft \, dt \] \hspace{1cm} (2)

\[ Q_T(f) = \int_{-T/2}^{T/2} x(t) \sin 2\pi ft \, dt \] \hspace{1cm} (3)

where \( T \) is the length of the input frame, \( \text{with } T \text{ centered about time } t=0. \)

Replacing the continuous input, \( x(t) \), with a set of \( 2N+1 \) discrete samples at intervals of \( t_0 = \frac{1}{2N} \), and replacing the sinusoidal functions by corresponding values, the continuous integrals may be expressed as the sum of products:
\[ P(k_{f_0}) = \sum_{n=-N}^{+N} x(nt_0) \cos \left[ 2 k_{f_0}(nt_0) \right] \quad (4) \]

\[ Q(k_{f_0}) = -\sum_{n=-N}^{+N} x(nt_0) \sin \left[ 2 k_{f_0}(nt_0) \right] \quad (5) \]

where \( k \) is a series of \( 2N \) integers and \( f_0 \) is the base frequency which is equal to \( \frac{1}{2T} \).

The PSD coefficients \( [S(k_{f_0})] \) are then computed from (4) and (5) by the equation:

\[ S(k_{f_0}) = \left| P(k_{f_0}) \right|^2 + \left| Q(k_{f_0}) \right|^2 \quad (6) \]

\( \psi_T \), Average rms (\( \psi_T \))

The average rms of the input signal is calculated from the PSD coefficients \( [S(k_{f_0})] \) by the following equation:

\[ \psi_T = \sqrt{\frac{2N}{f_0} \sum_{k=0}^{2N} S(k_{f_0})} \]

where \( f_0 = \frac{1}{2NT} \) is the base frequency or analysis bandwidth.
SECTION 7

PRESENTATION OF DATA

During the course of the Phase II study, approximately 660 power spectral diversity plots were obtained. These data have two primary uses. First they permit identification of the significant model contributions through comparison with measured and calculated and antural vibration modes of the aircraft. Second, they provide the data base for assessment of prediction methods.

The spectral content of the structural responses is related to the natural vibration modes. Summaries are presented of the natural vibration mode frequencies as determined from ground vibration tests and also as calculated using a finite element representation of the aircraft structure for each wing sweep. These data are useful for interpreting the power spectra.

Natural Vibration Modes

The measured natural vibration modes and their associated frequencies are presented in Tables 9 through 11 for wing sweeps of 26, 50, and 72.5 degrees. These data were obtained during extensive ground vibration tests conducted on aircraft in the F-111 development program and are taken from References 4 and 5. In addition, calculated modes were determined for
Table 9
MEASURED F-111A NATURAL VIBRATION MODES, \( \alpha = 26^\circ \)

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<th>Predominant Mode</th>
<th>Frequency - ( \text{Hz} )</th>
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<tr>
<td>(Airplane No. 12 Tests)</td>
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<tr>
<td></td>
<td>Fus. Empty, Wing Empty</td>
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<td></td>
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<td>Fuselage First Vertical Bending</td>
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<tr>
<td>Fuselage First Lateral Bending</td>
<td>---</td>
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<tr>
<td>Wing Fore and Aft Bending</td>
<td>7.9</td>
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<tr>
<td>Wing Second Bending</td>
<td>16.9</td>
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<td>Wing-Horizontal Tail</td>
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### Table 10
**MEASURED F-111A NATURAL VIBRATION MODES, $\alpha_E = 50^\circ$**

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<td>Fuse Full Wing Full</td>
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<td>Antisymmetric</td>
<td>Symmetric</td>
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<td>-</td>
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Table 11
MEASURED F-111A NATURAL VIBRATION MODES, $\alpha_{LE} = 70^\circ$

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<td>Fuselage First Lateral Bending</td>
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<td>-</td>
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<td>Wing Fore and Aft Bending</td>
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<td>Wing Second Bending</td>
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<td>30.0</td>
<td>12.9</td>
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<tr>
<td>Wing - Horizontal Tail</td>
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<td>Horizontal Tail Fore and Aft</td>
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<td>Rudder Torsion</td>
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</table>
specific flight conditions for use in the prediction method development and evaluation portions of the contracted investigation. The calculated modes are presented in Tables 12 through 19. Further discussion of the analytical effort appears in References 6, 7 and 8.

Power Spectral Density Plots

All power spectral density data obtained during the Phase II investigation are presented in this Section in plotted form. For ease of use the data are arranged in the following way.

Each figure number represents a data set which corresponds to a given Flight Number, Run Number and Point Number as listed in Table 8. Each Phase II data set consists of 7 pages of accelerometer data, 4 pages each of the wing shear, wing bending moment and wing torsion data, and 2 pages each of horizontal tail shear, bending moment and torsion data. For the Phase I maneuvers each data set has only the 6 pages of horizontal tail data since the wing and fuselage power spectra appear in Reference 2.

The format for each PSD plot is the same. The ordinates are normalized by the sum of the measured PSD values taken over the range from 1 to 100 Hz. The numerical value of this sum appears as the scaling factor listed above each plot.
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<th>Mode Description</th>
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<td>3</td>
<td>Horizontal Tail Bending + Sec. Wing Bend + Sec. Fus. Bend</td>
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<td>Horizontal Tail Bending + Second Wing Bending</td>
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<td>Third Fuselage Bending + Wing Torsion</td>
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<td>Second Wing Torsion</td>
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Table 13  
CALCULATED F-111A SYMMETRIC VIBRATION MODES  
$\Lambda_{LE} = 26^\circ$ \hspace{1cm} $GW = 293,138N \ (65936 \ lb)$

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<th>Mode No.</th>
<th>Mode Description</th>
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<td>Wing - Horizontal Tail (out of phase)</td>
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<tr>
<td>6</td>
<td>Third Fuselage Bending + Wing Torsion</td>
<td>22.665</td>
</tr>
<tr>
<td>7</td>
<td>First Wing Torsion</td>
<td>24.024</td>
</tr>
<tr>
<td>8</td>
<td>Horizontal Tail Second Bending</td>
<td>27.197</td>
</tr>
<tr>
<td>9</td>
<td>Third Wing Bending</td>
<td>30.446</td>
</tr>
<tr>
<td>10</td>
<td>Horizontal Tail Torsion</td>
<td>33.884</td>
</tr>
<tr>
<td>11</td>
<td>Fourth Fuselage Bending + Wing Second Torsion</td>
<td>37.551</td>
</tr>
<tr>
<td>12</td>
<td>Second Wing Torsion</td>
<td>39.076</td>
</tr>
<tr>
<td>Mode No.</td>
<td>Mode Description</td>
<td>Frequency - Hz</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>1</td>
<td>First Wing Bending</td>
<td>4.908</td>
</tr>
<tr>
<td>2</td>
<td>First Fuselage Vertical Bending</td>
<td>6.736</td>
</tr>
<tr>
<td>3</td>
<td>Wing - Horizontal Tail (in-phase) + Fuselage_Second_Bending</td>
<td>13.529</td>
</tr>
<tr>
<td>4</td>
<td>Wing - Horizontal Tail (out of phase)</td>
<td>15.218</td>
</tr>
<tr>
<td>5</td>
<td>Second Wing Bending</td>
<td>16.762</td>
</tr>
<tr>
<td>6</td>
<td>Third Fuselage Bending + Wing Torsion</td>
<td>21.836</td>
</tr>
<tr>
<td>7</td>
<td>First Wing Torsion</td>
<td>24.217</td>
</tr>
<tr>
<td>8</td>
<td>Horizontal Tail Second Bending</td>
<td>25.987</td>
</tr>
<tr>
<td>9</td>
<td>Third Wing Bending + Horizontal Tail Pitch</td>
<td>31.293</td>
</tr>
<tr>
<td>10</td>
<td>Horizontal Tail Pitch</td>
<td>33.869</td>
</tr>
<tr>
<td>11</td>
<td>Horizontal Tail Bending + Third Wing Bending</td>
<td>37.618</td>
</tr>
<tr>
<td>12</td>
<td>Wing Second Torsion + Horizontal Tail Pitch</td>
<td>39.377</td>
</tr>
</tbody>
</table>

Table 14
CALCULATED F-111A SYMMETRIC VIBRATION MODES

$\alpha = 50^\circ \quad GW = 331,392N (74,515 \text{ lb})$
Table 15
CALCULATED F-111A SYMMETRIC VIBRATION MODES

$A_{LE} = 72.5$  \hspace{1cm} GW = 268,673N (60,419 lb)

<table>
<thead>
<tr>
<th>Mode No.</th>
<th>Mode Description</th>
<th>Frequency - Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>First Wing Bending</td>
<td>4.849</td>
</tr>
<tr>
<td>2</td>
<td>First Fuselage Vertical Bending</td>
<td>6.913</td>
</tr>
<tr>
<td>3</td>
<td>Wing - Horizontal Tail (in-phase) + Fuselage Second Bending</td>
<td>14.391</td>
</tr>
<tr>
<td>4</td>
<td>Wing - Horizontal Tail (out of phase)</td>
<td>15.425</td>
</tr>
<tr>
<td>5</td>
<td>Second Wing Bending</td>
<td>17.794</td>
</tr>
<tr>
<td>6</td>
<td>Third Fuselage Bending + Wing Torsion</td>
<td>22.927</td>
</tr>
<tr>
<td>7</td>
<td>First Wing Torsion</td>
<td>24.571</td>
</tr>
<tr>
<td>8</td>
<td>Horizontal Tail Second Bending</td>
<td>27.448</td>
</tr>
<tr>
<td>9</td>
<td>Third Wing Torsion + Horizontal Tail Pitch</td>
<td>31.927</td>
</tr>
<tr>
<td>10</td>
<td>Horizontal Tail Pitch</td>
<td>33.898</td>
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<tr>
<td>11</td>
<td>Second Wing Torsion</td>
<td>39.260</td>
</tr>
<tr>
<td>12</td>
<td>Horizontal Tail Torsion</td>
<td>39.856</td>
</tr>
<tr>
<td>Mode No.</td>
<td>Mode Description</td>
<td>Frequency - Hz</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>1</td>
<td>First Wing Bending</td>
<td>7.417</td>
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<tr>
<td>2</td>
<td>First Fuselage Lateral Bending</td>
<td>8.119</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Tail Bending + Wing Bending</td>
<td>10.887</td>
</tr>
<tr>
<td>4</td>
<td>Horizontal Tail Bending + Wing Bending</td>
<td>12.290</td>
</tr>
<tr>
<td>5</td>
<td>Second Fuselage Lateral Bending</td>
<td>15.720</td>
</tr>
<tr>
<td>6</td>
<td>Wing - Horizontal Tail</td>
<td>18.510</td>
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<tr>
<td>7</td>
<td>Third Fuselage Lateral Bending</td>
<td>21.947</td>
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<td>8</td>
<td>Wing Torsion + Bending</td>
<td>22.983</td>
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<td>9</td>
<td>Wing Torsion + Horizontal Tail Pitch</td>
<td>25.081</td>
</tr>
<tr>
<td>10</td>
<td>Vertical Tail Torsion</td>
<td>25.678</td>
</tr>
<tr>
<td>11</td>
<td>Vertical Tail Torsion + Second Wing Bending</td>
<td>26.029</td>
</tr>
<tr>
<td>12</td>
<td>Second Wing Bending</td>
<td>27.179</td>
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<td>13</td>
<td>Fuselage Lateral Bending + Second Wing Bending</td>
<td>31.249</td>
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<tr>
<td>14</td>
<td>Horizontal Tail Pitch</td>
<td>31.990</td>
</tr>
<tr>
<td>15</td>
<td>Fuselage Lateral Bending + Second Wing Torsion + Hor. Tail Torsion</td>
<td>36.377</td>
</tr>
</tbody>
</table>
Table 17
CALCULATED F-111A ANTISYMMETRIC VIBRATION MODES
\[ \alpha_{LE} = 26^\circ \quad \text{GW} = 293,138 \text{N (65,936 lb)} \]

<table>
<thead>
<tr>
<th>Mode No.</th>
<th>Mode Description</th>
<th>Frequency - Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>First Wing Bending</td>
<td>7.284</td>
</tr>
<tr>
<td>2</td>
<td>First Fuselage Lateral Bending</td>
<td>7.863</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Tail Bending</td>
<td>10.699</td>
</tr>
<tr>
<td>4</td>
<td>Horizontal Tail Bending + Wing Bending</td>
<td>12.078</td>
</tr>
<tr>
<td>5</td>
<td>Second Fuselage Lateral Bending</td>
<td>15.663</td>
</tr>
<tr>
<td>6</td>
<td>Wing - Horizontal Tail</td>
<td>18.183</td>
</tr>
<tr>
<td>7</td>
<td>Third Fuselage Lateral Bending</td>
<td>21.636</td>
</tr>
<tr>
<td>8</td>
<td>Fuselage Lateral Bending + Wing Bending</td>
<td>22.586</td>
</tr>
<tr>
<td>9</td>
<td>Wing Torsion + Horizontal Tail Pitch</td>
<td>26.647</td>
</tr>
<tr>
<td>10</td>
<td>Vertical Tail Torsion</td>
<td>25.260</td>
</tr>
<tr>
<td>11</td>
<td>Vertical Tail Torsion + Second Wing Bending</td>
<td>25.595</td>
</tr>
<tr>
<td>12</td>
<td>Second Wing Bending</td>
<td>26.881</td>
</tr>
<tr>
<td>13</td>
<td>Fuselage Lateral Bending + Second Wing Bending</td>
<td>29.023</td>
</tr>
<tr>
<td>14</td>
<td>Horizontal Tail Pitch</td>
<td>31.460</td>
</tr>
<tr>
<td>15</td>
<td>Fuselage Lateral Bending + Second Wing Torsion + Hor. Tail Pitch</td>
<td>33.189</td>
</tr>
</tbody>
</table>
Table 18
CALCULATED Y-111A ANTI S YM ETRIC VIBRATION MODES
\( \alpha_{LE} = 50^\circ \quad GW = 331,392 \text{N} (74,515 \text{ lb}) \)

<table>
<thead>
<tr>
<th>Mode No.</th>
<th>Mode Description</th>
<th>Frequency - Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>First Wing Bending</td>
<td>6.917</td>
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<tr>
<td>2</td>
<td>First Fuselage Lateral Bending</td>
<td>7.795</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Tail Torsion + Wing Bending</td>
<td>10.844</td>
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<tr>
<td>4</td>
<td>Horizontal Tail Bending + Wing Bending</td>
<td>12.290</td>
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<tr>
<td>5</td>
<td>Second Fuselage Lateral Bending</td>
<td>15.070</td>
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<tr>
<td>6</td>
<td>Wing - Horizontal Tail</td>
<td>17.815</td>
</tr>
<tr>
<td>7</td>
<td>Horizontal Tail Pitch + Vertical Tail Torsion + Wing Bending</td>
<td>21.185</td>
</tr>
<tr>
<td>8</td>
<td>Third Fuselage Lateral Bending</td>
<td>22.354</td>
</tr>
<tr>
<td>9</td>
<td>Wing Torsion + Horizontal Tail Pitch</td>
<td>23.794</td>
</tr>
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<td>10</td>
<td>Vertical Tail Torsion</td>
<td>25.264</td>
</tr>
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<td>11</td>
<td>Vertical Tail Torsion + Second Wing Bending</td>
<td>25.915</td>
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<tr>
<td>12</td>
<td>Fuselage Lateral Bending + Second Wing Bending</td>
<td>27.925</td>
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<tr>
<td>13</td>
<td>Second Wing Bending</td>
<td>29.479</td>
</tr>
<tr>
<td>14</td>
<td>Horizontal Tail Pitch</td>
<td>31.498</td>
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<tr>
<td>15</td>
<td>Fuselage Lateral Bending + Second Wing Torsion + Hor. Tail Torsion</td>
<td>34.660</td>
</tr>
<tr>
<td>Mode No.</td>
<td>Mode Description</td>
<td>Frequency - Hz</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>1</td>
<td>First Wing Bending</td>
<td>6.036</td>
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<tr>
<td>2</td>
<td>First Fuselage Lateral Bending</td>
<td>7.973</td>
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<td>3</td>
<td>Vertical Tail Bending + Horizontal Tail Bending</td>
<td>10.739</td>
</tr>
<tr>
<td>4</td>
<td>Horizontal Tail Bending + Wing Bending</td>
<td>12.385</td>
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<td>5</td>
<td>Second Fuselage Lateral Bending</td>
<td>16.542</td>
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<tr>
<td>6</td>
<td>Wing - Horizontal Tail (out of phase)</td>
<td>17.408</td>
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<td>7</td>
<td>Wing - Horizontal Tail (in-phase)</td>
<td>20.631</td>
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<td>8</td>
<td>Vertical Tail Torsion + Wing Torsion</td>
<td>23.399</td>
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<td>9</td>
<td>Third Fuselage Lateral Bending + Vertical Tail Torsion</td>
<td>24.085</td>
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<td>10</td>
<td>Vertical Tail Torsion</td>
<td>25.462</td>
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<tr>
<td>11</td>
<td>Vertical Tail Bending</td>
<td>25.973</td>
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<tr>
<td>12</td>
<td>Fuselage Lateral Bending + Wing Torsion</td>
<td>29.300</td>
</tr>
<tr>
<td>13</td>
<td>Wing Second Bending</td>
<td>30.429</td>
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<tr>
<td>14</td>
<td>Horizontal Tail Pitch</td>
<td>31.581</td>
</tr>
<tr>
<td>15</td>
<td>Fuselage Lateral Bending + Wing Second Bending + Hor. Tail Torsion</td>
<td>36.404</td>
</tr>
</tbody>
</table>

Table 19
CALCULATED F-11A ANTISYMMETRIC VIBRATION MODES
$\alpha_{LE} = 72.5^\circ \quad GM = 268,673N (60,419$ lb)
The format for the scaling factor is:

\[ SF = .XXX \pm Y (Z)^{**2} \]

where

. XXX is a decimal value

Y is the power of 10 by which the decimal value must be multiplied.

