SPACE SHUTTLE—

STATIC STABILITY CHARACTERISTICS AND CONTROL SURFACE EFFECTIVENESS OF THE BOEING .00435 SCALE MODEL SPACE SHUTTLE BOOSTER H-32

by

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SADSAC SPACE SHUTTLE AEROTHERMODYNAMIC DATA MANAGEMENT SYSTEM

CONTRACT NAS8-4016

THIS DOCUMENT SHOULD BE REFERENCED AS NASA CR 120,002
SADSAC/SPACE SHUTTLE
WIND TUNNEL TEST DATA REPORT

CONFIGURATION: Boeing .00435 Scale Model Space Shuttle Booster H-32

TEST PURPOSE: To Determine Static Stability Characteristics and Control Surface Effectiveness

TEST FACILITY: Grumman 36-Inch Hypersonic Wind Tunnel

TESTING AGENCY: The Boeing Company

TEST NO. & DATE: GHWT-020; 6/1/71 through 6/18/71

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CONTRACT NAS 8-4016 AMENDMENT 153 DRL 184-58

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ABSTRACT

Experimental aerodynamic investigations were made in the Grumman Aerospace Corp. 36" Hypersonic Wind Tunnel on a .00435 scale model of the H-32 Reusable Space Shuttle Booster. The objectives of the test were to determine the static stability characteristics and control surface effectiveness at hypersonic speeds. Data were taken at M = 8.12 over a range of angles of attack between -5° and 85° at β = 0° and over a range of side slip angles between -10° and 10° at α = 0° and 70°. Six component balance data and base-cavity pressure data were recorded.
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CONFIGURATIONS INVESTIGATED

Model Components Tested;

B5 - B6 with upturned nose; no cab.
B6 - Basic booster body with axisymmetrical nose for high-angle testing. 55° sting adaptor coming out through top of body in place of vertical tail. After body complete with simulated thruster nozzles.
B7 - B6 with slab sides and bottom aft of the wing.
B8 - Basic booster body with axisymmetrical nose for low-angle testing. Straight sting coming out base of body.
B9 - B6 with droop nose; no cab.
B11 - B8 with upturned nose; no cab.
B12 - B8 with droop nose; no cab.
W4 - Basic wing configuration with 4° dihedral.
W5 - W4 moved aft 2% of body length.
W6 - W4 with 6° dihedral angle.
W7 - W3 with 8° dihedral angle.
H4 - Basic horizontal tail with elevator.
H5 - H4 with elevator removed.
V3 - Basic vertical tail without rudder.

Model Component Combinations Tested;

B5W5H4 B6V3
B6 B6W4V3
B6W4 B8H4V3
B6W4H4 B8W4H4V3
B6W5H5 B8W5H4V3
B6W5H5 B8W6H4V3
B6W6H4 B8W7H4V3
CONFIGURATIONS INVESTIGATED
(CONTINUED)

Model Component Combinations Tested (Con't):

- \( B_6 W_7 H_4 \)
- \( B_9 W_5 H_4 \)
- \( B_3 W_5 H_4 \)
- \( B_1 W_4 H_4 V_3 \)
- \( B_8 \)
- \( B_1 W_4 H_4 V_3 \)
- \( B_8 W_4 \)

Control Surface Deflections Tested:

Horizontal Tail -

The incidence of the horizontal tail was set to \(-30^\circ\), \(-15^\circ\), and \(0^\circ\) with respect to the body centerline.

Elevator -

The elevator was set to \(-30^\circ\), \(-15^\circ\), and \(0^\circ\) with respect to the horizontal tail chord plane.

Sketches of the components are shown in Figures 3 through 6.

Pertinent dimensional information for each of the components tested is given in the "Model Component Description Sheets" which follow the figures.
<table>
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<td>0° - -</td>
<td>8.12</td>
<td>5, 6</td>
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<td>B6 W4</td>
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<td>0° 0°</td>
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<td>031</td>
<td>B6 W4 H4</td>
<td>1</td>
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<td>9</td>
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<td>-30° 0°</td>
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<td></td>
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<td>-</td>
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<tr>
<td>143</td>
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<tr>
<td>153</td>
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<td>-15° 0°</td>
<td>24</td>
<td>24, 25</td>
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</tbody>
</table>

**COEFFICIENTS:**

- $\alpha$ or $\beta$
- $\alpha = +40° - 0° + 85°$
- $\alpha = -5° - 0° + 30°$
- $\beta = -10° - 0° + 10°$

**SCHEDULES**

1, 7, 13, 15, 25, 31, 37, 43, 49, 55, 61, 67, 75, 76

- NASA-MSFC-MAF
# DATA SET COLLATION SHEET

**DATA SET** | **IDENTIFIER** | **CONFIGURATION** | **SCHED. PARAMETERS/VALUES** | **NO. OF RUNS** | **MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)**
---|---|---|---|---|---
| RCX192 | B8 V3 | | | 2.12 |
| 202 | B8 W4 V3 | | | 20 |
| 222 | B8 W4 H4 V3 | | -15° 0° | 32 |
| 232 | B8 W4 H+ V3 | | 0° 0° | 29 |
| 272 | B8 H4 V3 | | | 36 |
| 332 | B8 W4 H+ V3 | | -15°-15° | 31 |
| 342 | B8 W5 H+ V3 | | -15° 0° | 34 |
| 352 | B12 W4 H+ V3 | | -15° 0° | 33 |
| 342 | B11 W4 H4 V3 | | -15° 0° | 35 |
| 284 | B8 | | 0° C | 31 |
| 294 | B8 W4 | | | 39 |
| 204 | B8 W4 V3 | | | 40 |
| 224 | B8 W6 H4 V3 | | -15° 0° | 41 |
| 374 | B8 W6 H+ V3 | | -15° 0° | 42 |
| 384 | B8 W7 H+ V3 | | -15° 0° | 43 |

<table>
<thead>
<tr>
<th>IDPVAR(1)</th>
<th>IDPVAR(2)</th>
<th>NDV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>19</td>
<td>25</td>
<td>31</td>
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<td>37</td>
<td>43</td>
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<td>55</td>
<td>61</td>
<td>67</td>
</tr>
<tr>
<td>75</td>
<td>76</td>
<td></td>
</tr>
</tbody>
</table>

**COEFFICIENTS:**

- \( \phi_A : \pm 45° \) to \( \pm 65° \)
- \( \phi_0 : \pm 5° \) to \( \pm 30° \)
- \( \beta : \pm 10° \) to \( \pm 10° \)
TEST FACILITY DESCRIPTION

GRUMMAN 36-INCH HYPERSONIC TUNNEL

DESCRIPTION: This is an intermittent blowdown to vacuum type tunnel. The test section is 36 inches in diameter. High temperature air from a pebble bed heater is introduced to the test section through fixed contoured, axisymmetric nozzles.

PERFORMANCE PARAMETERS:

Mach Range: 8, 10, 14
Reynolds Number \( \times 10^6/\text{ft} \): 0.2 to 4.5
Stagnation Pressure (psia): 200 to 2200
Dynamic Pressure (psf): 100 to 1200
Stagnation Temperature \( ^\circ\text{R} \): 1000 to 3500
Run Time (sec): 30 to 60

TESTING CAPABILITIES: Model mounting consists of a water-cooled, sting-balance sector rig which features a model injection system. Instrumentation for force, pressure, and heat transfer measurement is provided. A Schlieren system is available.
TEST CONDITIONS

The model was sting mounted by two different modes depending upon the range of angles of attack covered. For angles between \(-5^\circ\) and \(30^\circ\) a conventional sting coming in the base of the model was used. At the higher angles of attack a sting entering the top of the body in the region normally occupied by the vertical tail was used. Force data were acquired by a \(3/4"\) diameter Task Mk XLIII balance.

Yaw runs were made at \(\alpha = 0^\circ\) and \(70^\circ\) by rolling the sting and model \(90^\circ\) and yawing the model in the tunnel pitch plane.

Base pressures were measured only on the low \(-\alpha\) mounting configuration and cavity pressures only on the high \(-\alpha\) mounting configuration. Base pressure corrections were applied to the axial force coefficient and cavity pressure corrections were applied to the normal force and pitching moment coefficients. All of the coefficients in the stability axes system reflect the base and cavity pressure corrections.

Schlieren photographs were taken on each run.

Configuration changes were accomplished through the use of interchangeable nose and afterbody sections, wing dihedral blocks, and preformed body fairings to produce the slab-sided body \(B_7\).

Trip strips were not used on the model to fix or originate transition. However, the model was subjected to particle impingement from the pebble-bed heater which
caused serious deterioration of the model surface during a run. The damage to the model surface was especially severe at high angles of attack. The model surface was smoothed after each run by light filing or rubbing with emery cloth as required, but no effort was made to fill the depressions formed by the impact of the particles.

Values of the tunnel parameters used in the test program are summarized in Table I.
### Table I
#### Test Conditions

<table>
<thead>
<tr>
<th>MACH NUMBER</th>
<th>NOMINAL REYNOLDS NUMBER per unit length</th>
<th>NOMINAL DYNAMIC PRESSURE (pounds/sq. inch)</th>
<th>NOMINAL STAGNATION TEMPERATURE (degrees Fahrenheit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.12</td>
<td>$2.9 \times 10^6$</td>
<td>3.58</td>
<td>1041</td>
</tr>
</tbody>
</table>

**Balance Utilized:**

3/4\" DIA. TASK MK XLIII, 6-COMPONENT

**Capacity:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF</td>
<td>400</td>
</tr>
<tr>
<td>SF</td>
<td>200</td>
</tr>
<tr>
<td>AF</td>
<td>80</td>
</tr>
<tr>
<td>PM</td>
<td>600 in-lbs</td>
</tr>
<tr>
<td>YM</td>
<td>250 in-lbs</td>
</tr>
<tr>
<td>RM</td>
<td>80 in-lbs</td>
</tr>
</tbody>
</table>

**Accuracy:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
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<tr>
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**Coefficient Tolerance:**

<table>
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<th>Description</th>
<th>Value</th>
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<td></td>
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</table>

**Comments:**

Reynolds number was as high as $3.05 \times 10^6$ per foot and as low as $2.71 \times 10^6$ per foot but never changed by more than about 1.7\% in any run.
DATA REDUCTION

The six-component aerodynamic forces and moments measured during the tests have been reduced to coefficient form using the following reference values:

\[ S_{\text{REF}} = \text{reference wing area} = 13.344 \text{ in}^2 \]
\[ l_{\text{REF}} = \bar{c} = \text{wing mean aerodynamic chord} = 1.468 \text{ inches} \]
\[ b_{\text{REF}} = \text{wing span} = 9.652 \text{ inches} \]
\[ A_b = \text{base area} = 2.432 \text{ in}^2 \]

Moments are reduced about a reference c.g. location which is located at model station 7.812 on water line 1.587 and buttline 0.0 (see Figure 1).

