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COMPUTED RESPONSES OF SEVERAL AIRCRAFT TO ATMOSPHERIC TURBULENCE AND DISCRETE WIND SHEARS

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FOREWORD

This report was prepared under Contract NAS2-8889 between Systems Technology, Inc., Mountain View, California, and the National Aeronautics and Space Administration. The NASA project engineer was John D. Stewart of NASA/Ames Research Center. The STI project engineer was Robert L. Stapleford.

ABSTRACT

The computed RMS and peak responses due to atmospheric turbulence and discrete wind shears, respectively, are presented for several aircraft in different flight conditions. The responses are presented with and without the effects of a typical second order washout filter. A complete set of dimensional stability derivatives for each aircraft/flight condition combination evaluated is also presented.

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LIST OF ABBREVIATIONS

c.g.	Center of gravity. Units are those associated with the the particular aircraft.
FRL	Fuselage reference line
RMS	Root mean square

LIST OF SYMBOLS

b	Wing span or characteristic width
g	Acceleration of gravity
h	Perturbed altitude of the aircraft
h_o	Initial altitude of the aircraft with respect to sea level
h_R	Reference altitude used to calculate the gust scale lengths
K_θ	Pilot model gain in pitch axis
K_φ	Pilot model gain in roll axis
L_u, L_v, L_w	Scale lengths used in the atmospheric turbulence model
ℓ_x, ℓ_z	The x and z components of the pilot station with respect to the aircraft c.g.
P	Probability of exceedance
P_1	Probability of encountering turbulence
p, q, r	Components of the aircraft angular velocity with respect to an aircraft body-fixed axis system in the x, y, and z directions, respectively
p_g, q_g, r_g	Angular components of atmospheric turbulence with respect to an aircraft body-fixed axis system in the x, y, and z directions, respectively
SF	Scale factor used to compute RMS responses for values of P other than 0.01
s	Laplace operator
T_E	Pilot lag
T_L	Pilot lead
U_o, W_o	x and z components of the aircraft trim velocity with respect to the aircraft body axis system
u, v, w	Linear perturbation components of the aircraft velocity with respect to an aircraft body-fixed axis system in the x, y, and z directions, respectively

$\eta_1, \eta_2, \eta_3, \eta_4$	Uncorrelated white noise sources with unity power spectral density
u_g, v_g, w_g	Linear components of atmospheric turbulence with respect to an aircraft body-fixed axis system in the x, y, and z directions, respectively
V_{hw}	Discrete wind shear in either the x or y directions of the earth axis system
V_{T_o}	Magnitude of the trim aircraft velocity with respect to the air mass
W	Aircraft weight
x,y	Perturbed components of the aircraft position with respect to an earth-fixed axis system
α_o	This parameter defines the axis system of the stability derivatives. $\alpha_o = 0$ implies the stability derivatives are with respect to the conventional body-fixed stability axis system. $\alpha_o = \alpha_t$ implies the stability derivatives are with respect to the FRL body-fixed axis system
α_t	Trim angle of attack with respect to the FRL
β	Sideslip angle, v/V_{T_o}
β_g	v_g/V_{T_o}
γ_o	Initial flight path angle
δ_a	Aileron or primary roll control
δ_e	Elevator or primary pitch control
θ_o	Initial pitch attitude of the aircraft
σ_p	RMS value of the p-component of atmospheric turbulence
$\sigma_u, \sigma_v, \sigma_w$	RMS values of the atmospheric turbulence in the x, y, and z directions with respect to aircraft axis system
φ, θ, ψ	Perturbation components of the aircraft Euler angles
σ_R	Mode of the Rayleigh density function for σ_u

SUBSCRIPTS

p	At pilot station
wo	Washed out
g	Gust

SECTION I

INTRODUCTION

When using a motion simulator to conduct experiments involving piloted aircraft the researcher may ask the following questions: "How much motion is required to represent the piloted aircraft in a given flight condition?" and "Will these motions be within the capabilities of available simulators?" This report presents gust induced motion requirements of several aircraft in different flight conditions, and hence provides the researcher with a rough guide for answering the above questions. These motion requirements are based on computations of:

1. RMS response to atmospheric turbulence.

2. Peak response to a discrete wind shear.

The response calculations were done with and without the effects of a second order washout filter. A reasonable upper limit was used for the filter break frequency, and thus the results should be representative of the maximum effects of simulator motion logic.

It was desired that the results be indicative of responses when a pilot is flying the aircraft. However, because of the number of configurations, a complete multiloop pilot/vehicle analysis for each aircraft/flight condition combination was too costly. Thus a relatively simple pitch and roll attitude pilot model was designed for each aircraft/flight condition combination. The pilot models stabilize the phugoid and spiral modes (which would otherwise tend to dominate the response calculations), and thus perform one of the major functions of a real pilot.

Section II of this report contains descriptions of the mathematical models used to make the response calculations. These models include the aircraft dynamics, atmospheric turbulence, wind shear, washout logic, and pilot model.

Section III contains descriptions of the aircraft and flight conditions evaluated. These include a complete set of stability derivatives for each aircraft/flight condition combination.

Section IV contains the tabulated results.

SECTION II

MODEL DEFINITION

A. UNCOUPLED AIRCRAFT EQUATIONS OF MOTION

The uncoupled, small perturbation equations of motion used here are given in Table II-1. These equations are written with respect to an aircraft body-fixed axis system. They include provisions for one longitudinal and one lateral-directional control (δ_e, δ_a), random gusts with respect to all axes (u_g, w_g, etc.), and a discrete wind with respect to the horizon (V_{hw}). A complete discussion of these equations and their stability and control derivatives can be found in Reference 1.

B. KINEMATIC EQUATIONS

Table II-2a relates the aircraft Euler angle rates to the aircraft body axis angular rates. Note that the Euler angles would also be the gimbal angles of an aircraft simulator if the motion were one-to-one and the gimbals were arranged in the sequence Ψ, Θ, Φ progressing from earth to body.

Table II-2b contains expressions for the accelerations of the pilot station with respect to an earth-fixed axis system. Accelerations, velocities, and displacements are expressed in an earth-fixed axis system and would correspond to the motion of a simulator if it were to follow the actual aircraft's motion one-to-one. (The vertical offset of the pilot station from the aircraft c.g. has been neglected in the expression for $\ddot{x}_p$.)

C. ATMOSPHERIC TURBULENCE

The aircraft RMS response to atmospheric turbulence with and without motion washout filters was computed for all aircraft states except the

TABLE II-1

UNCOUPLED AIRCRAFT EQUATIONS OF MOTION

A. LONGITUDINAL

$$\dot{u} = X_u (u - u_g) + X_w (w - w_g) + X_q (q - q_g) - W_o q - (g \cos \theta_o) \theta$$
$$+ X_{\delta_e} \delta_e - (X_u \cos \theta_o + X_w \sin \theta_o) V_{hw} + (X_q \sin \theta_o / V_{T_o}) \dot{V}_{hw}$$

$$\dot{w} = Z_u (u - u_g) + Z_w (w - w_g) + Z_{\dot{w}} (\dot{w} - \dot{w}_g) + Z_q (q - q_g) + U_o q$$
$$- (g \sin \theta_o) \theta + Z_{\delta_e} \delta_e - (Z_u \cos \theta_o + Z_w \sin \theta_o) V_{hw}$$
$$+ (Z_q \sin \theta_o / V_{T_o}) \dot{V}_{hw}$$

$$\dot{q} = M_u (u - u_g) + M_w (w - w_g) + M_{\dot{w}} (\dot{w} - \dot{w}_g) + M_q (q - q_g) + M_{\delta_e} \delta_e$$
$$- (M_u \cos \theta_o + M_w \sin \theta_o) V_{hw} + (M_q \sin \theta_o / V_{T_o}) \dot{V}_{hw}$$

B. LATERAL-DIRECTIONAL

$$\dot{\beta} = Y_v (\beta - \beta_g) + \frac{Y_p}{V_{T_o}} (p - p_g) + \frac{Y_r}{V_{T_o}} (r - r_g) + \frac{W_o}{V_{T_o}} p - \frac{U_o}{V_{T_o}} r$$
$$+ \frac{g \cos \theta_o}{V_{T_o}} \varphi + Y^*_{\delta_a} \delta_a - \frac{Y_v}{V_{T_o}} V_{hw} - \frac{Y_r}{V_{T_o}^2} \dot{V}_{hw}$$

$$\dot{p} = L'_\beta (\beta - \beta_g) + L'_p (p - p_g) + L'_r r + L'_{\delta_a} \delta_a - \frac{L'_\beta}{V_{T_o}} V_{hw}$$

$$\dot{r} = N'_\beta (\beta - \beta_g) + N'_p (p - p_g) + N'_r (r - r_g) + N'_{\delta_a} \delta_a$$
$$- \frac{N'_\beta}{V_{T_o}} V_{hw} - \frac{N'_r}{V_{T_o}} \dot{V}_{hw}$$

TABLE II-2

REQUIRED KINEMATIC EQUATIONS

A. EULER ANGLES

$$\dot{\phi} = p + (\tan \theta_o)\, r$$

$$\dot{\theta} = q$$

$$\dot{\psi} = (\sec \theta_o)\, r$$

B. LINEAR MOTIONS AT THE PILOT STATION

$$\ddot{x}_p \doteq (\cos \theta_o)\, \dot{u} + (\sin \theta_o)\, \dot{w} + (W_o \cos \theta_o - U_o \sin \theta_o)\, q$$

$$\ddot{y}_p = V_{T_o}\, \dot{\beta} - \ell_z\, \dot{p} + \ell_x\, \dot{r} - W_o p + U_o r$$

$$\ddot{h}_p = (\sin \theta_o)\, \dot{u} - (\cos \theta_o)\, \dot{w} + \ell_x\, \dot{q} + (W_o \sin \theta_o + U_o \cos \theta_o)\, q$$

linear positions without washout filters (x_p, y_p, h_p), which were excluded because their RMS responses are unbounded.

For the longitudinal cases this involved the evaluation of the aircraft response to random gusts parallel and perpendicular to the aircraft's FRL x-axis (u_g, w_g). The effect of an axial variation in w_g (q_g) was also included.

For the lateral-directional cases this involved the evaluation of the aircraft response to random gusts parallel to the aircraft's y-axis (v_g) and to roll gusts* (p_g). The effect of an axial variation in v_g (r_g) was also included.

For the lateral-directional case the RMS values of the states $\dot{y}_p$ and ψ only include the effects of v_g. This is because their RMS responses to p_g are unbounded.

The subsections below contain a succinct description of the atmospheric turbulence model used and a description of a method for scaling the RMS response data contained herein to different values of probabilities of exceedance.

1. Model Definition

The atmospheric turbulence model specified in References 2 and 3 was used. For convenience the bare essentials of that model are reproduced below.

Equations for the linear (u_g, v_g, w_g) and angular (p_g, q_g, r_g) components of atmospheric turbulence with respect to the aircraft body axis are delineated in Table II-3. In these equations η_1, η_2, η_3, and η_4 are uncorrelated white noise sources with unity power spectral density. σ_u, σ_β, and σ_w are the RMS levels of the u, v ($\sigma_\beta = \sigma_v/V_{T_o}$), and w components of the atmospheric turbulence, respectively. All are functions of the aircraft altitude (h_o) and a specified probability of exceedance (P). These functions are defined below.

The Rayleigh distribution function of Equation II-1 was used to calculate σ_u.

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* Roll gusts result from a spanwise variation of the vertical gusts.

TABLE II-3

EQUATIONS FOR THE LINEAR AND ANGULAR COMPONENTS OF ATMOSPHERIC TURBULENCE

$$u_g = \sigma_u \sqrt{\frac{2V_{T_o}}{L_u}} \left[\frac{1}{s + \frac{V_{T_o}}{L_u}} \right] \eta_1$$

$$w_g = \sigma_w \sqrt{\frac{3V_{T_o}}{L_w}} \left[\frac{s + \frac{V_{T_o}}{\sqrt{3}\, L_w}}{\left(s + \frac{V_{T_o}}{L_w} \right)^2} \right] \eta_2$$

$$\beta_g = \sigma_\beta \sqrt{\frac{3V_{T_o}}{L_v}} \left[\frac{s + \frac{V_{T_o}}{\sqrt{3}\, L_v}}{\left(s + \frac{V_{T_o}}{L_v} \right)^2} \right] \eta_3$$

$$p_g = \sigma_w \sqrt{\frac{0.8\,\pi}{L_w V_{T_o}}} \left(\frac{\pi L_w}{4b} \right)^{1/6} \left[\frac{\pi V_{T_o}/4b}{s + \pi V_{T_o}/4b} \right] \eta_4$$

$$q_g = \left[\frac{-\pi/4b}{s + \pi V_{T_o}/4b} \right] \dot{w}_g$$

$$r_g = \left[\frac{\pi V_{T_o}/3b}{s + \pi V_{T_o}/3b} \right] \dot{\beta}_g$$

$$P = P_1 \cdot \mathrm{EXP}\left[-\frac{1}{2}\left(\sigma_u/\sigma_R\right)^2\right] \qquad \text{II-1}$$

$$\sigma_R = 0.70 \text{ m/s } (2.3 \text{ ft/s})$$

The parameter P_1 in Equation II-1 is the probability of encountering turbulence at an altitude h_o. It is plotted in Figure II-1 for altitudes up to 30,480 m (100,000 ft). The parameter P was set to 0.01 for all work contained in this report (i.e., a 1% probability of exceedance). The parameter σ_R is the mode of the Rayleigh density function for σ_u (note that σ_R^2 is one half the expected value of σ_u^2).

σ_w and σ_v are functions of σ_u and the scale lengths (L_u, L_v, L_w). The scale lengths are functions of altitude. Mathematical expressions for all these parameters are given in Equations II-2 through II-6.

$$\sigma_v = \sigma_u \qquad \text{II-2}$$

$$\sigma_w = \sigma_u \sqrt{\frac{L_w}{L_u}} \qquad \text{II-3}$$

$$L_u = \begin{cases} h_R & \text{for } h_o \geq h_R \\ \left(h_R^2\, h_o\right)^{1/3} & \text{for } h_o \leq h_R \end{cases} \qquad \text{II-4}$$

$$L_v = L_u \qquad \text{II-5}$$

$$L_w = \begin{cases} h_R & \text{for } h_o \geq h_R \\ h_o & \text{for } h_o \leq h_R \end{cases} \qquad \text{II-6}$$

$$h_R = 533 \text{ m } (1750 \text{ ft})$$

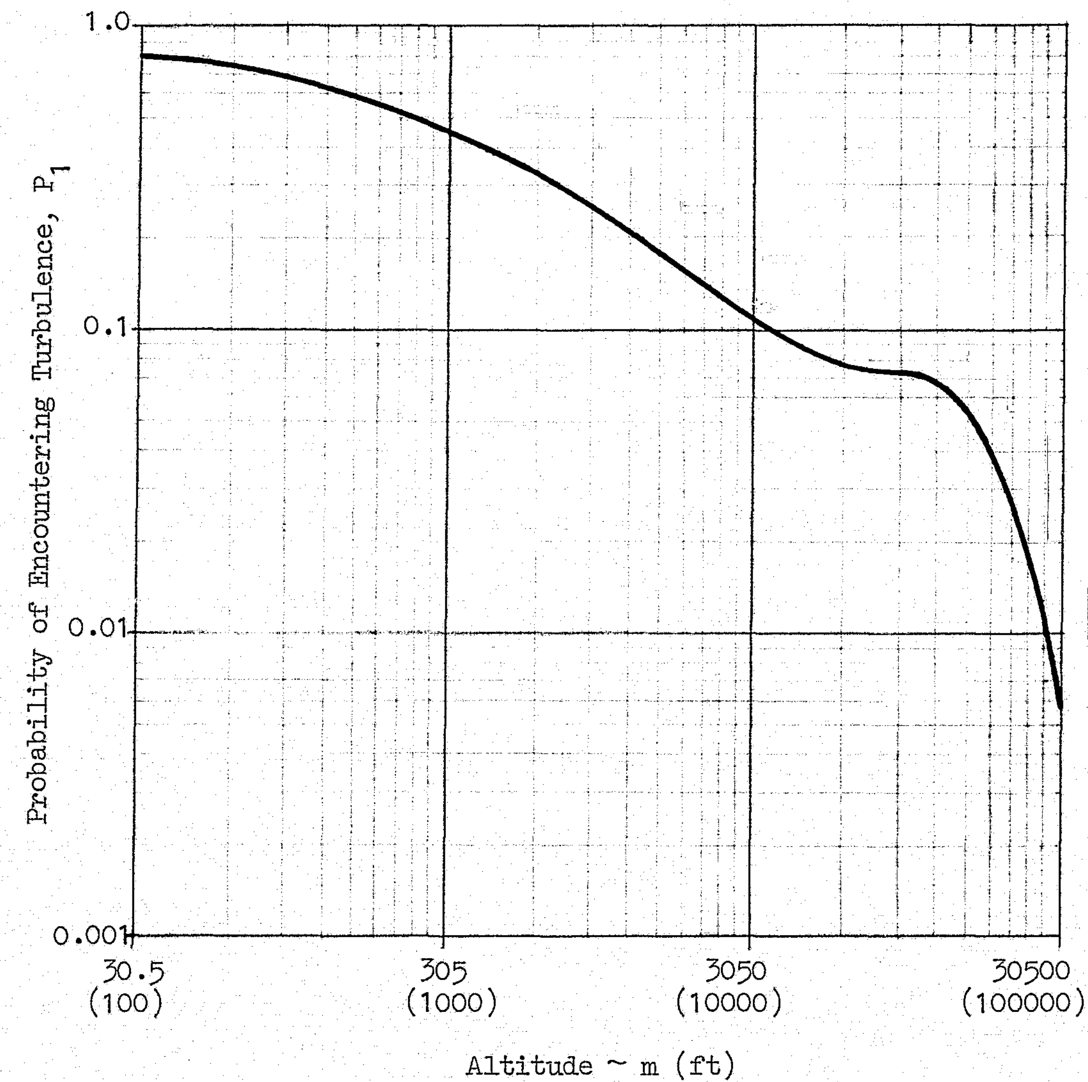


Figure II-1: Probability of Encountering Turbulence
(Adapted from Reference 2)

2. Scaling the RMS Response

As mentioned above, all data in this report are for a probability of exceedance of 1% (P = 0.01). However, because all RMS responses vary linearly with σ_u (which is a function of P and h), it is a simple procedure to scale the results contained herein for any desired value of P. The proper scale factor (SF) can be derived from Equation II-1. The result is:

$$SF \triangleq \frac{\sigma\ (P)}{\sigma\ (P = 0.01)} = \sqrt{\frac{\ell n\ (P_1/P)}{\ell n\ (100\ P_1)}} \qquad \text{II-7}$$

where P_1 is obtained from Figure II-1.