Z is the basic unit of the scaling factor.

**2 represents the fact that the units are squared.

Where appropriate, scaling factors are presented in both S.I. and U.S. Customary units.

The values plotted at frequencies of 0 to 1 Hz are used to set the scales for the automatic plotting routine and do not represent actual data. When a symbol appears on the lower bound of a plot for frequencies greater than 1 Hz, it actually represents the fact that measurement was below the dynamic threshold of the analysis equipment. Finally, although data are plotted at all frequencies from 2 to 100 Hz on all the plots, the upper frequency limit of valid data varies. Table 7 should be consulted for the frequency limit appropriate for each item and flight.
FLIGHT 61. FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .150+0 (6)*x2

ITEM - AN001 L/H WING TIP VERTICAL ACCELEROMETER

Figure 8. Power Spectra - Flight 61, Run 227, Point 1
T1 = 110107 9, ΔT = 1 Sec, αnom = 8.05 deg,
1Δα = 2.15 deg.
FLIGHT 61. FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .112 ± 0 (6)%

ITEM - AV002 R/H WING TIP VERTICAL ACCELEROMETER

Figure 8. Continued
FLIGHT 61, FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .355-2 \((G)^{2}\)
FLIGHT 61. FRAME 110107.90: RECORD LENGTH = 1 SEC.

SCALE FACTOR = .491-2 (S)**2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 8. Continued
FLIGHT 61. FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .100-2 (6)**2

ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 8, Continued
FLIGHT 61, FRAME 110107.90. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .646-3 (6)x10^2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 8. Continued
FLIGHT 61. FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .376 - 3 (G)**2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 8. Continued
ITEM - SW123 SHEAR AT WING STATION 1

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .179 + 6 (N)**2 = .905 + 4 (LB)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 8, Continued
FLIGHT 81, FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .4955 ft/s^2 = 251 ft/s^2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 8, Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .137*5 (N)**2 = .680*3 (LB)**2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 8. Continued
FLIGHT 61, FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .183+7 (H-N)**2 =.149+9 (IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1
FLIGHT 61, FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .687×6 (M-N)**2 = .558×8 (IN-LB)**2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 8. Continued
FLIGHT 61, FRAME 110107.90. RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.63 + 5 (M-N)*2 = 0.700*7 (IN-LB)*2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.231 + 5 (M-N)^2 = 0.188 + 7 (\text{IN-LB})^2\)

**ORIGINAL PAGE IS OF POOR QUALITY**

**ITEM - SW133 BENDING MOMENT AT WING STATION 4**

*Figure 8, Continued*
FLIGHT 61, FRAME 110107.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.123 + 6 (M-N) \times 2 = 0.997 + 7 (IN-LB) \times 2\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 8, Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .6555 (M-N)**2 = .5327 (IN-LB)**2

ITEM - SW128 TORSION AT WING STATION 2

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.266 x 5 (IN-LB)**2 = 0.216 x 7 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.8484 (M-N)**2 = 0.6896 (IN-LB)**2

ITEM - SW134 TORSION AT WING STATION 4

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.327 \times 10 \times (N)^2 = 0.165 \times 10 \times (LB)^2\)

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 8. Continued
FLIGHT 61, FRAME 110107.90. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .463+6 (N)**2 = .234+5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .655+6 (M-N)**2 = .694+8 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .617 + 6 (M-N)**2 = .501 + 8 (IN-LB)**2

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 8, Continued
ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 8. Continued
FLIGHT 61, FRAME 110107.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.5395 (M-N)^2 = 0.4387 (\text{IN-LB})^2\)

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 8, Concluded
FLIGHT 61, FRAME 110108.48, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .511*0 (5)#02

ITEM - AW001 L/H WING TIP VERTICAL ACCELEROMETER

Figure 9. Power Spectra - Flight 61, Run 227, Point 2

\[ T_1 = 110108.4, \Delta T = 1 \text{ Sec}, \alpha_{\text{Nom}} = 9.25 \text{ deg}, \]

\[ \Delta \alpha = 2.05 \text{ deg}. \]
ITEM - AV002 R/H WING TIP VERTICAL ACCELEROMETER

Figure 9. Continued
FLIGHT 61. FRAME 110108.40. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .888-2 (3)x102

ITEM - ABO18 C.G. VERTICAL ACCELEROMETER

Figure 9. Continued
FLIGHT 61, FRAME 110100.40, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.961-2 \times 10^{-2}\)

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 9. Continued
ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER
FLIGHT 61, FRAME 110106.40. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .774-3 (g)*.02

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 9, Continued
FLIGHT 61, FRAME 110108.40. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.568 \times 10^{-5}\) (6) x 2

Figure 9. Continued.
FLIGHT 61. FRAME 110108.40 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .310*6 (N)**2 = .157*5 (LB)**2

ITEM - SW123 SHEAR AT WING STATION 1

Figure 9. Continued
FLIGHT 61, FRAME 110108.40, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .328*6 (N)**2 = .166*5 (LB)**2

**ITEM - SW126 SHEAR AT WING STATION 2**

Figure 9. Continued
FLIGHT 61, FRAME 110108.40. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .992+5 (N)**2 = .501+4 (LB)**2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 9. Continued
FLIGHT 61, FRAME 110108.40 RECORD LENGTH = 1 SEC.
SCALE FACTOR = .364*5 (N)*2 = .104*4 (LB)*2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 9. Continued
FLIGHT 61. FRAME 110108.40 RECORD LENGTH = 1 SEC.
SCALE FACTOR = .229+7 (M-N)**2 = .186+9 (IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 9. Continued
FLIGHT 61, FRAME 110108.40, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .104 + 7 (M-N)**2 = .840 + 8 (IN-LB)**2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 9. Continued
FLIGHT 61, FRAME 110108.40. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.187+6 (\text{M-N})^2 = 0.152+8 (\text{IN-LB})^2\)

ITEM - SV130 BENDING MOMENT AT WING STATION 3

Figure 9. Continued
ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 9. Continued
FLIGHT 61. FRAME 110108.40 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .266+6 (M-N)**2 = .216+8 (IN-LB)**2

ITEM - SW125 TORSION AT WING STATION 1

Figure 9. Continued
FLIGHT 61, FRAME 110108.40, RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.126 + 6 (M-N)^2 = 1.02 + 8 (IN-LB)^2\)

ITEM - SW128 TORSION AT WING STATION 2

Figure 9. Continued
FLIGHT 61. FRAME 110108.40. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .691+5 (M-N)**2 = .561+7 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 9. Continued
FLIGHT 61, FRAME 110108.40 RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.187 + 5 (M-N)^2 = 0.152 + 7 (I-N-L^8)^2\)

ITEM - SW134 TORSION AT WING STATION 4

Figure 9. Continued
FLIGHT 61. FRAME 110108.40 RECORD LENGTH = 1 SEC.
SCALE FACTOR = .359+7 (N)**2 = .181+6 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 9. Continued
FLIGHT 61. FRAME 110108.40 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .446+6 (N)**2 = .225+5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 9. Continued
FLIGHT 61, FRAME 110108.40 RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.842*6 (M-N)**2 = 0.884*8 (IN-LB)**2

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ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 9. Continued
FLIGHT 61, FRAME 110108.40 RECORD LENGTH = 1 SEC.
SCALE FACTOR = .627+6 (M-N)**2 = 509+8 (IN-LB)**2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 9. Continued.
Figure 9. Continued
FLIGHT 61. FRAME 110108.40 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .694×5 (M-N)**2 = .563+7 (IN-LB)**2

ITEM - ST118 TORISON, R/H HORIZ TAIL HINGE LINE

Figure 9. Concluded
FLIGHT 61, FRAME 110109.78, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .133 + 1 (6)^0.5

ITEM - AW001 L/H WING TIP VERTICAL ACCELEROMETER

Figure 10. Power Spectra - Flight 61, Run 227, Point 3

$T_1 = 110109.7, \Delta T = 1 \text{ Sec}, \alpha_{\text{Nom}} = 10.42 \text{ deg}, \Delta \alpha = 0.70 \text{ deg}$.
FLIGHT 61, FRAME 110109.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .114+1 [(8)x2]

ITEM - AV002 R/H WING TIP VERTICAL ACCELEROMETER

Figure 10. Continued
FLIGHT 61, FRAME 110109.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .265-1 (G)^2

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 10. Continued
FLIGHT 61, FRAME 110109.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .270-1 (G)**2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 10. Continued
FLIGHT 61, FRAME 110109.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .225-2 (G)**2

ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 10. Continued
FLIGHT 61. FRAME 110109.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.136 - 2 (6)**2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 10. Continued
FLIGHT 61, FRAME 110109.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .141-2 (B)**2

ITEM - A8020 C.G. LATERAL ACCELEROMETER

Figure 10. Continued
FLIGHT 81, FRAME 110109.70 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .964 + 6 (N)**2 = .487 + 5 (LB)**2

ITEM - SW123 SHEAR AT WING STATION 1

Figure 10. Continued
FLIGHT 61, FRAME 110109.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .630 + 6 (N)**2 = .318 + 5 (LB)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 10, Continued
FLIGHT 61, FRAME 110109.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.294*10^{-6} (N)**2 = 0.149*10^{5} (LB)**2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 10, Continued
FLIGHT 61 FRAME 110109.70 RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.143 \times 6 \text{ N}^2 = 0.725 \times 4 \text{ (LB)}^2\)

ITEM - SW132 SHEAR AT WING STATION 4

Figure 10. Continued
ITEM - SW124 BENDING MOMENT AT WING STATION 1
FLIGHT 61, FRAME 110109.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .249+7 (M-N)**2 = .202+9 (IN-LB)**2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 10. Continued
FLIGHT 61, FRAME 110109.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .604+6 (H-N)²²2 = .490+8 (IN-LB)²²2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 10. Continued
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .944+5 (M-N)**2 = .768+7 (IN-LB)**2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 10. Continued
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.
SCALE FACTOR = \( 0.553 \times 6 (\text{M-N})^2 \times 0.448 \times 8 (\text{IN-LB})^2 \)

ITEM - SW125 TORSION AT WING STATION 1

Figure 10. Continued
FLIGHT 61, FRAME 110109.70, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .344+6 (M-N)**2 = .280+8 (IN-LB)**2

ITEM - SW128 TORSION AT WING STATION 2

Figure 10, Continued
ITEM - SW131 TORSION AT WING STATION 3

Figure 10, Continued

126
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .567 + .5 (M-N)**2 = .460 + .7 (IN-LB)**2

ITEM - SW134 TORSION AT WING STATION 4

Figure 10, Continued
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.221 ± 7 \( N \)^2 = 0.112 ± 6 \( LB \)^2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 10. Continued
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .508 + 6 (N)**2 = .257 + 5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 10. Continued
FLIGHT 61. FRAME 110109.70 RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(1.09 \times 10^7 (M-N)^2 \times 2 \times 1.884 \times 10^8 (IN-LB)^2\)

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 10. Continued
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.703+6 (M-N)*2 = 571+8 (IN-LB)**2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 10, Continued
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.103 + 6 (M-N)^2 = 0.838 + 7 (IN-LB)^2\)

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 10, Continued
FLIGHT 61, FRAME 110109.70 RECORD LENGTH = 1 SEC.
SCALE FACTOR = .115+8 (M-N)**2 = .933+8 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 10. Concluded
ITEM - AV001 L/H WING TIP VERTICAL ACCELEROMETER

Figure 11. Power Spectra - Flight 61, Run 227, Point 4

$T_1 = 110110.6, \Delta T = 1 \text{ Sec}, \alpha_{\text{Nom}} = 11.65 \text{ deg},$

$\Delta \alpha = 2.10 \text{ deg}$.
FLIGHT 61, FRAME 110110.60, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .220+1 (6)**2

ITEM - AV002 R/H WING TIP VERTICAL ACCELEROMETER

Figure 11. Continued
FLIGHT 61, FRAME 110110.60. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .520-1 (G)**2

ITEM - ABO18 C.G. VERTICAL ACCELEROMETER

Figure 11. Continued
FLIGHT 61, FRAME 110110.60. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .498-1 (6)**2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 11, Continued

137
ITEM - AF 008 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 11. Continued
FLIGHT 61. FRAME 110110.60. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .253-2 (6)**2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 11. Continued
FLIGHT 61, FRAME 110110.60. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .240-2 (G)**2

ITEM - ABO20 C.G. LATERAL ACCELEROMETER

Figure 11. Continued
FLIGHT 61. FRAME 110110.60 RECORD LENGTH = 1 SEC.
SCALE FACTOR = .218 x 10^7 (N) x 10^6 (LB)

ITEM - SW123 SHEAR AT WING STATION 1

Figure 11. Continued
FLIGHT 61, FRAME 11010.60, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .147+7 (N)**2 = .743+5 (LB)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 11, Continued
FLIGHT 61. FRAME 110110.60. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .656+6 (N)**2 = .332+5 (LB)**2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 11. Continued
FLIGHT 61, FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.241 \times 10^6 \text{(N)}^2 = 0.122 \times 10^5 \text{(LB)}^2\)

ITEM - SW132 SHEAR AT WING STATION 4

Figure 11. Continued
FLIGHT 61, FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.148 + 0.120 - 100.320 \times (IN-\text{LB})^2\)

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 11. Continued
FLIGHT 61, FRAME 110110.60, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .533+7 (M-N)**2 = .433+9 (IN-LB)**2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 11. Continued
FLIGHT 61. FRAME 110110.60. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .116+7 (M-N)**2 = .938+8 (IN-LB)**2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 11. Continued
FLIGHT 61. FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .185+6 (M-N)**2 = .151+8 (IN-LB)**2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 11. Continued
FLIGHT 61. FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.238 + 7 (M-N)**2 = 0.194 + 9 (IN-LB)**2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - SW125 TORSION AT WING STATION 1