High -\( \alpha \) runs have corrections applied to the normal force (NF) and pitching moment (PM) balance readings to account for the pressure in the cavity around the end of the dog-leg sting. As a consequence of correcting the NF, CL and CD for the high -\( \alpha \) runs are compensated for cavity pressures.

\[ (\Delta \text{NF})_C \text{ due to cavity press} = (p_t - p_c)(.891) \]
\[ \text{NF corrected} = \text{NF read} - (\Delta \text{NF})_C \]
\[ (\Delta \text{PM})_C = -2.683 (\Delta \text{NF})_C \]
\[ \text{PM corrected} = \text{PM read} - (\Delta \text{PM})_C \]

Low -\( \alpha \) runs have an increment applied to the axial force (AF) balance reading to express the axial force as though free stream static pressure were acting on the base of the model. As a consequence of this operation on AF, C\( _L \) and C\( _D \) are also for a model with free stream static pressure acting on the base.
# SUMMARY DATA PLOT INDEX

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<tr>
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<td>Configuration</td>
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<tr>
<td>Effect of Wing Dihedral in Yaw, Alpha = 0. Deg.</td>
<td>(D),(F)</td>
<td>Configuration</td>
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Note: Plotted Coefficients Schedule on following page.
PLOTTED COEFFICIENTS SCHEDULE:

(A) CL, CDF, CLM, CN, CAF, CDB, CAB vs. \( \alpha \),
    CL vs. CDF, CL vs. CLM, CN vs. CLM

(B) CL, CDF, CLM, CN, CAF, CDB vs. \( \alpha \),
    CL vs. CLM, CN vs. CLM

(C) CL, CDF, CLM, CN, CAF vs. \( \alpha \),
    CL vs. CLM, CN vs. CLM

(D) CY, CLN, CSL, CYN, CBL, CL, CLM, CDF vs. \( \beta \),
    CY vs. CYN, CY vs. CLN

(E) CY, CYN, CBL, CL, CLM, CDF, CDB vs. \( \beta \),
    CY vs. CYN

(F) CDB vs. \( \beta \)
FIGURES
AX - 1205I - 1
MODEL ASSEMBLY
DRAWING 1205-25

PLAN VIEW

SIDE VIEW

Figure 1. Model Assembly, Booster H-32
Figure 2. Model Mounting System
AX 1205 I-1

BODIES:

REF: 1205-7 NOTE
1206-3 BODY

B₅, B₁₁

B₆ ONLY

B₆, B₈

B₆ ONLY

B₉, B₁₂

B₉ ONLY

B₇

FILLER

SECTION A-A

BOTTOM VIEW

FIGURE 3. MODEL BODY CONFIGURATIONS
AX 12051-1
WINGS

REF: 1205-6

W_4, W_5, W_7 - MS 2.402
W_6 - MS 5.652

BL 4.826

791
TIP CHORD

BL 1.05

1974 ROOT CHORD

18°15'

MAC/4

BL 0

.791

4° - W_4, W_5
6° - W_6
8° - W_7

AIRFOIL: NACA 0015-64
MAC = 1.468 IN.
INCIDENCE ANGLE = 2°
(WRT BODY 

FIGURE 4  Booster Wing
AX 12051-1
HORIZONTAL TAIL
REF: 1205-10

NOT REPRODUCIBLE

Fig. 5. Booster Horizontal Tail

Root Chord & BL .343 = 1400 in.
Tip Chord = 0.700 in.
Airfoil: NACA 0012-84

δ = 0° - 15° - 30°
AX 12051-1
VERTICAL TAIL

REF: 12051-1

MS 11.824

WL 2.617

WL 3.661

45°

MAC/4

WL 4.766

KUT - MAD = 1.593 IN.
TIP CHORD = 0.957 IN.
AIRFOIL: NASA 0512-64

FIGURE 6. BOOSTER VERTICAL TAIL
Notes:
1. Positive directions of force coefficients, moment coefficients, and angles are indicated by arrows.

2. For clarity, origins of wind and stability axes have been displaced from the center of gravity.

Figure 1. Axis systems, showing direction and sense of force and moment coefficients, angle of attack, and sideslip angle.
MODEL COMPONENT DESCRIPTION SHEETS
MODEL COMPONENT: BODY - B3

GENERAL DESCRIPTION: Body based on the H-32 configuration with up-turned nose, no cab, and sting entering from the top of the body. Simulated thruster nozzles.

DRAWING NUMBER Full scale: 164-10060 Model: SP. 1205-27-7

DIMENSION:

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<td>Max Width</td>
<td>434 in</td>
<td>1.88 in</td>
</tr>
<tr>
<td>Max Depth</td>
<td>404 in</td>
<td>1.757 in</td>
</tr>
<tr>
<td>Fineness Ratio</td>
<td>7.05</td>
<td>7.05</td>
</tr>
<tr>
<td>Area</td>
<td>1031 ft^2</td>
<td>2.806 in^2</td>
</tr>
<tr>
<td>Max Cross-Sectional Planform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetted Base</td>
<td>866 ft^2</td>
<td>2.432 in^2</td>
</tr>
</tbody>
</table>

Balance center is at model B5, 7.753 ft, WL 1.739

Model nose is B5 0, & is WL 1.739
Full scale nose is B5 1000, & is WL 400
MODEL COMPONENT: BODY - 86

GENERAL DESCRIPTION: Body based on the H-32 configuration with axisymmetric nose and sting entering from the top of the body. Simulated thruster nozzles.

DRAWING NUMBER
Full scale: 164-10060
Model: 50-1205-27-1

DIMENSION

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<td>Max Width</td>
<td>4.34 in.</td>
<td>1.88 in.</td>
</tr>
<tr>
<td>Max Depth</td>
<td>4.04 in.</td>
<td>7.757 in.</td>
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<tr>
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<td>7.05</td>
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<tr>
<td>Area</td>
<td></td>
<td></td>
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<tr>
<td>Max Cross-Sectional Planform</td>
<td>1031 ft²</td>
<td>2.606 in²</td>
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<tr>
<td>Wetted Base</td>
<td>866 ft²</td>
<td>2.432 in²</td>
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Balance center at model BS 7.753, WL 1.739
Model nose is BS 0, L is WL 1.739
Full scale nose is BS 1000, L is WL 400
MODEL COMPONENT: BODY — B7

GENERAL DESCRIPTION: Body based on the H-32 configuration with axisymmetric nose, slab sides and bottom aft of the wing, and sting entering thru the top of the body. Simulated thrust nozzles.

DRAWING NUMBER
Full scale: 164-10060
Model: 50.1785-27, -7-28

DIMENSION:  

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<td>12.404 in.</td>
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<tr>
<td>Max Width</td>
<td>143 in.</td>
<td>1.88 in.</td>
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<tr>
<td>Max Depth</td>
<td>404 in.</td>
<td>1.757 in.</td>
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<td>Fineness Ratio</td>
<td>7.05</td>
<td>7.05</td>
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<tr>
<td>Area Max Cross-Sectional</td>
<td>(103) (\text{ft}^2)</td>
<td>(2.806 \text{ in.}^2)</td>
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<td>Planform Wetted Base</td>
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<td></td>
</tr>
<tr>
<td>Base</td>
<td>(866 \text{ ft}^2)</td>
<td>(2.432 \text{ in.}^2)</td>
</tr>
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</table>

Balance center is at model BS 7.753, WL 1.739
Model nose is at BS 0, \(c\) is at WL 1.739
Full scale nose is BS 1000, \(c\) is at WL 400
**MODEL COMPONENT:** BODY

**GENERAL DESCRIPTION:** Body based on the H-32 configuration with axisymmetrical nose and sting entering thru the base of the body.

**DRAWING NUMBER**

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<td>Max Depth</td>
<td>40.4 in.</td>
<td>1.757 in.</td>
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<td>1031 ft²</td>
<td>2.806 in²</td>
</tr>
<tr>
<td>Wetted Base</td>
<td>866 ft²</td>
<td>2.432 in²</td>
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Balance center is at model BS 7.753, WL 1.739.
Model nose is at BS 0, £ is at WL 1.739.
Full scale nose is BS 1000, £ is at WL 400.
MODEL COMPONENT: BODY

GENERAL DESCRIPTION: Body based on the H-32 configuration with drop nose, no cab, and sting entering then the top of the body. Simulated thruster nozzles.

DRAWING NUMBER
Full scale: 164-10060
Model: 50, 1205-27-7

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<tr>
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<td>2.806 in²</td>
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<tr>
<td>Max Cross-Sectional Planform</td>
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<td></td>
</tr>
<tr>
<td>Wetted Base</td>
<td>866 ft²</td>
<td>2.432 in²</td>
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Balance center is at model BS 7.753, WL 1.734
Model nose is at BS 0, E is at WL 1.734
Full scale nose is at BS 1000, E is at WL 400
MODEL COMPONENT: BODY — B11

GENERAL DESCRIPTION: Body based on the H-32 configuration with turned up nose, no cab, and sting entering thru the base of the body.

DRAWING NUMBER
Full scale: 12A-10060
Model: 50-1205-25-17

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<td>12,404 in</td>
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<td>Max Width</td>
<td>434 in</td>
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<td>Max Depth</td>
<td>404 in</td>
<td>1.757 in</td>
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<tr>
<td>Wetted Base</td>
<td>866 ft²</td>
<td>2.432 ft²</td>
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</table>

Balance center is at model BS 7.753, WL 1.739
Model nose is at BS 0, L is at WL 1.739
Full scale nose is at BS 1000, L is at WL 400
MODEL COMPONENT: BODY - B12

GENERAL DESCRIPTION: Body based on the H-32 configuration with deep nose, no gap, and sting entering thru the base of the body.

DRAWING NUMBER
Full scale: 16x - 10060
Model: 30 1205 - 25 - 7

DIMENSION:

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</tr>
<tr>
<td>Area</td>
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<td>(2.806) in²</td>
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<tr>
<td>Max Cross-Sectional Planform</td>
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<tr>
<td>Wetted Base</td>
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<td>(2.432) in²</td>
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Balance center is at model BL 1.753, WL 1.739
Model nose is BL 50, L is WL 1.739
Full scale nose is at BL 1000, L is at WL 400
**MODEL COMPONENT:** Wing - W1

**GENERAL DESCRIPTION:** Wing based on the H-32 configuration with sweep angle changed.

**DRAWING NUMBER:** Full Scale: 164-10060
Model 5.0: 1205-6

**DIMENSIONS:**

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<tr>
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<tr>
<td>Toe-In Angle</td>
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<td>0°</td>
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<tr>
<td>Cant Angle</td>
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<td></td>
</tr>
<tr>
<td>Sweep Back Angles, degrees</td>
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<tr>
<td>Leading Edge</td>
<td>14°</td>
<td>15°-16°</td>
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<tr>
<td>Trailing Edge</td>
<td>0°</td>
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<td>Chords: Root (Wing Sta. 0.0)</td>
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<td>Tip, (equivalent)</td>
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<td>W.P. of .25 MAC</td>
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<td>Root</td>
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<tr>
<td>Tip</td>
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</tbody>
</table>

**EXPOSED DATA**

| Area                          |            |             |
| Span, (equivalent)            |            |             |
| Aspect Ratio                  |            |             |
| Taper Ratio                   |            |             |
| Chords: Root                  |            |             |
| Tip                           |            |             |
| MAC                           |            |             |
| Fus. Sta. of .25 MAC          |            |             |
| W.P. of .25 MAC               |            |             |
| B.L. of .25 MAC               |            |             |

---

Full scale nose is at BS 1000; model nose is at BS 0.
Full scale t is at W 400; model t is at 1.739
MODEL COMPONENT: Wing - W.

GENERAL DESCRIPTION: Same as W. except moved aft on body 3% of body length (1.25 in).