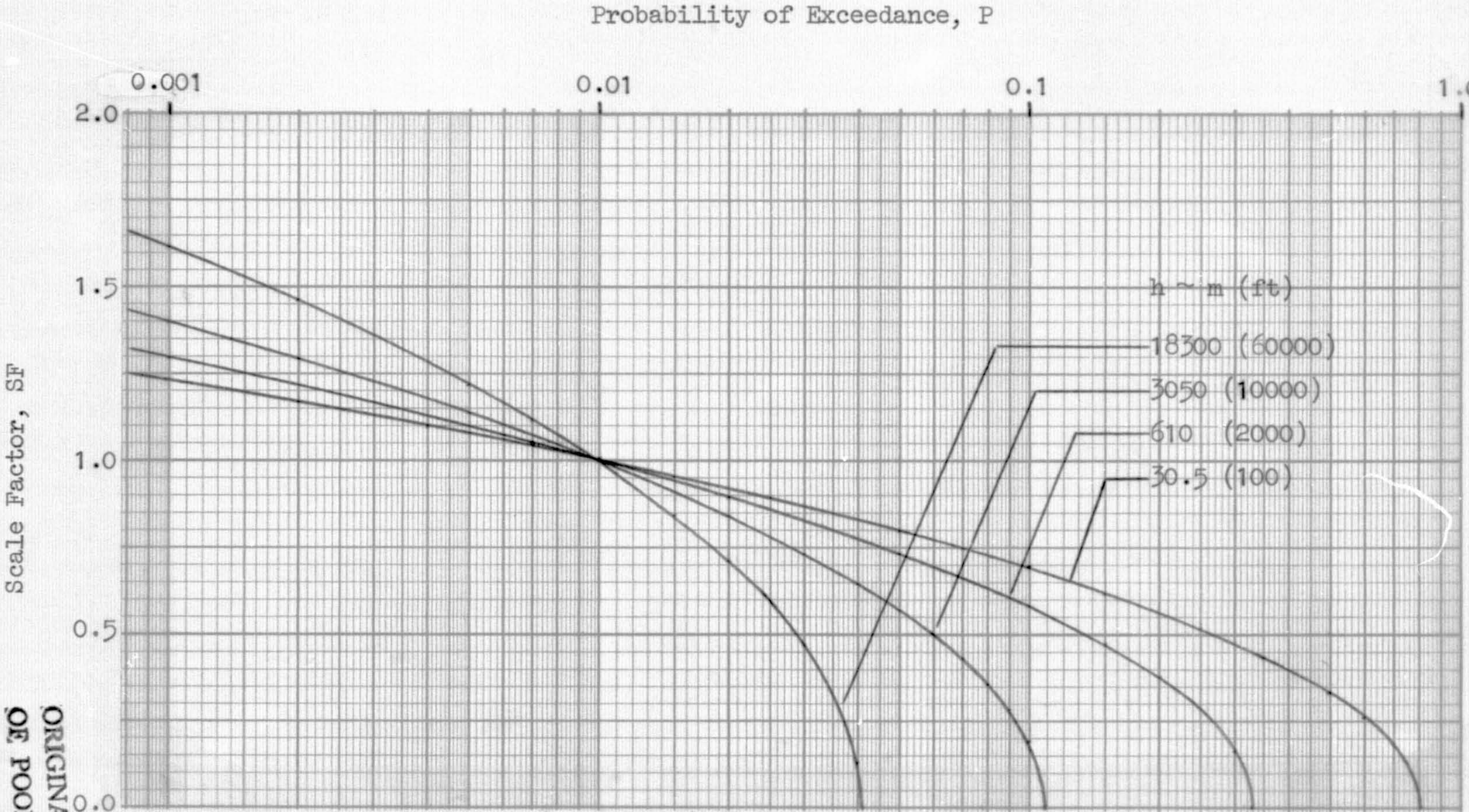
For convenience, Equation II-7 is plotted in Figure II-2 for a few key values of h_o.

D. WIND SHEAR

The aircraft's peak response to a discrete wind shear with and without motion washout filters was computed for both the longitudinal and lateral-directional cases. This was accomplished by saving the sign and maximum absolute value of each aircraft state. The search included the time from shear onset to 40 seconds after the shear ceased.

For the longitudinal cases an increasing tail wind was used. For the lateral-directional cases an increasing wind from the left side was used. In all cases the wind shear was 1 kt/sec and lasted for 10 seconds.

The peak response was computed for all aircraft states except the linear positions without washout filters (x_p, y_p, h_p). These were excluded because their responses are unbounded.



Notes: 1. See Equation II-7 for an explicit expression of SF as a function of P and P_1.

2. P_1 is plotted versus h in Figure II-1.

Figure II-2: Turbulence Scale Factor Versus Probability of Exceedance for Constant Values of Altitude

ORIGINAL ... OF POOR QUALITY

E. WASHOUT LOGIC

The underlying purpose of most simulator motion logic is to reduce the motions of the simulator such that the physical limits of the simulator are not exceeded. This is usually accomplished by the use of scale factors and/or washout filters.

The effect of scale factors on simulator motion fidelity (i.e., simulated versus actual aircraft motion) are easy to account for. However, the effect of washout filters are not. Thus the task of choosing the type of washout filter (and its associated parameters) best suited for a particular combination of aircraft and mission is very nebulous. In fact, the choice of the washout filter parameters has been described as an "organized art".

For the purposes of this study, though, it was decided to choose the following washout filter and parameters:

1. A second order washout filter,

$$i \longrightarrow \boxed{\frac{s^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}} \longrightarrow i_{wo}$$

2. A typical damping ratio, $\zeta = 0.7$

3. A reasonable upper limit of the break frequency, $\omega_n = 1.0$ rad/sec.

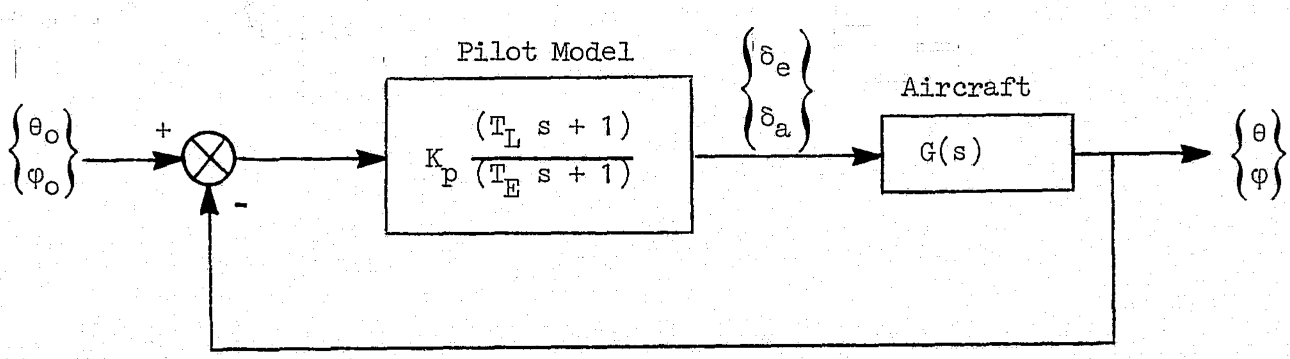
The large value of ω_n was used to demonstrate the maximum effects of a washout filter on the resulting simulator motions.

The above described washout filter was applied to all the linear and angular positions, velocities, and accelerations of the aircraft. Note that the washed-out responses of the linear positions to atmospheric turbulence and discrete wind shears all have finite values (the unwashed-out values are unbounded).

F. PILOT MODEL

Pilot models were used to stabilize pitch and roll attitudes. This prevents the phugoid or spiral modes from dominating the effects of external disturbances, and thus provides a more realistic evaluation of aircraft motions.

Both pilot models were identical and of the form shown below.



The pilot lag term, T_E, was set to 0.333 sec for all cases. The pilot lead term, T_L, was adjusted such that the phase margin would be at least 45 deg at a crossover frequency of 1.5 rad/sec. The pilot gain, K_p, was set to provide a crossover frequency of 1.5 rad/sec. Mathematically, T_L and K_p can be computed from:

If $\angle G(j\,1.5) \geq -108.4$ deg (i.e., airplane plus pilot lag = 135 deg)

$$T_L = 0$$

$$K_p = \frac{\sqrt{5}}{2\,|G(j\,1.5)|}$$

If $\angle G(j\,1.5) < -108.4$ deg

$$T_L = \frac{1}{1.5}\tan\left[-108.4 - \angle G(j\,1.5)\right]$$

$$K_p = \frac{\sqrt{5}\,\cos\left[-108.4 - \angle G(j\,1.5)\right]}{2\,|G(j\,1.5)|}$$

where $\angle G(j\,1.5)$ = Phase of θ/δ_e or φ/δ_a at $\omega = 1.5$ rad/sec

$|G(j\,1.5)|$ = Magnitude of θ/δ_e or φ/δ_a at $\omega = 1.5$ rad/sec

and the factor of $\sqrt{5}/2$ accounts for the magnitude of the pilot lag term at $s = 1.5\,j$

SECTION III

DESCRIPTIONS OF AIRCRAFT AND FLIGHT CONDITIONS

A. GENERAL DESCRIPTIONS OF AIRCRAFT

The 10 aircraft selected fall into the following general categories:

- 2 Light-weight, powered-lift STOL
- 2 Medium-weight, powered-lift STOL
- 1 Light-weight, non-powered-lift STOL
- 1 Medium-weight, conventional jet transport
- 1 Heavy-weight, conventional jet transport
- 1 Large supersonic bomber
- 1 Heavy-weight helicopter
- 1 Light-weight helicopter

Brief descriptions of each aircraft are contained in the following subsections. The data sources for each aircraft are also given.

1. AWJSRA

The NASA Augmentor Wing Jet STOL Research Aircraft is a light-weight powered-lift STOL aircraft modified from a de Havilland C-8A Buffalo. The flight conditions evaluated are:

a. Approach at an altitude of 30.5 m (100 ft)

b. Approach at an altitude of 610 m (2000 ft)

The data source used was Reference 4.

2. BR 941S

The Breguet 941S is a light-weight deflected slipstream powered-lift STOL aircraft. The flight conditions evaluated are:

a. Approach at an altitude of 30.5 m (100 ft)

b. Takeoff at an altitude of 30.5 m (100 ft)

The data source used was Reference 5.

3. STOL-X

The STOL-X is a medium-weight powered-lift STOL aircraft model developed for an FAA/NASA simulation investigation of STOL airworthiness criteria, and intended as a generic model representative of powered-lift STOL aircraft. The flight condition evaluated is approach at an altitude of 30.5 m (100 ft). The data source used was Reference 6.

4. AMST

The so-called "AMST" is a model of a medium-weight powered-lift STOL aircraft and is representative of the Advanced Medium STOL Transport being developed by the U.S. Air Force. The flight condition evaluated is approach at 30.5 m (100 ft). The data source used was Reference 7.

5. DHC-6

The de Havilland Twin Otter is a light-weight, non-powered-lift STOL aircraft. The flight conditions evaluated are:

a. Approach at an altitude of 30.5 m (100 ft)

b. Approach at an altitude of 610 m (2000 ft)

c. Takeoff at an altitude of 30.5 m (100 ft)

The data sources used were References 8 and 9.

6. CV-880M

The Convair 880M is a medium-weight conventional jet transport. The flight conditions evaluated are:

a. Approach at an altitude of 30.5 m (100 ft)

b. Turbulence penetration at an altitude of 7010 m (23000 ft)

c. Cruise at an altitude of 10675 m (35000 ft)

The data source used was Reference 10.

7. B-747

The Boeing 747 is a heavy-weight conventional jet transport. The flight conditions evaluated are:

a. Approach at an altitude of 30.5 m (100 ft)

b. Approach at an altitude of 610 m (2000 ft)

c. Takeoff at an altitude of 30.5 m (100 ft)

d. Turbulence penetration at an altitude of 6100 m (20000 ft)

e. Cruise at an altitude of 10675 (35000 ft)

The data sources used were References 10, 11, and 12.

8. XB-70A

The XB-70A was originally designed as a weapons system with long range, supersonic cruise capabilities. It is used here to also represent a supersonic transport class of aircraft. The flight conditions evaluated are:

a. Approach at an altitude of 30.5 m (100 ft)

b. Approach at an altitude of 610 m (2000 ft)

c. Subsonic cruise at an altitude of 12190 m (40000 ft)

d. Supersonic cruise at an altitude of 18300 m (60000 ft)

The data source used was Reference 10.

9. CH-53A

The CH-53A is a heavy-weight, single rotor transport helicopter. The flight conditions evaluated are:

a. Approach at an altitude of 30.5 m (100 ft)

b. Approach at an altitude of 610 m (2000 ft)

c. Hover* at an altitude of 30.5 m (100 ft)

d. Cruise at an altitude of 30.5 m (100 ft)

The data source used was Reference 13.

10. H-19

The H-19 is a light-weight, single rotor helicopter. The flight conditions evaluated are:

a. Hover* at an altitude of 30.5 (100 ft)

b. Cruise at an altitude of 30.5 m (100 ft)

The data source used was Reference 14.

B. GENERAL DESCRIPTIONS OF FLIGHT CONDITIONS

Brief descriptions of the aircraft/flight condition combinations selected are contained in Table III-1. These descriptions are intended to complement the purely numerical descriptions contained in Section III-C, and aid in the interpretation of the results contained in Section IV.

The parameter "aircraft" in Table III-1 is the standard designation used by the manufacturer. The "flight condition" describes the aircraft's state in terms associated with that aircraft. The parameters W, c.g., airspeed, γ_o, θ_o, and h_o are all self-explanatory. The parameter "configuration" is derived from the aircraft and flight condition by compressing the manufacturer's designation, and then adding the following code:

-A for approach

-T for takeoff

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* The "hover" case is actually for an airspeed of 15 kt. Zero airspeed cannot be used with the turbulence model.

TABLE III-1

FLIGHT CONDITION DESCRIPTIONS

Aircraft	AWJSRA	AWJSRA	BR 941S	BR 941S
Flight Condition	Approach 65 deg flaps 75 deg nozzles	Approach 65 deg flaps 75 deg nozzles	Approach 95 deg flaps zero trans.	Takeoff 45 deg flaps zero trans.
W ~ kg (lb)	18144 (40000)	18144 (40000)	20412 (45000)	20412 (45000)
c.g.	B.S. 341.2	B.S. 341.2	0.27 $\bar{c}$	0.27 $\bar{c}$
Airspeed ~ kt or [M]	65	65	65	75
γ_o ~ deg	-7.5	-7.5	-7.5	10.8
θ_o ~ deg	-2.3	-2.3	-9.6	10.2
h_o ~ m (ft)	30.5 (100)	610 (2000)	30.5 (100)	30.5 (100)
Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T

TABLE III-1 (Continued)

Aircraft	STOL-X	AMST	DHC-6	DHC-6
Flight Condition	Approach Flaps down	Approach Flaps down	Approach 40 deg flaps	Approach 40 deg flaps
W ~ kg (lb)	56699 (125000)	68040 (150000)	4990 (11000)	4990 (11000)
c.g.	0.25 $\bar{c}$	0.30 $\bar{c}$	0.22 $\bar{c}$	0.22 $\bar{c}$
Airspeed ~ kt or [M]	63.5	85	70	70
γ_o ~ deg	-6.0	-6.0	-5.4	-5.4
θ_o ~ deg	-3.5	0.1	-10.5	-10.5
h_o ~ m (ft)	30.5 (100)	30.5 (100)	30.5 (100)	610 (2000)
Configuration	STOLX-A	AMST-A	DHC6-A1	DHC6-A2

TABLE III-1 (Continued)

Aircraft	DHC-6	CV-880M	CV-880M	CV-880M
Flight Condition	Takeoff 20 deg flaps	Approach 50 deg flaps	Penetration Clean	Cruise Clean
W ~ kg (lb)	5253 (11580)	57153 (126000)	70307 (155000)	70307 (155000)
c.g.	0.22 $\bar{c}$	0.195 $\bar{c}$	0.25 $\bar{c}$	0.25 $\bar{c}$
Airspeed ~ kt or [M]	80	134	[0.60]	[0.86]
γ_o ~ deg	8.8	-3.0	0.0	0.0
θ_o ~ deg	6.2	2.2	5.3	4.0
h_o ~ m (ft)	30.5 (100)	30.5 (100)	7010 (23000)	10670 (35000)
Configuration	DHC6-T	CV880-A	CV880-P	CV880-C

TABLE III-1 (Continued)

Aircraft	B-747	B-747	B-747	B-747
Flight Condition	Approach 30 deg flaps	Approach 30 deg flaps	Takeoff 10 deg flaps	Penetration Clean
W ~ kg (lb)	258552 (570000)	258552 (570000)	332489 (733000)	288773 (636600)
c.g.	0.25 $\bar{c}$	0.25 $\bar{c}$	0.25 $\bar{c}$	0.25 $\bar{c}$
Airspeed ~ kt or [M]	142	142	173	[0.65]
γ_o ~ deg	-3.0	-3.0	2.5	0.0
θ_o ~ deg	1.4	1.4	12.5	2.5
h_o ~ m (ft)	30.5 (100)	610 (2000)	30.5 (100)	6100 (20000)
Configuration	B747-A1	B747-A2	B747-T	B747-P

TABLE III-1 (Continued)

Aircraft	B-747	XB-70A	XB-70A	XB-70A
Flight Condition	Cruise Clean	Approach Tips Extended	Approach Tips Extended	Subsonic Cruise Clean
W ~ kg (lb)	288773 (636600)	136077 (300000)	136077 (300000)	174417 (384524)
c.g.	0.25 $\bar{c}$	0.235 $\bar{c}$	0.235 $\bar{c}$	0.218 $\bar{c}$
Airspeed ~ kt or [M]	[0.88]	205	205	[0.90]
γ_o ~ deg	0.0	-3.0	-3.0	0.0
θ_o ~ deg	1.7	4.5	4.5	7.5
h_o ~ m (ft)	10670 (35000)	30.5 (100)	610 (2000)	12190 (40000)
Configuration	B747-C	XB70A-A1	XB70A-A2	XB70A-C1

TABLE III-1 (Continued)

Aircraft	XB-70A	CH-53A	CH-53A	CH-53A
Flight Condition	Supersonic Cruise Clean	Approach	Approach	"Hover"
W ~ kg (lb)	174417 (384524)	15195 (33500)	15195 (33500)	15195 (33500)
c.g.	0.218 $\bar{c}$	F.S. 352	F.S. 352	F.S. 352
Airspeed ~ kt or [M]	[2.5]	60	60	15
γ_o ~ deg	0.0	0.0	0.0	0.0
θ_o ~ deg	4.4	---	---	---
h_o ~ m (ft)	18290 (60000)	30.5 (100)	610 (2000)	30.5 (100)
Configuration	XB70A-C2	CH53A-A1	CH53A-A2	CH53A-H

TABLE III-1 (Concluded)

Aircraft	CH-53A	H-19	H-19
Flight Condition	Cruise	"Hover"	Cruise
W ~ kg (lb)	15195 (33500)	2902 (6400)	3175 (7000)
c.g.	F.S. 352	---	---
Airspeed ~ kt or [M]	150	15	69
γ_o ~ deg	0.0	0.0	0.0
θ_o ~ deg	---	---	---
h_o ~ m (ft)	30.5 (100)	30.5 (100)	30.5 (100)
Configuration	CH53A-C	H19-H	H19-C

-C for cruise

-P for turbulence penetration

-H for hover

Any parameters that are either unknown or not appropriate are indicated by a dash (---).