Figure 11. Continued
FLIGHT 61. FRAME 110110.60. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .148*7 (M-N)**2 = .120*9 (IN-LB)**2

ITEM - SW128 TORSION AT WING STATION 2

Figure 11. Continued
FLIGHT 61, FRAME 110110.60, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.569 + \(6(M-N)^{0.2} = 0.462 + 8(IN-LB)^{0.2}\)

ITEM - SW131 TORSION AT WING STATION 3

Figure 11. Continued
FLIGHT 61, FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .154*6 (M-N)**2 = .125*8 (IN-LB)**2

ITEM - SW134 TORSION AT WING STATION 4

Figure 11, Continued
FLIGHT 61, FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .314+7 (N)**2 = .159+6 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 11. Continued
FLIGHT 61, FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.935 + 6 (N)**2 = 0.473 + 5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 11. Continued
FLIGHT 61, FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .962+6 (M-N)**2 = .781+8 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 11. Continued
FLIGHT 61. FRAME 110110.60 RECORD LENGTH = 1 SEC.
SCALE FACTOR = .1157 (M-N)**2 = 933.9 (IN-LB)**2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 11. Continued

156
FLIGHT 61, FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = .200+6 (M-N)**2 = .162+8 (IN-LB)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 11. Continued
FLIGHT 61. FRAME 110110.60 RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.277x6 (M-N)**2 = 0.225x8 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 11. Concluded
FLIGHT 61, FRAME 110112.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .398+1 (8)+2

ITEM - AW001 L/H WING TIP VERTICAL ACCELEROMETER

Figure 12. Power Spectra - Flight 61, Run 227, Point 5, 
$T_i = 110112.0$, $\Delta T = 1$ Sec, $\alpha_{nom} = 13.75$ deg, 
$\Delta\alpha = 1.70$ deg.
ITEM - AW002 R/H WING TIP VERTICAL ACCELEROMETER

Figure 12, Continued
FLIGHT 61. FRAME 110112.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \( \frac{.630 - 1}{10^2} \)

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 12. Continued
FLIGHT G1. FRAME 110112.00. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .613-1 (6)**2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 12. Continued
FLIGHT 61, FRAME 110112.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .053-2 (G)**2

ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 12. Continued

163
FLIGHT 61. FRAME 110112.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .289-2 (G)^2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 12. Continued
FLIGHT 61, FRAME 110112.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .326-2 (G)**2

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 12, Continued
ITEM - SW123 SHEAR AT WING STATION 1
FLIGHT 81. FRAME 110112.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .204+7 (N)**2 = .103+6 (LB)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 12. Continued
FLIGHT 61. FRAME 110112.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.125 \times 7 (N)^{**2} = 0.830 + 5 (LB)^{**2}\)

ITEM - SW129 SHEAR AT WING STATION 3

Figure 12. Continued
FLIGHT 61. FRAME 110112.00. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .541+6 (N)**2 = .273+5 (LB)**2

ITEM - SHEAR AT WING STATION 4

Figure 12. Continued
ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 12. Continued
FLIGHT 61, FRAME 110112.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.991^7 (M-N)^{*2} = 0.804^9 \text{ (IN-LB)^{*2}}\)

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 12. Continued
ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 12. Continued
FLIGHT 61, FRAME 11012.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = $0.499 + 6 \text{(in-ft)}^2 = 0.397 + 8 \text{(in-lb)}^2$

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 12. Continued
FLIGHT 61, FRAME 110112.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .463 + 7 (M-N)**2 = .376 + 9 (IN-LB)**2

ITEM - SW125 TORSION AT WING STATION 1

Figure 12. Continued

174
FLIGHT 61, FRAME 110112.00. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .214+.7 (M-N)**2 = .174+.9 (IN-LB)**2

ITEM - SW128 TORSION AT WING STATION 2

Figure 12. Continued
FLIGHT 61. FRAME 110112.00. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .735+8 (M-N)**2 = .905+6 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 12. Continued
FLIGHT 61, FRAME 11012.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .275+6 (M-N)**2 = .223+8 (IN-LB)**2

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ITEM - SW134 TORSION AT WING STATION 4

Figure 12. Continued

177
FLIGHT 61, FRAME 110:012.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.511 \times 10^7 \text{ (N)}^{2}\) = \(0.258 \times 10^6 \text{ (LB)}^{2}\)

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 12. Continued
FLIGHT 61, FRAME 110112.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .1977 (N)**2 = .9965 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 12. Continued
ITEM - ST078 BEND, MOM, L/H HORIZ TAIL ROOT

Figure 12. Continued
FLIGHT 61, FRAME 110112.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .2607 (M-N)**2 = 2119 (IN-LB)**2

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 12, Continued
FLIGHT 61, FRAME 110112.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .785 + 6 (M-N)**2 = .637 + 8 (IN-LB)**2

ITEM - ST135 TORSION. L/H HORIZ TAIL HINGE LINE

Figure 12. Continued
FLIGHT 61, FRAME 11012.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .119+7 (M-N)**2 = .969+8 (IN-LB)**2

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ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 12, Concluded
ITEM - AV001 L/H WING TIP VERTICAL ACCELERATION

Figure 15. Power Spectra - Flight 51, Run S38/150,
Point 1, $T_1 = 95940.0$, $\Delta T = 2$ Sec, $\alpha_{\text{Nom}} = 14.85$ deg, $\Delta \alpha = 0.75$ deg.
FLIGHT 51: FRAME 0345:30, RECORD LENGTH = 2 SEC
SCALE FACTOR = .130+1 (S)=2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

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ITEM - AV002 R/H WING TIP VERTICAL ACCELERATION

Figure 15. Continued
FLIGHT 51. FRAME 030040.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = 0.315-1 (C)²/2

ITEM - AB010 C.G. VERTICAL ACCELEROMETER

Figure 13. Continued
FLIGHT 51. FRAME 000040.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .352-1 (O)=2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - 0019 C.G. VERTICAL ACCELEROMETER

Figure 15. Continued
FLIGHT 51. FRAME 69046.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .298-2 (8)**2

ITEM - AFOOS PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 13. Continued
FLIGHT 51. FRAME 025840.68. RECORD LENGTH = 2 SEC

SCALE FACTOR = .113-2 (6)×10²

Figure 13. Continued
FLIGHT 51. FRAME 0800-40.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .200-2 (8) x 10^{-2}

ITEM - AB028 C.G. LATERAL ACCELEROMETER

Figure 15, Continued
ITEM - SW125 TORSION AT WING STATION 1

Figure 15. Continued
ITEM - SW128 TORSION AT WING STATION 2

Figure 13. Continued
FLIGHT 51. FRAME 095940.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .224 + 6 (M-N)**2 = .182 + 8 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 19. Continued
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = \(0.3315 \times (M-N)^2 = 0.2687 \times (\text{in-lb})^2\)

ITEM - SW134 TORSION AT WING STATION 4

Figure 15. Continued
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = 0.407 + 8 (M-N)**2 = 0.331 + 10(IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 15. Continued
FLIGHT 51. FRAME 095940.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = \(0.881 \times 7\) \((\text{M-N})^{*2} = 0.715 + 9\) \((\text{IN-LB})^{*2}\)

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 13. Continued
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .780+6 (M-N)**2 = .634+8 (IN-LB)**2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 19. Continued
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .138 + 6 (M-N)**2 = .112 + 8 (IN-LB)**2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 13. Continued
FLIGHT 51, FRAME 095940.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = .3327 \( (N)^2 = 168 \times 6 \text{ (LB)}^2 \)

ITEM - SW123 SHEAR AT WING STATION 1

Figure 19. Continued
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .138 + 7 (N)**2 = .698 + 5 (LB)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 13. Continued
FLIGHT 51, FRAME 095940.00, RECORD LENGTH = 2 SEC
SCALE FACTOR = 0.4756 (N)**2 = 0.2405 (LB)**2
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .142*6 (N) * 2 = .718*4 (LB) * 2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 13, Continued
FLIGHT 51. FRAME 005840.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = 0.147 (N)**2 = 0.318 (Lb)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 1), Continued
FLIGHT 51. FRAME 085840.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = 0.15107 (N) = 0.79149 (LB) = 2

ITEM - ST072 SHEAR. R/H HORIZ TAIL ROOT

Figure 13. Continued
FLIGHT 91, FRAME 025340.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = 0.43147 (M-N)***2 = 0.35058 (IN-LB)***2

ITEM - 07070 BEND, MOM, L/H HORIZ TAIL ROOT

Figure 13. Continued
ITEM - ST073 BEND. H30H. R/H HORIZ TAIL ROOT

Figure 13. Continued
ITEM - 8T135 TORSION. L/H HORIZ TAIL WINGE LINE

Figure 13. Continued
FLIGHT 51, FRAME 68340.60, RECORD LENGTH = 2 SEC
SCALE FACTOR = .675*8 (M-N)*02 = .546*8 (IN-LB)*02

ITEM - ST118 TORSION, R/H HORIZ TAIL WINGE

Figure 17, Concluded
ITEM - AV001 L/H WING TIP VERTICAL ACCELERATION

Figure 14. Power Spectra, Flight 51, Run S38/150, Point 2, $T_1 = 95943.0$, $\Delta T = 1\text{ Sec.}$, $\alpha_{\text{Nom}} = 16.25\text{ deg}$, $\alpha = 0.50\text{ deg}$
Figure 14. Continued
Figure 14. Continued
FLIGHT 51. FRAME 0456.66. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.473-1 (G)^2 x 10^2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 14. Continued
ITEM - AFOOS PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 14. Continued
Flight 31, Frame 05548.00; Record Length = 1 Sec
Scale Factor = .1042 (0)2002

Figure 14. Continued
FLIGHT 51. FRAME 600042.00. RECORD LENGTH = 1 SEC

SCALE FACTOR = 107-2 (5)+2

ITEM - A6020 C.G. LATERAL ACCELEROMETER

Figure 14. Continued
FLIGHT 51, FRAME 095943.00, RECORD LENGTH = 1 SEC

SCALE FACTOR = .1857 (N)**2 = .9355 (LB)**2

ITEM - SW123 SHEAR AT WING STATION 1

Figure 14. Continued
FLIGHT 51, FRAME 095943.00, RECORD LENGTH = 1 SEC
SCALE FACTOR = .123*7 [N]**2 .622*5 [LB]**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 14. Continued
FLIGHT 51. FRAME 095943.00. RECORD LENGTH = 1 SEC

SCALE FACTOR = .559*6 [N]*2 = .283*5 [LB]*2

ITEM - S129 SHEAR AT WING STATION 3

Figure 14. Continued
FLIGHT 51, FRAME 095943.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = \(0.209 \times 6 \text{ (N)}^2 = 0.105 \times 5 \text{ (LB)}^2\)
FLIGHT 51, FRAME 095943.00. RECORD LENGTH = 1 SEC

SCALE FACTOR = .213x10 (M-N)**2 = .173x10(IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 14. Continued
FLIGHT 51, FRAME 095943.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.3657 (M-N)^2 = 0.2979 (IN-LB)^2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 14. Continued
FLIGHT 51, FRAME 095943.00, RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.975+6 (M-N)**2 = 0.792+8 (IN-LB)**2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 14, Continued
ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 14. Continued
FLIGHT 51, FRAME 095943.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = .178+7 (M-N)*2 = .145+9 (IN-LB)*2

ITEM - SW125 TORSION AT WING STATION 1

Figure 14. Continued
FLIGHT 51. FRAME 095943.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = .589*6 (M-N)**2 = .478*8 (IN-LB)**2

ITEM - SW128 TORSION AT WING STATION 2
Figure 14. Continued
FLIGHT 51. FRAME 095943.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = .203 + 6 (M-N)**2 = .165 + 8 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 14. Continued
FLIGHT 51, FRAME 095943.00, RECORD LENGTH = 1 SEC

SCALE FACTOR = .3185 (M-N)**2 = .2597 (IN-LB)**2

ITEM - SW134 TORSION AT WING STATION 4

Figure 11. Continued
FLIGHT 51, FRAME 09843.00. RECORD LENGTH = 1 SEC

SCALE FACTOR = \( 0.809 \times 10^{-7} \) (N) or \( 0.353 \times 10^{-6} \) (LB)
FLIGHT 31, FRAME 005643.00, RECORD LENGTH = 1 SEC
SCALE FACTOR = \(0.160 \times 7\) (N) = \(0.949 \times 5\) (Lb) = 2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 14. Continued
FLIGHT 51, FRAME 022343.00, RECORD LENGTH = 1 SEC
SCALE FACTOR = \(353 \times 10^{-6} (N-N)^{0.2} = 310 \times 10^{-6} (N-L)^{0.2}\)

Figure 14. Continued
Figure 14. Continued
FLIGHT 51. FRAME 0620-42.00. RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.00006 (\text{in} \cdot \text{lb})^{0.2} = 0.730 \times 10^{-3} (\text{in} \cdot \text{lb})^{0.2}\)

ITEM - 6T133 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 14. Continued
FLIGHT 51, FRAME 095043.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = .100-7 (M-N)/2 = .887-8 (IN-LB)/2

ITEM - ST118 TORSION: R/H HORIZ TAIL HINGE

Figure 14. Concluded
ITEM - AU001 L/H WING TIP VERTICAL ACCELERATION

Figure 15. Power Spectra - Flight 51, Run S38/150, Point 3, \( T_1 = 95940.0 \), \( \Delta T = 4 \) Sec, \( \alpha_{\text{Nom}} = 15.12 \) deg, \( \alpha = 1.90 \) deg.
FLIGHT 51. FRAME 02040.09. RECORD LENGTH = 4 SEC
SCALE FACTOR = .1281 (0)412

ITEM - AV002 R/H WING TIP VERTICAL ACCELERATION

Figure 15. Continued
FLIGHT 51, FRAME 02340.60, RECORD LENGTH = 4 SEC

SCALE FACTOR = .235-1 (8)×2

ITEM - ABO18 C.G. VERTICAL ACCELEROMETER

Figure 15. Continued
FLIGHT 51. FRAME 005048.00. RECORD LENGTH = 4 SEC
SCALE FACTOR = .377-1 (E)-02

ITEM - AD019 C.G. VERTICAL ACCELEROMETER

Figure 15. Continued
FLIGHT 51. FRAME 00340.08. RECORD LENGTH = 4 SEC
SCALE FACTOR = .236-2 (G)0.02

ITEM - AFOOS PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 15. Continued

238
FLIGHT 51. FRAME 00340.00. RECORD LENGTH = 4 SEC
SCALE FACTOR = .119-2 (0)*2

Figure 15. Continued
FLIGHT 51. FRAME 083040.00. RECORD LENGTH = 4 SEC

SCALE FACTOR = .180-2 (8)**2

Figure 15. Continued

ITEM - AB020 C.G. LATERAL ACCELEROMETER
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 4 SEC
SCALE FACTOR = .289 + 7 (N)**2 = .145 + 6 (LB)**2

ITEM - SW123 SHEAR AT WING STATION 1
Figure 15. Continued
Flight 51, Frame 095940.00, Record Length = 4 Sec
Scale Factor = 0.1497 \times 10^2 \cdot (\text{N})^{.52} + 0.752 \cdot 5 \cdot (\text{lb})^{.52}

Normalized power spectral density - 1/Hz

Frequency (Hz)

Item - SW126 Shear at Wing Station 2

Figure 15. Continued
FLIGHT 31, FRAME 095940.00, RECORD LENGTH = 4 SEC
SCALE FACTOR = .547+6 (N)**2 = .277+5 (LB)**2