DRAWING NUMBER: 

DIMENSIONS: 

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<th>MODEL SCALE</th>
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<tbody>
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<tr>
<td>Planform</td>
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<tr>
<td>Wetted</td>
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<tr>
<td>Span (equivalent)</td>
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</tr>
<tr>
<td>Aspect Ratio</td>
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</tr>
<tr>
<td>Rate of Taper</td>
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</tr>
<tr>
<td>Taper Ratio</td>
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</tr>
<tr>
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<tr>
<td>Aerodynamic Twist, degrees</td>
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<td></td>
</tr>
<tr>
<td>Toe-In Angle</td>
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<td></td>
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<tr>
<td>Cant Angle</td>
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<td>Sweep Back Angles, degrees</td>
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<td>W.P. of .25 MAC</td>
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<td>B.L. of .25 MAC</td>
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<tr>
<td>Airfoil Section</td>
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<td></td>
</tr>
<tr>
<td>Tip</td>
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</table>

EXPOSED DATA

| Area                           |            |             |
| Span, (equivalent)             |            |             |
| Aspect Ratio                   |            |             |
| Taper Ratio                    |            |             |
| Chords:                        |            |             |
| Root                           |            |             |
| Tip                            |            |             |
| MAC                            |            |             |
| Fus. Sta. of .25 MAC           |            |             |
| W.P. of .25 MAC                |            |             |
| B.L. of .25 MAC                |            |             |
MODEL COMPONENT: Wing - WA

GENERAL DESCRIPTION: Same as WA with 6° dihedral angle.

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**DRAWING NUMBER:**

**DIMENSIONS:**

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<td>MAC</td>
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<tr>
<td>B.L. of .25 MAC</td>
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MODEL COMPONENT: **Wing - W7**

GENERAL DESCRIPTION: Same as W6 with 2° dihedral angle.

**DRAWING NUMBER:**

**DIMENSIONS:**

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<td>Toe-In Angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cant Angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweep Back Angles, degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leading Edge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailing Edge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25 Element Line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chords:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Root (Wing Sta. 0.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tip, (equivalent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fus. Sta. of .25 MAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W.P. of .25 MAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.L. of .25 MAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airfoil Section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Root</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tip</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| EXPOSED DATA                    |            |             |
| Area                            |            |             |
| Span, (equivalent)              |            |             |
| Aspect Ratio                    |            |             |
| Taper Ratio                     |            |             |
| Chords                          |            |             |
| Root                            |            |             |
| Tip                             |            |             |
| MAC                             |            |             |
| Fus. Sta. of .25 MAC            |            |             |
| W.P. of .25 MAC                 |            |             |
| B.L. of .25 MAC                 |            |             |
MODEL COMPONENT: **Horizontal Tail - H4**

GENERAL DESCRIPTION: Horizontal stabilizer based on the H-37 configuration with adjustable incidence angle and adjustable angle elevator.

**Full Scale: 164-10060**

**Model: 50.1205-10**

**DIMENSIONS:**

<table>
<thead>
<tr>
<th></th>
<th>FULL-SCALE</th>
<th>MODEL SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (exposed)</td>
<td>1620 ft²</td>
<td>4.418 in²</td>
</tr>
<tr>
<td>Span (equivalent) (exposed)</td>
<td>968 in.</td>
<td>2.708 in.</td>
</tr>
<tr>
<td>Inb'd equivalent chord</td>
<td>322 in.</td>
<td>140 in.</td>
</tr>
<tr>
<td>Outb'd equivalent chord</td>
<td>161 in.</td>
<td>4.70 in.</td>
</tr>
<tr>
<td>Ratio movable surface chord/total surface chord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Inb'd equiv. chord</td>
<td>1.297</td>
<td>.30</td>
</tr>
<tr>
<td>At Outb'd equiv. chord</td>
<td>1.278</td>
<td>.30</td>
</tr>
<tr>
<td>Sweep Back Angles, degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leading Edge</td>
<td>29°</td>
<td>29°</td>
</tr>
<tr>
<td>Tailing Edge</td>
<td>12.5°</td>
<td>12.5°</td>
</tr>
<tr>
<td>Hingeline</td>
<td>18°</td>
<td>18°</td>
</tr>
<tr>
<td>Area Moment (Normal to hinge line)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC</td>
<td>251 in.</td>
<td>1.089 in.</td>
</tr>
<tr>
<td>BS MAC 4</td>
<td>3719</td>
<td>11.820</td>
</tr>
<tr>
<td>Airfoil section</td>
<td>NACA-0012-64</td>
<td>NACA-0012-64</td>
</tr>
</tbody>
</table>

*Full scale nose is at BS 1000; model nose is at BS 0*

*Full scale χ is at WL 200; model χ is at WL 1.789*
MODEL COMPONENT: Horizontal Tail - Hs

GENERAL DESCRIPTION: Hs with elevator removed.

DRAWING NUMBER: Model 50 1205-10

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>FULL-SCALE</th>
<th>MODEL SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td></td>
<td>3.093 in²</td>
</tr>
<tr>
<td>Span (equivalent) (exposed)</td>
<td></td>
<td>4.208 in.</td>
</tr>
<tr>
<td>Inb'd equivalent chord</td>
<td></td>
<td>0.98 in.</td>
</tr>
<tr>
<td>Outb'd equivalent chord</td>
<td></td>
<td>0.49 in.</td>
</tr>
<tr>
<td>Ratio movable surface chord/total surface chord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Inb'd equiv. chord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Outb'd equiv. chord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweep Back Angles, degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leading Edge</td>
<td></td>
<td>29°</td>
</tr>
<tr>
<td>Tailing Edge</td>
<td></td>
<td>18°</td>
</tr>
<tr>
<td>Hingeline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area Moment (Normal to hinge line)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MAC**

\[ \frac{85}{44} \text{ for MAC} \]

\[ 0.762 \text{ in} \]

Full-scale nose is at 85,000, model nose is at 850.
Full-scale \( \delta \) is at W/L 400, model \( \delta \) is at W/L 1,739.
MODEL COMPONENT: Vertical Tail - V3

GENERAL DESCRIPTION: Vertical without rudder based on the H-32 configuration.

Full scale: 164 - 10060

DRAWING NUMBER: Model: 5.0.1205-1

DIMENSIONS:

<table>
<thead>
<tr>
<th></th>
<th>FULL-SCALE</th>
<th>MODEL SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>1125 in²</td>
<td>3.069 in²</td>
</tr>
<tr>
<td>Span (equivalent)</td>
<td>492 in.</td>
<td>2.139 in.</td>
</tr>
<tr>
<td>Inb'd equivalent chord</td>
<td>440 in.</td>
<td>1.913 in.</td>
</tr>
<tr>
<td>Outb'd equivalent chord</td>
<td>220 in.</td>
<td>0.957 in.</td>
</tr>
<tr>
<td>Ratio movable surface chord/total surface chord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Inb'd equiv. chord</td>
<td>.301</td>
<td></td>
</tr>
<tr>
<td>At Outb'd equiv. chord</td>
<td>.338</td>
<td></td>
</tr>
<tr>
<td>Sweep Back Angles, degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leading Edge</td>
<td>45°</td>
<td>45°</td>
</tr>
<tr>
<td>Tailing Edge</td>
<td>19°</td>
<td>19°</td>
</tr>
<tr>
<td>Hingeline</td>
<td>34°</td>
<td></td>
</tr>
<tr>
<td>Area Moment (Normal to hinge line)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airfoil section</td>
<td>U869-0012-64</td>
<td>U869-0012-64</td>
</tr>
<tr>
<td>MAC</td>
<td>344 in.</td>
<td>1446 in.</td>
</tr>
<tr>
<td>BS MAC</td>
<td>3720</td>
<td>11.825</td>
</tr>
</tbody>
</table>

Full scale nose is at BS 1000; model nose is at BS 0
Full scale q is at Wk 403; model q is at Wk 1.739
### NOMENCLATURE

(General)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SADSAC SYMBOL</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>ALPHA</td>
<td>angle of attack, angle between the projection of the wind $X_w$-axis on the body $X$, $Z$-plane and the body $X$-axis; degrees</td>
</tr>
<tr>
<td>$\beta$</td>
<td>BETA</td>
<td>sideslip angle, angle between the wind $X_w$-axis and the projection of this axis on the body $X$-$Z$-plane; degrees</td>
</tr>
<tr>
<td>$\psi$</td>
<td>PSI</td>
<td>yaw angle, angle of rotation about the body $Z$-axis, positive when the positive $X$-axis is rotated toward the positive $Y$-axis; degrees</td>
</tr>
<tr>
<td>$\phi$</td>
<td>PHI</td>
<td>roll angle, angle of rotation about the body $X$-axis, positive when the positive $Y$-axis is rotated toward the positive $Z$-axis; degrees</td>
</tr>
<tr>
<td>$\rho$</td>
<td></td>
<td>air density; $K_g/m^3$, slugs/ft$^3$</td>
</tr>
<tr>
<td>$s$</td>
<td></td>
<td>speed of sound; m/sec, ft/sec</td>
</tr>
<tr>
<td>$V$</td>
<td></td>
<td>speed of vehicle relative to surrounding atmosphere; m/sec, ft/sec</td>
</tr>
<tr>
<td>$q$</td>
<td>Q(PSI)</td>
<td>dynamic pressure; $1/2PV^2$, psi, psf</td>
</tr>
<tr>
<td></td>
<td>Q(PSF)</td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>MACH</td>
<td>Mach number; $V/a$</td>
</tr>
<tr>
<td>$RN/L$</td>
<td>RN/L</td>
<td>Reynolds number per unit length; million/ft</td>
</tr>
<tr>
<td>$p$</td>
<td></td>
<td>static pressure; psi</td>
</tr>
<tr>
<td>$P$</td>
<td></td>
<td>total pressure; psi</td>
</tr>
<tr>
<td>$C_p$</td>
<td>CP</td>
<td>pressure coefficient; $(p-p_\infty)/q$</td>
</tr>
</tbody>
</table>
### NOMENCLATURE (Continued)

**Reference & C. G. Definitions**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SADSAC SYMBOL</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S$</td>
<td>SREF</td>
<td>wing area; $m^2$, $ft^2$</td>
</tr>
<tr>
<td>$S$</td>
<td>SREF</td>
<td>reference area; $m^2$, $ft^2$</td>
</tr>
<tr>
<td>$\bar{c}$</td>
<td></td>
<td>wing mean aerodynamic chord or reference chord; m, ft, in (see $l_{ref}$ or LREF)</td>
</tr>
<tr>
<td>$l_{ref}$</td>
<td>LREF</td>
<td>reference length; m, ft, in.; (see $\bar{c}$)</td>
</tr>
<tr>
<td>$b_{ref}$</td>
<td>BREF</td>
<td>wing span or reference span; m, ft, in</td>
</tr>
<tr>
<td>$A_b$</td>
<td></td>
<td>base area; $m^2$, $ft^2$, $in^2$</td>
</tr>
<tr>
<td>c. g.</td>
<td></td>
<td>center of gravity</td>
</tr>
<tr>
<td>MRP</td>
<td>MRP</td>
<td>abbreviation for moment reference point</td>
</tr>
<tr>
<td>XMRP</td>
<td></td>
<td>abbreviation for moment reference point on X-axis</td>
</tr>
<tr>
<td>YMRP</td>
<td></td>
<td>abbreviation for moment reference point on Y-axis</td>
</tr>
<tr>
<td>ZMRP</td>
<td></td>
<td>abbreviation for moment reference point on Z-axis</td>
</tr>
<tr>
<td>SYMBOL</td>
<td>DEFINITION</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>force; F, lbs</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>moment; M, in-lb</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subscript</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>normal force</td>
</tr>
<tr>
<td>A</td>
<td>axial force</td>
</tr>
<tr>
<td>L</td>
<td>lift force</td>
</tr>
<tr>
<td>D</td>
<td>drag force</td>
</tr>
<tr>
<td>Y</td>
<td>force or moment about the Y axis</td>
</tr>
<tr>
<td>Z</td>
<td>moment about the Z axis</td>
</tr>
<tr>
<td>X</td>
<td>moment about the X axis</td>
</tr>
<tr>
<td>s</td>
<td>stability axis system</td>
</tr>
<tr>
<td>w</td>
<td>wind axis system</td>
</tr>
<tr>
<td>ref</td>
<td>reference conditions</td>
</tr>
<tr>
<td>∞</td>
<td>free stream conditions</td>
</tr>
<tr>
<td>t</td>
<td>total conditions</td>
</tr>
<tr>
<td>b</td>
<td>base</td>
</tr>
<tr>
<td>SYMBOL</td>
<td>SADSAC SYMBOL</td>
</tr>
<tr>
<td>--------</td>
<td>---------------</td>
</tr>
<tr>
<td>( C_N )</td>
<td>CN</td>
</tr>
<tr>
<td>( C_A )</td>
<td>CA</td>
</tr>
<tr>
<td>( C_{Ab} )</td>
<td>CAB</td>
</tr>
<tr>
<td>( C_{Af} )</td>
<td>CAF</td>
</tr>
<tr>
<td>( C_n )</td>
<td>CYN</td>
</tr>
<tr>
<td>( C_f )</td>
<td>CBL</td>
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</table>