There are five configurations described in Table III-1 that are simply variations in altitude for aircraft in the approach configuration (e.g., AWJSRA-A1 and AWJSRA-A2). These cases are intended to demonstrate the altitude effects of the atmospheric turbulence model on the resulting RMS responses. The peak responses to the discrete wind shear for these cases will, of course, be identical.

C. NUMERICAL DESCRIPTION OF FLIGHT CONDITIONS

Numerical descriptions of the flight conditions for all configurations evaluated are contained in Tables III-2 through III-5. Tables III-4 and III-5 are the S.I. unit equivalents of Tables III-2 and III-3, respectively.

Table III-2 contains parameters associated with the longitudinal equations of motion. Table III-3 contains parameters associated with the lateral-directional equations of motion. The information contained in these tables can be classified as follows:

1. Trim conditions
2. Geometry
3. Stability derivatives
4. Pilot model parameters
5. Atmospheric turbulence model parameters.

TABLE III-2

TRIM CONDITIONS AND STABILITY DERIVATIVES. LONGITUDINAL, U.S. UNITS

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
V_{T_o} ~ ft/sec	109.7	109.7	109.7	126.7	107.2	143.6
h_o ~ ft	100.0	2000.	100.0	100.0	100.0	100.0
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	5.19	5.19	-2.07	-.630	2.54	6.10
γ_o ~ deg	-7.50	-7.50	-7.50	10.80	-6.0	-6.0
ℓ_x ~ ft	18.80	18.80	21.0	21.0	43.0	40.0
b ~ ft	78.8	78.8	76.8	76.8	111.4	110.3
X_u ~ 1/sec	-.0680	-.0680	-.1190	-.0465	-.1178	-.0779
Z_u ~ 1/sec	-.281	-.281	-.397	-.288	-.419	-.316
M_u ~ 1/sec-ft	-.000350	-.000350	.001596	.00303	-.0001660	-.0001552
$Z_{\dot{w}}$ ~ 1/1	-.0130	-.0130	-.01250	-.01250	-.00644	-.00631
$M_{\dot{w}}$ ~ 1/ft	-.00374	-.00374	-.00281	-.00278	-.000838	-.000987
X_w ~ 1/sec	.1360	.1360	.1290	.1510	.0905	.0742
Z_w ~ 1/sec	-.505	-.505	-.557	-.908	-.422	-.430
M_w ~ 1/sec-ft	-.00450	-.00450	-.00396	-.00315	-.00256	-.00383
X_q ~ ft/sec	0.0	0.0	0.0	0.0	0.0	0.0
Z_q ~ ft/sec	0.0	0.0	-3.60	-4.16	-4.64	0.0
M_q ~ 1/sec	-1.080	-1.080	-.807	-.921	-.494	-.779
X_{δ_e} ~ ft/sec^2	0.0	0.0	0.0	0.0	0.0	0.0
Z_{δ_e} ~ ft/sec^2	3.51	3.51	4.57	4.63	9.25	8.43
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
K_θ ~ 1/1	3.20	3.20	2.58	2.84	1.746	2.28
T_L ~ sec	.269	.269	.40	.403	.699	.399
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_u ~ ft/sec	6.82	6.08	6.82	6.82	6.82	6.82
σ_w ~ ft/sec	2.63	6.08	2.63	2.63	2.63	2.63
L_u ~ ft	673.	1750.	673.	673.	673.	673.
L_w ~ ft	100.0	1750.	100.0	100.0	100.0	100.0

TABLE III-2 (Continued)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
V_{T_o} ~ ft/sec	118.2	118.2	135.1	226.	615.	837.
h_o ~ ft	100.0	2000.	100.0	100.0	23000.	35000.
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	-5.10	-5.10	-2.59	5.20	5.30	4.04
γ_o ~ deg	-5.40	-5.40	8.78	-3.0	0.0	0.0
ℓ_x ~ ft	9.75	9.75	9.75	49.2	49.2	49.2
b ~ ft	65.0	65.0	65.0	120.0	120.0	120.0
X_u ~ 1/sec	-.0678	-.0678	-.0646	-.0423	-.00642	-.00590
Z_u ~ 1/sec	-.524	-.524	-.383	-.284	-.1050	-.0772
M_u ~ 1/sec-ft	.001050	.001050	.00515	-.0001372	-.249E-4	-.227E-4
$Z_{\dot{w}}$ ~ 1/1	-.0389	-.0389	-.01271	-.01550	-.00550	-.00420
$M_{\dot{w}}$ ~ 1/ft	-.00270	-.00270	-.00459	-.000726	-.000340	-.000243
X_w ~ 1/sec	.1840	.1840	.0629	.0828	.0321	.0219
Z_w ~ 1/sec	-.930	-.930	-1.504	-.661	-.628	-.631
M_w ~ 1/sec-ft	-.0245	-.0245	-.01191	-.001580	-.00277	-.00345
X_q ~ ft/sec	0.0	0.0	0.0	0.0	0.0	0.0
Z_q ~ ft/sec	0.0	0.0	0.0	-10.40	-9.34	-9.25
M_q ~ 1/sec	-1.750	-1.750	-1.332	-.481	-.578	-.530
X_{δ_e} ~ ft/sec^2	0.0	0.0	0.0	0.0	0.0	0.0
Z_{δ_e} ~ ft/sec^2	2.83	2.83	2.79	11.30	9.23	9.39
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
X_θ ~ 1/1	4.77	4.77	4.08	2.99	2.18	2.35
T_L ~ sec	0.0	0.0	.1597	.643	.1064	0.0
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_u ~ ft/sec	6.82	6.08	6.82	6.82	4.64	4.55
σ_w ~ ft/sec	2.63	6.08	2.63	2.63	4.64	4.55
L_u ~ ft	673.	1750.	673.	673.	1750.	1750.
L_w ~ ft	100.0	1750.	100.0	100.0	1750.	1750.

TABLE III-2 (Continued)

Configuration	B747-A1	B747-A2	B747-T	3747-P	B747-C
V_{T_o} ~ ft/sec	241.	241.	292.	674.	856.
h_o ~ ft	100.0	2000.	100.0	20000.	35000.
α_o ~ deg	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	4.44	4.44	10.0	2.50	1.70
γ_o ~ deg	-3.0	-3.0	2.50	0.0	0.0
ℓ_x ~ ft	86.0	86.0	86.0	86.0	86.0
b ~ ft	195.7	195.7	195.7	195.7	195.7
X_u ~ 1/sec	-.0335	-.0335	-.0209	-.00534	-.0284
Z_u ~ 1/sec	-.265	-.265	-.213	-.1070	-.0321
M_u ~ 1/sec-ft	-.0001074	-.0001074	-.000201	.574E-5	-.000306
$Z_{\dot{w}}$ ~ 1/1	-.0338	-.0338	-.0263	-.01560	-.00785
$M_{\dot{w}}$ ~ 1/ft	-.000241	-.000241	-.000218	-.0001550	-.0001830
X_w ~ 1/sec	.0492	.0492	.0314	.0249	-.001472
Z_w ~ 1/sec	-.521	-.521	-.472	-.537	-.468
M_w ~ 1/sec-ft	-.00206	-.00206	-.00224	-.00190	-.001841
X_q ~ ft/sec	0.0	0.0	0.0	0.0	0.0
Z_q ~ ft/sec	-6.67	-6.67	-6.19	-8.11	-7.70
M_q ~ 1/sec	-.385	-.385	-.413	-.535	-.474
X_{δ_e} ~ ft/sec^2	0.0	0.0	0.0	0.0	0.0
Z_{δ_e} ~ ft/sec^2	16.95	16.95	14.40	15.62	15.56
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00
K_θ ~ 1/1	1.545	1.545	1.581	1.860	1.793
T_L ~ sec	.719	.719	.621	.270	.1609
T_E ~ sec	.333	.333	.333	.333	.333
σ_u ~ ft/sec	6.82	6.08	6.82	4.66	4.55
σ_w ~ ft/sec	2.63	6.08	2.63	4.66	4.55
L_u ~ ft	673.	1750.	673.	1750.	1750.
L_w ~ ft	100.0	1750.	100.0	1750.	1750.

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TABLE III-2 (Continued)

Configuration	X870A-A1	X870A-A2	X870A-C1	X370A-C2
V_{T_o} ~ ft/sec	346.	346.	871.	2420.
h_o ~ ft	100.0	2000.	40000.	60000.
α_o ~ deg	0.0	0.0	0.0	0.0
α_t ~ deg	7.50	7.50	7.50	4.40
γ_o ~ deg	-3.0	-3.0	0.0	0.0
ℓ_x ~ ft	99.0	99.0	97.7	97.7
b ~ ft	105.0	105.0	105.0	105.0
X_u ~ 1/sec	-.0306	-.0306	-.00865	-.00323
Z_u ~ 1/sec	-.1850	-.1850	-.0888	-.0170
M_u ~ 1/sec-ft	-.395E-4	-.395E-4	-.000528	-.380E-4
$Z_{\dot{w}}$ ~ 1/1	0.0	0.0	0.0	0.0
$M_{\dot{w}}$ ~ 1/ft	.721E-4	.721E-4	.290E-4	0.0
X_w ~ 1/sec	-.0630	-.0630	-.0419	-.00577
Z_w ~ 1/sec	-.737	-.737	-.369	-.204
M_w ~ 1/sec-ft	-.00292	-.00292	-.001530	-.000810
X_q ~ ft/sec	0.0	0.0	0.0	0.0
Z_q ~ ft/sec	0.0	0.0	0.0	0.0
M_q ~ 1/sec	-.749	-.749	-.653	-.1070
X_{δ_e} ~ ft/sec^2	0.0	0.0	0.0	0.0
Z_{δ_e} ~ ft/sec^2	52.9	52.9	33.1	15.85
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00
K_θ ~ 1/1	2.23	2.23	1.734	.567
T_L ~ sec	.249	.249	.211	.218
T_E ~ sec	.333	.333	.333	.333
σ_u ~ ft/sec	6.82	6.08	4.52	3.86
σ_w ~ ft/sec	2.63	6.08	4.52	3.86
L_u ~ ft	673.	1750.	1750.	1750.
L_w ~ ft	100.0	1750.	1750.	1750.

TABLE III-2 (Concluded)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
V_{T_o} ~ ft/sec	101.0	101.0	25.3	253.	25.3	116.4
h_o ~ ft	100.0	2000.	100.0	100.0	100.0	100.0
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
γ_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
ℓ_x ~ ft	17.0	17.0	17.0	17.0	2.40	2.40
b ~ ft	72.3	72.3	72.3	72.3	53.0	53.0
X_u ~ 1/sec	-.0227	-.0227	-.01540	-.0396	-.0284	-.0525
Z_u ~ 1/sec	-.0893	-.0893	0.0	.0733	0.0	.01510
M_u ~ 1/sec-ft	.00322	.00322	.00204	.001650	.00609	.00612
$Z_{\dot{w}}$ ~ 1/1	0.0	0.0	0.0	0.0	0.0	0.0
$M_{\dot{w}}$ ~ 1/ft	-.000213	-.000213	0.0	-.0001120	0.0	0.0
X_w ~ 1/sec	-.000528	-.000528	0.0	.0301	0.0	.0207
Z_w ~ 1/sec	-.694	-.694	-.303	-1.080	-.690	-.810
M_w ~ 1/sec-ft	.001695	.001695	.000746	.00702	0.0	-.00231
X_q ~ ft/sec	1.690	1.690	1.360	.790	2.73	3.81
Z_q ~ ft/sec	.0954	.0954	.1260	.1620	0.0	-.40
M_q ~ 1/sec	-.562	-.562	-.438	-.724	-.610	-1.004
X_{δ_e} ~ ft/sec^2	-7.10	-7.10	-7.69	-4.02	-4.84	-4.31
Z_{δ_e} ~ ft/sec^2	-14.79	-14.79	0.0	-39.4	0.0	-12.96
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
K_θ ~ 1/1	1.706	1.706	1.469	2.11	1.669	2.29
T_L ~ sec	.877	.877	.987	1.135	.828	.472
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_u ~ ft/sec	6.82	6.08	6.82	6.82	6.82	6.82
σ_w ~ ft/sec	2.63	6.08	2.63	2.63	2.63	2.63
L_u ~ ft	673.	1750.	673.	673.	673.	673.
L_w ~ ft	100.0	1750.	100.0	100.0	100.0	100.0

TABLE III-3

TRIM CONDITIONS AND STABILITY DERIVATIVES. LATERAL-DIRECTIONAL, U.S. UNITS

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
V_{T_o} ~ ft/sec	109.7	109.7	109.7	126.7	107.2	143.6
h_o ~ ft	100.0	2000.	100.0	100.0	100.0	100.0
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	5.19	5.19	-2.07	-.630	2.54	6.10
γ_o ~ deg	-7.50	-7.50	-7.50	10.80	-6.0	-6.0
ℓ_x ~ ft	18.80	18.80	21.0	21.0	43.0	40.0
ℓ_z ~ ft	-1.240	-1.240	0.0	0.0	0.0	0.0
b ~ ft	78.8	78.8	76.8	76.8	111.4	110.3
Y_v ~ 1/sec	-.1240	-.1240	-.1140	-.1610	-.0765	-.0851
Y_p ~ ft/sec	0.0	0.0	0.0	0.0	.975	0.0
Y_r ~ ft/sec	0.0	0.0	0.0	0.0	.474	0.0
L'_β ~ 1/sec^2	.0403	.0403	-.206	-.805	-.505	-.875
L'_p ~ 1/sec	-.624	-.624	-.786	-.704	-.625	-.750
L'_r ~ 1/sec	1.567	1.567	-.0970	.749	.980	1.364
N'_β ~ 1/sec^2	.534	.534	.554	.0706	.1788	.377
N'_p ~ 1/sec	-.232	-.232	-.1150	-.1560	-.140	-.199
N'_r ~ 1/sec	-.238	-.238	-.490	-.428	-.0735	-.1660
$Y^*_{\delta_a}$ ~ 1/sec	-.0239	-.0239	0.0	0.0	0.0	0.0
L'_{δ_a} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
N'_{δ_a} ~ 1/sec^2	-.1476	-.1476	.00190	-.01890	.0778	.0350
K_φ ~ 1/1	1.928	1.928	1.914	1.744	1.466	1.508
T_L ~ sec	.375	.375	.702	.709	.937	.769
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_v ~ ft/sec	6.82	6.08	6.82	6.82	6.82	6.82
σ_p ~ deg/sec	1.684	1.502	1.714	1.714	1.337	1.346
L_v ~ ft	673.	1750.	673.	673.	673.	673.

TABLE III-3 (Continued)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
V_{T_o} ~ ft/sec	118.2	118.2	135.1	226.	615.	837.
h_o ~ ft	100.0	2000.	100.0	100.0	23000.	35000.
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	-5.10	-5.10	-2.59	5.20	5.30	4.04
γ_o ~ deg	-5.40	-5.40	8.78	-3.0	0.0	0.0
ℓ_x ~ ft	9.75	9.75	9.75	49.2	49.2	49.2
ℓ_z ~ ft	-2.03	-2.03	-2.03	-4.15	-4.15	-4.15
b ~ ft	65.0	65.0	65.0	120.0	120.0	120.0
Y_v ~ 1/sec	-.1337	-.1337	-.1780	-.1390	-.1150	-.1080
Y_p ~ ft/sec	0.0	0.0	0.0	0.0	0.0	0.0
Y_r ~ ft/sec	0.0	0.0	0.0	0.0	0.0	0.0
L'_β ~ 1/sec^2	-2.21	-2.21	-2.95	-3.13	-5.82	-7.57
L'_p ~ 1/sec	-4.49	-4.49	-4.67	-1.30	-1.090	-.863
L'_r ~ 1/sec	2.47	2.47	2.46	1.080	.518	.450
N'_β ~ 1/sec^2	2.02	2.02	1.742	.786	1.970	2.36
N'_p ~ 1/sec	-.738	-.738	-.307	-.01390	.0424	.0325
N'_r ~ 1/sec	-.706	-.706	-.546	-.303	-.233	-.20
$Y^*_{\delta_a}$ ~ 1/sec	0.0	0.0	-.1223E-4	-.00960	-.00160	-.00130
L'_{δ_a} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
N'_{δ_a} ~ 1/sec^2	.01063	.01063	.1463	.01330	-.01220	-.0218
K_φ ~ 1/1	10.76	10.76	6.33	2.27	2.34	2.62
T_L ~ sec	0.0	0.0	0.0	.517	.411	.258
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_v ~ ft/sec	6.82	6.08	6.82	6.82	4.64	4.55
σ_p ~ deg/sec	1.915	1.708	1.915	1.272	.865	.849
L_v ~ ft	673.	1750.	673.	673.	1750.	1750.

TABLE III-3 (Continued)

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
V_{T_o} ~ ft/sec	241.	241.	292.	674.	856.
h_o ~ ft	100.0	2000.	100.0	20000.	35000.
α_o ~ deg	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	4.44	4.44	10.0	2.50	1.70
γ_o ~ deg	-3.0	-3.0	2.50	0.0	0.0
ℓ_x ~ ft	86.0	86.0	86.0	86.0	86.0
ℓ_z ~ ft	-10.0	-10.0	-10.0	-10.0	-10.0
b ~ ft	195.7	195.7	195.7	195.7	195.7
Y_v ~ 1/sec	-.0935	-.0935	-.0699	-.1040	-.0765
Y_p ~ ft/sec	5.70	5.70	4.35	0.0	0.0
Y_r ~ ft/sec	.207	.207	1.035	0.0	.241
L'_β ~ 1/sec^2	-1.321	-1.321	-1.240	-2.92	-3.06
L'_p ~ 1/sec	-1.016	-1.016	-.757	-.791	-.559
L'_r ~ 1/sec	.315	.315	.344	.344	.314
N'_β ~ 1/sec^2	.273	.273	.436	1.050	1.694
N'_p ~ 1/sec	-.0909	-.0909	-.0430	-.0270	.01092
N'_r ~ 1/sec	-.212	-.212	-.209	-.205	-.1738
$Y^*_{\delta_a}$ ~ 1/sec	0.0	0.0	0.0	0.0	0.0
L'_{δ_a} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00
N'_{δ_a} ~ 1/sec^2	.0337	.0337	-.0718	.0507	-.0443
K_φ ~ 1/1	2.18	2.18	1.818	1.803	1.484
T_L ~ sec	.589	.589	.680	.846	.714
T_E ~ sec	.333	.333	.333	.333	.333
σ_v ~ ft/sec	6.82	6.08	6.82	4.66	4.55
σ_p ~ deg/sec	.918	.819	.918	.628	.613
L_v ~ ft	673.	1750.	673.	1750.	1750.