ITEM - SW129 SHEAR AT WING STATION 3
Figure 15, Continued
FLIGHT 51. FRAME 095940.00. RECORD LENGTH = 4 SEC

SCALE FACTOR = \( \frac{167 \times 6 (N)^2}{844 + 4 (LB)^2} \)

ITEM - SW132 SHEAR AT WING STATION 4

Figure 15. Continued
ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 15. Continued
ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 15. Continued
FLIGHT 51, FRAME 095340.00, RECORD LENGTH = 4 SEC

SCALE FACTOR = \(0.896 \times 10^6 (M-N)^{2.2} \times 0.728 \times 10^8 (IN-LB)^{2.2}\)

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 15, Continued
FLIGHT 51. FRAME 095940.00, RECORD LENGTH = 4 SEC
SCALE FACTOR = .164+6 (M-N)**2 = .133+8 (IN-LB)**2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 15. Continued
FLIGHT 51. FRAME 095940.00. RECORD LENGTH = 4 SEC
SCALE FACTOR = .234 + 7 (M-N)**2 = .190 + 9 (IN-LB)**2

ITEM - SW125 TORSION AT WING STATION 1

Figure 15. Continued
ITEM - SW128 TORSION AT WING STATION 2

Figure 15. Continued
ITEM - SW131 TORSION AT WING STATION 3

Figure 15. Continued
FLIGHT 51, FRAME 095940.00. RECORD LENGTH = 4 SEC
SCALE FACTOR = .332 x 5 (M-N)**2 = .270 x 7 (IN-LB)**2

ITEM - SW134 TORSION AT WING STATION 4
Figure 15. Continued
FLIGHT 51: FRAME 000010.00. RECORD LENGTH = 4 SEC

SCALE FACTOR = .5617 (N) x 10^2 = .2938 (LB) x 10^2

ITEM - ST077 SHEAR, L/H Horiz Tail Root

Figure 15. Continued
FLIGHT 51  FRAME 035040.00  RECORD LENGTH = 4 SEC

SCALE FACTOR = \(0.103 \times 10^{-7} (N) \times 2 = 0.48 \times 10^{-5} (LB) \times 2\)

ITEM - 870272 SHEAR: R/H HORIZ TAIL ROOT

Figure 15. Continued
ITEM - ST078 BEND, MOM, L/M HORIZ TAIL ROOT

Figure 15. Continued
FLIGHT 51, FRAME 02940.00, RECORD LENGTH = 4 SEC
SCALE FACTOR = $3.128 \times 10^{-3}$ (IN-LB)$^{-2}$ $\times$ $10.246$ (IN-LB)$^{-2}$

ITEM - ST073 BEND. HIN. R/H HORIZ TAIL ROOT

Figure 15. Continued
ITEM - 6T135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 15. Continued
FLIGHT 51. FRAME 055849.00. RECORD LENGTH = 4 SEC
SCALE FACTOR = .739 X 2 (IN-LB)^2 = .813 X 2 (IN-LB)^2

ITEM - 6T118 TORSION, R/H HORIZ TAIL HINGE

Figure 15. Concluded
Figure 16. Power Spectra - Flight 48, Run 4, Point 1

$T_1 = 135315.7$, $\Delta T = 1$ Sec, $\alpha_{\text{Nom}} = 4.95$ deg,
$\Delta \alpha = 0.80$ deg.
ITEM - AV002 R/H WING TIP VERTICAL ACCELERATION

Figure 16. Continued
FLIGHT 40b FRAME 13 0813.70c RECORD LENGTH = 1 SEC

SCALE FACTOR = .256-2 (8)×10^2

ITEM - ASS10 C.G. VERTICAL ACCELEROMETER

Figure 16. Continued
Figure 16. Continued
Figure 16. Continued
ITEM - AF016 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 16. Continued
FLIGHT #2 FRAME 120835.70 RECORD LENGTH = 1 SEC
SCALE FACTOR = .345-9 (8)cc2

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ITEM - AB920 C.G. LATERAL ACCELEROMETER

Figure 16. Continued
ITEM - SW123 SHEAR AT WING STATION 1

Figure 16. Continued
FLIGHT 49 FRAME 135015.70

SCALE FACTOR = 0.225 x (N)^2 = 0.170 x (LB)^2

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ITEM - SV126 SHEAR AT WING STATION 2

Figure 16. Continued

267
ITEM - SW120 SHEAR AT WING STATION 3

Figure 16. Continued
FLIGHT 49: FRAME 125315.70

SCALE FACTOR = \(0.657 \times 10^4 \text{ (N)} \times 2 = 0.392 \times 10^3 \text{ (LB)} \times 2\)

Figure 16. Continued

ITEM - SW132 SHEAR AT WING STATION 4
ITEM - SV124 BENDING MOMENT AT WING STATION 1

Figure 16. Continued
FLIGHT 48. FRAME 135315.78

SCALE FACTOR = .130+7 (M-N)**2 = .112+9 (IN-LB)**2

ITEM - SV127 BENDING MOMENT AT WING STATION 2

Figure 16. Continued
Figure 16. Continued

ITEM - SV139 BENDING MOMENT AT WING STATION 3
ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 16. Continued
ITEM - SV125 TORSION AT WING STATION 1

Figure 16. Continued
FLIGHT 48, FRAME 135315.70

SCALE FACTOR = 0.135+3 (M-N)+2 = 0.116+7 (IN-LB)+2

ITEM - SW120 Torsion at Wing Station 2

Figure 16, Continued
FLIGHT 48, FRAME 136015.76

SCALE FACTOR = \(0.239 \times 10^{-4} \text{ (L-M)} \cdot 10^{-2} = 0.124 \times 10^{-2} \text{ (IN-LB)} \cdot 10^{-2}\)

ITEM - SW131 TORSION AT WING STATION 3

Figure 16, Continued

276
ITEM - SW134 TORSION AT WING STATION 4

Figure 16. Continued
FLIGHT 48, FRAME 135315.78. RECORD LENGTH = 1 SEC

SCALE FACTOR = .250 x 7 (N) = 2 = .182 x 6 (LB) = 2

ITEM - S077 SHEAR, L/H HORIZ TAIL ROOT

Figure 16. Continued
FLIGHT 49. FRAME 135215.70. RECORD LENGTH = 1 SEC
SCALE FACTOR = .638 x 10^2 (N) = .316 x 10^5 (LB) = .3

Figure 16. Continued
FLIGHT 48, FRAME 133815.70, RECORD LENGTH = 1 SEC
SCALE FACTOR = .320x7 (IN-LB)**2 = .200x9 (IN-LB)**2

ITEM - ST070 BEND, M34% L/H HORIZ TAIL ROOT

Figure 16. Continued
FLIGHT 48. FRAME 135015.70. RECORD LENGTH = 1 SEC
SCALE FACTOR = .535·6 (M-N)*2 = .434·6 (IN-1B)*2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 16. Continued
FLIGHT 48. FRAME 135315.70. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.037+3 (M-N)-02 = 0.317+7 (IN-LB)-02

ITEM - ST135 TOR:ION. L/H HORIZ TAIL HINGE LINE

Figure 16. Continued
FLIGHT 49, FRAME 135215-70, RECORD LENGTH = 1 SEC
SCALE FACTOR = .215+6 (M-N)**2 = .175+8 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE

Figure 16. Concluded
ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 17. Power Spectra - Flight 48, Run 4, Point 2
T = 135320.7, ΔT = 1 Sec, α Nom = 8.90 deg,
Δα = 1.60 deg
Figure 17. Continued
FLIGHT 46, FRAME 133500.00, RECORD LENGTH = 1 SEC
SCALE FACTOR = 1 x 10^{-10}

Figure 17. Continued

ITEM - AD010 C.G. VERTICAL ACCELEROMETER

286
FLIGHT 48 FRAME 13580.00 RECORD LENGTH = 1 SEC
SCALE FACTOR = .122-1 (03)**2

ITEM - AB010 C.O. VERTICAL ACCELEROMETER

Figure 17. Continued
FLIGHT 46: FRAME 152028.62: RECORD LENGTH = 1 SEC

SCALE FACTOR = .116-2 (69)2 x 2

ITEM - AFOOD PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 17. Continued

288
FLIGHT 48 FRAME 1850-08 RECORD LENGTH = 1 SEC
SCALE FACTOR = $4.256 \times 10^{-6}$

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ITEM - AF019 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 17. Continued
FLIGHT 4B FRAME 108084.00 RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.794-9 (B)E02

ITEM - AB020 C.S. LATERAL ACCELEROMETER

Figure 17. Continued
ITEM - SV123 SHAEAR AT WING STATION 1

Figure 17. Continued
ITEM - SW128 SHEAR AT WING STATION 2

Figure 17. Continued
original page is of poor quality

item - sv129 shear at wing station 3
figure 17. continued
FLIGHT 48, FRAME 135328.00

SCALE FACTOR = 0.471 x 10^5 (N/m^2) = 0.230 x 10^4 (lb/in^2)

ITEM - SW132 SHEAR AT WING STATION 4

Figure 17. Continued
FLIGHT 48, FRAME 135220.68

SCALE FACTOR = 0.972+7 (M-H) - 0.789+9 (IN- LB) - 0.92

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ITEM - 6V124 BENDING MOMENT AT WING STATION 1

Figure 17. Continued
ITEM - SU127 BENDING MOMENT AT WIND STATION 2

Figure 17. Continued
FLIGHT 49 FRAME 135323.00

SCALE FACTOR = $0.272 \times 10^8 (\text{N-m}) = 221 \times 10^6 \text{ (IN-LB)}$

ITEM - WA130 BENDING MOMENT AT WING STATION 3

Figure 17. Continued
FLIGHT 48, FRAME 135820.60

SCALE FACTOR = 0.6855 (M-N)^2 = 4.047 (IN-LB)^2

ITEM - SV133 BENDING MOMENT AT WING STATION 4

Figure 17, Continued
FLIGHT 49, FRAME 135320.00

SCALE FACTOR = 0.4258 (M-N) x 10^2 = 0.4498 (IN-LB) x 10^2

ITEM - SA125 TORSION AT WING STATION 1

Figure 17. Continued
FLIGHT 48, FRAME 133229.00

SCALE FACTOR = .672 x 5 (M-N)^2 = .548 x 7 (IN-LB)^2

ITEM - SW120 TORSION AT WING STATION 2

Figure 17. Continued
ITEM - SW131 TORSION AT WING STATION 3

Figure 17. Continued
FLIGHT 48, FRAME 135320.00

Scale Factor = 0.1425 (IN-LS) x 10^2 = 118.7 (IN-LS) x 10^2

Normalized Power Spectral Density - 1/Hz

Frequency (Hz)

Item - S1134 Torsion at Wing Station 4

Figure 17. Continued
FLIGHT 49, FRAME 135326.00, RECORD LENGTH = 1 SEC
SCALE FACTOR = .25147 (N)**2 = .12766 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 17. Continued
FLT16IT 48, FRAME 135320.09, RECORD LENGTH = 1 SEC

SCALE FACTOR = .149*7 (N)**2 = .754*5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 17. Continued
FLIGHT 48, FRAME 135328.80. RECORD LENGTH = 1 SEC

SCALE FACTOR = .144 + 7 (M-N)**2 = .117 + 9 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 17. Continued
FLIGHT 49, FRAME 13320.00. RECORD LENGTH = 1 SEC

SCALE FACTOR = $0.874 \times 10^8 (\text{in-lbf})^{0.5} = 0.547 \times 10^2 (\text{in-lbf})^{0.02}$

ITEM - ST073 BEND. R/H R/HORIZ TAIL ROOT

Figure 17. Continued
FLIGHT 49. FRAME 133220.00. RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.105 \times (\text{ft-lb})^{2/2} = 0.056 \times (\text{in-lb})^{2/2}\)

**NORMALIZED POWER SPECTRAL DENSITY - 1/Hz**

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<th>Frequency (Hz)</th>
<th>Normalized Power Spectral Density</th>
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**ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE**

Figure 17. Continued
FLIGHT 49. FRAME 135226.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = .100×6 (IN-N)×2 = .148×6 (IN-LB)×2

ITEM - ST118 TORSION. R/H HORIZ TAIL HINGE

Figure 17. Concluded
Figure 18. Power Spectra - Flight 48, Run 4, Point 3
T1 = 135322.8, ΔT = 1 Sec, αNom = 12.95 deg,
Δα = 1.70 deg
Figure 18. Continued
FLIGHT 49: FRAME 105052.63: RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.227 - 1 (G) x 2

Figure 18. Continued
FLIGHT 4B FRAME 12:00:00 RECORD LENGTH = 1 SEC

SCALE FACTOR = .250-1 000002

ITEM - ABO18 C.S. VERTICAL ACCELEROMETER

Figure 18. Continued
FLIGHT 40B FRAME 180323.00 RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.302 (N) 0.02

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - AFD00 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 18, Continued
FLIGHT 42, FRAME 10, RECORD LENGTH = 1 SEC

SCALE FACTOR = .117-2 10^3 x 10^-2

Figure 18, Continued
FLIGHT 46, FRAME 189522-09, RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.105-2 (S)²/2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - A5020 C.O. LATERAL ACCELEROMETER

Figure 18. Continued
FLIGHT 48, FRAME 135822.00

SCALE FACTOR = \(0.100+7 \text{ (in)}^2 \times \text{sec}^{-2} = 391+8 \text{ (lb)}^2 \times \text{sec}^{-2}\)

Figure 18. Continued

ITEM - SW123 SHEAR AT WIND STATION 1
ITEM - SHEAR AT WING STATION 2

FREQUENCY (Hz)

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

SCALE FACTOR = 0.16447 (N) = 2 = 0.5245 (LBD) = 2
ITEM - SW129 SHEAR AT WING STATION 3

Figure 18. Continued
FLIGHT 48, FRAME 135222.94

SCALE FACTOR = .115*8 (N)**2 = .583*4 (LB)**2

ITEM - SU132 SHEAR AT WING STATION 4

Figure 18. Continued
FLIGHT 48, FRAME 133222.00

SCALE FACTOR = 0.237° (R•M) = 0.132 + 1.0(R•M-LD)°2

ITEM - SIV124 BENDING MOMENT AT WING STATION 1

Figure 18. Continued
FLIGHT 48, FRAME 183022.60

SCALE FACTOR = 80007 (IN-lb) = 72149 (IN-lb) = 7

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 18, Continued
FLIGHT 40, FRAME 135322.88

SCALE FACTOR = 0.684 (M-N) = 1.355 (IN-LB) = 2

Figure 18, Continued
FLIGHT 48, FRAME 133322.80

SCALE FACTOR = \(0.122 + 8 \text{ (IN-LB)}^{0.52} = 0.502 + 7 \text{ (IN-LB)}^{0.52}\)

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 18, Continued

323
ITEM - SW125 TORSION AT WING STATION 1

Figure 18, Continued
ITEM - SW120 TORSION AT WING STATION 2

Figure 18. Continued
FLIGHT 48, FRAME 13522.00

SCALE FACTOR = \(0.287 \times 10^{-3} (\text{IN-N})^{0.2} = 0.217 \times 10^{-3} (\text{IN-LB})^{0.2}\)

ITEM - SW131 TORSION AT WING STATION 3
ITEM - SV134 TORSION AT WING STATION 4

Figure 18. Continued
FLIGHT 49. FRAME 123322.86. RECORD LENGTH = 1 SEC

SCALE FACTOR = .3157 (N) = .1586 (LB) = .3125 (kN) = .8855 (K)

ITEM - ST077 SHEAR L/H HORIZ TAIL ROOT

Figure 18. Continued
FLIGHT 49, FRAME 135922.90, RECORD LENGTH = 1 SEC
SCALE FACTOR = .230 x 10^-7 (N) = 1.31 x 10^-8 (LB)

Figure 18. Continued

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 18. Continued
ITEM - ST078 BEND, M54, L/H HORIZ TAIL ROOT