### Common to Both Axis Systems

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SADSAC SYMBOL</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_m )</td>
<td>CLM</td>
<td>pitching moment coefficient; ( M_y/qS ) ( l_{ref} )</td>
</tr>
<tr>
<td>( C_y )</td>
<td>CY</td>
<td>side force coefficient; ( F_y/qS )</td>
</tr>
</tbody>
</table>

### Stability Axis System

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SADSAC SYMBOL</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_L )</td>
<td>CL</td>
<td>lift force coefficient; ( F_L/qS )</td>
</tr>
<tr>
<td>( C_D )</td>
<td>CD</td>
<td>drag force coefficient; ( F_D/qS )</td>
</tr>
<tr>
<td>( C_{Db} )</td>
<td>CDB</td>
<td>base drag coefficient</td>
</tr>
<tr>
<td>( C_{Dr} )</td>
<td>CDF</td>
<td>forebody drag coefficient; ( C_D - C_{Db} )</td>
</tr>
<tr>
<td>( C_m )</td>
<td>CIN</td>
<td>yawing moment coefficient; ( M_{z,s}/qS ) ( b_{ref} )</td>
</tr>
<tr>
<td>( C_f )</td>
<td>CSL</td>
<td>rolling moment coefficient; ( M_{x,s}/qS ) ( b_{ref} )</td>
</tr>
<tr>
<td>( L/D )</td>
<td>L/D</td>
<td>lift-to-drag ratio; ( C_L/C_D )</td>
</tr>
<tr>
<td>( L/DF )</td>
<td>L/DF</td>
<td>lift to forebody drag ratio; ( C_L/C_{Dr} )</td>
</tr>
</tbody>
</table>
### Surface Definitions

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SADSAC SYMBOL</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>hte</td>
<td>HORIZT</td>
<td>horizontal tail incidence; positive when trailing edge down; degrees</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>symmetrical surface deflection angle; degrees; positive deflections are:</td>
</tr>
<tr>
<td>AILRON</td>
<td></td>
<td>aileron - total aileron deflection; (left aileron - right aileron)/2</td>
</tr>
<tr>
<td>CANARD</td>
<td></td>
<td>canard - trailing edge down</td>
</tr>
<tr>
<td>ELEVON</td>
<td></td>
<td>elevon - trailing edge down</td>
</tr>
<tr>
<td>ELEVTR</td>
<td></td>
<td>elevator - trailing edge down</td>
</tr>
<tr>
<td>FLAP</td>
<td></td>
<td>flap - trailing edge down</td>
</tr>
<tr>
<td>Rudder</td>
<td></td>
<td>rudder - trailing edge to the left</td>
</tr>
<tr>
<td>SPOILR</td>
<td></td>
<td>spoiler - trailing edge down</td>
</tr>
<tr>
<td>TAB</td>
<td></td>
<td>tab - trailing edge down with respect to control surface</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>antisymmetrical surface deflection angle, degrees; positive trailing edge down:</td>
</tr>
<tr>
<td>AIL-L</td>
<td></td>
<td>left aileron - trailing edge down</td>
</tr>
<tr>
<td>AIL-R</td>
<td></td>
<td>right aileron - trailing edge down</td>
</tr>
<tr>
<td>ELVN-L</td>
<td></td>
<td>left elevon - trailing edge down</td>
</tr>
<tr>
<td>ELVN-R</td>
<td></td>
<td>right elevon - trailing edge down</td>
</tr>
<tr>
<td>SPLR-L</td>
<td></td>
<td>left spoiler - trailing edge down</td>
</tr>
<tr>
<td>SPLR-R</td>
<td></td>
<td>right spoiler - trailing edge down</td>
</tr>
</tbody>
</table>

### Surface Subscripts

- **s**: aileron
- **b**: base
- **c**: canard
- **e**: elevator or elevon
- **f**: flap
- **r**: rudder or ruddervator
- **s**: horizontal tail
- **t**: tail
TABULATED DATA LISTING

A tabulated data listing, consisting of all aero data sets, both original and those created in arriving at the plotted material to be presented subsequently, is available as an addendum to this report. The tabular listing is made up in two sections:

(a) a brief summary list of all data sets containing the identifier, the descriptor, and the resident dependent variables.

(b) a full list of all data sets containing all resident or selected aerodynamic coefficients of the data sets as well as the above mentioned information.

The listing is currently sent on limited distribution to the following organizations:

NASA AMES        Mr. V. Stevens
GAC              Mr. M. Quan

If copies of this listing are desired, please contact the above or the cognizant SADSAC personnel who, for this data, is:

Miss B. J. Fricken
Department 2780
Chrysler Corporation Space Division
New Orleans, La. 70129
(504) 255-2304
Note: On plots where low and high alpha ranges are stacked, the CAF and CDF coefficients are in fact CA and CD for the high alpha range, i.e., these coefficients were not corrected for base pressures.
Model Build-Up in Pitch - No Vertical at High Alpha

Forebody Drag Coefficient, CDF

Angle of Attack, Alpha, Degrees

Reference Information

Data Set Symbol | Configuration Description | Beta | Tail | Elev | Reference Information
--- | --- | --- | --- | --- | ---
(GCX011) | GAC HST-020 TBC H-32 Booster B9V3 | 0.000 | 0.000 | 0.000 | SREF 13.3440 INCHES
(GCX081) | GAC HST-020 TBC H-32 Booster B9M4V3 | 0.000 | -13.000 | 0.000 | BREF 9.9980 INCHES
(GCX961) | GAC HST-020 TBC H-32 Booster B9M4H4V3 | 0.000 | -13.000 | 0.000 | ZHTRP 0.0000 INCHES
(RCX872) | GAC HST-020 TBC H-32 Booster B9M4V3 | 0.000 | 0.000 | 0.000 | SCALE 0.4348 PERCENT

Mach 0.120
MODEL BUILD-UP IN PITCH - NO VERTICAL AT HIGH ALPHA

PITCHING MOMENT COEFFICIENT, CLM

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GCXO1) GAC MST-02D TBC H-32 BOOSTER B8V3
(GCXO1) GAC MST-02D TBC H-32 BOOSTER B8W4V3
(NC2272) GAC MST-02D TBC H-32 BOOSTER B8W4V3

BETA NTAI ELEVTR
0.000 0.000
0.000 -15.000 0.000
0.000 -15.000 0.000

REFERENCE INFORMATION
BREF 13.3440 INCHES
LREF 1.4880 INCHES
XNRP 7.8210 INCHES
YNRP 0.0000 INCHES
ZNRP 1.5870 INCHES
SCALE 0.4348 PERCENT

MACH 0.120

PAGE 3
MODEL BUILD-UP IN PITCH - NO VERTICAL AT HIGH ALPHA

FOREBODY AXIAL FORCE COEFFICIENT, CAF

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GCXOII) GAC HST-020 TBC H-32 BOOSTER B8V3
(GCXOII) GAC HST-020 TBC H-32 BOOSTER B8W4V3
(GCXOII) GAC HST-020 TBC H-32 BOOSTER B8W4V3
(RCIZZ2) GAC HST-020 TBC H-32 BOOSTER B8W4V3

MACH 8.120

REFERENCE INFORMATION
BREF 13.3440
LREF 1.4660 INCHES
HREF 9.8820 INCHES
XHRP 7.4200 INCHES
YHRP 1.5670 INCHES
ZHRP 0.0000 INCHES
SCALE 0.4348 PERCENT
EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

ANGLE OF ATTACK, ALPHA, DEGREES

LIFT COEFFICIENT, CL

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR
(GCX021) GAC MST-020 TBC H-32 BOOSTER B6MV3 0.000 0.000 0.000
(GCX031) GAC MST-020 TBC H-32 BOOSTER B6MV3 0.000 -15.000 0.000
(GCX081) GAC MST-020 TBC H-32 BOOSTER B6MV4 0.000 -30.000 0.000
(RCX091) GAC MST-020 TBC H-32 BOOSTER B6MV4

MACH 0.120

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.4680 INCHES
BREF 9.6520 INCHES
XHMRP 7.8210 INCHES
ZHRP 1.5670 INCHES
SCALE 0.4348 PERCENT

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EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

ANGLE OF ATTACK, ALPHA, DEGREES

FOREBODY DRAG COEFFICIENT, CDF

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR

(GCX081) GAC HST-020 TBC H-32 BOOSTER B8M4V3 0.000 0.000 0.000

(GCX081) GAC HST-020 TBC H-32 BOOSTER B8M4V3 0.000 -15.000 0.000

(GCX081) GAC HST-020 TBC H-32 BOOSTER B6M4V3 0.000 -30.000 0.000

REFERENCE INFORMATION
SREF 13.3440 SQ.IN.
LREF 1.4660 INCHES
BREF 9.6520 INCHES
XMRP 7.8210 INCHES
ZMRP 0.0000 INCHES
SCALE 0.4348 PERCNT

MACH 0.120

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EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GCXOBI) GAC HST-020 TBC H-32 BOOSTER B6W4H4
(GCX031) GAC HST-020 TBC H-32 BOOSTER B6W4H4V3
(GCX03) GAC HST-020 TBC H-32 BOOSTER B6W4H4V3
(RCX03) GAC HST-020 TBC H-32 BOOSTER B6W4H4

REFERENCE INFORMATION
SREF 13.3440 SQ. IN.
LREF 1.4680 INCHES
BREF 9.6520 INCHES
XNRP 1.6210 INCHES
YNRP 0.0000 INCHES
ZNRP 1.5620 INCHES
SCALE 0.4346 PERCNT

ANGLE OF ATTACK, ALPHA, DEGREES
PITCHING MOMENT COEFFICIENT, CLM

MACH 0.120

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EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  BETA  NTAIL  ELEVTR  REFERENCE INFORMATION
(GCX021)  GAC HST-020 TBC H-32 BOOSTER B6W4V3  0.000  0.000  0.000  SREF  13.3440 SQ. IN.
(GCX031)  GAC HST-020 TBC H-32 BOOSTER B6W4H4V3  0.000  -15.000  0.000  LREF  1.4480 INCHES
(GCX041)  GAC HST-020 TBC H-32 BOOSTER B6W4H4V3  0.000  -30.000  0.000  BREF  9.4320 INCHES
(GCX051)  GAC HST-020 TBC H-32 BOOSTER B6W4H4  0.000  0.000  0.000  YMRP  7.8540 INCHES
MACH  0.120  ZMRP  0.0500 INCHES
SCALE  0.4346 PERCNT

REFERENCE INFORMATION
SREF  13.3440 SQ. IN.
LREF  1.4480 INCHES
BREF  9.4320 INCHES
YMRP  7.8540 INCHES
ZMRP  0.0500 INCHES
SCALE  0.4346 PERCNT