TABLE III-3 (Continued)

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
V_{T_o} ~ ft/sec	346.	346.	871.	2420.
h_o ~ ft	100.0	2000.	40000.	60000.
α_o ~ deg	0.0	0.0	0.0	0.0
α_t ~ deg	7.50	7.50	7.50	4.40
γ_o ~ deg	-3.0	-3.0	0.0	0.0
ℓ_x ~ ft	99.0	99.0	97.7	97.7
ℓ_z ~ ft	-6.70	-6.70	-6.70	-6.70
b ~ ft	105.0	105.0	105.0	105.0
Y_v ~ 1/sec	-.0508	-.0508	-.0352	-.0548
Y_p ~ ft/sec	0.0	0.0	0.0	0.0
Y_r ~ ft/sec	0.0	0.0	0.0	0.0
L'_β ~ 1/sec^2	-4.88	-4.88	-6.01	2.05
L'_p ~ 1/sec	-1.730	-1.730	-1.220	-.411
L'_r ~ 1/sec	-.01120	-.01120	.241	.0412
N'_β ~ 1/sec^2	1.550	1.550	1.680	.757
N'_p ~ 1/sec	.0451	.0451	.206	.000752
N'_r ~ 1/sec	-.1780	-.1780	-.1280	-.1530
$Y^*_{\delta_a}$ ~ 1/sec	-.00639	-.00639	-.504E-4	0.0
L'_{δ_a} ~ 1/sec^2	1.00	1.00	1.00	1.00
N'_{δ_a} ~ 1/sec^2	-.1777	-.1777	-.1857	-.1175
K_φ ~ 1/1	1.549	1.549	2.15	1.663
T_L ~ sec	.1833	.1833	.0533	1.049
T_E ~ sec	.333	.333	.333	.333
σ_v ~ ft/sec	6.82	6.08	4.52	3.86
σ_p ~ deg/sec	1.391	1.241	.922	.788
L_v ~ ft	673.	1750.	1750.	1750.

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TABLE III-3 (Concluded)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
V_{T_o} ~ ft/sec	101.0	101.0	25.3	253.	25.3	116.4
h_o ~ ft	100.0	2000.	100.0	100.0	100.0	100.0
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
γ_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
ℓ_x ~ ft	17.0	17.0	17.0	17.0	2.70	2.70
ℓ_z ~ ft	0.0	0.0	0.0	0.0	0.0	0.0
b ~ ft	72.3	72.3	72.3	72.3	53.0	53.0
Y_v ~ 1/sec	-.0867	-.0867	-.0352	-.1540	-.0731	-.1220
Y_p ~ ft/sec	-1.90	-1.90	-1.430	-1.240	-3.0	-5.0
Y_r ~ ft/sec	2.04	2.04	.850	3.23	1.420	1.30
L'_β ~ 1/sec^2	-1.141	-1.141	-.324	-5.85	-1.316	-8.47
L'_p ~ 1/sec	-2.0	-2.0	-2.31	-1.790	-3.18	-4.81
L'_r ~ 1/sec	.227	.227	.0946	.654	.804	1.00
N'_β ~ 1/sec^2	.901	.901	.1343	2.71	.891	3.78
N'_p ~ 1/sec	.0471	.0471	.01660	.1150	.220	.201
N'_r ~ 1/sec	-.553	-.553	-.232	-.842	-1.10	-1.10
$Y^*_{\delta_a}$ ~ 1/sec	.01450	.01450	.0586	.00573	.0436	.00651
L'_{δ_a} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
N'_{δ_a} ~ 1/sec^2	.00409	.00409	.00384	.00937	0.0	0.0
K_φ ~ 1/1	3.69	3.69	4.18	3.25	4.72	8.14
T_L ~ sec	.234	.234	.1908	.303	.0685	0.0
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_v ~ ft/sec	6.82	6.08	6.82	6.82	6.82	6.82
σ_p ~ deg/sec	1.785	1.592	1.785	1.785	2.19	2.19
L_v ~ ft	673.	1750.	673.	673.	673.	673.

TABLE III-4

TRIM CONDITIONS AND STABILITY DERIVATIVES. LONGITUDINAL, S.I. UNITS

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
V_{T_o} ~ m/sec	33.4	33.4	33.4	38.6	32.7	43.8
h_o ~ m	30.5	610.	30.5	30.5	30.5	30.5
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	5.19	5.19	-2.07	-.630	2.54	6.10
γ_o ~ deg	-7.50	-7.50	-7.50	10.80	-6.0	-6.0
l_x ~ m	5.73	5.73	6.40	6.40	13.11	12.19
b ~ m	24.0	24.0	23.4	23.4	33.9	33.6
X_u ~ 1/sec	-.0680	-.0680	-.1190	-.0465	-.1178	-.0779
Z_u ~ 1/sec	-.281	-.281	-.397	-.288	-.419	-.316
M_u ~ 1/sec-m	-.001148	-.001148	.00524	.00994	-.000545	-.000509
$Z_{\dot{w}}$ ~ 1/1	-.0130	-.0130	-.01250	-.01250	-.00544	-.00631
$M_{\dot{w}}$ ~ 1/m	-.01227	-.01227	-.00922	-.00912	-.00275	-.00324
X_w ~ 1/sec	.1360	.1360	.1290	.1510	.0905	.0742
Z_w ~ 1/sec	-.505	-.505	-.557	-.908	-.422	-.430
M_w ~ 1/sec-m	-.01476	-.01476	-.01299	-.01033	-.00840	-.01256
X_q ~ m/sec	0.0	0.0	0.0	0.0	0.0	0.0
Z_q ~ m/sec	0.0	0.0	-1.097	-1.268	-1.414	0.0
M_q ~ 1/sec	-1.080	-1.080	-.807	-.921	-.494	-.779
X_{δ_e} ~ m/sec^2	0.0	0.0	0.0	0.0	0.0	0.0
Z_{δ_e} ~ m/sec^2	1.070	1.070	1.393	1.411	2.82	2.57
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
K_θ ~ 1/1	3.20	3.20	2.58	2.84	1.746	2.28
T_L ~ sec	.269	.269	.40	.403	.699	.399
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_u ~ m/sec	2.08	1.854	2.08	2.08	2.08	2.08
σ_w ~ m/sec	.801	1.854	.801	.801	.801	.801
L_u ~ m	205.	533.	205.	205.	205.	205.
L_w ~ m	30.5	533.	30.5	30.5	30.5	30.5

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TABLE III-4 (Continued)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
V_{T_o} ~ m/sec	36.0	36.0	41.2	168.9	187.5	255.
h_o ~ m	30.5	610.	30.5	30.5	7010.	10670.
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	-5.10	-5.10	-2.59	5.20	5.30	4.04
γ_o ~ deg	-5.40	-5.40	8.78	-3.0	0.0	0.0
ℓ_x ~ m	2.97	2.97	2.97	15.0	15.0	15.0
b ~ m	19.81	19.81	19.81	36.6	36.6	36.6
X_u ~ 1/sec	-.0678	-.0678	-.0646	-.0423	-.00642	-.00590
Z_u ~ 1/sec	-.524	-.524	-.383	-.284	-.1050	-.0772
M_u ~ 1/sec-m	.00344	.00344	.01690	-.000450	-.817E-4	-.745E-4
$Z_{\dot{w}}$ ~ 1/1	-.0389	-.0389	-.01271	-.01550	-.00550	-.00420
$M_{\dot{w}}$ ~ 1/m	-.00886	-.00886	-.01505	-.00238	-.001116	-.000796
X_w ~ 1/sec	.1840	.1840	.0629	.0828	.0321	.0219
Z_w ~ 1/sec	-.930	-.930	-1.504	-.661	-.628	-.631
M_w ~ 1/sec-m	-.0804	-.0804	-.0391	-.00518	-.00909	-.01133
X_q ~ m/sec	0.0	0.0	0.0	0.0	0.0	0.0
Z_q ~ m/sec	0.0	0.0	0.0	-3.17	-2.85	-2.82
M_q ~ 1/sec	-1.750	-1.750	-1.332	-.481	-.578	-.530
X_{δ_e} ~ m/sec^2	0.0	0.0	0.0	0.0	0.0	0.0
Z_{δ_e} ~ m/sec^2	.863	.863	.850	3.44	2.81	2.86
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
K_θ ~ 1/1	4.77	4.77	4.08	2.99	2.18	2.35
T_L ~ sec	0.0	0.0	.1597	.643	.1064	0.0
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_u ~ m/sec	2.08	1.854	2.08	2.08	1.413	1.387
σ_w ~ m/sec	.801	1.854	.801	.801	1.413	1.387
L_u ~ m	205.	533.	205.	205.	533.	533.
L_w ~ m	30.5	533.	30.5	30.5	533.	533.

TABLE III-4 (Continued)

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
V_{T_o} ~ m/sec	73.3	73.3	89.1	205.	261.
h_o ~ m	30.5	610.	30.5	6100.	10670.
α_o ~ deg	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	4.44	4.44	10.0	2.50	1.70
γ_o ~ deg	-3.0	-3.0	2.50	0.0	0.0
ℓ_x ~ m	26.2	26.2	26.2	26.2	26.2
b ~ m	59.6	59.6	59.6	59.6	59.6
X_u ~ 1/sec	-.0335	-.0335	-.0209	-.00534	-.0284
Z_u ~ 1/sec	-.265	-.265	-.213	-.1070	-.0321
M_u ~ 1/sec-m	-.000352	-.000352	-.000659	.1883E-4	-.001003
$Z_{\dot{w}}$ ~ 1/1	-.0338	-.0338	-.0263	-.01560	-.00785
$M_{\dot{w}}$ ~ 1/m	-.000790	-.000790	-.000716	-.000509	-.00060
X_w ~ 1/sec	.0492	.0492	.0314	.0249	-.001472
Z_w ~ 1/sec	-.521	-.521	-.472	-.537	-.468
M_w ~ 1/sec-m	-.00677	-.00677	-.00734	-.00623	-.00604
X_q ~ m/sec	0.0	0.0	0.0	0.0	0.0
Z_q ~ m/sec	-2.03	-2.03	-1.887	-2.47	-2.35
M_q ~ 1/sec	-.385	-.385	-.413	-.535	-.474
X_{δ_e} ~ m/sec^2	0.0	0.0	0.0	0.0	0.0
Z_{δ_e} ~ m/sec^2	5.17	5.17	4.39	4.76	4.74
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00
K_θ ~ 1/1	1.545	1.545	1.581	1.860	1.793
T_L ~ sec	.719	.719	.621	.270	.1609
T_E ~ sec	.333	.333	.333	.333	.333
σ_u ~ m/sec	2.08	1.854	2.08	1.421	1.387
σ_w ~ m/sec	.801	1.854	.801	1.421	1.387
L_u ~ m	205.	533.	205.	533.	533.
L_w ~ m	30.5	533.	30.5	533.	533.

TABLE III-4 (Continued)

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
V_{T_o} ~ m/sec	105.5	105.5	265.	738.
h_o ~ m	30.5	610.	12190.	18290.
α_o ~ deg	0.0	0.0	0.0	0.0
α_t ~ deg	7.50	7.50	7.50	4.40
γ_o ~ deg	-3.0	-3.0	0.0	0.0
ℓ_x ~ m	30.2	30.2	29.8	29.8
b ~ m	32.0	32.0	32.0	32.0
X_u ~ 1/sec	-.0306	-.0306	-.00865	-.00323
Z_u ~ 1/sec	-.1850	-.1850	-.0888	-.0170
M_u ~ 1/sec-m	-.0001296	-.0001296	-.001732	-.0001247
$Z_{\dot{w}}$ ~ 1/1	0.0	0.0	0.0	0.0
$M_{\dot{w}}$ ~ 1/m	.000237	.000237	.951E-4	0.0
X_w ~ 1/sec	-.0630	-.0630	-.0419	-.00577
Z_w ~ 1/sec	-.737	-.737	-.369	-.204
M_w ~ 1/sec-m	-.00958	-.00958	-.00502	-.00266
X_q ~ m/sec	0.0	0.0	0.0	0.0
Z_q ~ m/sec	0.0	0.0	0.0	0.0
M_q ~ 1/sec	-.749	-.749	-.653	-.1070
X_{δ_e} ~ m/sec^2	0.0	0.0	0.0	0.0
Z_{δ_e} ~ m/sec^2	16.12	16.12	10.10	4.83
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00
K_θ ~ 1/1	2.23	2.23	1.734	.567
T_L ~ sec	.249	.249	.211	.218
T_E ~ sec	.333	.333	.333	.333
σ_u ~ m/sec	2.08	1.854	1.378	1.177
σ_w ~ m/sec	.801	1.854	1.378	1.177
L_u ~ m	205.	533.	533.	533.
L_w ~ m	30.5	533.	533.	533.

TABLE III-4 (Concluded)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
V_{T_o} ~ m/sec	30.8	30.8	7.71	77.1	7.71	35.5
h_o ~ m	30.5	610.	30.5	30.5	30.5	30.5
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
γ_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
ℓ_x ~ m	5.18	5.18	5.18	5.18	.732	.732
b ~ m	22.0	22.0	22.0	22.0	16.15	16.15
X_u ~ 1/sec	-.0227	-.0227	-.01540	-.0396	-.0284	-.0525
Z_u ~ 1/sec	-.0893	-.0893	0.0	.0733	0.0	.01510
M_u ~ 1/sec-m	.01056	.01056	.00669	.00541	.020	.0201
$Z_{\dot{w}}$ ~ 1/1	0.0	0.0	0.0	0.0	0.0	0.0
$M_{\dot{w}}$ ~ 1/m	-.000699	-.000699	0.0	-.000367	0.0	0.0
X_w ~ 1/sec	-.000528	-.000528	0.0	.0301	0.0	.0207
Z_w ~ 1/sec	-.694	-.694	-.303	-1.080	-.690	-.810
M_w ~ 1/sec-m	.00556	.00556	.00245	.0230	0.0	-.00758
X_q ~ m/sec	.515	.515	.415	.241	.832	1.161
Z_q ~ m/sec	.0291	.0291	.0384	.0494	0.0	-.1219
M_q ~ 1/sec	-.562	-.562	-.438	-.724	-.610	-1.004
X_{δ_e} ~ m/sec^2	-2.16	-2.16	34	-1.225	-1.475	-1.314
Z_{δ_e} ~ m/sec^2	-4.51	-4.51	0.0	-12.01	0.0	-3.95
M_{δ_e} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
K_θ ~ 1/1	1.706	1.706	1.469	2.11	1.669	2.29
T_L ~ sec	.877	.877	.987	1.135	.828	.472
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_u ~ m/sec	2.08	1.854	2.08	2.08	2.08	2.08
σ_w ~ m/sec	.801	1.854	.801	.801	.801	.801
L_u ~ m	205.	533.	205.	205.	205.	205.
L_w ~ m	30.5	533.	30.5	30.5	30.5	30.5

TABLE III-5

TRIM CONDITIONS AND STABILITY DERIVATIVES. LATERAL-DIRECTIONAL, S.I. UNITS

Configuration		AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
V_{T_o}	~ m/sec	33.4	33.4	33.4	38.6	32.7	43.8
h_o	~ m	30.5	610.	30.5	30.5	30.5	30.5
α_o	~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t	~ deg	5.19	5.19	-2.07	-.630	2.54	6.10
γ_o	~ deg	-7.50	-7.50	-7.50	10.80	-6.0	-6.0
ℓ_x	~ m	5.73	5.73	6.40	6.40	13.11	12.19
ℓ_z	~ m	-.378	-.378	0.0	0.0	0.0	0.0
b	~ m	24.0	24.0	23.4	23.4	33.9	33.6
Y_v	~ 1/sec	-.1240	-.1240	-.1140	-.1610	-.0765	-.0851
Y_p	~ m/sec	0.0	0.0	0.0	0.0	.297	0.0
Y_r	~ m/sec	0.0	0.0	0.0	0.0	.1446	0.0
L'_β	~ 1/sec^2	.0403	.0403	-.206	-.805	-.505	-.875
L'_p	~ 1/sec	-.624	-.624	-.786	-.704	-.625	-.750
L'_r	~ 1/sec	1.567	1.567	-.0970	.749	.980	1.364
N'_β	~ 1/sec^2	.534	.534	.554	.0706	.1788	.377
N'_p	~ 1/sec	-.232	-.232	-.1150	-.1560	-.140	-.199
N'_r	~ 1/sec	-.238	-.238	-.490	-.428	-.0735	-.1660
$Y^*_{\delta_a}$	~ 1/sec	-.0239	-.0239	0.0	0.0	0.0	0.0
L'_{δ_a}	~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
N'_{δ_a}	~ 1/sec^2	-.1476	-.1476	.00190	-.01890	.0778	.0350
K_φ	~ 1/1	1.928	1.928	1.914	1.744	1.466	1.508
T_L	~ sec	.375	.375	.702	.709	.937	.769
T_E	~ sec	.333	.333	.333	.333	.333	.333
σ_v	~ m/sec	2.08	1.854	2.08	2.08	2.08	2.08
σ_p	~ deg/sec	.513	.458	.522	.522	.408	.410
L_v	~ m	205.	533.	205.	205.	205.	205.