Figure 18, Continued
FLIGHT 46, FRAME 135322.99, RECORD LENGTH = 1 SEC

SCALE FACTOR = .107+7 (N-N)*2 = .888+6 (IN-LB)*2

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ITEM - ST073 BEND, N/S, R/H HORIZ TAIL ROOT
Figure 18. Continued
FLIGHT 48. FRAME 135922.00. RECORD LENGTH = 1 SEC
SCALE FACTOR = .720+6 (IN-N)**2 = .991+6 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE

Figure 18. Concluded
ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 19. Power Spectra - Flight 48, Run 4, Point 4
T1 = 135323.9, ΔT = 1 Sec, αNom = 14.3 deg,
Δα = 1.30 deg.
FLIGHT 45A FRAME 123325.985; RECORD LENGTH = 1 SEC

SCALE FACTOR = .171-1 (G)^1/2

ITEM - AV8B2 R/H WING TIP VERTICAL ACCELERATION

Figure 19. Continued
ITEM - AD916 C.G. VERTICAL ACCELEROMETER

Figure 19. Continued
FLIGHT 42 FLIGHT 120805,00; RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.448 -1 (8) x 10^2

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NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - ATLAS C.S. VERTICAL ACCELEROMETER

Figure 19. Continued
Figure 19. Continued
Figure 19. Continued
Figure 19. Continued
FLIGHT 49, FRAME 125223.98

SCALE FACTOR = 0.379 x 7 (N) x 10^-2 = 0.192 x 6 (LB) x 10^-2

Figure 19, Continued
ITEM - SW12G SHEAR AT WING STATION 2

Figure 19. Continued
FLIGHT 48, FRAME 135323.90

SCALE FACTOR = .715 x 10^2 (in) = 331 x 10^2 (lb) x 10^2

Figure 19, Continued
FLIGHT 43, FRAME 133523.03
SCALE FACTOR = .240 (IN) / 2 = .125 (LB) / 2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - SW132 SHEAR AT WING STATION 4

Figure 19. Continued
FLIGHT 48 FRAME 123823.98

SCALE FACTOR = \( 0.475 + 0 \ (H-N)^{0.5} = 0.835 + 10 \ (IN-LB)^{0.5} \)

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ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 19. Continued
FLIGHT 40, FRAME 125323.39

SCALE FACTOR = .114+0 (H-M) + 2 = .828+0 (H-L) + 2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 19. Continued
Figure 19. Continued
FLIGHT 48, FRAME 133323.89

SCALE FACTOR = 0.242 (H-N)*2 = 0.167 (IN-LB)**2

ITEM - SV133 BENDING MOMENT AT WING STATION 4

Figure 19. Continued
FLIGHT 48, FRAME 135822.99

SCALE FACTOR = \(10^9\) (M-N)\(^2\) = \(10^9\) (IN-LB)\(^2\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 19. Continued
ITEM - SU120 TORSION AT WINGS STATION 2

Figure 19. Continued
FLIGHT 49, FRAME 125228.96

SCALE FACTOR = $0.377 \times (\text{IN-H})^{0.2} - 0.208 \times (\text{IN-LB})^{0.2}$

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ITEM - SW131 TORSION AT WING STATION 3

Figure 19. Continued
ITEM - SV134 TORSION AT WING STATION 4

Figure 19. Continued
FLIGHT 49, FRAME 12332390, RECORD LENGTH = 1 SEC

SCALE FACTOR = .138*7 (N)**2 = .2216 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 19, Continued

353
FLIGHT 48. FRAME 135523.96. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.2017 (N) = 2 = 0.1426 (LB) = 2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT
FLIGHT 48. FRAME 135323.90. RECORD LENGTH = 1 SEC
SCALE FACTOR = .429+7 (M-N)°=2 = .343+9 (IN-LB)°=2

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ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 19. Continued
ITEM - ST073 BEND. HSH. R/H HORIZ TAIL ROOT

Figure 19. Continued
FLIGHT 49. FRAME 135323.90. RECORD LENGTH = 1 SEC
SCALE FACTOR = $0.437 \times 10^{-6} (\text{in}-\text{lb})^2 = 335 \times 10^{-8} (\text{in}-\text{lb})^2$

Figure 19. Continued
FLIGHT 48. FRAME 135323.90. RECORD LENGTH = 1 SEC
SCALE FACTOR = .936 x 10 (H-N)**2 = .794 x 10 (IN-LB)**2

ITEM - 8T119 TORSION, R/H HORIZ TAIL HINGE

Figure 19. Concluded
FLIGHT 48, FRAME 135951.70, RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.591 \times 10^{-2}\) (G)\(^{0.5}\)

Figure 20. Power Spectra - Flight 48, Run 7R1, Point 1
\(T_1 = 135951.7\), \(\Delta T = 1\) Sec, \(\alpha_{\text{Nom}} = 8.00\) deg,
\(\Delta \alpha = 1.50\) deg

ITEM - AVO01 L/W WING TIP VERTICAL ACCELERATION

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FLIGHT 40, FRAME 135051.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .61200 (G)602

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 20. Continued
FLIGHT 49. FRAME 135831.70. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .219-1 [G]**2

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 20. Continued
ITEM - ABOIS C.G. VERTICAL ACCELEROMETER

Figure 20. Continued
FLIGHT 48, FRAME 13851.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .139-2 (G)**2

ITEM - AFOOG PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 20. Continued
FLIGHT 40, FRAME 13551.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .759-3 (6)°.02

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 20. Continued
Figure 20. Continued

FLIGHT 46, FRAME 135531.70, RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.033-3 (G) + e2

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 20. Continued
FLIGHT 48, FRAME 135851.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .310+6 (N)*2 = .157+5 (LB)*2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (HZ)

ITEM - S4123 SHEAR AT WING STATION 1

Figure 20. Continued
FLIGHT 49a FRAME 1356/70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .289 x 10^8 (N)*x = .151 x 10^5 (LB)*x

ITEM - SW128 SHEAR AT WING STATION 2

Figure 20. Continued
FLIGHT 49. FRAME 135951.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.137 \times 10^2\) (N) = \(0.044\) (Lb) \(\times 10^2\)

ITEM - SW123 SHEAR AT WING STATION 3

Figure 20. Continued
FLIGHT 48: FRAME 132851.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .217+8 (M-N)°e2 = .176+10(IN-LB)°e2

ITEM - SV124 BENDING MOMENT AT WING STATION 1

Figure 20. Continued
FLIGHT 48, FRAME 133551.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.1524 (H-N) = 2 = 0.158 + 0 (IN-LB)**2

ITEM - SV127 BENDING MOMENT AT WING STATION 2

Figure 20, Continued
FLIGHT 46, FRAME 135851.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = $0.231 \times (M-N)^{0.2} = 182 \times (IN-1B)^{0.2}$

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 20, Continued
FLIGHT 48, FRAME 135951.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.428 + 5 (M-N)^2 = 0.347 + 7 (IN-LB)^2\)

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 20. Continued
FLIGHT 48, FRAME 13351.78. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.33 \times 10^{-8} (M-N)^2 = 0.678 \times 10^{-8} (\text{IN-LB})^2\)

ITEM - S/W125 TORSION AT WING STATION I

Figure 20. Continued
FLIGHT 40. FRAME 125051.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .863+3 (H-H) = 2 = .554+7 (IN-LB) = 2

ITEM - SV128 TORSION AT WING STATION 2

Figure 20. Continued
FLIGHT 48. FRAME 135951.78. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .224+8 (M-N)**2 = .102+8 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 20. Continued
ITEM - SW134 TORSION AT WING STATION 4

Figure 20. Continued
FLIGHT 48. FRAME 135951.70. RECORD LENGTH = 1 SEC

SCALE FACTOR = .346+7 (N)**2 = .175+6 (IN)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 20. Continued
FLIGHT 48, FRAME 135951.70 - RECORD LENGTH = 1 SEC.

SCALE FACTOR = 172 + 4 (N)**2 = .870 + 5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 20. Continued

378
FLIGHT 48, FRAME 135951.70. RECORD LENGTH = 1 SEC
SCALE FACTOR = .2217 (M-N)**2 = .1799 (IN-LB)**2

Figure 20. Continued
FLIGHT 48, FRAME 13951.70. RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.576 + 2 (M-N) + 2 = 0.469 + 4 (IN-LB)**2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 20. Continued
FLIGHT 48. FRAME 135951.70. RECORD LENGTH = 1 SEC
SCALE FACTOR = .185 + 6 (M-N)**2 = .150 + 8 (IN-LB)**2

ITEM - ST135 TORSION. L/H HORIZ TAIL HINGE LINE

Figure 20. Continued
FLIGHT 48. FRAME 135951.70. RECORD LENGTH = 1 SEC

SCALE FACTOR = \[0.168 \times 3 (\text{H-N})^2 = 0.1368 (\text{IN-LB})^2\]

ITEM - ST118 TORSION. R/H HORIZ TAIL WINGE

Figure 20. Concluded
FLIGHT 48, FRAME 135952.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .164 + 1 \( (g) = \alpha \)

ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 21. Power Spectra - Flight 48, Run 7R1, Point 2

\( T_1 = 135952.7, \Delta T = 1 \) Sec, \( \alpha_{\text{Nom}} = 1.35 \) deg, 

\( \alpha = 1.35 \) deg.
FLIGHT 48, FRAME 135832.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.128 \times 10^{-2}\)

ITEM - AY002 R/H WING TIP VERTICAL ACCELERATION

Figure 21. Continued
ITEM - ABO19 C.G. VERTICAL ACCELEROMETER

Figure 21. Continued
FLIGHT 48. FRAME 139552.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .556-1 (6) x 10^-2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 21. Continued
FLIGHT 48. FRAME 13382/70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .177-2 (E) 2

NORMALIZED POWER SPECTRAL DENSITY - 1/HZ

INTERN - AFOOS PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 21. Continued
ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 21. Continued
FLIGHT 48, FRAME 135832.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .143-2 (6)**2

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 21. Continued
FLIGHT 4B, FRAME 135352.7. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .391+8 \( (N) \times 2 \times 266+5 \) \( (Lb) \times 2 \)

ITEM - SW123 SHEAR AT WING STATION 1

Figure 21, Continued
FLIGHT 48. FRAME 135552.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .625 x 10 \( ^{-3} \) (N) \( ^{-2} \) = .417 x 10 \( ^{-3} \) (LB) \( ^{-2} \)

ITEM - SW126 SHEAR AT WING STATION 2

Figure 21. Continued
ITEM – SW129 SHEAR AT WING STATION 3

Figure 21. Continued
FLIGHT 4Q. FRAME 135952.70. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .155+2 (N)°2 = .784+4 (LB)°2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 21. Continued
FLIGHT 48. FRAME 130032.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .137 + 0 (H-H)**2 = .111 + 10(IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 21. Continued
FLIGHT 48. FRAME 135652.78. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .9827 (N-M) = .4739 (IN-LB)
FLIGHT 48, FRAME 135652.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .794 (IN-LS) 0.62 = .645 (IN-LB) 0.62

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 21. Continued
FLIGHT 40. FRAME 135952.701, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .126+8 (IN-H)^2 = .972+7 (IN-LB)^2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 21. Continued
FLIGHT 49, FRAME 1352.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.638 \times (N-N)^{0.5} = 0.817 \times (I-N-I)^{0.5}\)

Figure 21. Continued
ITEM - SW129 TORSION AT WING STATION 2

Figure 21. Continued
Flight 48, Frame 13552.70, Record Length = 1 Sec.

Scale Factor = 0.417 x 10^6 (N-m)^2 = 3.83 x 10^6 (lbf-in)^2

Item - SW131 Torsion at wing station 3

Figure 21. Continued
ITEM - SW134 TORSION AT WING STATION 4

Figure 21. Continued
FLIGHT 48 FRAME 133932.70 RECORD LENGTH = 1 SEC

SCALE FACTOR = .405 x 10^2 (N) x 10^2 = .205 x 10^2 (IN) x 10^2

NORMALIZED POWER SPECTRAL DENSITY = 1/Hz

ITEM - ST077 SHEAR L/H HORIZ TAIL ROOT

Figure 21. Continued
FLIGHT 49, FRAME 135852.70, RECORD LENGTH = 1 SEC
SCALE FACTOR = .14147 (N)**2 = .7155 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 21. Continued
FLIGHT 48, FRAME 135952.78. RECORD LENGTH = 1 SEC
SCALE FACTOR = \(0.257\times10^7 (\text{in}-\text{lb}) \times 0.209\times10^3 (\text{in}-\text{lb})^2\)

ITEM - ST078 BEND, MOM, L/H HORIZ TAIL ROOT

Figure 21. Continued
FLIGHT 48, FRAME 135952.70, RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.488 \times 2 (\text{in}-\text{lb})^2 = 0.396 \times 4 (\text{in}-\text{lb})^2

Figure 21. Continued
FLIGHT 40. FRAME 135952.70. RECORD LENGTH = 1 SEC
SCALE FACTOR = .315+6 (IN.-N)**2 = .255+9 (IN.-LBS)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 21. Continued
FLIGHT 48. FRAME 135952.70. RECORD LENGTH = 1 SEC
SCALE FACTOR = .295+6 (IN-LB)**2 = .240+8 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE

Figure 21. Concluded
FLIGHT 49. FRAME 135954.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .131 \times 10^{-2}

ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 24. Power Spectra - Flight 48, Run 7R1, Point 3

$T_1 = 135954.3$, $\Delta T = 1$ Sec, $\alpha_{\text{Nom}} = 11.62$ deg,

$\Delta \alpha = 1.45$ deg.
FLIGHT 49, FRAME 135954.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .104 + 1 (0.002)

ITEM - AV002 R/H WING TIP VERTICAL ACCELERATION

Figure 22. Continued
ITEM - A8018 C.G. VERTICAL ACCELEROMETER

Figure 22. Continued
FLIGHT 49. FRAME 135694.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .215-1 \times 10^{.2}

ITEM - A0019 C.G. VERTICAL ACCELEROMETER

Figure 22. Continued
FLIGHT 46. FRAME 133554.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .134-2 [G]°2

ITEM - AFO08 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 22. Continued
ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 22. Continued
ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 22. Continued.
FLIGHT 48, FRAME 13554.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.487\times10^{-6} \text{ (N)} = 0.266\times10^{-5} \text{ (Lb)}\)

ITEM - SW123 SHEAR AT WING STATION 1

Figure 22. Continued
FLIGHT 48. FRAME 135854.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .454+6 (N)²+2 = .228+5 (Lb)²+2

ITEM - SW128 SHEAR AT WING STATION 2

Figure 22. Continued
FLIGHT 48, FRAME 123854.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = $0.243 \times 10^{-6} \text{ N m}^2 = 0.123 \times 10^{-3} \text{ lb m}^2$

ITEM - SW129 SHEAR AT WING STATION 3

Figure 22. Continued
ITEM - SW132 SHEAR AT WING STATION 4

Figure 22. Continued
FLIGHT 48, FRAME 135854.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .682*7 (M-N)**2 = .651*9 (IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 22. Continued
FLIGHT 48. FRAME 123354.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.56+7 (H-N) e+2 = 0.05+9 (IN-LB) e+2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 22. Continued
FLIGHT 40, FRAME 13585430, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 49708 (M-N)**2 = 4048 (IN-LB)**2

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ITEM - SV130 BENDING MOMENT AT WING STATION 3

Figure 22, Continued
FLIGHT 49, FRAME 135954.30, RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.927 + 5 (IN-LB)**2 = 0.753 + 7 (IN-LB)**2

Figure 22. Continued

ITEM - SW133 BENDING MOMENT AT WING STATION 4
FLIGHT 49, FRAME 135054.38. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .4726 (M-N)**2 = .3036 (IN-LB)**2