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EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

ANALYSIS OF RESULTS

EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  REFERENCE INFORMATION

- (GCX021)  GAC MST-020 TBC H-32 BOOSTER  B6M4V3  BREF 15.3440 SQ. IN.
- (GCX031)  GAC MST-020 TBC H-32 BOOSTER  B6M4H4V3  LREF 1.4480 INCHES
- (GCX081)  GAC MST-020 TBC H-32 BOOSTER  B6M4H4V3  XHRF 7.8210 INCHES
- (RCX081)  GAC MST-020 TBC H-32 BOOSTER  B6M4H4  ZHRF 3.5670 INCHES

SCALE 0.4346 PERCENT
EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

BASE DRAG COEFFICIENT, CDB

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA H TAIL ELEVTR
(F18021) GAC HST-020 TBC H-32 BOOSTER B8W4V3 0.000 0.000 0.000
(F18323) GAC HST-020 TBC H-32 BOOSTER B8W4H4V3 0.000 -15.000 0.000
(F18322) GAC HST-020 TBC H-32 BOOSTER B8W4H4V3 0.000 -15.000 0.000

REFERENCE INFORMATION
BREF 15.3440 SQ. INCHES
LREF 1.4680 INCHES
XREF 1.4680 INCHES
YREF 0.0000 INCHES
ZREF 1.4680 INCHES
SCALE 0.4340 PERCENT

MACH 0.120
EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

LIFT COEFFICIENT, CL

PITCHING MOMENT COEFFICIENT, CLM

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR NTAIL REFERENCE INFORMATION
(GCX01) GAc HST-O2D TBC H-32 BOOSTER B6W4H3 0.000 0.000 SREF 13.3440 IN
(GCX02) GAc HST-O2D TBC H-32 BOOSTER B6W4H4V3 0.000 -15.000 DREF 1.4440 INCHES
(GCX03) GAc HST-O2D TBC H-32 BOOSTER B6W4H4V3 0.000 -30.000 XREF 9.8320 INCHES
(GCX04) GAc HST-O2D TBC H-32 BOOSTER B6W4H4 0.000 ZREF 7.6210 INCHES
(RCX01) GAc HST-O2D TBC H-32 BOOSTER B6W4H4 0.000 YHP 0.0000 INCHES
MACH 0.120
SCALE 0.4340 PERCNT

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EFFECT OF STABILIZER DEFLECTION - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  ALPHA  ELEV'TR  H'TAIL
(GCX021)  6AC HST-020 TBC H-32 BOOSTER B8W4V3  0.000  0.000
(GCX031)  6AC HST-020 TBC H-32 BOOSTER B8W4H4V3  0.000  -15.000
(GCX041)  6AC HST-020 TBC H-32 BOOSTER B8W4H4V3  0.000  -30.000
(RCX091)  6AC HST-020 TBC H-32 BOOSTER B8W4H4

REFERENCE INFORMATION
SREF  13.3440  IN.
LREF  1.4680  INCHES
BREF  9.6320  INCHES
XMRP  7.4210  INCHES
ZMRP  0.0000  INCHES
SCALE  0.4340  PERCENT
EFFECT OF ELEVATOR DEFLECTION, HTAIL=0. DEG. - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GC0351) □ GAC HST-020 TBC H-32 BOOSTER B6W4H4
(RC041) □ GAC HST-020 TBC H-32 BOOSTER B6W4H4

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.4600 INCHES
YHREF 7.8820 INCHES
ZHREF 0.0000 INCHES
SCALE 0.4344 PERCENT

MACH 0.120
### Reference Information

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<th>Elev</th>
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**Data Set Symbol**: GCX031, RCX041

**Mach Number**: 0.120

---

**Effect of Elevator Deflection, Htail=0° Deg. - No Vertical at High Alpha**

**Graph**: Forebody Drag Coefficient vs. Angle of Attack (Alpha), Degrees.
EFFECT OF ELEVATOR DEFLECTION, HTAIL=0. DEG. - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GCXD31) GC HST-020 TBC H-32 BOOSTER BM4H4V3
(RCX041) GC HST-020 TBC H-32 BOOSTER BM4H4

REFERENCE INFORMATION
SREF 13.4440 SQ. IN.
LREF 1.4480 INCHES
BREF 9.6580 INCHES
XHNP 0.0000 INCHES
YNRP 1.9440 INCHES
ZNRP 1.5870 INCHES
SCEA 0.4340 PERCHT

MACH 0.120
### Data Set Symbols and Configuration Description

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### Reference Information

| SREF | 13.3440 | 58.1 IN. |
| LREF | 1.4680 | INCHES |
| BREF | 9.8220 | INCHES |
| XHREF | 7.8210 | INCHES |
| YHREF | 0.0000 | INCHES |
| ZHREF | 1.5970 | INCHES |
| SCALE | 0.4340 | PERCNT |

### Graph Description

Effect of elevator deflection, HTAIL = 0. Deg. - No vertical at high alpha.

- **NORMAL FORCE COEFFICIENT, CN**
- **ANGLE OF ATTACK, ALPHA, DEGREES**

Data set: Symbol = RCX041, Configuration = GAC HST-020 TBC H-32 Booster B6W4H4, Description = Reference Information.

Mach = 0.180

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EFFECT OF ELEVATOR DEFLECTION, HTAIL = 0. DEG. - NO VERTICAL AT HIGH ALPHA

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DATA SET SYMBOL  CONFIGURATION DESCRIPTION  BETA  HTAIL  ELEVTR  REFERENCE INFORMATION
(GCX031)  GAC MST-020 TBC H-32 BOOSTER B66H4H4  0.000  0.000  0.000  SREF  13.440  SQ. IN.
(RCX041)  GAC MST-020 TBC H-32 BOOSTER B66H4H4  0.000  0.000  -10.000  LREF  1.4880  INCHES

REFERENCE INFORMATION
- SREF 13.440  SQ. IN.
- LREF 1.4880  INCHES
- BREF 9.6520  INCHES
- XMRP 7.9210  INCHES
- ZMRP 0.0000  INCHES
- SCALE 0.4348 PERCENT
EFFECT OF ELEVATOR DEFLECTION. HTAIL = 0. DEG. - NO VERTICAL AT HIGH ALPHA

ANGLE OF ATTACK, ALPHA, DEGREES

BASE DRAG COEFFICIENT, CDB

REFERENCE INFORMATION
SREF 13.3440  50. IN.
LREF 1.4660  INCHES
HREF 9.6580  INCHES
XHP 7.8210  INCHES
YHP 0.0000  INCHES
ZHP 1.5670  INCHES
SCALE 0.4346  PERCNT

GAC HST-020  TBC H-32 BOOSTER  B8W4H4V3  (FCX232)  05 AUG 71  PAGE 24
EFFECT OF ELEVATOR DEFLECTION, H'TAIL=0, DEG. - NO VERTICAL AT HIGH ALPHA

PITCHING MOMENT COEFFICIENT, CLM

DATA SET SYMBOL CONFIGURATION DESCRIPTION  BETA  HTAIL  ELEVTR
(GCX031)  GAC HST-020 TBC H-32 BOOSTER BSW4H4V3 0.000 0.000 0.000
(GCX041)  GAC HST-020 TBC H-32 BOOSTER BSW4H4 0.000 0.000 -0.000

REFERENCE INFORMATION
SREF  13.3440 INCHES
XREF  1.4660 INCHES
YMPF  9.0920 INCHES
XMPF  7.8810 INCHES
XMPF  0.0000 INCHES
SCALE  0.4348 PERCENT

MACH  0.120
EFFECT OF ELEVATOR DEFLECTION, H-TAIL = 0. DEG. - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  BETA  H-TAIL  ELEVTR
(GCX031)  ▲  GAC HST-020 TBC H-32 BOOSTER B6W4H4V3  0.000  0.000  0.000
(RCX041)  ▲  GAC HST-020 TBC H-32 BOOSTER B6W4H4  0.000  0.000 -15.000

REFERENCE INFORMATION
SREF  13.3440  50. IN.
LREF  1.4660  INCHES
BREF  9.3200  INCHES
XHPR  7.8230  INCHES
YMRP  0.0000  INCHES
ZMNP  1.3670  INCHES
SCALE  0.4348  PERCENT

MACH  0.120

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EFFECT OF ELEVATOR DEFLECTION, HTAIL=-15°, NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL CONFIGURATION DESCRIPTION REFERENCE INFORMATION

MACH 0.4

REFERENCE INFORMATION

BETA HTAIL ELEV

0.000 -15.000 0.000
0.000 -15.000 -15.000
0.000 -15.000 -30.000

SCREF 1.3440 INCHES
LREF 1.4680 INCHES
BREF 9.6580 INCHES
XREF 7.6810 INCHES
YREF 0.0000 INCHES
ZREF 1.3870 INCHES
SCALE 0.4348 PERCENT

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EFFECT OF ELEVATOR DEFLECTION, HTAIL=-15. DEG. - NO VERTICAL AT HIGH ALPHA

FOREBODY DRAG COEFFICIENT, CDF

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GC6081) GAC HST-020 TBC H-32 BOOSTER B8W4H4V3
(GC6071) GAC HST-020 TBC H-32 BOOSTER B8W4H4V3
(GC6061) GAC HST-020 TBC H-32 BOOSTER B6W4H4

MACH 6.120

REFERENCE INFORMATION
SREF 15.3440 SQ. IN.
LREF 1.4680 INCHES
BREF 9.5510 INCHES
XMRP 7.6210 INCHES
YMRP 0.0000 INCHES
ZMRP 1.3670 INCHES
SCALE 0.4348 PERCENT

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EFFECT OF ELEVATOR DEFLECTION, HTAIL=-15 DEG. - NO VERTICAL AT HIGH ALPHA

REFERENCE INFORMATION

REFERENCE INFORMATION

DATA SET SYMBOL | CONFIGURATION DESCRIPTION | BETA | HTAIL | ELEVTR
------- | -------------------------- | ---- | ------ | ----
(6CX081) | GAC HST-020 TBC H-32 BOOSTER BMW4AV5 | 0.000 | -15.000 | 0.000
(6CX071) | GAC HST-020 TBC H-32 BOOSTER BMW4AV5 | 0.000 | -15.000 | -15.000
(RCX081) | GAC HST-020 TBC H-32 BOOSTER BMW4AV5 | 0.000 | -15.000 | -30.000

REFERENCE INFORMATION

MACH 0.120

PITCHING MOMENT COEFFICIENT, CLM

ANGLE OF ATTACK, ALPHA, DEGREES

REFERENCE INFORMATION

MACH 0.120

SCALE 0.4340 PERCNT

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EFFECT OF ELEVATOR DEFLECTION, H-TAIL = -15. DEG. - NO VERTICAL AT HIGH ALPHA

NORMAL FORCE COEFFICIENT, CN

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  REFERENCE INFORMATION
(GC1001)  GAC HST-020 TBC M-32 BOOSTER 864M4943  BREF 13.3440 50. IN.
(GC1071)  GAC HST-020 TBC M-32 BOOSTER 864M4943  LREF 1.4640  INCHES
(RC1061)  GAC HST-020 TBC M-32 BOOSTER 864M4943  XREF 9.6520  INCHES

REFERENCE INFORMATION

NACH 0.120

SCALE 0.4349 PERCENT
EFFECT OF ELEVATOR DEFLECTION. HTAIL=-15. DEG. - NO VERTICAL AT HIGH ALPHA

FOREBODY AXIAL FORCE COEFFICIENT, CAF

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  BETA  HTAIL  ELEVTR
(GCC061)  GAC HST-D20 TBC M-32 BOOSTER BBMM4AV3  0.000  -15.000  0.000
(GCC071)  GAC HST-D20 TBC M-32 BOOSTER BBMM4AV3  0.000  -15.000  -15.000
(RCC061)  GAC HST-D20 TBC M-32 BOOSTER BBMM4AV3  0.000  -15.000  -30.000