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TABLE III-5 (Continued)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
V_{T_o} ~ m/sec	36.0	36.0	41.2	68.9	187.5	255.
h_o ~ m	30.5	610.	30.5	30.5	7010.	10670.
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	-5.10	-5.10	-2.59	5.20	5.30	4.04
γ_o ~ deg	-5.40	-5.40	6.78	-3.0	0.0	0.0
ℓ_x ~ m	2.97	2.97	2.97	15.0	15.0	15.0
ℓ_z ~ m	-.619	-.619	-.619	-1.265	-1.265	-1.265
b ~ m	19.81	19.81	19.81	36.6	36.6	36.6
Y_v ~ 1/sec	-.1337	-.1337	-.1780	-.1390	-.1150	-.1080
Y_p ~ m/sec	0.0	0.0	0.0	0.0	0.0	0.0
Y_r ~ m/sec	0.0	0.0	0.0	0.0	0.0	0.0
L'_β ~ 1/sec^2	-2.21	-2.21	-2.95	-3.13	-5.82	-7.57
L'_p ~ 1/sec	-4.49	-4.49	-4.67	-1.30	-1.090	-.863
L'_r ~ 1/sec	2.47	2.47	2.46	1.080	.518	.450
N'_β ~ 1/sec^2	2.02	2.02	1.742	.786	1.970	2.36
N'_p ~ 1/sec	-.738	-.738	-.307	-.01390	.0424	.0325
N'_r ~ 1/sec	-.706	-.706	-.546	-.303	-.233	-.20
$Y^*_{\delta_a}$ ~ 1/sec	0.0	0.0	-.1223E-4	-.00960	-.00160	-.00130
L'_{δ_a} ~ 1/sec^2	1.00	1.00	1.00	1.00	1.00	1.00
N'_{δ_a} ~ 1/sec^2	.01063	.01063	.1463	.01330	-.01220	-.0218
K_φ ~ 1/1	10.76	10.76	6.33	2.27	2.34	2.62
T_L ~ sec	0.0	0.0	0.0	.517	.411	.258
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_v ~ m/sec	2.08	1.854	2.08	2.08	1.413	1.387
σ_p ~ deg/sec	.584	.521	.584	.388	.264	.259
L_v ~ m	205.	533.	205.	205.	533.	533.

TABLE III-5 (Continued)

Configuration		B747-A1	B747-A2	B747-T	B747-P	B747-C
V_{T_o}	~ m/sec	73.3	73.3	89.1	205.	261.
h_o	~ m	30.5	610.	30.5	6100.	10670.
α_o	~ deg	0.0	0.0	0.0	0.0	0.0
α_t	~ deg	4.44	4.44	10.0	2.50	1.70
γ_o	~ deg	-3.0	-3.0	2.50	0.0	0.0
ℓ_x	~ m	26.2	26.2	26.2	26.2	26.2
ℓ_z	~ m	-3.05	-3.05	-3.05	-3.05	-3.05
b	~ m	59.6	59.6	59.6	59.6	59.6
Y_v	~ 1/sec	-.0935	-.0935	-.0699	-.1040	-.0765
Y_p	~ m/sec	1.737	1.737	1.326	0.0	0.0
Y_r	~ m/sec	.0631	.0631	.315	0.0	.0735
L'_β	~ 1/sec^2	-1.321	-1.321	-1.240	-2.92	-3.06
L'_p	~ 1/sec	-1.016	-1.016	-.757	-.791	-.559
L'_r	~ 1/sec	.315	.315	.344	.344	.314
N'_β	~ 1/sec^2	.273	.273	.436	1.050	1.694
N'_p	~ 1/sec	-.0909	-.0909	-.0430	-.0270	.01092
N'_r	~ 1/sec	-.212	-.212	-.209	-.205	-.1738
$Y^*_{\delta_a}$	~ 1/sec	0.0	0.0	0.0	0.0	0.0
L'_{δ_a}	~ 1/sec^2	1.00	1.00	1.00	1.00	1.00
N'_{δ_a}	~ 1/sec^2	.0337	.0337	-.0718	.0507	-.0443
K_φ	~ 1/1	2.18	2.18	1.818	1.803	1.484
T_L	~ sec	.589	.589	.680	.846	.714
T_E	~ sec	.333	.333	.333	.333	.333
σ_v	~ m/sec	2.08	1.854	2.08	1.421	1.387
σ_p	~ deg/sec	.280	.250	.280	.1914	.1868
L_v	~ m	205.	533.	205.	533.	533.

TABLE III-5 (Continued)

Configuration		XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
V_{T_o}	~ m/sec	105.5	105.5	265.	738.
h_o	~ m	30.5	610.	12190.	18290.
α_o	~ deg	0.0	0.0	0.0	0.0
α_t	~ deg	7.50	7.50	7.50	4.40
γ_o	~ deg	-3.0	-3.0	0.0	0.0
ℓ_x	~ m	30.2	30.2	29.8	29.8
ℓ_z	~ m	-2.04	-2.04	-2.04	-2.04
b	~ m	32.0	32.0	32.0	32.0
Y_v	~ 1/sec	-.0508	-.0508	-.0352	-.0548
Y_p	~ m/sec	0.0	0.0	0.0	0.0
Y_r	~ m/sec	0.0	0.0	0.0	0.0
L'_β	~ 1/sec^2	-4.88	-4.88	-6.01	2.05
L'_p	~ 1/sec	-1.730	-1.730	-1.220	-.411
L'_r	~ 1/sec	-.01120	-.01120	.241	.0412
N'_β	~ 1/sec^2	1.550	1.550	1.680	.757
N'_p	~ 1/sec	.0451	.0451	.206	.000752
N'_r	~ 1/sec	-.1780	-.1780	-.1280	-.1530
$Y^*_{\delta_a}$	~ 1/sec	-.00639	-.00639	-.504E-4	0.0
L'_{δ_a}	~ 1/sec^2	1.00	1.00	1.00	1.00
N'_{δ_a}	~ 1/sec^2	-.1777	-.1777	-.1857	-.1175
K_φ	~ 1/1	1.549	1.549	2.15	1.663
T_L	~ sec	.1833	.1833	.0533	1.049
T_E	~ sec	.333	.333	.333	.333
σ_v	~ m/sec	2.08	1.854	1.378	1.177
σ_p	~ deg/sec	.424	.378	.281	.240
L_v	~ m	205.	533.	533.	533.

TABLE III-5 (Concluded)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
V_{T_o} ~ m/sec	30.8	30.8	7.71	77.1	7.71	35.5
h_o ~ m	30.5	610.	30.5	30.5	30.5	30.5
α_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
α_t ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
γ_o ~ deg	0.0	0.0	0.0	0.0	0.0	0.0
ℓ_x ~ m	5.18	5.18	5.18	5.18	.823	.823
ℓ_z ~ m	0.0	0.0	0.0	0.0	0.0	0.0
b ~ m	22.0	22.0	22.0	22.0	16.15	16.15
Y_v ~ 1/sec	-.0867	-.0867	-.0352	-.1540	-.0731	-.1220
Y_p ~ m/sec	-.579	-.579	-.436	-.378	-.914	-1.524
Y_r ~ m/sec	.622	.622	.259	.985	.433	.396
L'_β ~ $1/sec^2$	-1.141	-1.141	-.324	-5.85	-1.316	-8.47
L'_p ~ 1/sec	-2.0	-2.0	-2.31	-1.790	-3.18	-4.31
L'_r ~ 1/sec	.227	.227	.0946	.654	.804	1.00
N'_β ~ $1/sec^2$	.901	.901	.1343	2.71	.891	3.78
N'_p ~ 1/sec	.0471	.0471	.01660	.1150	.220	.201
N'_r ~ 1/sec	-.553	-.553	-.232	-.842	-1.10	-1.10
Y'_{δ_a} ~ 1/sec	.01450	.01450	.0586	.00573	.0436	.00651
L'_{δ_a} ~ $1/sec^2$	1.00	1.00	1.00	1.00	1.00	1.00
N'_{δ_a} ~ $1/sec^2$	.00409	.00409	.00384	.00937	0.0	0.0
K_φ ~ 1/1	3.69	3.69	4.18	3.25	4.72	8.14
T_L ~ sec	.234	.234	.1908	.303	.0685	0.0
T_E ~ sec	.333	.333	.333	.333	.333	.333
σ_v ~ m/sec	2.08	1.854	2.08	2.08	2.08	2.08
σ_p ~ deg/sec	.544	.485	.544	.544	.669	.669
L_v ~ m	205.	533.	205.	205.	205.	205.

Note that the stability derivatives L'_{δ_a} and M_{δ_e} are unity for all configurations (c.f., Tables III-2, III-3). This was intentionally done at the time the data was compiled, and is, in effect, a scaling change accomplished by dividing Y_{δ_a}, N_{δ_a} and X_{δ_e}, Z_{δ_e} by the original values of L'_{δ_a} and M_{δ_e}, respectively. The motivation for the scaling change was to simplify the procedure for calculating the pitch and roll pilot parameters.

A caveat is in order here. The data presented in Tables III-2 and III-3 have been collected from very diverse sources over a long period of time. In a few cases the original source of the data is now unclear. Those familiar with the art will know the considerable difficulty which attends the attempt to discover definitive data. In many cases we, our colleagues, and (we suspect) our predecessors have, according to the best judgment available, altered the data as may have been indicated by internal inconsistencies or physical improbabilities revealed by the attempt to use them. For these reasons we wish to make it clear that the data are only <u>nominally</u> representative of the several aircraft configurations. In particular, the manufacturers of the aircraft cannot be held accountable for this information, nor would they be bound to concur in any conclusions with respect to their aircraft which might be derived from its use.

SECTION IV

RESULTS

The results of this study are summarized in Tables IV-1 through IV-4. Tables IV-3 and IV-4 are the S.I. unit equivalents of Tables IV-1 and IV-2, respectively.

The contents of these tables can be summarized as follows:

1. Linear and angular RMS values of the aircraft motion due to 1% probability atmospheric turbulence with and without the effects of a second order washout filter.

2. Linear and angular peak values of the aircraft motion due to a discrete wind shear (1 kt/sec lasting for 10 seconds) with and without the effects of a second order washout filter.

TABLE IV-1: LONGITUDINAL RESULTS, U.S. UNITS

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{x}$ ~ ft/sec^2	.253	.203	.315	.237	.282	.229
$\ddot{x}_{wo}$ ~ ft/sec^2	.1366	.0925	.1497	.0976	.1084	.0946
$\dot{x}$ ~ ft/sec	1.525	1.659	1.657	1.405	1.676	1.436
$\dot{x}_{wo}$ ~ ft/sec	.0930	.0772	.1230	.10	.1008	.0786
x_{wo} ~ ft	.213	.1812	.279	.217	.261	.209
$\ddot{h}_p$ ~ ft/sec^2	.486	.445	.618	.764	.562	.516
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	.399	.268	.466	.673	.393	.397
$\dot{h}_p$ ~ ft/sec	.80	1.866	1.121	.915	1.213	1.045
$\dot{h}_{p_{wo}}$ ~ ft/sec	.222	.203	.299	.342	.268	.229
$h_{p_{wo}}$ ~ ft	.281	.357	.410	.368	.405	.333
$\ddot{\theta}$ ~ deg/sec^2	.526	.330	.511	.854	.1367	.230
$\ddot{\theta}_{wo}$ ~ deg/sec^2	.516	.321	.488	.828	.1221	.218
$\dot{\theta}$ ~ deg/sec	.213	.1491	.282	.40	.1170	.1434
$\dot{\theta}_{wo}$ ~ deg/sec	.1940	.1337	.224	.340	.0698	.1044
θ ~ deg	.207	.1589	.40	.477	.276	.290
θ_{wo} ~ deg	.1093	.0806	.1582	.220	.0630	.0776

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind.

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{x}$ ~ ft/sec^2	.423	.423	.498	.416	.495	.423
$\ddot{x}_{wo}$ ~ ft/sec^2	-.0236	-.0236	-.0333	-.0336	-.0316	-.0223
$\dot{x}$ ~ ft/sec	5.15	5.15	5.17	5.15	5.24	5.19
$\dot{x}_{wo}$ ~ ft/sec	.0559	.0559	.0796	.0645	.0706	.0538
x_{wo} ~ ft	.411	.411	.488	.403	.483	.414
$\ddot{h}_p$ ~ ft/sec^2	-.1699	-.1699	-.233	-.270	-.287	-.251
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	-.0383	-.0383	-.0595	-.0724	-.0681	-.0510
$\dot{h}_p$ ~ ft/sec^2	-1.296	-1.296	-1.481	-1.865	-2.05	-2.03
$\dot{h}_{p_{wo}}$ ~ ft/sec^2	.0686	.0686	.0975	.1186	.1225	.0976
$h_{p_{wo}}$ ~ ft	-.1697	-.1697	-.230	-.264	-.289	-.255
$\ddot{\theta}$ ~ deg/sec^2	.0521	.0521	.1354	.0909	.0479	.0464
$\ddot{\theta}_{wo}$ ~ deg/sec^2	-.0258	-.0258	.0733	.0749	-.0274	-.01618
$\dot{\theta}$ ~ deg/sec	-.0539	-.0539	-.1372	-.1488	-.0778	-.0712
$\dot{\theta}_{wo}$ ~ deg/sec	-.01523	-.01523	-.0422	-.0571	-.0213	-.01411
θ ~ deg	-.337	-.337	-.576	-.803	-.511	-.568
θ_{wo} ~ deg	.0244	.0244	.0581	.0702	.0366	.0315

TABLE IV-1 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{x}$ ~ ft/sec^2	.364	.272	.277	.1559	.0440	.0379
$\ddot{x}_{wo}$ ~ ft/sec^2	.1856	.1255	.1578	.0922	.0257	.0248
$\dot{x}$ ~ ft/sec	1.693	1.746	1.385	.944	.333	.250
$\dot{x}_{wo}$ ~ ft/sec	.1441	.1108	.1236	.0577	.0216	.0199
x_{wo} ~ ft	.314	.243	.229	.1263	.0360	.0269
$\ddot{h}_p$ ~ ft/sec^2	.821	.611	1.067	.575	.504	.505
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	.647	.409	.978	.520	.415	.452
$\dot{h}_p$ ~ ft/sec	1.324	1.972	1.005	.650	.923	.738
$\dot{h}_{p_{wo}}$ ~ ft/sec	.382	.286	.444	.225	.225	.204
$h_{p_{wo}}$ ~ ft	.512	.458	.436	.249	.290	.229
$\ddot{\theta}$ ~ deg/sec^2	1.050	.651	1.032	.1522	.391	.720
$\ddot{\theta}_{wo}$ ~ deg/sec^2	1.014	.627	.996	.1504	.374	.702
$\dot{\theta}$ ~ deg/sec	.543	.352	.514	.0526	.218	.345
$\dot{\theta}_{wo}$ ~ deg/sec	.446	.286	.432	.0476	.1978	.328
θ ~ deg	.753	.525	.636	.0575	.1665	.211
θ_{wo} ~ deg	.285	.1874	.284	.0248	.1223	.1752

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b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{x}$ ~ ft/sec^2	.517	.517	.414	.284	.0826	.0645
$\ddot{x}_{wo}$ ~ ft/sec^2	-.0361	-.0361	-.0390	-.01354	-.00241	-.001752
$\dot{x}$ ~ ft/sec	5.21	5.21	5.14	5.06	2.92	2.43
$\dot{x}_{wo}$ ~ ft/sec	-.0864	-.0864	.0698	.0342	.00849	.00656
x_{wo} ~ ft	.511	.511	.399	.281	.0829	.0646
$\ddot{h}_p$ ~ ft/sec^2	.286	.286	-.292	-.1684	-.1364	-.1250
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	-.0685	-.0685	-.0837	-.0385	.0203	.01565
$\dot{h}_p$ ~ ft/sec^2	-1.633	-1.633	-1.812	-1.428	-1.329	-1.234
$\dot{h}_{p_{wo}}$ ~ ft/sec^2	.1160	.1160	.1293	.0650	.0327	.0257
$h_{p_{wo}}$ ~ ft	.277	.277	-.272	-.1706	-.1366	-.1234
$\ddot{\theta}$ ~ deg/sec^2	.296	.296	.1401	.00721	.00518	-.00415
$\ddot{\theta}_{wo}$ ~ deg/sec^2	.1886	.1886	.1107	.00340	-.00203	.001461
$\dot{\theta}$ ~ deg/sec	-.254	-.254	-.1977	-.01396	-.01780	-.01510
$\dot{\theta}_{wo}$ ~ deg/sec	-.0893	-.0893	-.0782	-.00357	.00277	.001854
θ ~ deg	-1.107	-1.107	-1.049	-.1188	-.1735	-.1495
θ_{wo} ~ deg	.1172	.1172	.0939	.00558	.00422	.00332

TABLE IV-1 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{x}$ ~ ft/sec^2	.1243	.1321	.0833	.0364	.0430
$\ddot{x}_{wo}$ ~ ft/sec^2	.0607	.0509	.0350	.0205	.0290
$\dot{x}$ ~ ft/sec	.907	1.186	.692	.309	.307
$\dot{x}_{wo}$ ~ ft/sec	.0415	.0461	.0319	.01740	.0209
x_{wo} ~ ft	.1087	.1222	.0758	.0303	.0320
$\ddot{h}_p$ ~ ft/sec^2	.489	.540	.397	.473	.381
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	.405	.333	.349	.382	.324
$\dot{h}_p$ ~ ft/sec	.852	1.801	.625	.888	.650
$\dot{h}_{p_{wo}}$ ~ ft/sec	.206	.254	.1511	.219	.1693
$h_{p_{wo}}$ ~ ft	.276	.428	.1909	.282	.203
$\ddot{\theta}$ ~ deg/sec^2	.140	.1322	.1707	.243	.346
$\ddot{\theta}_{wo}$ ~ deg/sec^2	.1320	.1201	.1635	.229	.329
$\dot{\theta}$ ~ deg/sec	.0867	.0978	.0912	.1457	.1973
$\dot{\theta}_{wo}$ ~ deg/sec	.0632	.0701	.0740	.1284	.1791
θ ~ deg	.1714	.1945	.1461	.1270	.1475
θ_{wo} ~ deg	.0482	.0568	.0511	.0852	.1129

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b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{x}$ ~ ft/sec^2	.266	.266	.1969	.0774	.1141
$\ddot{x}_{wo}$ ~ ft/sec^2	-.01052	-.01052	-.00848	-.0020	-.00638
$\dot{x}$ ~ ft/sec	5.07	5.07	4.79	2.79	3.46
$\dot{x}_{wo}$ ~ ft/sec	.0301	.0301	.0213	.00790	.01252
x_{wo} ~ ft	.266	.266	.1985	.0774	.1113
$\ddot{h}_p$ ~ ft/sec^2	-.234	-.234	-.261	-.160	.01245
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	.0429	.0429	.0392	.0211	-.00351
$\dot{h}_p$ ~ ft/sec^2	-2.11	-2.11	-2.45	-1.567	.1119
$\dot{h}_{p_{wo}}$ ~ ft/sec^2	.0757	.0757	.0717	.0347	-.00396
$h_{p_{wo}}$ ~ ft	-.237	-.237	-.262	-.1590	.01184
$\ddot{\theta}$ ~ deg/sec^2	.01896	.01896	.01457	.00548	-.01204
$\ddot{\theta}_{wo}$ ~ deg/sec^2	-.00736	-.00736	-.01021	-.00226	.00916
$\dot{\theta}$ ~ deg/sec	-.0448	-.0448	-.0399	-.01842	.01389
$\dot{\theta}_{wo}$ ~ deg/sec	.00708	.00708	.00356	.00223	.00566
θ ~ deg	-.404	-.404	-.375	-.1801	.0892
θ_{wo} ~ deg	.01598	.01598	.01011	.00457	-.00617