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ITEM - SW125 TORSION AT WING STATION 1

Figure 21. Continued
FLIGHT 49, FRAME 135654.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.563 \times 5 (\text{in}-\text{lb})^2 = 0.457 \times 7 (\text{in}-\text{lb})^2\)

ITEM - SW120 TORSION AT WING STATION 2

Figure 22. Continued
FLIGHT 48, FRAME 135954.30. RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.128+6 [IN-LB]**2 = 0.155+8 [IN-LB]**2

ITEM - SW131 TORSION AT WING STATION 3
Figure 22. Continued
FLIGHT 40, FRAME 135954.30 RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.393 \times 5 (\text{N} - \text{Nin}) \times 2 = 0.295 + 7 (\text{in-Lb})^{1/2}\)

ITEM - SW134 TORSION AT WING STATION 4

Figure 21. Continued
FLIGHT 48. FRAME 135954.30. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.455+7 (N)**2 = 0.230+6 (IN)**2

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ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 7. Continued
FLIGHT 48, FRAME 135954.30. RECORD LENGTH = 1 SEC

SCALE FACTOR = \( .141 \times 7 \text{ (N)}^2 = .715 \times 5 \text{ (LB)}^2 \)

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 24. Continued
FLIGHT 48. FRAME 135954.30. RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.2317 (M-N)**2 = 0.1079 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 2. Continued

429
FLIGHT 48. FRAME 135954.30. RECORD LENGTH = 1 SEC
SCALE FACTOR = .627\times 2 \ (M-N)^2 = .509 \times 4 \ (IN-LB)^2

ITEM - ST073 BEND. MGM. R/H HORIZ TAIL ROOT

Figure 22. Continued
FLIGHT 48, FRAME 135954.30, RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.548 + 6 (\text{M-N})^2 = 0.445 + 8 (\text{IN-LB})^2\)

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 22. Continued
ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE

Figure 22, Concluded
FLIGHT 49, FRAME 135956.80, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 156+1 (6)-2

ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 23. Power Spectra - Flight 48, Run 7R1, Point 4
T1 = 135956.8, ΔT = 1 Sec, α_{Nom} = 15 15 deg.,
α = 2.00 deg.
FLIGHT 49, FRAME 135956.80, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .153 +1 (8)**2

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 2). Continued
FLIGHT 48, FRAME 135236.80. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .281-1 (G)**2

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 25. Continued
FLIGHT 40. FRAME 135936.90. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .281-1 [G]**2

ITEM - ABO19 C.G. VERTICAL ACCELEROMETER

Figure 25. Continued
FLIGHT 48, FRAME 135956.90, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .166 - 2 (8)x+2

ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 25. Continued
FLIGHT 48, FRAME 135936.80, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .858-3 (6) x 10^2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 23, Continued
FLIGHT 48, FRAME 133356.80. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 1.46-2 (G)^2

ITEM - A8020 C.G. LATERAL ACCELEROMETER

Figure 2a. Continued
FLIGHT 40, FRAME 135958.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .546+6 (N)**2 = .276+5 (LB)**2

ITEM - SW123 SHEAR AT WING STATION 1

Figure 23. Continued
FLIGHT 40. FRAME 135688.80. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .140+7 (N)**2 = .709+5 (LB)**2

ITEM - SW12G SHEAR AT WING STATION 2

Figure 23. Continued
FLIGHT 46, FRAME 135356.80, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.231 + 6 \times (\text{N})^2 = 0.117 + 5 \times (\text{LB})^2\)

ITEM - SW129 SHEAR AT WING STATION 3

Figure 23, Continued

442
FLIGHT 40, FRAME 135956.80, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .123+6 (N)**2 = .619+4 (LB)**2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 23. Continued
FLIGHT 40. FRAME 135956.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.500 + (H-N)² = 0.477 + 10(IN-LB)²

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 23. Continued
FLIGHT 49, FRAME 135836.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.250 + 0 (N-N)^2 = 0.206 + 10(IN-LB)^2\)

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 25, Continued
FLIGHT 49, FRAME 135858.80, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .42146 (N-M) = 342.89 (IN-LB)°2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 23, Continued
FLIGHT 48. FRAME 135956.80, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .135+6 (IN-N)*2 = .109+8 (IN-LB)*2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 23. Continued
FLIGHT 48, FRAME 133956.80, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.1797 \times (N-H)^{0.2} = 0.1450 \times (IN-LB)^{0.2}\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 2). Continued
FLIGHT 48; FRAME 135956.99. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.953 + 5 (M-N)^{2} = 0.774 + 7 (IN-LB)^{2}\)

ITEM - SW128 TORSION AT WING STATION 2

Figure 7c. Continued
FLIGHT 48. FRAME 135956.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \( \frac{3.23}{10^6} (M-N)^{0.2} = \frac{2.62}{10^3} (IN-LB)^{0.2} \)

ITEM - SV131 TORSION AT WING STATION 3

Figure 23, Continued
FLIGHT 48, FRAME 135956.80, RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.774*5 (IN-N)*2 = 0.23*7 (IN-LB)*2

ITEM - SV134 TORSION AT WING STATION 4

Figure 23, Continued
FLIGHT 48, FRAME 135956.80, RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.656 + 7 (N)² = 0.332 + 6 (IN)²

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 23. Continued
FLIGHT 48, FRAME 135956.80, RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.1707 (N)*2 = 0.8505 (LB)*2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 23. Continued
FLIGHT 48, FRAME 13596.80. RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.1827 (N-M)**2 = 0.1489 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 23. Continued
FLIGHT 48, FRAME 135956.80. RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.658 + 2(N-H)^2\) = \(0.535 + 4(IN-LB)^2\)

**Figure 23. Continued**
FLIGHT 48, FRAME 135956.80, RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.182 + 7 (M-N)^2\) = \(0.148 + 9 (IN-LB)^2\)

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE
FLIGHT 48, FRAME 135366.90. RECORD LENGTH = 1 SEC

SCALE FACTOR = .314 x 6 (N-N)**2 = .255 x 8 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE

Figure 2). Concluded
FLIGHT 48, FRAME 135958.55. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .392+1 (B)*2

ITEM - A0001 L/H WING TIP VERTICAL ACCELERATION

Figure 24. Power Spectra - Flight 48, Run 7R1, Point 5
T1 = 135958.55, ΔT = 1 Sec, \( \alpha_{\text{Nom}} = 18.70 \text{ deg} \),
\( \Delta \alpha = 1.45 \text{ deg} \).
FLIGHT 48, FRAME 135930.55. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .220+1 (G)*2

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION
Figure 4, Continued
FLIGHT 49. FRAME 135938.55. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.931 - (8)^{+2}

ITEM - A9018 C.G. VERTICAL ACCELEROMETER

Figure 24. Continued
ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 24. Continued
ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 24. Continued
Figure 24. Continued

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER
ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 24. Continued
ITEM - SW123 SHEAR AT WING STATION 1

Figure 24. Continued
FLIGHT 48, FRAME 135950.55, RECORD LENGTH = 1 SEC.

SCALE FACTOR = $0.756 \times 10^2 \text{ (N)} = 0.382 \times 10^2 \text{ (LB)}$

ITEM - SW126 SHEAR AT WING STATION 2

Figure 24. Continued
FLIGHT 40, FRAME 135950.55, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .40466 (N)**2 = .2045 (LB)**2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 24. Continued
FLIGHT 48. FRAME 135958.55. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.1906 \times (N)^{2} = 0.9987 + 4(LB)^{2}\)

ITEM - SV132 SHEAR AT WING STATION 4

Figure 24. Continued
FLIGHT 49: FRAME 135050.35, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .028+7 (M-N)**2 = .666+9 (IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 4. Continued
FLIGHT 40. FRAME 135050.55. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .155 + (M-N)^2 = .126 + 10(IN-LB)^2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 24. Continued
FLIGHT 48, FRAME 135958.55, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .102\times 10^{-7} \text{(M-N)} = 10.25 \times 10^{-9} \text{(IN-LB)}

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ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 24, Continued
FLIGHT 49, FRAME 135958 55, RECORD LENGTH 9 SEC.

SCALE FACTOR = \(0.169 \times (M-N)^2\) = \(0.137 \times (IN-LB)^2\)

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 24. Continued
FLIGHT 49, FRAME 135056.55, RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.649 + 6 \text{ (in-N)\(\times\)sec} = 0.527 + 8 \text{ (in-lb)\(\times\)sec}^2\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 21, Continued
FLIGHT 40, FRAME 135950.55. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .119+6 (M-N)**2 = .965+7 (IN-LS)**2

ITEM - SW128 TORSION AT WING STATION 2
Figure 24. Continued
FLIGHT 48. FRAME 135950.35. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .200 + 6 (M-N) ** 2 = .234 + 6 (IN-LB) ** 2

ITEM - SW131 TORSION AT WING STATION 3

Figure 24. Continued
FLIGHT 48: FRAME 135958.55; RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.7495 \times (\text{in}-\text{N})^2 = 0.6087 \times (\text{in}-\text{lb})^2\)

ITEM - SW134 TORSION AT WING STATION 4

Figure 24, Continued
FLIGHT 48, FRAME 135958.55, RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.667 \times 7 \text{(N)}^2 = 0.337 \times 6 \text{(IN)}^2\)

**Figure 24.** Continued
FLIGHT 48, FRAME 135958.55. RECORD LENGTH = 1 SEC

SCALE FACTOR = .337+7 (N)**2 = .171+6 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 24. Continued
FLIGHT 48, FRAME 135958.55, RECORD LENGTH = 1 SEC
SCALE FACTOR = \(0.331 + 7 (M-N)^{0.5} = 0.269 + 9 (IN-LB)^{0.5}\)

ITEM - ST078 BEND, MOM. L/H HORIZ TAIL ROOT

**Figure 24. Continued**
FLIGHT 48, FRAME 135950.55. RECORD LENGTH = 1 SEC
SCALE FACTOR = .969+2 (M-N)**2 = .786+4 (IN-LB)**2

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 24. Continued
FLIGHT 48, FRAME 135958.55, RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.801 + 8(M-N)^2 = 0.650 + 8(IN-LB)^2\)

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 24. Continued
ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE

Figure 24. Concluded
FLIGHT 48, FRAME 134426.20. RECORD LENGTH = 1 SEC
SCALE FACTOR = .973-1 (G)**2

ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 25. Power Spectra - Flight 48, Run 5, Point 1
T = 134426.2, ΔT = 1 Sec, $\alpha_{\text{Nom}} = 480$ deg,
$\Delta \alpha = \pm 0.1$ deg.
FLIGHT 48, FRAME 134426.20, RECORD LENGTH = 1 SEC

SCALE FACTOR = .158-1 (6)**2

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 25. Continued
ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 25. Continued
FLIGHT 48, FRAME 134426.20, RECORD LENGTH = 1 SEC
SCALE FACTOR = .307-2 (G)^2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 25. Continued
ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 25. Continued
ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = .391-3 (G)**2

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .256+8 (N)**2 = .130+5 (Lb)**2

ITEM - SW123 SHEAR AT WING STATION 1

Figure 25. Continued
FLIGHT 48, FRAME 134426.20, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .212+6 (N)**2 = .107+5 (LB)**2

**Figure 25. Continued**
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \( 0.4395 \times (N)^{2.2} = 0.2224 \times (LB)^{2.2} \)

ITEM - SW129 SHEAR AT WING STATION 3

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.2804 \times (N \cdot N)^{1/2} = 0.228 \times (M \cdot N)^{1/2}\)

ITEM - SW132 SHEAR AT WING STATION 4

Figure 25, Continued
FLIGHT 48, FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.232 \times 10^{-6} (M-N)^2 = 1.08 \times 10^{-10} (IN-LB)^2\)

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .747*6 (M-N)**2 = .607*8 (IN-LB)**2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.529 + 5 \((M-N)^2\) = 0.430 + 7 \((I-N-LB)^2\)

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.372 × 10^4 (N)**2 = 100 × 3 (LB)**2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 25, Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .345+6 \((M-N)^2\) = .280+8 \((\text{IN-LB})^2\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 25. Continued
FLIGHT 40. FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.1095 (M-N)^2\) = \(0.6846 (IN-LB)^2\)

**ITEM - SW128 TORSION AT WING STATION 2**

Figure 23. Continued
FLIGHT 40, FRAME 134426.20, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.592 \times 10^4 (M-N)^2 = 481 \times 10^6 (IN-LB)^2\)

ITEM - SW131 TORSION AT WING STATION 3

Figure 25. Continued
FLIGHT 48, FRAME 134426.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .101+5 (M-N)**2 = .817+6 (M-N)**2

ITEM - SW134 TORSION AT WING STATION 4

Figure 25, Continued
FLIGHT 48, FRAME 134426.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = .337 + 7 (M)**2 = .170 + 6 (L)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.346\times7 (N)^{2} = 0.175\times6 (LB)^{2}\)

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 25. Continued
FLIGHT 48, FRAME 134426.20. RECORD LENGTH = 1 SEC
SCALE FACTOR = \(0.1887 \times (\text{in.-lb})^2 = 0.1539 \times (\text{in.-lb})^2\)

ITEM - ST078 BEND, MOM, L/H HORIZ TAIL ROOT

Figure 25. Continued
FLIGHT 48, FRAME 134426.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = .1847 (M-N)**2 = .1499 (IN-LB)**2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 25, Continued
FLIGHT 48, FRAME 134426.20, RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.238\times5 \text{ (M-N)}^2 = 0.193\times7 \text{ (IN-LB)}^2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 25. Continued
FLIGHT 48. FRAME 134426.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.9195 (M-N)**2 = 0.7467 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 2). Concluded
ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 26. Power Spectra - Flight 48, Run 5, Point 2
T = 134432.3 sec, ΔT = 1 sec, α_Nom = 8.41 deg,
Δα = 0 80 deg.

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ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 26. Continued
ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 26. Continued
ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 26. Continued
ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 26. Continued
FLIGHT 48. FRAME 134432.30. RECORD LENGTH = 1 SEC

SCALE FACTOR = .945-3 (6)**2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 26. Continued
ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 26. Continued
FLIGHT 48. FRAME 134432.30. RECORD LENGTH = 1 SEC.
SCALE FACTOR = \( 0.522 \times 10^6 \) (N)**2 = \( 2.64 \times 10^5 \) (LB)**2

ITEM - SV123 SHEAR AT WING STATION 1

Figure 26. Continued
FLIGHT 49, FRAME 134432.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .616 + 6 (N)**2 = .311 + 5 (LB)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 26. Continued
FLIGHT 46. FRAME 134432.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .244 x 6 (N) = 2 = .123 x 5 (LB) = 2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 26. Continued
FLIGHT 49. FRAME 134432.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .768 + 5 (M-N)**2 = .623 + 7 (M-N)**2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 26. Continued
FLIGHT 48, FRAME 134432.30, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .619 x 7 (M-N)**2 = .503 x 9 (IN-LB)**2

ITEM - S4124 BENDING MOMENT AT WING STATION 1
Figure 26, Continued
FLIGHT 48, FRAME 134432.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.923+7 (M-N)**2 = 0.669+9 (IN-LB)**2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 26. Continued
FLIGHT 40, FRAME 134432.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .396+6 (M-N)**2 = .322+8 (IN-LB)**2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 26, Continued
FLIGHT 48. FRAME 13432.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .125*6 (N)**2 = 632+4 (LB)**2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 26. Continued
FLIGHT 48, FRAME 134432.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.107+7 (N-M)^2 = 0.669+8 (IN-LB)^2\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 26. Continued
FLIGHT 49, FRAME 134432.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .239+6 (M-N)**2 = .194+8 (IN-LB)**2

**Figure 26. Continued**

ITEM - SW128 TORSION AT WING STATION 2
FLIGHT 48, FRAME 134432.30. RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.3926 (M-N)**2 = 0.3198 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 26. Continued
FLIGHT 48, FRAME 134432.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.8155 (M-N)^2 = 0.6617 (M-N)^2\)

**Figure 26. Continued**
FLIGHT 48, FRAME 134432.30, RECORD LENGTH = 1 SEC

SCALE FACTOR = .417*7 (N)**2 = .211*6 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 26. Continued
FLIGHT 48, FRAME 134432.30. RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.227+7 (N)**2 = 0.115+6 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 26. Continued
FLIGHT 48, FRAME 134432.30, RECORD LENGTH = 1 SEC
SCALE FACTOR = .275*(M-N)**2 = .224*(IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 26. Continued
FLIGHT 48, FRAME 134432.30, RECORD LENGTH = 1 SEC

SCALE FACTOR = .158 + 7 (M-N)**2 = .129 + 9 (IN-LB)**2

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 26, Continued
ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 26. Continued
FLIGHT 48. FRAME 134432.30. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.779+6 (M-N)**2 = 0.632+8 (IN-LB)**2

**ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE**

Figure 26. Concluded
FLIGHT 48, FRAME 134436.20. RECORD LENGTH = 1 SEC
SCALE FACTOR = .193+1 (G)**2

ITEM - AV001 L/H WING TIP VERTICAL ACCELERATION

Figure 21. Power Spectra - Flight 48, Run 5, Point 3
T_i = 134436 2, AT = 1 Sec, \( \alpha_{\text{Nom}} = 12 \) 10 deg.
\( \Delta \alpha = 1.40 \) deg.
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC
SCALE FACTOR = .156 + 1 (6)**2

ITEM - AV002 R/H WING TIP VERTICAL ACCELERATION.