REFERENCE INFORMATION
SREF  13.3440  SQ. IN.
LREF  1.4480  INCHES
BREF  9.9520  INCHES
XREF  7.8110  INCHES
YREF  0.0000  INCHES
ZREF  1.5870  INCHES
SCALE  0.4348  PERCENT

MACH  0.120

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EFFECT OF ELEVATOR DEFLECTION, HTAIL=15. DEG. - NO VERTICAL AT HIGH ALPHA

BASE DRAG COEFFICIENT, CD

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR
(FCX232) ▲ GAC HST-Z20 TBC H-32 BOOSTER BMH44Y3 0.000 -15.000 0.000
(FCX332) ▲ GAC HST-Z20 TBC H-32 BOOSTER BMH44Y3 0.000 -15.000 -15.000

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.4600 INCHES
BREF 0.0000 INCHES
CRM 7.8310 INCHES
YRM 0.0000 INCHES
ZRM 1.5440 INCHES
SCALE 0.4348 PERCENT

MACH 0.120

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EFFECT OF ELEVATOR DEFLECTION, HTAIL=-15. DEG. - NO VERTICAL AT HIGH ALPHA

LIFT COEFFICIENT, CL

PITCHING MOMENT COEFFICIENT, CLM

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR
(GC2061) GAC HST-020 TBC H-32 BOOSTER BSW4H4Y3 0.000 -15.000 0.000
(GC2061) GAC HST-020 TBC H-32 BOOSTER BSW4H4Y3 0.000 -15.000 -15.000
(RC2061) GAC HST-020 TBC H-32 BOOSTER BSW4H4 0.000 -15.000 -30.000

REFERENCE INFORMATION
SREF 13.3440 36. IN.
LREF 1.4880 INCHES
BREF 9.8820 INCHES
XMRP 7.8210 INCHES
ZMRP 0.0000 INCHES
XMRP 1.9870 INCHES
SCALE 0.4348 PER CENT

MACH 6.150
EFFECT OF ELEVATOR DEFLECTION, HTAIL=-15. DEG. - NO VERTICAL AT HIGH ALPHA
EFFECT OF ELEVATOR DEFLECTION, HTAIL = -30, DEG.

LIFT COEFFICIENT, CL

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(RCX901) (R) GAC HST-020 TBC H-32 BOOSTER 864WH4 0.000 -30.000 0.000 3BW4H4
(RCX810) (O) GAC HST-020 TBC H-32 BOOSTER 864WH4 0.000 -30.000 -15.000 3BW4H4
(RCX111) (O) GAC HST-020 TBC H-32 BOOSTER 864WH4 0.000 -30.000 -30.000 3BW4H4

REFERENCE INFORMATION
SREF 13.3440 30.1H.
LREF 1.4680 INCHES
BREF 9.6210 INCHES
XMRP 7.8210 INCHES
ZMRP 0.0000 INCHES
SCALE 0.4340 PERCENT

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EFFECT OF ELEVATOR DEFLECTION. HTAIL = 30. DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR
(RCX091) GAC HST-02D TBC H-32 BOOSTER 864W4H4 0.000 -30.000 0.000
(RCX101) GAC HST-02D TBC H-32 BOOSTER 864W4H4 0.000 -30.000 -15.000
(RCX111) GAC HST-02D TBC H-32 BOOSTER 864W4H4 0.000 -30.000 -30.000

REFERENCE INFORMATION
SREF 13.3440 SQ.IN.
LREF 1.4000 INCHES
BREF 9.6520 INCHES
YNRP 0.0000 INCHES
ZNRP 1.8210 INCHES
SCALE 0.4346 PERCNT

MACH 6.120

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EFFECT OF ELEVATOR DEFLECTION, HTAIL=-30. DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR REFERENCE INFORMATION
(RCX091) GAC HST-020 TBC M-32 BOOSTER 86W4H4 0.000 -30.000 0.000 SREF 13.3440 90. IN.
(RCX101) GAC HST-020 TBC M-32 BOOSTER 86W4H4 0.000 -30.000 -15.000 LREF 1.4660 INCHES
(RCX111) GAC HST-020 TBC M-32 BOOSTER 86W4H4 0.000 -30.000 -30.000 XREF 9.4520 INCHES
XMRP 7.8210 INCHES
YMRP 0.0000 INCHES
ZMRP 1.3870 INCHES
SCALE 0.4344 PERCHT

ANGLE OF ATTACK, ALPHA, DEGREES
EFFECT OF ELEVATOR DEFLECTION, HTAIL = -30. DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR
(RCX091) S GAC HST-020 TBC H-32 BOOSTER B64HH4 0.000 -30.000 0.000
(SI7U2) D GAC HST-020 TBC H-32 BOOSTER B64HH4 0.000 -30.000 -15.000
(RCX111) X GAC HST-020 TBC H-32 BOOSTER B64HH4 0.000 -30.000 -30.000

REFERENCE INFORMATION
SREF 13.3440 SQ.IN.
LREF 1.4660 INCHES
BREF 9.6320 INCHES
XRFP 7.8210 INCHES
ZMRP 1.9870 INCHES
SCALE 0.4348 PERCENT

MACH 0.120

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EFFECT OF ELEVATOR DEFLECTION. HTAIL = -30. DEG.

LIFT COEFFICIENT, CL

PITCHING MOMENT COEFFICIENT, CLM

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEV
GAC MST-020 TBC H-32 BOOSTER B6W4H4 0.000 -30.000 -15.000
GAC MST-020 TBC H-32 BOOSTER B6W4H4 0.000 -30.000 -15.000
GAC MST-020 TBC H-32 BOOSTER B6W4H4 0.000 -30.000 -15.000

REFERENCE INFORMATION
SREF 13.3440 SQ. IN.
LREF 1.4440 INCHES
BREF 9.6520 INCHES
HREF 7.1010 INCHES
ZMRF 1.5870 INCHES
SCALE 0.4346 PER CT

MACH 0.120

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EFFECT OF STABILIZER AREA

LIFT COEFFICIENT, CL

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(RCX131) GAC HST-020 TBC H-32 BOOSTER B853H4
(RCX311) GAC HST-020 TBC H-32 BOOSTER B853H5

BETA H/TAIL ELEV
0.000 -15.000 0.000

REFERENCE INFORMATION
SREF 13.3440 SQ.IN.
LREF 1.4680 INCHES
BMFP 9.9520 INCHES
NMRP 7.8210 INCHES
ZMPR 0.0700 INCHES
SCALE 0.4340 PERCENT

MACH 0.120

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EFFECT OF STABILIZER AREA

FOREBODY DRAG COEFFICIENT, CD

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION REFERENCE INFORMATION
(RCX301) GAC HST-02D TBC H-32 BOOSTER
(RCX311) GAC HST-02D TBC H-32 BOOSTER
B6W5SH4
B6W5SH3
0.000 -15.000 0.000
0.000 -15.000
SREF 13.3440 IN.
LREF 1.0840 IN.
BREF 9.000 IN.
XHMR 7.810 IN.
YHMR 0.0000 IN.
ZHMR 1.2970 IN.
SCALE 0.4546 PERCENT

MACH 0.120

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EFFECT OF STABILIZER AREA

DATA SET SYMBOL CONFIGURATION DESCRIPTION REFERENCE INFORMATION
(RCX131 A GAC NST-020 TBC H-32 BOOSTER BS6S54 13.3440 13.440 86.14"
(RCX311) 6 GAC NST-020 TBC H-32 BOOSTER BS6S55 1.4600 1.460 INCHES

MACH 0.120

ANGLE OF ATTACK, ALPHA, DEGREES

PITCHING MOMENT COEFFICIENT, CLM

BETA H TAIL ELEVTR SCALE 0.4346 PCT
EFFECT OF STABILIZER AREA

NORMAL FORCE COEFFICIENT, CN

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAI ELEVTR
(RCX131) O GAC HST-020 TBC H-32 BOOSTER 88W3H4 0.000 -15.000 0.000
(RCX131) O GAC HST-020 TBC H-32 BOOSTER 86W3H5 0.000 -15.000 0.000

REFERENCE INFORMATION
BREF 13.5440 SQ. IN.
LREF 1.4480 INCHES
ZMRP 0.0000 INCHES
ZMRP 1.3870 INCHES
SCALE 0.4346 PERCENT

MACH 0.120
EFFECT OF STABILIZER AREA

FOREBODY AXIAL FORCE COEFFICIENT, CAF

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(RCX131) Q GAC HST-020 TBC H-32 BOOSTER B6WSH4
(RCX311) G GAC HST-020 TBC H-32 BOOSTER B6WSH5

BETA MTAIL ELEVTR
0.000 -15.000 0.000

REFERENCE INFORMATION
SREF 13.3440 86.1 IN.
LREF 1.4600 INCHES
BREF 9.4920 INCHES
Y1REF 7.8210 INCHES
Y2REF 0.0000 INCHES
Z1REF 1.5070 INCHES
SCALE 0.4340 PERCENT

MACH 8.120

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EFFECT OF STABILIZER AREA

PITCHING MOMENT COEFFICIENT, CLM

NORMAL FORCE COEFFICIENT, CN

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(RCX311) GAC HST-020 TBC H-32 BOOSTER B6W5H4
(RCX311) GAC HST-020 TBC H-32 BOOSTER B6W5H5

BETA NTAIL ELEVTR
0.000 -15.000 0.000
0.000 -15.000

REFERENCE INFORMATION
SREF 13.3440 IN.
LREF 1.4860 INCHES
BREF 9.8330 INCHES
XREF 7.8210 INCHES
YREF 0.0000 INCHES
ZREF 1.8770 INCHES
SCALE 0.4344 PERCENT

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EFFECT OF WING FORE AND AFT LOCATION IN PITCH - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GC1081) GAC HST-020 TBC H-32 BOOSTER BBW4H4V3
(GC1381) GAC HST-020 TBC H-32 BOOSTER BBW4H4V3

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.6080 INCHES
BREF 9.6530 INCHES
XNRP 0.0000 INCHES
ZNRP 1.9870 INCHES
SCALE 0.4340 PERCENT

PAGE 49
EFFECT OF WING FORE AND AFT LOCATION IN PITCH - NO VERTICAL AT HIGH ALPHA

DATA SET SYMBOL CONFIGURATION DESCRIPTION DESCRIPTION
(GCX081) (GCX131) GAC M5T-020 TBC M-32 BOOSTER GAC M5T-020 TBC M-32 BOOSTER BSW4H4V3 BSW4H4V3

MACH 0.120

REFERENCE INFORMATION
SREF 13.3640 SQ. IN.
LREF 1.4460 INCHES
BREF 9.4380 INCHES
XHREF 7.8810 INCHES
YHREF 0.0000 INCHES
ZHREF 1.5870 INCHES
SCALE 0.4346 PERCHT

PAGE 50
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EFFECT OF WING FORE AND AFT LOCATION IN PITCH - NO VERTICAL AT HIGH ALPHA

NORMAL FORCE COEFFICIENT, CN

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL  CONFIGURATION DESCRIPTION
(6CX9)  GAC HST=020 TBC H-32 BOOSTER  BBV4H4V3
(6CX13) GAC HST=020 TBC H-32 BOOSTER  BBV4H4V3

MACH 0.120

REFERENCE INFORMATION
SREF 13.3440 56.1 IN.
LREF 1.4680 INCHES
BREF 0.0000 INCHES
HREF 0.0870 INCHES
ZMRP 1.5000 INCHES
SCALE 0.4340 PERCENT