TABLE IV-1 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{x}$ ~ ft/sec^2	.0492	.0518	.0647	.0338
$\ddot{x}_{wo}$ ~ ft/sec^2	.0318	.0328	.060	.0309
$\dot{x}$ ~ ft/sec	.429	.599	.281	.0713
$\dot{x}_{wo}$ ~ ft/sec	.0211	.0230	.0336	.01968
x_{wo} ~ ft	.0378	.0403	.0251	.01421
$\ddot{h}_p$ ~ ft/sec^2	.734	.772	.408	.233
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	.714	.623	.366	.223
$\dot{h}_p$ ~ ft/sec	.480	1.544	.589	.1923
$\dot{h}_{p_{wo}}$ ~ ft/sec	.1938	.351	.1661	.1135
$h_{p_{wo}}$ ~ ft	.1753	.461	.1848	.0708
$\ddot{\theta}$ ~ deg/sec^2	.430	.406	.464	.353
$\ddot{\theta}_{wo}$ ~ deg/sec^2	.425	.394	.451	.334
$\dot{\theta}$ ~ deg/sec	.1358	.1864	.212	.209
$\dot{\theta}_{wo}$ ~ deg/sec	.1258	.1697	.1949	.1935
θ ~ deg	.1221	.1683	.1489	.1377
θ_{wo} ~ deg	.0669	.1010	.1170	.1225

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{x}$ ~ ft/sec^2	.1037	.1037	-.0256	.01899
$\ddot{x}_{wo}$ ~ ft/sec^2	-.00508	-.00508	.00261	-.000698
$\dot{x}$ ~ ft/sec	3.31	3.31	-1.010	.788
$\dot{x}_{wo}$ ~ ft/sec	.01125	.01125	-.00322	.001617
x_{wo} ~ ft	.1025	.1025	-.0254	.01898
$\ddot{h}_p$ ~ ft/sec^2	-.1696	-.1696	-.0586	-.0391
$\ddot{h}_{p_{wo}}$ ~ ft/sec^2	.0273	.0273	.00795	.00287
$\dot{h}_p$ ~ ft/sec^2	-1.641	-1.641	-.789	-.874
$\dot{h}_{p_{wo}}$ ~ ft/sec^2	.0446	.0446	-.01117	-.00469
$h_{p_{wo}}$ ~ ft	-.1705	-.1705	-.0557	-.0371
$\ddot{\theta}$ ~ deg/sec^2	.01203	.01203	-.0218	-.00266
$\ddot{\theta}_{wo}$ ~ deg/sec^2	-.00587	-.00587	.01528	.001947
$\dot{\theta}$ ~ deg/sec	-.0316	-.0316	.0235	-.00375
$\dot{\theta}_{wo}$ ~ deg/sec	.00635	.00635	.00957	.001433
θ ~ deg	-.306	-.306	.1349	-.0403
θ_{wo} ~ deg	.00921	.00921	-.0100	-.001237

TABLE IV-1 (Concluded)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{x}$ ~ ft/sec^2	.1076	.0893	.0786	.1189	.1471	.1739
$\ddot{x}_{wo}$ ~ ft/sec^2	.0338	.0252	.0214	.0509	.0460	.0616
$\dot{x}$ ~ ft/sec	1.124	1.343	1.551	.819	1.843	1.307
$\dot{x}_{wo}$ ~ ft/sec	.0391	.0305	.0271	.0471	.0568	.0677
x_{wo} ~ ft	.1025	.0859	.0759	.1078	.1402	.1632
$\ddot{h}_p$ ~ ft/sec^2	.545	.476	.205	.928	.356	.599
$\ddot{h}_{Pwo}$ ~ ft/sec^2	.489	.324	.1444	.884	.263	.543
$\dot{h}_p$ ~ ft/sec	.596	1.773	.532	.565	.669	.540
$\dot{h}_{Pwo}$ ~ ft/sec	.237	.224	.0953	.306	.1826	.278
h_{Pwo} ~ ft	.246	.351	.1469	.290	.243	.260
$\ddot{\theta}$ ~ deg/sec^2	1.118	.707	.512	1.964	.90	1.780
$\ddot{\theta}_{wo}$ ~ deg/sec^2	1.078	.670	.476	1.944	.839	1.734
$\dot{\theta}$ ~ deg/sec	.550	.405	.330	.586	.572	.784
$\dot{\theta}_{wo}$ ~ deg/sec	.463	.322	.249	.514	.435	.687
θ ~ deg	.706	.606	.542	.586	.913	.876
θ_{wo} ~ deg	.311	.237	.1959	.293	.338	.425

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{x}$ ~ ft/sec^2	.230	.230	.1836	.247	.358	.339
$\ddot{x}_{wo}$ ~ ft/sec^2	-.01102	-.01102	-.00770	-.01043	-.0225	-.0216
$\dot{x}$ ~ ft/sec	4.81	4.81	4.47	4.91	5.13	5.11
$\dot{x}_{wo}$ ~ ft/sec	.0294	.0294	.0221	.0311	.0523	.0482
x_{wo} ~ ft	.228	.228	.1832	.245	.356	.331
$\ddot{h}_p$ ~ ft/sec^2	-.1050	-.1050	-.01304	-.0922	-.0367	-.0775
$\ddot{h}_{Pwo}$ ~ ft/sec^2	-.01871	-.01871	.00291	-.01690	-.00598	-.01813
$\dot{h}_p$ ~ ft/sec^2	-.906	-.906	-.1237	-.654	-.271	-.562
$\dot{h}_{Pwo}$ ~ ft/sec^2	.0328	.0328	.00373	.0344	.01399	.0332
h_{Pwo} ~ ft	-.1064	-.1064	-.01312	-.0902	-.0363	-.0744
$\ddot{\theta}$ ~ deg/sec^2	.1386	.1386	.0969	.0770	.267	.216
$\ddot{\theta}_{wo}$ ~ deg/sec^2	-.0711	-.0711	-.0467	.0276	.1408	-.1372
$\dot{\theta}$ ~ deg/sec	-.1860	-.1860	-.1377	-.1397	-.351	-.271
$\dot{\theta}_{wo}$ ~ deg/sec	-.0545	-.0545	-.0369	-.0290	-.1037	-.0908
θ ~ deg	-1.369	-1.369	-1.102	-.984	-2.15	-1.528
θ_{wo} ~ deg	.0793	.0793	.0554	.0515	.1534	.1218

TABLE IV-2: LATERAL-DIRECTIONAL RESULTS, U.S. UNITS

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{y}_p$ ~ ft/sec^2	-.858	-.858	.495	2.33	-.307	-.266
$\ddot{y}_{p_{wo}}$ ~ ft/sec^2	-.1248	-.1248	-.0627	-.1774	-.0605	-.0756
$\dot{y}_p$ ~ ft/sec	-5.78	-5.78	4.32	24.0	.891	-.862
$\dot{y}_{p_{wo}}$ ~ ft/sec	-.259	-.259	.1239	.429	.0848	-.0874
$y_{p_{wo}}$ ~ ft	-.847	-.847	.495	2.27	-.297	-.229
$\ddot{\varphi}$ ~ deg/sec^2	-.276	-.276	-.1235	-.354	-.1777	-.235
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	.1625	.1625	.0704	-.231	.1443	.1937
$\dot{\varphi}$ ~ deg/sec	-.451	-.451	.1346	.477	.20	-.251
$\dot{\varphi}_{wo}$ ~ deg/sec	.1472	.1472	.0635	.1544	-.1126	-.1510
φ ~ deg	-1.410	-1.410	.291	1.848	-.688	-.571
φ_{wo} ~ deg	-.1749	-.1749	-.0566	-.204	-.1201	-.1521
$\ddot{\psi}$ ~ deg/sec^2	-.456	-.456	-.402	-.1442	.304	-.322
$\ddot{\psi}_{wo}$ ~ deg/sec^2	-.1640	-.1640	.245	-.0807	.0821	.1130
$\dot{\psi}$ ~ deg/sec	-1.784	-1.784	-.870	.372	-1.130	-.834
$\dot{\psi}_{wo}$ ~ deg/sec	.1904	.1904	-.1858	.0910	-.1072	-.1333
ψ ~ deg	-12.88	-12.88	-7.09	3.54	-10.16	-7.46
ψ_{wo} ~ deg	-.858	.495	2.33	-.307	-.266	-.251

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{y}_p$ ~ ft/sec^2	1.601	1.103	.681	1.804	.60	.748
$\ddot{y}_{p_{wo}}$ ~ ft/sec^2	.610	.404	.374	.770	.253	.407
$\dot{y}_p$ ~ ft/sec	3.02	2.29	1.560	6.83	1.018	.894
$\dot{y}_{p_{wo}}$ ~ ft/sec	.823	.546	.345	.794	.305	.407
$y_{p_{wo}}$ ~ ft	1.489	1.032	.574	1.639	.548	.632
$\ddot{\varphi}$ ~ deg/sec^2	1.617	1.266	1.193	1.948	1.229	1.939
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	1.397	1.135	1.134	1.817	1.121	1.784
$\dot{\varphi}$ ~ deg/sec	1.451	1.012	.653	1.226	.855	1.269
$\dot{\varphi}_{wo}$ ~ deg/sec	.859	.644	.539	.945	.625	1.005
φ ~ deg	2.31	1.585	.692	1.662	1.139	1.405
φ_{wo} ~ deg	.832	.576	.387	.727	.519	.786
$\ddot{\psi}$ ~ deg/sec^2	1.460	.931	.871	.708	.660	.989
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.790	.502	.611	.660	.399	.737
$\dot{\psi}$ ~ deg/sec	2.48	1.616	1.102	.552	1.135	1.192
$\dot{\psi}_{wo}$ ~ deg/sec	.782	.494	.539	.283	.376	.60
ψ ~ deg	5.84	4.75	2.67	1.204	3.66	2.75
ψ_{wo} ~ deg	1.103	.681	1.804	.60	.748	.671

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TABLE IV-2 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{y}_p$ ~ ft/sec^2	.759	.60	.896	1.141	.524	.708
$\ddot{y}_{p_{wo}}$ ~ ft/sec^2	.567	.432	.750	.821	.451	.637
$\dot{y}_p$ ~ ft/sec	.677	.608	.755	1.385	.425	.503
$\dot{y}_{p_{wo}}$ ~ ft/sec	.395	.306	.490	.703	.322	.429
$y_{p_{wo}}$ ~ ft	.510	.420	.501	.804	.274	.320
$\ddot{\varphi}$ ~ deg/sec^2	5.85	4.86	6.40	4.36	3.39	5.22
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	5.80	4.82	6.30	4.08	3.19	4.94
$\dot{\varphi}$ ~ deg/sec	1.876	1.528	2.37	2.55	2.0	3.05
$\dot{\varphi}_{wo}$ ~ deg/sec	1.794	1.458	2.25	2.20	1.829	2.65
φ ~ deg	1.083	.904	1.490	2.05	1.360	1.921
φ_{wo} ~ deg	.842	.683	1.20	1.580	1.204	1.763
$\ddot{\psi}$ ~ deg/sec^2	2.47	1.643	2.57	1.183	.829	.722
$\ddot{\psi}_{wo}$ ~ deg/sec^2	2.26	1.508	2.36	.956	.742	.662
$\dot{\psi}$ ~ deg/sec	1.741	1.157	1.80	1.105	.60	.482
$\dot{\psi}_{wo}$ ~ deg/sec	1.270	.848	1.425	.759	.506	.417
ψ ~ deg	2.92	2.65	2.64	1.574	.573	.422
ψ_{wo} ~ deg	.60	.896	1.141	.524	.708	.299

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{y}_p$ ~ ft/sec^2	.237	.237	.267	.453	.1533	.1431
$\ddot{y}_{p_{wo}}$ ~ ft/sec^2	-.0760	-.0760	.1170	.1234	.0685	.0758
$\dot{y}_p$ ~ ft/sec	1.743	1.743	1.687	2.85	.796	.583
$\dot{y}_{p_{wo}}$ ~ ft/sec	.0917	.0917	-.1132	-.1523	.0559	-.0571
$y_{p_{wo}}$ ~ ft	.1901	.1901	.217	.395	.1250	.1030
$\ddot{\varphi}$ ~ deg/sec^2	-.289	-.289	-.398	.377	-.408	-.646
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	-.420	-.420	-.396	-.365	.375	.473
$\dot{\varphi}$ ~ deg/sec	.217	.217	.274	-.340	-.293	.431
$\dot{\varphi}_{wo}$ ~ deg/sec	.1882	.1882	.243	-.273	-.237	-.308
φ ~ deg	-.1379	-.1379	-.238	.568	.283	-.279
φ_{wo} ~ deg	-.0861	-.0861	.1606	.251	.1658	.1984
$\ddot{\psi}$ ~ deg/sec^2	-.766	-.766	.676	.269	-.1536	.1309
$\ddot{\psi}_{wo}$ ~ deg/sec^2	-.424	-.424	-.382	-.1431	-.1104	-.0738
$\dot{\psi}$ ~ deg/sec	-.896	-.896	-.80	-.494	-.233	-.1777
$\dot{\psi}_{wo}$ ~ deg/sec	.232	.232	.237	-.1261	.0941	.0635
ψ ~ deg	-7.62	-7.62	-6.73	-3.83	-1.581	-1.178
ψ_{wo} ~ deg	.237	.267	.453	.1533	.1431	-.0672

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TABLE IV-2 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{y}_p$ ~ ft/sec^2	.741	.503	.569	.404	.503
$\ddot{y}_{p_{wo}}$ ~ ft/sec^2	.561	.340	.441	.343	.437
$\dot{y}_p$ ~ ft/sec	1.181	1.171	.753	.354	.387
$\dot{y}_{p_{wo}}$ ~ ft/sec	.320	.214	.242	.225	.317
$y_{p_{wo}}$ ~ ft	.489	.373	.360	.218	.257
$\ddot{\varphi}$ ~ deg/sec^2	1.678	1.088	1.552	1.378	1.581
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	1.569	1.017	1.446	1.254	1.449
$\dot{\varphi}$ ~ deg/sec	1.015	.662	.958	.908	1.039
$\dot{\varphi}_{wo}$ ~ deg/sec	.805	.518	.759	.770	.915
φ ~ deg	1.053	.733	.988	.739	.780
φ_{wo} ~ deg	.618	.40	.586	.591	.658
$\ddot{\psi}$ ~ deg/sec^2	.470	.304	.474	.621	.60
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.325	.203	.325	.512	.533
$\dot{\psi}$ ~ deg/sec	.607	.435	.607	.535	.441
$\dot{\psi}_{wo}$ ~ deg/sec	.284	.1786	.287	.412	.365
ψ ~ deg	1.260	1.215	1.175	.565	.418
ψ_{wo} ~ deg	.503	.568	.404	.503	.286

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{y}_p$ ~ ft/sec^2	.426	.426	.274	.1483	.1190
$\ddot{y}_{p_{wo}}$ ~ ft/sec^2	-.0443	-.0443	-.0357	-.0467	-.0574
$\dot{y}_p$ ~ ft/sec	3.48	3.48	2.06	.952	.457
$\dot{y}_{p_{wo}}$ ~ ft/sec	-.0879	-.0879	.0617	-.0450	.0491
$y_{p_{wo}}$ ~ ft	.418	.418	.265	.1333	.0837
$\ddot{\varphi}$ ~ deg/sec^2	.1865	.1865	.1547	-.1576	.1762
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	.1508	.1508	.1294	.1405	.1685
$\dot{\varphi}$ ~ deg/sec	.228	.228	.1894	-.1459	-.1447
$\dot{\varphi}_{wo}$ ~ deg/sec	-.1077	-.1077	-.0950	-.1067	.1265
φ ~ deg	.488	.488	.390	.1850	.1507
φ_{wo} ~ deg	-.1020	-.1020	-.0923	-.1001	-.1002
$\ddot{\psi}$ ~ deg/sec^2	-.1496	-.1496	-.1350	-.1184	-.1133
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.0563	.0563	.0509	.0812	.0703
$\dot{\psi}$ ~ deg/sec	-.433	-.433	-.407	-.232	-.1706
$\dot{\psi}_{wo}$ ~ deg/sec	-.0657	-.0657	-.0558	-.0729	.0643
ψ ~ deg	-3.51	-3.51	-3.20	-1.441	-1.153
ψ_{wo} ~ deg	.426	.274	.1483	.1190	-.0662

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TABLE IV-2 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{y}_p$ ~ ft/sec²	2.84	1.821	.498	.233
$\ddot{y}_{p_{wo}}$ ~ ft/sec²	2.47	1.524	.367	.214
$\dot{y}_p$ ~ ft/sec	2.21	1.683	.564	.1295
$\dot{y}_{p_{wo}}$ ~ ft/sec	1.677	1.053	.293	.0991
$y_{p_{wo}}$ ~ ft	1.442	1.019	.342	.0950
$\ddot{\varphi}$ ~ deg/sec²	6.10	3.86	2.28	.509
$\ddot{\varphi}_{wo}$ ~ deg/sec²	5.77	3.66	2.18	.462
$\dot{\varphi}$ ~ deg/sec	3.49	2.18	1.192	.318
$\dot{\varphi}_{wo}$ ~ deg/sec	3.14	1.942	1.043	.244
φ ~ deg	2.65	1.808	.985	.296
φ_{wo} ~ deg	2.09	1.304	.686	.218
$\ddot{\psi}$ ~ deg/sec²	1.522	.931	.222	.268
$\ddot{\psi}_{wo}$ ~ deg/sec²	1.388	.840	.20	.208
$\dot{\psi}$ ~ deg/sec	1.052	.680	.1816	.246
$\dot{\psi}_{wo}$ ~ deg/sec	.891	.548	.1080	.1786
ψ ~ deg	.969	.843	.306	.243
ψ_{wo} ~ deg	1.821	.498	.233	.1735