Figure 27. Continued
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = .175-1 (G)**2

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 21. Continued
FLIGHT 48, FRAME 134436.20, RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.256-1 (G)**2

ORIGINAL POWER SPECTRAL DENSITY - 1/Hz

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 27. Continued
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = .222-2 (G)**2

Figure 21. Continued
ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 27. Continued
FLIGHT 48, FRAME 134436.20, RECORD LENGTH = 1 SEC

SCALE FACTOR = .204-2 (G)**2

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 27. Continued
FLIGHT 48, FRAME 134436.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.537 \times 10^6 \text{ (N)}^2 = 0.271 \times 10^5 \text{ (LB)}^2\)

ITEM - SW123 SHEAR AT WING STATION 1

Figure 27. Continued
FLIGHT 48, FRAME 13436.20, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .872 x 10^6 (N)**2 = 441 x 10^5 (LB)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 27. Continued
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .233+6 (N)**2 = .118+5 (LB)**2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 27. Continued
FLIGHT 48, FRAME 134436.20, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .4395 (M-N)**2 = .3567 (M-N)**2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 27. Continued
FLIGHT 48, FRAME 134436.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.134 + 8 \cdot (M-N)^{2} = 1.09 + 10 \cdot (IN-LB)^{2}

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 27. Continued
FLIGHT 48, FRAME 134436.20, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.2447 (M-N)^{2.0} = 0.1989 (\text{IN-LB})^{2.0}\)

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 27. Continued
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .362+6 (M-N)**2 = .294+8 (IN-LB)**2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 27. Continued
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.111 \times 6 \text{ (N)}^2 = 0.560 \times 4 \text{ (LB)}^2\)

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 27. Continued
FLIGHT 48, FRAME 134436.20, RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.684 \times 10^{-6} (M-N)^2 + 0.558 \times 10^{-8} (IN-\text{LB})^2\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 27. Continued
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .907+5 (M-N)**2 = .736+7 (IN-LB)**2

ITEM - SW128 TORSION AT WING STATION 2

Figure 27. Continued
FLIGHT 48, FRAME 134436.20, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .143 + 6 (M-N)**2 = .116 + 8 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 27. Continued
FLIGHT 48, FRAME 134436.20. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.107 \times 10^6 (M-N)^2\) = 0.3667 \((M-N)^2\)

ITEM - SV134 TORSION AT WING STATION 4

Figure 27. Continued.
FLIGHT 48. FRAME 134436.20. RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.508 \times 10^7 \text{ (N)}^2\) = \(0.257 \times 6 \text{ (LB)}^2\)

Figure 27. Continued
FLIGHT 46. FRAME 134436.20. RECORD LENGTH = 1 SEC
SCALE FACTOR = .319 x 7 (N)**2 = .161 x 6 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 27. Continued
ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 27. Continued
ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 27. Continued
FLIGHT 4B: FRAME 134436.20. RECORD LENGTH = 1 SEC
SCALE FACTOR = 0.1147 (M-N)**2 = 0.9258 (IN-LB)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 27. Continued
FLIGHT 48, FRAME 134436.20, RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.785 \times (M-N)^{0.2} = 0.637 \times (IN-LB)^{0.2}\)

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 27, Concluded
ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 28. Power Spectra - Flight 48, Run 5, Point 4
T₁ = 134439.65, ΔT = 1 Sec, α_Nom = 15.95 deg,
Δα = 1.80 deg.
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.429 + 1 \times 10^{-2}

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 23. Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC

SCALE FACTOR = .216-1 (G)**2

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 20. Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC
SCALE FACTOR = .261-1 (G)**2

Figure 23. Continued

ITEM - AB019 C.G. VERTICAL ACCELEROMETER
ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 28. Continued
FLIGHT 48, FRAME 134439.65. RECORD LENGTH = 1 SEC

SCALE FACTOR = .153-2 (6)**2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 28. Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC

SCALE FACTOR = .164-3 (6) x 10^2

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 28. Continued
FLIGHT 48, FRAME 134439.65. RECORD LENGTH = 1 SEC.

SCALE FACTOR = \(0.120\times7 \text{ (N)}^{\times2} = 0.607\times5 \text{ (LB)}^{\times2}\)

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - SV123 SHEAR AT WING STATION 1

Figure 26. Continued
FLIGHT 40. FRAME 134439.65. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .146+7 (N)*2 = .738+5 (Lb)**2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 28. Continued
FLIGHT 49. FRAME 131439.65. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .923×6 \( (N)^{2} \) = .467×5 \( (LB)^{2} \)

ITEM - SWI29 SHEAR AT WING STATION 3

Figure 28. Continued
FLIGHT 48, FRAME 134439.65, RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.915 \times 5 \text{(M-N)}^2 = 0.743 \times 7 \text{(M-N)}^2\)

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

ITEM - SW132 SHEAR AT WING STATION 4

Figure 28. Continued
FLIGHT 48, FRAME 134439.65. RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.204 B (M-N)**2 = 0.165 + 10(IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 28. Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .225 + 8 (M-N)**2 = .182 * 10(IN-LB)**2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 28. Continued
FLIGHT 48, FRAME 134435.65, RECORD LENGTH = 1 SEC.

SCALE FACTOR = $0.912 \times 10^6 (\text{M-N})^2 = 0.749 \times 10^8 (\text{IN-LB})^2$

Figure 20. Continued
Figure 28. Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.152 + 7 (M-N) = 2 = 0.123 + 9 \text{ (IN-LB)} = 2\)

ITEM - SW125 TORSION AT WING STATION 1

Figure 28. Continued
ITEM - SV128 TORSION AT WING STATION 2

Figure 28. Continued
FLIGHT 48, FRAME 134439.65, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .433+6 (M-N)**2 = .351+8 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 28. Continued
FLIGHT 48, FRAME 134439.65, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.155+6 (M-N)**2 = 0.126+8 (M-N)**2

ITEM - SW134 TORSION AT WING STATION 4

Figure 28, Continued
Figure 23. Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC

SCALE FACTOR = \(0.187 \times 10^{-7} \text{(N)}^2 = 0.947 \times 10^{-5} \text{(LB)}^2\)

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 28. Continued
ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 28. Continued
FLIGHT 48, FRAME 134439.65, RECORD LENGTH = 1 SEC
SCALE FACTOR = .183+7 (M-N)**2 = .148+9 (IN-LB)**2

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 28, Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC
SCALE FACTOR = $0.162 + 7 (M-N)_{**2} = 0.131 + 9 (IN-LB)_{**2}$

ITEM - ST135 TORSION. L/H HORIZ TAIL HINGE LINE

Figure 28. Continued
FLIGHT 48. FRAME 134439.65. RECORD LENGTH = 1 SEC

SCALE FACTOR = 0.250 + 7 (M-N)**2 = 0.203 + 9 (IN-LB)**2

ITEM - ST118 TORSION. R/H HORIZ TAIL HINGE LINE

Figure 28. Concluded
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = .431 + 1 (G)**2

ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 29. Power Spectra - Flight 59, Run S132R, Point 1
T_i = 31901 0, ΔT = 2 Sec, α_Nom = 16.75 deg,
Δα = 1.60 deg

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FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .287+1 (G) * 2

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 29. Continued
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = \(0.958 - 1 \times 10^{-2}\)

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 29. Continued
FLIGHT 59, FRAME 031901.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .141+0 (G)**2

ITEM - ABO19 C.G. VERTICAL ACCELEROMETER

Figure 29. Continued
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .636-2 (G)**2

ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 29. Continued
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = .206-2 (G)**2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 29. Continued
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .533-2 (6)**2

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 29. Continued
ITEM - SW123 SHEAR AT WING STATION 1

Figure 29. Continued
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC.
SCALE FACTOR = 0.1047 (N)² = 0.5285 (LB)²

ITEM - SW126 SHEAR AT WING STATION 2

Figure 29, Continued
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.828 \times 10^6 \text{ (N)} + 2 = 0.419 \times 10^5 \text{ (LB)} + 2\)

ITEM - SW129 SHEAR AT WING STATION 3

Figure 29. Continued
FLIGHT 59, FRAME 031901.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.263 + 6 \text{ (N) } \times 2 = 0.133 + 5 \text{ (LB) } \times 2\)

**Figure 29. Continued**
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .342+8 (M-N)**2 = .278+10(IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 29. Continued
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.983 \times 10^{-7} \text{(M-N)}^2 \times 10 \times 0.786 \times 9 \text{(IN-LB)}^2\)

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 29. Continued
FLIGHT 59, FRAME 031901.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.164 \times 7 (\text{M-N})^2 = 0.133 \times 9 (\text{IN-LB})^2\)

Figure 29, Continued
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = $0.203 \times 10^6 (M-N)^2 = 0.164 \times 10^8 (IN-LB)^2$

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 29, Continued
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .263*7 (M-N)**2 = .214*9 (IN-LB)**2

ITEM - SW125 TORSION AT WING STATION 1

Figure 29. Continued
FLIGHT 59, FRAME 031901.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .270+6 (M-N)**2 = .219+8 (IN-LB)**2

ITEM - SW128 TORSION AT WING STATION 2

Figure 29. Continued
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .461 + 6 (M-N)² = .374 + 8 (IN-LB)²

ITEM - SW131 TORSION AT WING STATION 3

Figure 29, Continued
FLIGHT 59, FRAME 031901.00. RECORD LENGTH = 2 SEC.
SCALE FACTOR = 0.8995 \times (M-N) = 0.7307 \times (IN-LB)²

ITEM - SW134 TORSION AT WING STATION 4

Figure 29. Continued
FLIGHT 59, FRAME 031901.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .491+7 (N)*2 = .248+6 (LB)*2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 29. Continued
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .162+7 (N)**2 = .819+5 (LB)**2

ITEM - ST072 SHEAR R/H HORIZ TAIL ROOT

Figure 29. Continued
FLIGHT 59, FRAME 031901.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .276+7 (M-N)**2 = .224+9 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 29. Continued
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .223+7 (M-N)**2 = .181+9 (IN-LB)**2

Figure 29. Continued
FLIGHT 59. FRAME 031901.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .2187 (M-N)**2 = .1779 (IN-LB)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 29. Continued
FLIGHT 59, FRAME 031901.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = .200/7 (M-N)**2 = .162/9 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 29. Concluded
FLIGHT 59. FRAME 031903.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .515*10^6 (6)**2

ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION

Figure 30. Power Spectra - Flight 59, Run S132R, Point 2
T_1 = 31903.0, ΔT = 2 Sec, α_Nom = 17.75 deg,
Δα = 0.63 deg

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FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = \(0.374 \times 10^{-1} \times (6)^{0.5\times 2}\)

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 50. Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = .752-1 (G)**2

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 50. Continued
ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 30. Continued
FLIGHT 59, FRAME 031903.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .102-1 (G)**2

ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 30. Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = .274 - 2 (G)² * 2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 50, Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = 0.568-2 (6)\times10^{-2}

ITEM - ABO20 C.G. LATERAL ACCELEROMETER

Figure 50, Continued
FLIGHT 59, FRAME 031903.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = 0.648 x 7 (N)**2 = 0.326 x 6 (LB)**2

ITEM - SW123 SHEAR AT WING STATION 1

Figure 30. Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.435^7 \text{ (N)}^{*2} = 0.220^6 \text{ (LB)}^{*2}\)

ITEM - SW126 SHEAR AT WING STATION 2

Figure 10. Continued
FLIGHT 59, FRAME 031903.00. RECORD LENGTH = 2 SEC.
SCALE FACTOR = 0.257 + 7 (N)**2 = 0.130 + 6 (LB)**2

Figure 20. Continued
FLIGHT 59. FRAME 031903.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .645+6 (N)**2 = .326+5 (LB)**2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 30. Continued
FLIGHT 59. FRAME 031903.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .793+8 (M-N)**2 = .644+10(IN-LB)**2
ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 30. Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(.477+7 \text{(M-N)}^2 = .387+9 (\text{IN-LB})^2\)

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 50. Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = 0.388 (M-N)**2 = 0.315 (IN-LB)**2

ITEM - SW133 BENDING MOMENT AT WING STATION 4

Figure 30, Continued
FLIGHT 59, FRAME 031903.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .3367(M-N)**2 = .272+9(IN-LB)**2
FLIGHT 59. FRAME 031903.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.3486 (M-N)^{2} = 0.2838 (IN-LB)^{2}\)

ITEM - SW128 TORSION AT WING STATION 2

Figure 30. Continued
FLIGHT 59. FRAME 031903.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .479 + 6 (H-N)**2 = .389 + 8 (IN-LB)**2

ITEM - SW131 TORSION AT WING STATION 3

Figure 50. Continued
ITEM - SW134 TORSION AT WING STATION 4

Figure 90. Continued
Figure 30. Continued

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

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FLIGHT 59, FRAME 031903.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = 0.516 x 10^7 (N)**2 = 0.261 x 10^6 (LB)**2

ITEM - ST072 SHEAR R/H HORIZ TAIL ROOT

Figure 30. Continued
FLIGHT 59. FRAME 031903.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .3387 (M-N)**2 = .2749 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 26. Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC

SCALE FACTOR = \(0.5477 (\text{M-N})^{**2} = 0.4449 (\text{IN-LB})^{**2}\)

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure D0. Continued
FLIGHT 59, FRAME 031903.00, RECORD LENGTH = 2 SEC
SCALE FACTOR = \(0.322 \times 7 (M-N)^{2 \times 2} = 0.261 \times 9 (IN-LB)^{2 \times 2}\)

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 50. Continued
ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 30. Concluded
FLIGHT 59, FRAME 031907.00, RECORD LENGTH = 2 SEC
SCALE FACTOR = .346+1 (G)\textsuperscript{2}

*Figure 3.1. Power Spectra - Flight 59, Run S132R, Point 3
T = 31907.0, \Delta T = 2 Sec, \alpha_{\text{Nom}} = 19.80 \text{ deg},
\Delta \alpha = 0.45 \text{ deg.}*

ITEM - AW001 L/H WING TIP VERTICAL ACCELERATION
FLIGHT 59, FRAME 031907.00, RECORD LENGTH = 2 SEC
SCALE FACTOR = 0.190 \times 10^{-2}