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EFFECT OF WING FORE AND AFT LOCATION IN PITCH - NO VERTICAL AT HIGH ALPHA

FOREBODY AXIAL FORCE COEFFICIENT, CAF

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GCX2631) GAC HST-O20 TBC H-32 BOOSTER 88444V3
(GCX131) GAC HST-O20 TBC H-32 BOOSTER 88444V3

BETA MFAIL ELEVTR
0.000 -15.000 0.000
0.000 -15.000 0.000

REFERENCE INFORMATION
SREF 13.3440 58.0 IN.
LREF 1.4600 INCHES
RREF 9.6820 INCHES
XREF 7.8210 INCHES
YREF 0.0000 INCHES
ZREF 1.3670 INCHES
SCALE 0.4346 PERCENT

MACH 0.120

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EFFECT OF WING FORE AND AFT LOCATION IN PITCH - NO VERTICAL AT HIGH ALPHA

DATA SET  SYMBOL  CONFIGURATION  DESCRIPTION  BETA  MTAIL  ELEVTR
(FCX222)  O  GAC  HST-020  TBC  M-32  BOOSTER  B6V4HAV3  0.000  -15.000  0.000
(FCX242)  D  GAC  HST-020  TBC  M-32  BOOSTER  B6V5HAV3  0.000  -15.000  0.000

REFERENCE INFORMATION
SREF  15.3440  INCHES
LREF  1.4690  INCHES
XREF  9.6920  INCHES
YREF  7.8210  INCHES
ZREF  0.5200  INCHES
SCALE  0.4348  PERCENT

MACH  0.120
EFFECT OF WING FORE AND AFT LOCATION IN PITCH - NO VERTICAL AT HIGH ALPHA

![Graph showing the effect of wing fore and aft location in pitch with no vertical at high alpha.](image)

**DATA SET SYMBOL**
- GCX081
- GCX131

**CONFIGURATION DESCRIPTION**
- GAC HST-O20 TBC H-32 BOOSTER BRW4H4V3
- GAC HST-O20 TBC H-32 BOOSTER BRW4H4V3

**REFERENCE INFORMATION**
- SREF 13.3440
- LREF 1.4680
- HREF 0.6320
- YREF 0.0000
- ZREF 1.2370
- SCALE 0.6340

**MACH** 0.120

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EFFECT OF NOSE SHAPE

FOREBODY DRAG COEFFICIENT, CDF

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR
(FX3222) GAC HST-02D TBC H-32 BOOSTER 88W4H4V3 0.000 -15.000 0.000
(FX3222) GAC HST-02D TBC H-32 BOOSTER 81W4H4V3 0.000 15.000 0.000
(FX3222) GAC HST-02D TBC H-32 BOOSTER 81H4H4V3 0.000 -15.000 0.000

REFERENCE INFORMATION
SREF 13.3440 58.1 IN.
LREF 1.4680 INCHES
BREF 9.4520 INCHES
XREF 7.8210 INCHES
YREF 0.0000 INCHES
ZREF 1.5670 INCHES
SCALE 0.4349 PERCENT

MACH 6.120

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EFFECT OF NOSE SHAPE

PITCHING MOMENT COEFFICIENT, CLM

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA H'TAIL ELECTRF REFERENCE INFORMATION
(FCX582) Q GAC HST-D20 TBC H-32 BOOSTER B84W4H4V3 0.000 -15.000 0.000 SREF 13.3440 INCHES
(FCX582) Q GAC HST-D20 TBC H-32 BOOSTER B12W4H4V3 0.000 -15.000 0.000 LREF 1.4680 INCHES
(FCX582) Q GAC HST-D20 TBC H-32 BOOSTER B11W4H4V3 0.000 -15.000 0.000 BREF 9.4580 INCHES

MACH 0.120
EFFECT OF NOSE SHAPE

ANGLE OF ATTACK, ALPHA, DEGREES

BASE DRAG COEFFICIENT, CD

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR REFERENCE INFORMATION
(FCX232) 6AC HST-020 TBC H-32 BOOSTER BS4H4V3 0.000 -15.000 0.000 SREF 13.3440 16 INCHES
(FCX232) 6AC HST-020 TBC H-32 BOOSTER B12W4H4V3 0.000 -15.000 0.000 LREF 1.4860 INCHES
(FCX232) 6AC HST-020 TBC H-32 BOOSTER B11W4H4V3 0.000 -15.000 0.000 XREF 9.4920 INCHES
XREF 7.8810 INCHES
YREF 0.0000 INCHES
ZREF 1.5870 INCHES
SCALE 0.4348 PERCENT

MACH 0.120

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EFFECT OF NOSE SHAPE

NORMAL FORCE COEFFICIENT, CN

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA MTAIL ELEV

(FCC222) GAC M5T-020 TBC N-52 BOOSTER B12W4H4V3 0.000 -15.000 0.000

(FCC352) GAC M5T-020 TBC N-52 BOOSTER B12W4H4V3 0.000 -15.000 0.000

(FCC366) GAC M5T-020 TBC N-52 BOOSTER B11W4H4V3 0.000 -15.000 0.000

REFERENCE INFORMATION

SREF 13.3440 INH
LREF 1.4880 INCHES
BREF 0.4820 INCHES
XREF 7.8810 INCHES
YREF 0.0000 INCHES
ZREF 1.2070 INCHES
SCALE 0.4348 PERCENT

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EFFECT OF NOSE SHAPE

ANGLE OF ATTACK, ALPHA, DEGREES

FOREBODY AXIAL FORCE COEFFICIENT, CAF

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR

(FCA222) O 6AC HST-020 TBC H-32 BOOSTER B64W4H4V3 0.000 -15.000 0.000

(FCA322) X 6AC HST-020 TBC H-32 BOOSTER B12W4H4V3 0.000 -15.000 0.000

(FCA332) 6AC HST-020 TBC H-32 BOOSTER B11W4H4V3 0.000 -15.000 0.000

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.4840 INCHES
BREF 9.6320 INCHES
YMRP 0.0000 INCHES
ZMRP 1.3870 INCHES
SCALE 0.4348 PERCENT

MACH 0.120

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DATA SET SYMBOL | CONFIGURATION DESCRIPTION |
--- | --- |
(FCS333) | GAC HST-020 TBC H-32 BOOSTER B1W4N4V3 |
(FCS334) | GAC HST-020 TBC H-32 BOOSTER B1W4M4V3 |
(FCS332) | GAC HST-020 TBC H-32 BOOSTER B1IWM4V3 |

REFERENCE INFORMATION |
SREF | 13.3440 SQ. IN. |
LREF | 1.4600 INCHES |
BREF | 9.6320 INCHES |
XREF | 7.8210 INCHES |
YREF | 0.0000 INCHES |
ZREF | 1.3870 INCHES |
SCALE | 0.4340 PERCENT |

EFFECT OF NOSE SHAPE

PITCHING MOMENT COEFFICIENT, CLM

NORMAL FORCE COEFFICIENT, CN

MACH 0.120
EFFECT OF NOSE SHAPE

DATA SET SYMBOL      CONFIGURATION DESCRIPTION     BETA  HTAIL  ELEVTR
(RCX311)           GAC HST-020 TBC H-32 BOOSTER 86W3H4  0.000  -15.000  0.000
(VCX321)           GAC HST-020 TBC H-32 BOOSTER 85W3H4  0.000  -15.000  0.000
(VCX3301)          GAC HST-020 TBC H-32 BOOSTER 89W3H4  0.000  -15.000  0.000

REFERENCES INFORMATION
SREF     13.3440  50 IN.
LREF     1.4800  INCHES
BREF     0.6520  INCHES
XHFP     7.8210  INCHES
YHFP     0.0000  INCHES
ZHFP     1.3270  INCHES
SCALE    0.4344  PERCENT

MACH     0.120
EFFECT OF NOSE SHAPE

NORMAL FORCE COEFFICIENT, CN

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEVTR
(RCX31) GAC HST-O20 TBC H-32 BOOSTER BSWS4 0.000 -15.000 0.000
(RCX301) GAC HST-O20 TBC H-32 BOOSTER BSWS4 0.000 -15.000 0.000

REFERENCE INFORMATION
SREF 13.3440 50.0 IN.
LREF 1.4680 INCHES
DREF 9.6220 INCHES
XMRP 7.8210 INCHES
YMRP 0.0000 INCHES
ZMRP 1.5570 INCHES
SCALE 0.4346 PERCHN

MACH 8.120

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### Data Set Symbol Configuration Description

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### Effect of Nose Shape

**Angle of Attack, Alpha, Degrees**

**Forebody Axial Force Coefficient, Caf**

**Mach 0.120**
EFFECT OF NOSE SHAPE
EFFECT OF NOSE SHAPE

NORMAL FORCE COEFFICIENT, CN

PITCHING MOMENT COEFFICIENT, CLM

EFFECT OF NOSE SHAPE

DATA SET SYMBOL CONFIGURATION DESCRIPTION REFERENCE INFORMATION
(RCX131) GAC HST-020 TBC H-32 BOOSTER B6W4H4 SREF 13.3440 INCHES
(RCX321) GAC HST-020 TBC H-32 BOOSTER B5W5H4 BLEF 9.6520 INCHES
(RCX301) GAC HST-020 TBC H-32 BOOSTER B6W5H4 ZNRP 1.9870 INCHES
MACH 0.120 SCALE 0.4346 PERCENT

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EFFECT OF AFT BODY SHAPE

LIFT COEFFICIENT, CL

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HтаIL ELEVTR
(GCX06) 6AC HST-020 TBC H-32 BOOSTER B8W4W45 0.000 -15.000 0.000
(RCX101) 6AC HST-020 TBC H-32 BOOSTER B7W4H4 0.000 -15.000 0.000

REFERENCE INFORMATION
REF 13.344U 89.1 IN.
LREF 1.4080 INCHES
HREF 9.4820 INCHES
BREF 7.05210 INCHES
BREF 0.0000 INCHES
ZMNP 1.5870 INCHES
SCALE 0.4340 PERCENT

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EFFECT OF AFT BODY SHAPE

FOREBODY DRAG COEFFICIENT, CD

ANGLE OF ATTACK, ALPHA, DEGREES

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  BETA  HTAIL  ELEVTR
(GCX001)  GAC HST-020 TBC H-32 BOOSTER B6W4H4Y3  0.000 -15.000  0.000
(RCX101)  GAC HST-020 TBC H-32 BOOSTER B7W4H4  0.000 -15.000  0.000

REFERENCE INFORMATION
SREF  13.3440  IN.
LREF  1.4880  INCHES
NREF  9.4980  INCHES
XRNP  7.4310  INCHES
YRNP  0.0000  INCHES
ZRNP  1.5870  INCHES
SCALE  0.4340  PERCH1

MACH  0.120

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EFFECT OF AFT BODY SHAPE

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GCX081) GAC HST-020 TBC H-32 BOOSTER BBM4K4V3
(RCX181) GAC HST-020 TBC H-32 BOOSTER BTM4K4

BETA  HTAIL  ELEVTR
0.000  -15.000  0.000
0.000  -15.000  0.000

REFERENCE INFORMATION
SREF  15.3444  50.16
LREF  1.4660   INCHES
BREF  9.6520   INCHES
XMRP  7.8260   INCHES
YMRP  0.0000   INCHES
ZMRP  1.3970   INCHES
SCALE  0.4348   PERCENT

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Effect of Aft Body Shape

Normal Force Coefficient, \( C_n \)