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{y}_p$ ~ ft/sec²	.569	.569	.212	.0334
$\ddot{y}_{p_{wo}}$ ~ ft/sec²	.237	.237	-.0649	.0206
$\dot{y}_p$ ~ ft/sec	3.72	3.72	.804	.216
$\dot{y}_{p_{wo}}$ ~ ft/sec	-.244	-.244	.0823	-.0210
$y_{p_{wo}}$ ~ ft	.473	.473	.1770	.0302
$\ddot{\varphi}$ ~ deg/sec²	.489	.489	-.238	-.0658
$\ddot{\varphi}_{wo}$ ~ deg/sec²	.454	.454	.237	.0497
$\dot{\varphi}$ ~ deg/sec	-.433	-.433	.215	-.0698
$\dot{\varphi}_{wo}$ ~ deg/sec	.327	.327	-.1679	.0460
φ ~ deg	.756	.756	.405	.0653
φ_{wo} ~ deg	.250	.250	-.1344	-.0473
$\ddot{\psi}$ ~ deg/sec²	.1869	.1869	-.0515	.0558
$\ddot{\psi}_{wo}$ ~ deg/sec²	-.1343	-.1343	-.0205	.0410
$\dot{\psi}$ ~ deg/sec	-.286	-.286	-.1562	-.0724
$\dot{\psi}_{wo}$ ~ deg/sec	-.1022	-.1022	.01938	-.0394
ψ ~ deg	-2.29	-2.29	-1.140	-.450
ψ_{wo} ~ deg	.569	.212	.0334	.0465

TABLE IV-2 (Concluded)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{y}_p$ ~ ft/sec^2	.652	.491	.524	1.422	.960	1.329
$\ddot{y}_{P_{wo}}$ ~ ft/sec^2	.427	.322	.229	1.232	.583	1.165
$\dot{y}_p$ ~ ft/sec	.963	.859	1.735	1.286	3.34	1.155
$\dot{y}_{P_{wo}}$ ~ ft/sec	.380	.278	.228	.847	.494	.715
$y_{P_{wo}}$ ~ ft	.499	.375	.474	.729	.769	.654
$\ddot{\varphi}$ ~ deg/sec^2	3.17	2.51	1.774	8.22	4.33	12.08
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	3.05	2.43	1.710	7.95	4.20	11.92
$\dot{\varphi}$ ~ deg/sec	1.533	1.156	.878	4.01	2.03	4.53
$\dot{\varphi}_{wo}$ ~ deg/sec	1.354	1.033	.739	3.76	1.807	4.36
φ ~ deg	1.257	.944	1.078	2.48	1.827	2.41
φ_{wo} ~ deg	.883	.651	.494	2.20	1.137	2.16
$\ddot{\psi}$ ~ deg/sec^2	1.363	.783	.549	2.29	1.489	3.92
$\ddot{\psi}_{wo}$ ~ deg/sec^2	1.028	.585	.214	2.14	1.213	3.74
$\dot{\psi}$ ~ deg/sec	1.511	.909	1.665	1.409	1.857	2.21
$\dot{\psi}_{wo}$ ~ deg/sec	.871	.499	.251	1.211	.842	1.886
ψ ~ deg	3.33	2.98	10.99	1.410	7.33	2.90
ψ_{wo} ~ deg	.491	.524	1.422	.960	1.329	1.216

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{y}_p$ ~ ft/sec^2	.316	.316	.515	.423	1.121	.448
$\ddot{y}_{P_{wo}}$ ~ ft/sec^2	-.0677	-.0677	.01932	.1417	-.307	-.218
$\dot{y}_p$ ~ ft/sec	2.49	2.49	4.83	2.75	8.95	2.63
$\dot{y}_{P_{wo}}$ ~ ft/sec	-.1115	-.1115	-.0953	-.1602	-.428	.1931
$y_{P_{wo}}$ ~ ft	.297	.297	.517	.330	1.004	.305
$\ddot{\varphi}$ ~ deg/sec^2	.272	.272	.304	.822	-1.429	-1.126
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	-.282	-.282	-.238	-.576	-1.204	-1.10
$\dot{\varphi}$ ~ deg/sec	-.282	-.282	-.433	-.518	1.364	.776
$\dot{\varphi}_{wo}$ ~ deg/sec	.206	.206	.1534	.331	.791	-.681
φ ~ deg	.513	.513	1.142	.627	2.19	.733
φ_{wo} ~ deg	.1708	.1708	.1705	.244	-.624	-.387
$\ddot{\psi}$ ~ deg/sec^2	.609	.609	.929	.421	1.675	-1.069
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.360	.360	-.323	-.234	1.686	.732
$\dot{\psi}$ ~ deg/sec	-1.106	-1.106	-4.03	-.454	-3.04	-1.00
$\dot{\psi}_{wo}$ ~ deg/sec	.309	.309	.411	-.1318	-1.001	-.366
ψ ~ deg	-8.66	-8.66	-31.8	-3.32	-18.92	-7.26
ψ_{wo} ~ deg	.316	.515	.423	1.121	.448	-.430

TABLE IV-3: LONGITUDINAL RESULTS, S.I. UNITS

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{x}$ ~ m/sec^2	.829	.666	1.035	.778	.924	.752
$\ddot{x}_{wo}$ ~ m/sec^2	.448	.303	.491	.320	.356	.311
$\dot{x}$ ~ m/sec	5.0	5.44	5.44	4.61	5.50	4.71
$\dot{x}_{wo}$ ~ m/sec	.305	.253	.404	.328	.331	.258
x_{wo} ~ m	.70	.595	.914	.712	.855	.687
$\ddot{h}_p$ ~ m/sec^2	1.594	1.459	2.03	2.51	1.844	1.693
$\ddot{h}_{p_{wo}}$ ~ m/sec^2	1.309	.879	1.530	2.21	1.290	1.302
$\dot{h}_p$ ~ m/sec	2.63	5.12	3.68	3.0	3.98	3.43
$\dot{h}_{p_{wo}}$ ~ m/sec	.729	.665	.980	1.121	.879	.752
$h_{p_{wo}}$ ~ m	.921	1.172	1.345	1.207	1.330	1.093
$\ddot{\theta}$ ~ deg/sec^2	.526	.330	.511	.854	.1367	.230
$\ddot{\theta}_{wo}$ ~ deg/sec^2	.516	.321	.488	.828	.1221	.218
$\dot{\theta}$ ~ deg/sec	.213	.1491	.282	.40	.1170	.1434
$\dot{\theta}_{wo}$ ~ deg/sec	.1940	.1337	.224	.340	.0698	.1044
θ ~ deg	.207	.1589	.40	.477	.276	.290
θ_{wo} ~ deg	.1093	.0806	.1582	.220	.0630	.0776

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{x}$ ~ m/sec^2	1.386	1.386	1.633	1.365	1.623	1.388
$\ddot{x}_{wo}$ ~ m/sec^2	-.0774	-.0774	-.1092	-.1102	-.1036	-.0733
$\dot{x}$ ~ m/sec	16.89	16.89	16.96	16.88	17.18	17.01
$\dot{x}_{wo}$ ~ m/sec	.1834	.1834	.261	.212	.232	.1765
x_{wo} ~ m	1.347	1.347	1.601	1.322	1.584	1.358
$\ddot{h}_p$ ~ m/sec^2	-.558	-.558	-.764	-.885	-.940	-.823
$\ddot{h}_{p_{wo}}$ ~ m/sec^2	-.1256	-.1256	-.1952	-.238	-.223	-.1673
$\dot{h}_p$ ~ m/sec	-4.25	-4.25	-4.86	-6.12	-6.72	-6.66
$\dot{h}_{p_{wo}}$ ~ m/sec	.225	.225	.320	.389	.402	.320
$h_{p_{wo}}$ ~ m	-.557	-.557	-.754	-.867	-.947	-.838
$\ddot{\theta}$ ~ deg/sec^2	.0521	.0521	.1354	.0909	.0479	.0464
$\ddot{\theta}_{wo}$ ~ deg/sec^2	-.0258	-.0258	.0733	.0744	-.0274	-.01618
$\dot{\theta}$ ~ deg/sec	-.0539	-.0539	-.1372	-.1488	-.0778	-.0712
$\dot{\theta}_{wo}$ ~ deg/sec	-.01523	-.01523	-.0422	-.0571	-.0213	-.01411
θ ~ deg	-.337	-.337	-.576	-.803	-.511	-.568
θ_{wo} ~ deg	.0244	.0244	.0581	.0702	.0366	.0315

TABLE IV-3. (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{x}$ ~ m/sec^2	1.193	.893	.908	.512	.1445	.1242
$\ddot{x}_{wo}$ ~ m/sec^2	.609	.412	.518	.302	.0843	.0814
$\dot{x}$ ~ m/sec	5.56	5.73	4.54	3.10	1.091	.819
$\dot{x}_{wo}$ ~ m/sec	.473	.364	.406	.1894	.0708	.0654
x_{wo} ~ m	1.031	.796	.750	.414	.1182	.0947
$\ddot{h}_p$ ~ m/sec^2	2.70	2.01	3.50	1.886	1.654	1.656
$\ddot{h}_{p_{wo}}$ ~ m/sec^2	2.12	1.341	3.21	1.706	1.361	1.482
$\dot{h}_p$ ~ m/sec	4.34	6.47	3.30	2.13	3.03	2.42
$\dot{h}_{p_{wo}}$ ~ m/sec	1.255	.938	1.458	.739	.738	.668
$h_{p_{wo}}$ ~ m	1.679	1.504	1.430	.816	.951	.750
$\ddot{\theta}$ ~ deg/sec^2	1.050	.651	1.032	.1522	.391	.720
$\ddot{\theta}_{wo}$ ~ deg/sec^2	1.014	.627	.996	.1504	.374	.702
$\dot{\theta}$ ~ deg/sec	.543	.352	.514	.0526	.218	.345
$\dot{\theta}_{wo}$ ~ deg/sec	.446	.286	.432	.0476	.1978	.328
θ ~ deg	.753	.525	.636	.0575	.1665	.211
θ_{wo} ~ deg	.285	.1874	.284	.0248	.1223	.1752

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{x}$ ~ m/sec^2	1.697	1.697	1.359	.932	.271	.212
$\ddot{x}_{wo}$ ~ m/sec^2	-.1185	-.1185	-.1278	-.0444	-.00792	-.00575
$\dot{x}$ ~ m/sec	17.09	17.09	16.88	16.59	9.57	7.97
$\dot{x}_{wo}$ ~ m/sec	-.283	-.283	.229	.1123	.0279	.0215
x_{wo} ~ m	1.677	1.677	1.310	.923	.272	.212
$\ddot{h}_p$ ~ m/sec^2	.938	.938	-.958	-.552	-.447	-.410
$\ddot{h}_{p_{wo}}$ ~ m/sec^2	-.225	-.225	-.275	-.1262	.0667	.0514
$\dot{h}_p$ ~ m/sec	-5.36	-5.36	-5.95	-4.69	-4.36	-4.05
$\dot{h}_{p_{wo}}$ ~ m/sec	.381	.381	.424	.213	.1072	.0843
$h_{p_{wo}}$ ~ m	.909	.909	-.891	-.560	-.448	-.405
$\ddot{\theta}$ ~ deg/sec^2	.296	.296	.1401	.00721	.00518	-.00415
$\ddot{\theta}_{wo}$ ~ deg/sec^2	.1886	.1886	.1107	.00340	-.00203	.001461
$\dot{\theta}$ ~ deg/sec	-.254	-.254	-.1977	-.01396	-.01780	-.01510
$\dot{\theta}_{wo}$ ~ deg/sec	-.0893	-.0893	-.0782	-.00357	.00277	.001854
θ ~ deg	-1.107	-1.107	-1.049	-.1188	-.1735	-.1495
θ_{wo} ~ deg	.1172	.1172	.0939	.00558	.00422	.00332

TABLE IV-3 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration		B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{x}$	~ m/sec^2	.408	.433	.273	.1193	.1410
$\ddot{x}_{wo}$	~ m/sec^2	.199	.1670	.1147	.0672	.0951
$\dot{x}$	~ m/sec	2.98	3.89	2.27	1.014	1.009
$\dot{x}_{wo}$	~ m/sec	.1360	.1513	.1047	.0571	.0684
x_{wo}	~ m	.357	.401	.249	.0992	.1050
$\ddot{h}_p$	~ m/sec^2	1.604	1.771	1.302	1.550	1.251
$\ddot{h}_{p_{wo}}$	~ m/sec^2	1.330	1.092	1.145	1.254	1.064
$\dot{h}_p$	~ m/sec	2.79	5.91	2.05	2.91	2.13
$\dot{h}_{p_{wo}}$	~ m/sec	.677	.832	.496	.718	.556
$h_{p_{wo}}$	~ m	.906	1.404	.626	.924	.667
$\ddot{\theta}$	~ deg/sec^2	.140	.1322	.1707	.243	.346
$\ddot{\theta}_{wo}$	~ deg/sec^2	.1320	.1201	.1635	.229	.329
$\dot{\theta}$	~ deg/sec	.0867	.0978	.0912	.1457	.1973
$\dot{\theta}_{wo}$	~ deg/sec	.0632	.0701	.0740	.1284	.1791
θ	~ deg	.1714	.1945	.1461	.1270	.1475
θ_{wo}	~ deg	.0482	.0568	.0511	.0852	.1129

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration		B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{x}$	~ m/sec^2	.872	.872	.646	.254	.374
$\ddot{x}_{wo}$	~ m/sec^2	-.0345	-.0345	-.0278	-.00658	-.0209
$\dot{x}$	~ m/sec	16.63	16.63	15.71	9.16	11.35
$\dot{x}_{wo}$	~ m/sec	.0988	.0988	.0698	.0259	.0411
x_{wo}	~ m	.874	.874	.651	.254	.365
$\ddot{h}_p$	~ m/sec^2	-.769	-.769	-.856	-.525	.0408
$\ddot{h}_{p_{wo}}$	~ m/sec^2	.1408	.1408	.1288	.0693	-.01152
$\dot{h}_p$	~ m/sec	-6.91	-6.91	-8.03	-5.14	.367
$\dot{h}_{p_{wo}}$	~ m/sec	.248	.248	.235	.1138	-.01298
$h_{p_{wo}}$	~ m	-.779	-.779	-.859	-.522	.0388
$\ddot{\theta}$	~ deg/sec^2	.01896	.01896	.01457	.00548	-.01204
$\ddot{\theta}_{wo}$	~ deg/sec^2	-.00736	-.00736	-.01021	-.00226	.00916
$\dot{\theta}$	~ deg/sec	-.0448	-.0448	-.0399	-.01842	.01389
$\dot{\theta}_{wo}$	~ deg/sec	.00708	.00708	.00356	.00223	.00566
θ	~ deg	-.404	-.404	-.375	-.1801	.0892
θ_{wo}	~ deg	.01598	.01598	.01011	.00457	-.00617

TABLE IV-3 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{x}$ ~ m/sec^2	.1615	.170	.212	.1110
$\ddot{x}_{wo}$ ~ m/sec^2	.1044	.1077	.1968	.1015
$\dot{x}$ ~ m/sec	1.408	1.966	.921	.234
$\dot{x}_{wo}$ ~ m/sec	.0692	.0754	.1104	.0646
x_{wo} ~ m	.1240	.1324	.0825	.0466
$\ddot{h}_p$ ~ m/sec^2	2.41	2.53	1.340	.763
$\ddot{h}_{p_{wo}}$ ~ m/sec^2	2.34	2.04	1.20	.731
$\dot{h}_p$ ~ m/sec	1.574	5.07	1.933	.631
$\dot{h}_{p_{wo}}$ ~ m/sec	.636	1.151	.545	.372
$h_{p_{wo}}$ ~ m	.575	1.514	.606	.232
$\ddot{\theta}$ ~ deg/sec^2	.430	.406	.464	.353
$\ddot{\theta}_{wo}$ ~ deg/sec^2	.425	.394	.451	.334
$\dot{\theta}$ ~ deg/sec	.1358	.1864	.212	.209
$\dot{\theta}_{wo}$ ~ deg/sec	.1258	.1697	.1949	.1935
θ ~ deg	.1221	.1683	.1489	.1377
θ_{wo} ~ deg	.0669	.1010	.1170	.1225

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{x}$ ~ m/sec^2	.340	.340	-.0839	.0623
$\ddot{x}_{wo}$ ~ m/sec^2	-.01668	-.01668	.00857	-.00229
$\dot{x}$ ~ m/sec	10.88	10.88	-3.31	2.58
$\dot{x}_{wo}$ ~ m/sec	.0369	.0369	-.01055	.00530
x_{wo} ~ m	.336	.336	-.0834	.0623
$\ddot{h}_p$ ~ m/sec^2	-.556	-.556	-.1922	-.1282
$\ddot{h}_{p_{wo}}$ ~ m/sec^2	.0896	.0896	.0261	.00942
$\dot{h}_p$ ~ m/sec	-5.38	-5.38	-2.59	-2.87
$\dot{h}_{p_{wo}}$ ~ m/sec	.1463	.1463	-.0366	-.01538
$h_{p_{wo}}$ ~ m	-.559	-.559	-.1826	-.1218
$\ddot{\theta}$ ~ deg/sec^2	.01203	.01203	-.0218	-.00266
$\ddot{\theta}_{wo}$ ~ deg/sec^2	-.00587	-.00587	.01528	.001947
$\dot{\theta}$ ~ deg/sec	-.0316	-.0316	.0235	-.00375
$\dot{\theta}_{wo}$ ~ deg/sec	.00635	.00635	.00957	.001433
θ ~ deg	-.306	-.306	.1349	-.0403
θ_{wo} ~ deg	.00921	.00921	-.0100	-.001237

TABLE IV-3 (Concluded)

RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{x}$ ~ m/sec^2	.353	.293	.258	.390	.483	.570
$\ddot{x}_{wo}$ ~ m/sec^2	.1108	.0828	.0703	.1670	.1508	.202
$\dot{x}$ ~ m/sec	3.69	4.41	5.09	2.69	6.05	4.29
$\dot{x}_{wo}$ ~ m/sec	.1282	.0999	.0889	.1546	.1862	.222
x_{wo} ~ m	.336	.282	.249	.354	.460	.535
$\ddot{h}_p$ ~ m/sec^2	1.789	1.561	.673	3.04	1.169	1.965
$\ddot{h}_{P_{wo}}$ ~ m/sec^2	1.604	1.063	.474	2.90	.863	1.781
$\dot{h}_p$ ~ m/sec	1.954	5.82	1.745	1.855	2.19	1.773
$\dot{h}_{P_{wo}}$ ~ m/sec	.779	.736	.313	1.004	.599	.911
$h_{P_{wo}}$ ~ m	.806	1.153	.482	.951	.799	.852
$\ddot{\theta}$ ~ deg/sec^2	1.118	.707	.512	1.964	.90	1.780
$\ddot{\theta}_{wo}$ ~ deg/sec^2	1.078	.670	.476	1.944	.839	1.734
$\dot{\theta}$ ~ deg/sec	.550	.405	.330	.586	.572	.784
$\dot{\theta}_{wo}$ ~ deg/sec	.463	.322	.249	.514	.435	.687
θ ~ deg	.706	.606	.542	.586	.913	.876
θ_{wo} ~ deg	.311	.237	.1959	.293	.338	.425