ITEM - AW002 R/H WING TIP VERTICAL ACCELERATION

Figure 1. Continued
FLIGHT 59, FRAME 031907.00, RECORD LENGTH = 2 SEC
SCALE FACTOR = .612-1 (G)**2

ITEM - AB018 C.G. VERTICAL ACCELEROMETER

Figure 51. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .831-1 (G)**2

ITEM - AB019 C.G. VERTICAL ACCELEROMETER

Figure 51. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = 0.413-2 (6)**2

ITEM - AF009 PILOT'S SEAT VERTICAL ACCELEROMETER

Figure 31. Continued
FLIGHT 59, FRAME 031907.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .182-2 (6)**2

ITEM - AF010 PILOT'S SEAT LATERAL ACCELEROMETER

Figure 31. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = .398-2 \((6)\times 2\)

ITEM - AB020 C.G. LATERAL ACCELEROMETER

Figure 5.1. Continued
FLIGHT 59, FRAME 031907.00, RECORD LENGTH = 2 SEC.
SCALE FACTOR = .1777 \times 10^{-7} \text{ N}^2 = .8945 \text{ (LB)}^2"
FLIGHT 59, FRAME 031907.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = 0.1187 \times (N)^2 = 0.5985 \times (LB)^2

ITEM - SW126 SHEAR AT WING STATION 2

Figure 31. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .895+6 (N)**2 = .453+5 (LB)**2

ITEM - SW129 SHEAR AT WING STATION 3

Figure 31. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .223+6 (N)**2 = .113+5 (LB)**2

ITEM - SW132 SHEAR AT WING STATION 4

Figure 31. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .173+8 (M-N)**2 = .140+10(IN-LB)**2

ITEM - SW124 BENDING MOMENT AT WING STATION 1

Figure 51. Continued
FLIGHT 59, FRAME 031307.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = 190*(M-N)*2 = 160*(IN-LB)*2

ITEM - SW127 BENDING MOMENT AT WING STATION 2

Figure 31. Continued
FLIGHT 59, FRAME 031907.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .163+7 (M-N)**2 = .132+9 (IN-LB)**2

ITEM - SW130 BENDING MOMENT AT WING STATION 3

Figure 51. Continued
FLIGHT 59, FRAME 031907.00. RECORD LENGTH = 2 SEC.
SCALE FACTOR = \(0.1776 \times (\text{in} \cdot \text{lb})^{0.5} = 0.1438 \times (\text{in} \cdot \text{lb})^{0.5}\)

ITEM - SW133 BENDING MOMENT AT WING STATION 4

*Figure 31. Continued*
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .162+7 (M-N)**2 = .131+9 (IN-LB)**2

ITEM - SW125 TORSION AT WING STATION 1

Figure 31. Continued
FLIGHT 59, FRAME 031907.00, RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.199+6 \ (M-N)^2 = 0.161+8 \ (IN-LB)^2\)

ITEM - SW128 TORSION AT WING STATION 2

Figure 1, Continued
FLIGHT 59, FRAME 031907.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = \(0.341 \times 6 \text{(IN-LB)}^{**2} = 0.277 \times 8 \text{(IN-LB)}^{**2}\)

ITEM - SW131 TORSION AT WING STATION 3

Figure 31. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .564*5 (M-N)**2 = .458*7 (IN-LB)**2

ITEM - SW134 TORSION AT WING STATION 4

Figure 31. Continued
FLIGHT 59, FRAME 031907.00, RECORD LENGTH = 2 SEC
SCALE FACTOR = .536 + 7 \( (N)^2 = .271 + 6 \ (LB)^2 \)

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 51. Continued
FLIGHT 59, FRAME 031907.00. RECORD LENGTH = 2 SEC

SCALE FACTOR = \(0.259 + 7 (N)^2 = 0.131 + 6 (LB)^2\)

ITEM - ST072 SHEAR R/H HORIZ TAIL ROOT

**Figure 51. Continued**
FLIGHT 59, FRAME 031907.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .367+7 (M-N)**2 = .298+9 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 21. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .309*7 (M-N)**2 = .251*9 (IN-LB)**2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 31. Continued
FLIGHT 59. FRAME 031907.00. RECORD LENGTH = 2 SEC
SCALE FACTOR = .430+7 (M-N)**2 = .349+9 (IN-LB)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 31. Continued
FLIGHT 59, FRAME 031907.00, RECORD LENGTH = 2 SEC
SCALE FACTOR = .151+7 (M-N)**2 = .123+9 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 31. Concluded
FLIGHT 48, FRAME 133415.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.283+7 (N)**2 = 1.143+9 (LB)**2

ITEM - SJ077 SHEAR, L/H HORIZ TAIL ROOT

Figure 52. Power Spectra - Flight 48, Run 6, Point 3
T = 133415 0, ΔT = 1 Sec, α_Nom = 9.1 deg,
Δα = 0 83 deg.

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FLIGHT 48. FRAME 133415.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .872 + 6 (N)**2 = .441 + 5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 52. Continued
FLIGHT 48, FRAME 133415.00, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .328 + 7 (M-N)**2 = .266 + 9 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure j2. Continued
FLIGHT 48, FRAME 133415.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = $0.349 + 5(M-N)^2 = 0.283 + 7(IN-LB)^2$
FLIGHT 48. FRAME 133415.00. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .109 + (M-N)^2 = .887 + (IN-LB)^2

ITEM - ST18 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 32. Concluded
FLIGHT 48. FRAME 133416.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .308+7 (N)**2 = .156+6 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 33. Power Spectra - Flight 48, Run 6, Point 4
T = 133416.7, ΔT = 1 Sec, α_Nom = 10 2 deg,
Δα = 1.05 deg.
FLIGHT 48, FRAME 133416.70, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.128 + 7 (N)**2 = 0.647 + 5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 27. Continued
FLIGHT 48. FRAME 133416.70. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .261 + 7 (M-N)**2 = .212 + 9 (IN-LB)**2

ITEM - ST078 BEND. M0M. L/H HORIZ TAIL ROOT

Figure 53, Continued
ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 33. Continued
FLIGHT 40, FRAME 133416.70, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .2198 (M-N)**2 = .17810(IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 3j. Concluded
FLIGHT 48, FRAME 133417.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = .425+7 (N)**2 = .215+6 (Lb)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 1. Power Spectra - Flight 48, Run 6, Point 5

$T_{1} = 133417.3, \Delta T = 1 \text{ Sec}, \alpha_{\text{Nom}} = 11.1 \text{ deg},$

$\Delta \alpha = 1.45 \text{ deg}$
FLIGHT 48, FRAME 133417.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .181 + 7 \( (N)^{**2} \) = .914 + 5 \( (LB)^{**2} \)

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure A. Continued
FLIGHT 48, FRAME 133417.30, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .306 + 7 (M-N)**2 = .248 + 9 (IN-LB)**2

ITEM - ST078 BEND, MOM, L/H HORIZ TAIL ROOT

Figure 34, Continued
FLIGHT 49, FRAME 133417.30, RECORD LENGTH = 1 SEC.
SCALE FACTOR = 0.418 + 6 (M-N)**2 = 0.340 + 8 (IN-LB)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 4. Continued
FLIGHT 48. FRAME 133417.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .324 + 8 (M-N)**2 = .263 + 10(IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 24. Concluded
FLIGHT 48. FRAME 133419.00. RECORD LENGTH = 1 SEC.
SCALE FACTOR = .288 x 7 (N)**2 = .146 x 6 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT
Figure 35. Power Spectra - Flight 48, Run 6, Point 6
T = 133419.0, ΔT = 1 Sec, α_{Nom} = 123 deg.
Δα = 240 deg.

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FLIGHT 48, FRAME 133419.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.266+7 (N)**2 = 1.35+6 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 25. Continued
FLIGHT 48, FRAME 133419.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.3437 (M-N)**2 = 0.2799 (IN-LB)**2

Figure 55. Continued
ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE
FLIGHT 48, FRAME 133419.00, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.560 + 0.8 (M-N)**2 = 0.454 + 10(IN-LB)**2

NORMALIZED POWER SPECTRAL DENSITY - 1/Hz

FREQUENCY (Hz)

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 35. Concluded
ITEM - SBO77 SHEAR, L/H HORIZ TAIL ROOT

Figure 16. Power Spectra - Flight 48, Run 6, Point 7
T1 = 133420, ΔT = 1 Sec, αNom = 15.3 deg,
Δα = 2.35 deg
FLIGHT 48, FRAME 133420.30. RECORD LENGTH = 1 SEC.

SCALE FACTOR = .473*7 (N)**2 = .239*6 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 96. Continued
FLIGHT 48, FRAME 133420.30, RECORD LENGTH = 1 SEC.
SCALE FACTOR = .319 + 7 (M-N)**2 = .259 + 9 (IN-LB)**2

ITEM - ST078 BEND MOM L/H HORIZ TAIL ROOT

Figure 36. Continued
FLIGHT 48, FRAME 133420.30, RECORD LENGTH = 1 SEC.

SCALE FACTOR = 0.121 + 7 (M-N)**2 = 0.981 + 8 (IN-LB)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 6. Continued
FLIGHT 48, FRAME 133420.30, RECORD LENGTH = 1 SEC.
SCALE FACTOR = \(0.139 \times 9 \text{ (M-N)}^2 = 0.113 \times 11 \text{ (IN-LB)}^2\)

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 26, Concluded
ITEM - STOE SHEAR, L/H HORIZ TAIL ROOT

Figure 7. Power Spectra - Flight 77, Run S&C-R, Point 7

$T = 153311.0, \Delta T = 2 \text{ Sec}, \alpha_{\text{Nom}} = 5.1 \text{ deg}, \Delta \alpha = 1.76 \text{ deg}$
FLIGHT 77. FRAME 153311.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .214+6 (N)**2 = .108+5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 37. Continued
FLIGHT 77, FRAME 153311.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .392+6 (M-N)**2 = .318+8 (IN-LB)**2

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ITEM - ST078 BEND, MOM. L/H HORIZ TAIL ROOT

Figure 71. Continued
FLIGHT 77, FRAME 153311.00, RECORD LENGTH = 2 SEC.
SCALE FACTOR = \(0.116 + 6 (M-N) L^2 = 0.958 + 7 (IN-LB)^2\)

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 57. Continued
FLIGHT 77, FRAME 153311.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .146+6 (M-N)^2 = .118+8 (IN-LB)^2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 57. Continued
FLIGHT 77, FRAME 153311.00. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .486 + 5 (M-N) \times 2 = .395 + 7 (IN-LB) \times 2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 57. Concluded
FLIGHT 77. FRAME 153315.50. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .502+6 (N)**2 = .254+5 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 39. Power Spectra Flight 77, Run S&G-R, Point 8
T = 153315 5, \Delta T = 2 Sec, \alpha_{Nom} = 71 deg,
\Delta \alpha = 0.32 deg
FLIGHT 77, FRAME 153315.50, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .543\times 6 (N)**2 = .275\times 5 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 58. Continued
FLIGHT 77, FRAME 153315.50. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .530+6 (M-N)**2 = .430+8 (IN-LB)**2

ITEM - ST078 BEND. MOM. L/H HORIZ TAIL ROOT

Figure 23. Continued
FLIGHT 77. FRAME 153315.50. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .233+6 (M-N)**2 = .189+8 (IN-LB)**2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 38. Continued
FLIGHT 77, FRAME 153315.50, RECORD LENGTH = 2 SEC.

SCALE FACTOR = \( 0.415 + 6 (M-N)^{2} = 0.337 + 8 \text{(IN-LB)}^{2} \)

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 38. Continued
FLIGHT 77, FRAME 153315.50. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .147+6 (M-N)**2 = .120+8 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 38. Concluded
ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 19. Power Spectra - Flight 77, Run S&C-R, Point 9
\[ T_i = 153318.5, \Delta T = 2 \text{ Sec}, \alpha_{\text{Nom}} = 9.2 \text{ deg}, \]
\[ \Delta \alpha = 1.24 \text{ deg}. \]
FLIGHT 77, FRAME 153318.50, RECORD LENGTH = 2 SEC.
SCALE FACTOR = .219+7 (N)**2 = .111+6 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 59. Continued
FLIGHT 77, FRAME 153318.50. RECORD LENGTH = 2 SEC.
SCALE FACTOR = 0.1797 (m-N)**2 = 0.1469 (in-lb)**2

ITEM - ST078 BEND, MOM. L/H HORIZ TAIL ROOT

Figure 59. Continued
FLIGHT 77, FRAME 153318.50, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .1237 (M-N)**2 = .9958 (IN-LB)**2

ITEM - ST073 BENO. MOM. R/H HORIZ TAIL ROOT

Figure 59. Continued
FLIGHT 77, FRAME 153318.50. RECORD LENGTH = 2 SEC.

SCALE FACTOR = 0.114 * (M-N)\(^2\) = 0.927 * (IN-LB)\(^2\)

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ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure 39. Continued
FLIGHT 77, FRAME 153318.50. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .148 + 7 (M-N)**2 = .120 + 9 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 59. Concluded
FLIGHT 77, FRAME 153322.35, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .286 X 7 (N)**2 = .145 X 6 (LB)**2

ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 40. Power Spectra - Flight 77, Run S&C-R, Point 10

T = 153322.35, ΔT = 2 Sec, α_Nom = 12.2 deg,

Δα = 255 deg.
FLIGHT 77, FRAME 153322.35, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .525+7 (N)**2 = .265+6 (LB)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 40. Continued
FLIGHT 77, FRAME 153322.35, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .2327 (M-N)**2 = .1889 (IN-LB)**2

ITEM - ST078 BEND, MOM, L/H HORIZ TAIL ROOT

Figure 40. Continued
FLIGHT 77. FRAME 153322.35. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .284+7 (M-N)**2 = .231+9 (IN-LB)**2

ITEM - ST073 BEND. MOM. R/H HORIZ TAIL ROOT

Figure 40. Continued
FLIGHT 77, FRAME 153322.35, RECORD LENGTH = 2 SEC.
SCALE FACTOR = .244+7 (M-N)**2 = .198+9 (IN-LB)**2

Figure 40. Continued

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE
FLIGHT 77, FRAME 153322.35. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .309+7 (M-N)**2 = .251+9 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 40. Concluded
ITEM - ST077 SHEAR, L/H HORIZ TAIL ROOT

Figure 41. Power Spectra - Flight 77, Run S&C-R, Point 11
T = 153324.35, ΔT = 2 Sec, α_Nom = 14.8 deg,
Δα = 2.15 deg.
FLIGHT 77. FRAME 153324.35. RECORD LENGTH = 2 SEC.

SCALE FACTOR = .663+7 (N)**2 = .335+6 (L8)**2

ITEM - ST072 SHEAR, R/H HORIZ TAIL ROOT

Figure 41. Continued
FLIGHT 77, FRAME 153324.35. RECORD LENGTH = 2 SEC.
SCALE FACTOR = .4397 \((M-N)^2\) = .3579 \((\text{IN-LB})^2\)

ITEM - ST078 BEND, MOM, L/H HORIZ TAIL ROOT

Figure 41. Continued
FLIGHT 77, FRAME 153324.35, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .349\times10^7 (\text{M-N})^2 \times 2 = .283\times10^9 (\text{IN-LB})^2

ITEM - ST073 BEND, MOM, R/H HORIZ TAIL ROOT

Figure 41, Continued
FLIGHT 77, FRAME 153324.35, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .417+7 (M-N)**2 = .338+9 (IN-LB)**2

ITEM - ST135 TORSION, L/H HORIZ TAIL HINGE LINE

Figure A1. Continued
FLIGHT 77, FRAME 153324.35, RECORD LENGTH = 2 SEC.

SCALE FACTOR = .209+7 (M-N)**2 = .234+9 (IN-LB)**2

ITEM - ST118 TORSION, R/H HORIZ TAIL HINGE LINE

Figure 41. Concluded
REFERENCES