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{x}$ ~ m/sec^2	.756	.756	.602	.810	1.174	1.112
$\ddot{x}_{wo}$ ~ m/sec^2	-.0362	-.0362	-.0252	-.0342	-.0739	-.0708
$\dot{x}$ ~ m/sec	15.78	15.78	14.68	16.09	16.83	16.78
$\dot{x}_{wo}$ ~ m/sec	.0964	.0964	.0726	.1019	.1716	.1582
x_{wo} ~ m	.746	.746	.601	.803	1.166	1.085
$\ddot{h}_p$ ~ m/sec^2	-.345	-.345	-.0428	-.303	-.1204	-.254
$\ddot{h}_{P_{wo}}$ ~ m/sec^2	-.0614	-.0614	.00953	-.0554	-.01963	-.0595
$\dot{h}_p$ ~ m/sec	-2.97	-2.97	-.406	-2.15	-.889	-1.844
$\dot{h}_{P_{wo}}$ ~ m/sec	.1077	.1077	.01224	.1128	.0459	.1090
$h_{P_{wo}}$ ~ m	-.349	-.349	-.0431	-.296	-.1190	-.244
$\ddot{\theta}$ ~ deg/sec^2	.1396	.1386	.0969	.0770	.267	.216
$\ddot{\theta}_{wo}$ ~ deg/sec^2	-.0711	-.0711	-.0467	.0276	.1408	-.1372
$\dot{\theta}$ ~ deg/sec	-.1860	-.1860	-.1377	-.1397	-.351	-.271
$\dot{\theta}_{wo}$ ~ deg/sec	-.0545	-.0545	-.0369	-.0290	-.1037	-.0908
θ ~ deg	-1.369	-1.369	-1.102	-.984	-2.15	-1.528
θ_{wo} ~ deg	.0793	.0793	.0554	.0515	.1534	.1218

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TABLE IV-4: LATERAL-DIRECTIONAL RESULTS, S.I. UNITS

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{y}_p$ ~ m/sec^2	.488	.336	.208	.550	.1829	.226
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	.1859	.1232	.1139	.235	.0771	.1241
$\dot{y}_p$ ~ m/sec	.920	.698	.475	2.08	.310	.272
$\dot{y}_{p_{wo}}$ ~ m/sec	.251	.1663	.1050	.242	.0928	.1242
$y_{p_{wo}}$ ~ m	.454	.314	.1748	.50	.1689	.1927
$\ddot{\varphi}$ ~ deg/sec^2	1.617	1.266	1.193	1.948	1.229	1.939
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	1.397	1.135	1.134	1.817	1.121	1.784
$\dot{\varphi}$ ~ deg/sec	1.451	1.012	.653	1.226	.855	1.269
$\dot{\varphi}_{wo}$ ~ deg/sec	.859	.644	.539	.945	.625	1.005
φ ~ deg	2.31	1.585	.692	1.662	1.139	1.405
φ_{wo} ~ deg	.832	.576	.387	.727	.519	.786
$\ddot{\psi}$ ~ deg/sec^2	1.460	.931	.871	.708	.660	.989
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.790	.502	.611	.660	.399	.737
$\dot{\psi}$ ~ deg/sec	2.48	1.616	1.102	.552	1.135	1.192
$\dot{\psi}_{wo}$ ~ deg/sec	.782	.494	.539	.283	.376	.60
ψ ~ deg	5.84	4.75	2.67	1.204	3.66	2.75
ψ_{wo} ~ deg	.336	.208	.550	.1829	.228	.671

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	AWJSRA-A1	AWJSRA-A2	BR941-A	BR941-T	STOLX-A	AMST-A
$\ddot{y}_p$ ~ m/sec^2	-.262	-.262	.1509	.710	-.0935	-.0811
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	-.0380	-.0380	-.01912	-.0541	-.01844	-.0231
$\dot{y}_p$ ~ m/sec	-1.763	-1.763	1.318	7.31	.271	-.263
$\dot{y}_{p_{wo}}$ ~ m/sec	-.0789	-.0789	.0378	.1309	.0259	-.0266
$y_{p_{wo}}$ ~ m	-.258	-.258	.1508	.693	-.0905	-.0698
$\ddot{\varphi}$ ~ deg/sec^2	-.276	-.276	-.1235	-.354	-.1777	-.235
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	.1625	.1625	.0704	-.231	.1443	.1937
$\dot{\varphi}$ ~ deg/sec	-.451	-.451	.1346	.477	.20	-.251
$\dot{\varphi}_{wo}$ ~ deg/sec	.1472	.1472	.0635	.1544	-.1126	-.1510
φ ~ deg	-1.410	-1.410	.291	1.848	-.688	-.571
φ_{wo} ~ deg	-.1749	-.1749	-.0566	-.204	-.1201	-.1521
$\ddot{\psi}$ ~ deg/sec^2	-.456	-.456	-.402	-.1442	.304	-.322
$\ddot{\psi}_{wo}$ ~ deg/sec^2	-.1640	-.1640	.245	-.0807	.0821	.1130
$\dot{\psi}$ ~ deg/sec	-1.784	-1.784	-.870	.372	-1.130	-.834
$\dot{\psi}_{wo}$ ~ deg/sec	.1904	.1904	-.1858	.0910	-.1072	-.1333
ψ ~ deg	-12.88	-12.88	-7.09	3.54	-10.16	-7.46
ψ_{wo} ~ deg	-.262	.1509	.710	-.0935	-.0811	-.251

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TABLE IV-4 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{y}_p$ ~ m/sec^2	.231	.1828	.273	.348	.1597	.216
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	.1727	.1318	.229	.250	.1374	.1942
$\dot{y}_p$ ~ m/sec	.206	.1853	.230	.422	.1296	.1534
$\dot{y}_{p_{wo}}$ ~ m/sec	.1203	.0932	.1493	.214	.0980	.1309
$y_{p_{wo}}$ ~ m	.1556	.1281	.1526	.245	.0836	.0976
$\ddot{\varphi}$ ~ deg/sec^2	5.85	4.86	6.40	4.36	3.39	5.22
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	5.80	4.82	6.30	4.08	3.19	4.94
$\dot{\varphi}$ ~ deg/sec	1.876	1.528	2.37	2.55	2.0	3.05
$\dot{\varphi}_{wo}$ ~ deg/sec	1.794	1.458	2.25	2.20	1.829	2.85
φ ~ deg	1.083	.904	1.490	2.05	1.360	1.921
φ_{wo} ~ deg	.842	.683	1.20	1.580	1.204	1.763
$\ddot{\psi}$ ~ deg/sec^2	2.47	1.643	2.57	1.183	.829	.722
$\ddot{\psi}_{wo}$ ~ deg/sec^2	2.26	1.508	2.36	.956	.742	.662
$\dot{\psi}$ ~ deg/sec	1.741	1.157	1.80	1.105	.60	.482
$\dot{\psi}_{wo}$ ~ deg/sec	1.270	.848	1.425	.759	.506	.417
ψ ~ deg	2.92	2.65	2.64	1.574	.573	.422
ψ_{wo} ~ deg	.1828	.273	.348	.1597	.216	.299

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	DHC6-A1	DHC6-A2	DHC6-T	CV880-A	CV880-P	CV880-C
$\ddot{y}_p$ ~ m/sec^2	.0721	.0721	.0813	.1380	.0467	.0436
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	-.0232	-.0232	.0356	.0376	.0209	.0231
$\dot{y}_p$ ~ m/sec	.531	.531	.514	.870	.243	.1778
$\dot{y}_{p_{wo}}$ ~ m/sec	.0279	.0279	-.0345	-.0464	.01704	-.01742
$y_{p_{wo}}$ ~ m	.0579	.0579	.0662	.1204	.0381	.0314
$\ddot{\varphi}$ ~ deg/sec^2	-.289	-.289	-.398	.377	-.408	-.646
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	-.420	-.420	-.396	-.365	.375	.473
$\dot{\varphi}$ ~ deg/sec	.217	.217	.274	-.340	-.293	.431
$\dot{\varphi}_{wo}$ ~ deg/sec	.1882	.1882	.243	-.273	-.237	-.308
φ ~ deg	-.1379	-.1379	-.238	.568	.283	-.279
φ_{wo} ~ deg	-.0861	-.0861	.1606	.251	.1658	.1984
$\ddot{\psi}$ ~ deg/sec^2	-.766	-.766	.676	.269	-.1536	.1309
$\ddot{\psi}_{wo}$ ~ deg/sec^2	-.424	-.424	-.382	-.1431	-.1104	-.0738
$\dot{\psi}$ ~ deg/sec	-.896	-.896	-.80	-.494	-.233	-.1777
$\dot{\psi}_{wo}$ ~ deg/sec	.232	.232	.237	-.1261	.0941	.0635
ψ ~ deg	-7.62	-7.62	-6.73	-3.83	-1.581	-1.178
ψ_{wo} ~ deg	.0721	.0813	.1380	.0467	.0436	-.0672

TABLE IV-4 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{y}_p$ ~ m/sec^2	.226	.1532	.1730	.1230	.1534
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	.1710	.1035	.1345	.1045	.1333
$\dot{y}_p$ ~ m/sec	.360	.357	.230	.1080	.1181
$\dot{y}_{p_{wo}}$ ~ m/sec	.0975	.0653	.0736	.0686	.0966
$y_{p_{wo}}$ ~ m	.1490	.1137	.1098	.0664	.0783
$\ddot{\varphi}$ ~ deg/sec^2	1.678	1.088	1.552	1.378	1.581
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	1.569	1.017	1.446	1.254	1.449
$\dot{\varphi}$ ~ deg/sec	1.015	.662	.958	.908	1.039
$\dot{\varphi}_{wo}$ ~ deg/sec	.805	.518	.759	.770	.915
φ ~ deg	1.053	.733	.988	.739	.780
φ_{wo} ~ deg	.618	.40	.586	.591	.658
$\ddot{\psi}$ ~ deg/sec^2	.470	.304	.474	.621	.60
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.325	.203	.325	.512	.533
$\dot{\psi}$ ~ deg/sec	.607	.435	.607	.535	.441
$\dot{\psi}_{wo}$ ~ deg/sec	.284	.1786	.287	.412	.365
ψ ~ deg	1.260	1.215	1.175	.565	.418
ψ_{wo} ~ deg	.1532	.1730	.1230	.1534	.286

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	B747-A1	B747-A2	B747-T	B747-P	B747-C
$\ddot{y}_p$ ~ m/sec^2	.1297	.1297	.0837	.0452	.0363
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	-.01351	-.01351	-.01087	-.01422	-.01749
$\dot{y}_p$ ~ m/sec	1.062	1.062	.628	.290	.1394
$\dot{y}_{p_{wo}}$ ~ m/sec	-.0268	-.0268	.01881	-.01373	.01495
$y_{p_{wo}}$ ~ m	.1274	.1274	.0808	.0406	.0255
$\ddot{\varphi}$ ~ deg/sec^2	.1865	.1865	.1547	-.1576	.1762
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	.1508	.1508	.1294	.1405	.1685
$\dot{\varphi}$ ~ deg/sec	.228	.228	.1894	-.1459	-.1447
$\dot{\varphi}_{wo}$ ~ deg/sec	-.1077	-.1077	-.0950	-.1067	.1265
φ ~ deg	.488	.488	.390	.1850	.1507
φ_{wo} ~ deg	-.1020	-.1020	-.0923	-.1001	-.1002
$\ddot{\psi}$ ~ deg/sec^2	-.1496	-.1496	-.1350	-.1184	-.1133
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.0563	.0563	.0509	.0812	.0703
$\dot{\psi}$ ~ deg/sec	-.433	-.433	-.407	-.232	-.1706
$\dot{\psi}_{wo}$ ~ deg/sec	-.0657	-.0657	-.0558	-.0729	.0643
ψ ~ deg	-3.51	-3.51	-3.20	-1.441	-1.153
ψ_{wo} ~ deg	.1297	.0837	.0452	.0363	-.0662

TABLE IV-4 (Continued)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{y}_p$ ~ m/sec^2	.865	.555	.1518	.0710
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	.752	.465	.1118	.0651
$\dot{y}_p$ ~ m/sec	.673	.513	.1720	.0395
$\dot{y}_{p_{wo}}$ ~ m/sec	.511	.321	.0892	.0302
$y_{p_{wo}}$ ~ m	.440	.310	.1041	.0290
$\ddot{\varphi}$ ~ deg/sec^2	6.10	3.86	2.28	.509
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	5.77	3.66	2.18	.462
$\dot{\varphi}$ ~ deg/sec	3.49	2.18	1.192	.318
$\dot{\varphi}_{wo}$ ~ deg/sec	3.14	1.942	1.043	.244
φ ~ deg	2.65	1.808	.985	.296
φ_{wo} ~ deg	2.09	1.304	.686	.218
$\ddot{\psi}$ ~ deg/sec^2	1.522	.931	.222	.268
$\ddot{\psi}_{wo}$ ~ deg/sec^2	1.388	.840	.20	.208
$\dot{\psi}$ ~ deg/sec	1.052	.680	.1816	.246
$\dot{\psi}_{wo}$ ~ deg/sec	.891	.548	.1080	.1786
ψ ~ deg	.969	.843	.306	.243
ψ_{wo} ~ deg	.555	.1518	.0710	.1735

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	XB70A-A1	XB70A-A2	XB70A-C1	XB70A-C2
$\ddot{y}_p$ ~ m/sec^2	.1736	.1736	.0645	.01019
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	.0721	.0721	-.01977	.00629
$\dot{y}_p$ ~ m/sec	1.135	1.135	.245	.0658
$\dot{y}_{p_{wo}}$ ~ m/sec	-.0742	-.0742	.0251	-.00539
$y_{p_{wo}}$ ~ m	.1442	.1442	.0540	.00920
$\ddot{\varphi}$ ~ deg/sec^2	.489	.489	-.238	-.0658
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	.454	.454	.237	.0497
$\dot{\varphi}$ ~ deg/sec	-.433	-.433	.215	-.0698
$\dot{\varphi}_{wo}$ ~ deg/sec	.327	.327	-.1679	.0460
φ ~ deg	.756	.756	.405	.0653
φ_{wo} ~ deg	.250	.250	-.1344	-.0473
$\ddot{\psi}$ ~ deg/sec^2	.1869	.1869	-.0515	.0558
$\ddot{\psi}_{wo}$ ~ deg/sec^2	-.1343	-.1343	-.0205	.0410
$\dot{\psi}$ ~ deg/sec	-.286	-.286	-.1562	-.0724
$\dot{\psi}_{wo}$ ~ deg/sec	-.1022	-.1022	.01938	-.0394
ψ ~ deg	-2.29	-2.29	-1.140	-.450
ψ_{wo} ~ deg	.1736	.0645	.01019	.0465

TABLE IV-4 (Concluded)

a. RMS Response to Atmospheric Turbulence (1% Probability of Exceedance)

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{y}_p$ ~ m/sec^2	.1987	.1496	.1598	.433	.293	.405
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	.1302	.0980	.0699	.376	.1778	.355
$\dot{y}_p$ ~ m/sec	.293	.262	.529	.392	1.018	.352
$\dot{y}_{p_{wo}}$ ~ m/sec	.1157	.0846	.0696	.258	.1505	.218
$y_{p_{wo}}$ ~ m	.1520	.1143	.1443	.222	.234	.199
$\ddot{\varphi}$ ~ deg/sec^2	3.17	2.51	1.774	8.22	4.33	12.08
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	3.05	2.43	1.710	7.95	4.20	11.92
$\dot{\varphi}$ ~ deg/sec	1.533	1.156	.878	4.01	2.03	4.53
$\dot{\varphi}_{wo}$ ~ deg/sec	1.354	1.033	.739	3.76	1.807	4.36
φ ~ deg	1.257	.944	1.078	2.48	1.827	2.41
φ_{wo} ~ deg	.883	.651	.494	2.20	1.137	2.16
$\ddot{\psi}$ ~ deg/sec^2	1.363	.783	.549	2.29	1.489	3.92
$\ddot{\psi}_{wo}$ ~ deg/sec^2	1.028	.585	.214	2.14	1.213	3.74
$\dot{\psi}$ ~ deg/sec	1.511	.909	1.665	1.409	1.857	2.21
$\dot{\psi}_{wo}$ ~ deg/sec	.871	.499	.251	1.211	.842	1.886
ψ ~ deg	3.33	2.98	10.99	1.410	7.33	2.90
ψ_{wo} ~ deg	.1496	.1598	.433	.293	.405	1.216

Note: RMS $\dot{y}_p$ and ψ are for v_g only

b. Peak Values Resulting from a 10 Second Ramp in Horizontal Wind

Configuration	CH53A-A1	CH53A-A2	CH53A-H	CH53A-C	H19-H	H19-C
$\ddot{y}_p$ ~ m/sec^2	.0964	.0964	.1569	.1289	.342	.1366
$\ddot{y}_{p_{wo}}$ ~ m/sec^2	-.0206	-.0206	.00589	.0432	-.0937	-.0665
$\dot{y}_p$ ~ m/sec	.759	.759	1.472	.839	2.73	.801
$\dot{y}_{p_{wo}}$ ~ m/sec	-.0340	-.0340	-.0291	-.0488	-.1306	.0588
$y_{p_{wo}}$ ~ m	.0905	.0905	.1577	.1007	.306	.0928
$\ddot{\varphi}$ ~ deg/sec^2	.272	.272	.304	.822	-1.429	-1.126
$\ddot{\varphi}_{wo}$ ~ deg/sec^2	-.282	-.282	-.238	-.576	-1.204	-1.10
$\dot{\varphi}$ ~ deg/sec	-.282	-.282	-.433	-.518	1.364	.776
$\dot{\varphi}_{wo}$ ~ deg/sec	.206	.206	.1534	.331	.791	-.661
φ ~ deg	.513	.513	1.142	.627	2.19	.733
φ_{wo} ~ deg	.1708	.1708	.1705	.244	-.624	-.387
$\ddot{\psi}$ ~ deg/sec^2	.609	.609	.929	.421	1.675	-1.069
$\ddot{\psi}_{wo}$ ~ deg/sec^2	.360	.360	-.323	-.234	1.686	.732
$\dot{\psi}$ ~ deg/sec	-1.106	-1.106	-4.03	-.454	-3.04	-1.00
$\dot{\psi}_{wo}$ ~ deg/sec	.309	.309	.411	-.1318	-1.001	-.366
ψ ~ deg	-8.66	-8.66	-31.8	-3.32	-18.92	-7.26
ψ_{wo} ~ deg	.0964	.1569	.1289	.342	.1366	-.430