Angle of Attack, \( \alpha \), Degrees

Data Set Symbol | Configuration Description | Beta | H-Tail | Elev. | Reference Information
--- | --- | --- | --- | --- | ---
(GCX001) | GAC HST-020 TBC M-32 Booster | 0.000 | -15.000 | 0.000 | Reference Information
(RCX181) | GAC HST-020 TBC M-32 Booster | 0.000 | -15.000 | 0.000 | Reference Information

Mach 6.120

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EFFECT OF AFT BODY SHAPE

DATA SET SYMBOL CONFIGURATION DESCRIPTION
(GC021) □ GAC MB1-020 TBC H-32 BOOSTER B3W4H3
(RC111) □ GAC MB1-020 TBC H-32 BOOSTER B7W4H4

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.4600 INCHES
BREF 9.6530 INCHES
XNRP 2.8100 INCHES
YNRP 0.0000 INCHES
ZNRP 1.0770 INCHES
SCALE 0.4348 PERCENT

MACH 0.120

ANALYSIS

FOREBODY AXIAL FORCE COEFFICIENT, CAF

ANGLE OF ATTACK, ALPHA, DEGREES

0.000 -15.000 0.000
0.000 -15.000 0.000

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EFFECT OF AFT BODY SHAPE

ANGLE OF ATTACK, ALPHA, DEGREES

BASE DRAG COEFFICIENT, CD

PARAMETRIC VALUES

SYMBOL  Mach  BETA  ELEVTR  HTAIL  ELEVTR

REFERENCE INFORMATION

GAC HST-020  TBC H-32 BOOSTER  B8W4H4V3  (FCX222)  05 AUG 71  PAGE 77
EFFECT OF AFT BODY SHAPE

EFFECT OF AFT BODY SHAPE

LIFT COEFFICIENT, CL

PITCHING MOMENT COEFFICIENT, CLM

DATA SET SYMBOL CONFIGURATION DESCRIPTION BETA HTAIL ELEV

(GCX021) GAC HST-020 TBC H-32 BOOSTER BSHW4V3 0.000 0.000 0.000

(RCX181) GAC HST-020 TBC H-32 BOOSTER B7W4H4 0.000 0.000 0.000

REFERENCE INFORMATION

SREF 13.3040 INCHES
LREF 1.4800 INCHES
MREF 9.4500 INCHES
YHPR 7.6210 INCHES
YHPR 0.0000 INCHES
ZHRP 1.3870 INCHES
SCALE 0.4340 PERCENT

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MACH 0.120
MODEL BUILD-UP IN YAW, ALPHA=70. DEG.

SIDE SLIP ANGLE, BETA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL REFERENCE INFORMATION
(FCX013) □ GAC HST-020 TBC H-32 BOOSTER B6 70.000 13.3440 INCHES
(FCX023) ▲ GAC HST-020 TBC H-32 BOOSTER B6H4 70.000 1.4660 INCHES
(FCX033) ◇ GAC HST-020 TBC H-32 BOOSTER B6WH4 70.000 90.520 INCHES

SCALE 0.4346 PER INCH

MACH 0.120

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MODEL BUILD-UP IN YAW. ALPHA=70. DEG.

SIDE SLIP ANGLE, BETA, DEGREES

ROLLING MOMENT COEFFICIENT, Cm (STABILITY AXIS)

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEV' R TAIL REFERENCE INFORMATION

(FC2013) GAC HST-020 TBC H-32 BOOSTER 86 70.000 SREF 13.3440 INCHES

(FC2023) GAC HST-020 TBC H-32 BOOSTER 86W4 70.000 LREF 1.4880 INCHES

(FC2033) GAC HST-020 TBC H-32 BOOSTER 86W4H4 70.000 ZREF 9.6350 INCHES

MACH 0.120

XREF 7.4210 INCHES

YREF 0.0000 INCHES

ZREF 1.5270 INCHES

SCALE 0.4344 PERCENT

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MODEL BUILD-UP IN YAW. ALPHA=70. DEG.

ROLLING MOMENT COEFFICIENT, CBL (BODY AXIS)

SIDE SLIP ANGLE, BETA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL

FCX015 GAC HST-020 T6C H-32 Booster 88 70.000

FCX023 GAC HST-020 T6C H-32 Booster 88W4 70.000

FCX023 GAC HST-020 T6C H-32 Booster 88W4M4 70.000 0.000 -15.000

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 9.4490 INCHES
XREF 7.0210 INCHES
YREF 0.0000 INCHES
ZREF 1.3870 INCHES
SCALE 0.4340 PERCENT

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MODEL BUILD-UP IN YAW, $\alpha = 70^\circ$ DEG.

SIDE SLIP ANGLE, $\beta$, DEGREES

LIFT COEFFICIENT, $C_L$

REFERENCE INFORMATION
- $X_{REF} = 3.3440$ INCHES
- $Y_{REF} = 1.4600$ INCHES
- $Z_{REF} = 0.6520$ INCHES
- SCALE $= 0.4340$ PERCHT

DATA SET SYMBOL CONFIGURATION DESCRIPTION $\alpha$ ELEVTR NTAIL REFERENCE INFORMATION
- GAC HST-020 TBC H-32 BOOSTER $B6$ 70.000
- GAC HST-020 TBC H-32 BOOSTER $B6W4$ 70.000
- GAC HST-020 TBC H-32 BOOSTER $B6W4W6$ 70.000 $0.000 - 10.000$

MACH $= 0.120$

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MODEL BUILD-UP IN YAW, ALPHA=70.000, DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION   ALPHA    ELEVTR   HTAIL
(FCX013) □ GAC HST-O20 TBC H-32 BOOSTER B6    70.000    70.000    0.000 -19.000
(FCX023) ◇ GAC HST-O20 TBC H-32 BOOSTER B6W4    70.000    70.000    0.000 -19.000
(FCX033) □ GAC HST-O20 TBC H-32 BOOSTER B6W4H4  70.000    0.000 -19.000

REFERENCE INFORMATION
SREF  13.3440  50.1 IN.
LREF  1.4660  INCHES
BREF  9.4050  INCHES
XREF  7.6810  INCHES
YREF  0.0000  INCHES
ZREF  1.5870  INCHES
SCALE  0.4348  PERCNT

MACH  0.120

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MODEL BUILD-UP IN YAW, ALPHA = 70 DEG.

SYMBOL CONFIGURATION DESCRIPTION

GAC HST-020 TBC H-32 BOOSTER BS 70,000
GAC HST-020 TBC H-32 BOOSTER BS64 70,000
GAC HST-020 TBC H-32 BOOSTER BS64H4 70,000 0.000 -15.000

REFERENCE INFORMATION
BREF 13.3440 89.196
LREF 1.4380 INCHES
XREF 9.8520 INCHES
ZREF 7.8210 INCHES
TREF 0.0000 INCHES
ZTREF 1.3870 INCHES
SSCALE 0.4344 PER CNT

MACH 0.120

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MODEL BUILD-UP IN YAW, ALPHA = 70° DEG.

LATERAL FORCE COEFFICIENT, CY

YAWING MOMENT COEFFICIENT, CLN (STABILITY AXIS)

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEV TAIL REFERENCE INFORMATION
(FCX013) ○ GAC HST-020 TBC H-32 BOOSTER 86 70.000 70.000 0.000 -15.000 SREF 13.3440 60.1 IN.
(FCX023) ○ GAC HST-020 TBC H-32 BOOSTER B6M4 70.000 70.000 0.000 -15.000 LREF 1.4480 INCHES
(FCX063) ○ GAC HST-020 TBC H-32 BOOSTER B6M4H4 70.000 70.000 0.000 -15.000 HREF 0.6520 INCHES
MACH 8.120 ZHREF 7.8910 INCHES SCALE 0.4340 PERCENT
XMRP 0.0000 YMRP 0.0000 ZMRP 1.5600 INCHES
MODEL BUILD-UP IN YAW, ALPHA = 0. DEG.

SIDE SLIP ANGLE, BETA, DEGREES

ROLLING MOMENT COEFFICIENT, CBL (BODY AXIS)

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL REFERENCE INFORMATION

MACH 0.120

REFERENCE INFORMATION

SREF 13.3440 INCHES
LREF 1.6680 INCHES
XREF 9.6320 INCHES
YREF 7.8610 INCHES
ZREF 1.3870 INCHES
SCALE 0.4348 PERCENT
MODEL BUILD-UP IN YAW, ALPHA = 0.0 DEG.

SIDE SLIP ANGLE, BETA, DEGREES

LIFT COEFFICIENT, CL

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL REFERENCE INFORMATION
(FCX204) GAC HST-020 TBC H-32 BOOSTER 88 0.000
(FCX204) GAC HST-020 TBC H-32 BOOSTER 88W4 0.000
(FCX224) GAC HST-020 TBC H-32 BOOSTER 88W4H4V3 0.000 0.000 -15.000

MACH 0.120

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MODEL BUILD-UP IN YAW, ALPHA=0. DEG.

SIDE SLIP ANGLE, BETA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL REFERENCE INFORMATION
(FY2284) GAC HST-020 TBC M-32 BOOSTER BB 0.000
(FY2284) GAC HST-020 TBC M-32 BOOSTER BBW4 0.000
(FY2284) GAC HST-020 TBC M-32 BOOSTER BBW4V5 0.000

MACH 0.120

REFERENCE INFORMATION
ZREF 13.3440 INCHES
LREF 1.4480 INCHES
BREF 9.8920 INCHES
XMRP 7.6210 INCHES
YMRP 0.0000 INCHES
ZMRP 1.5270 INCHES
SCALE 0.4344 PERCM
MODEL BUILD-UP IN YAW, ALPHA = 0, DEG.

LATERAL FORCE COEFFICIENT, CY

YAWING MOMENT COEFFICIENT, CYN (BODY AXIS)

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MACH 6.120

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EFFECT OF WING DIHEDRAL IN YAW. ALPHA=70. DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHAP ELEVronic HTAIL REFERENCE INFORMATION
(FCX1043) A GAC HST-20 TBC H-32 BOOSTER B64H4 70.000 0.000 -15.000 SREF 13.3440 INCHES
(FCX1443) A GAC HST-20 TBC H-32 BOOSTER B6DH4 70.000 0.000 -15.000 LREF 1.4440 INCHES
(FCX1943) A GAC HST-20 TBC H-32 BOOSTER B6WH4 70.000 0.000 -15.000 ZREF 9.6270 INCHES

MACH 0.120

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.4440 INCHES
ZREF 9.6270 INCHES
SCALE 0.6348 PERCENT

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EFFECT OF WING DIHEDRAL IN YAW. ALPHA=70. DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEV TR WTAI REFERENCE INFORMATION
(FCX803) GAC HST-020 TBC H-32 BOOSTER BMWN4 70.000 0.000 -15.000 SREF 13.3440 50. INCHES
(FCX43) GAC HST-020 TBC H-32 BOOSTER BMWN4 70.000 0.000 -15.000 LREF 1.4460 INCHES
(FCX93) GAC HST-020 TBC H-32 BOOSTER BMWN4 70.000 0.000 -15.000 DREF 9.6520 INCHES
MACH 8.120 XNRP 7.8210 INCHES
ZMRP 0.0000 INCHES
SCALE 0.4340 PERCNT

SIDE SLIP ANGLE, BETA, DEGREES

YAWING MOMENT COEFFICIENT, CLN (STABILITY AXIS)
EFFECT OF WING DIHEDRAL IN YAW. ALPHA=70. DEG.

SIDE SLIP ANGLE, BETA, DEGREES
EFFECT OF WING DIHEDRAL IN YAW, ALPHA = 70. DEG.

ROLLING MOMENT COEFFICIENT, CBL (BODY AXIS)

SIDE SLIP ANGLE, BETA, DEGREES

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  ALPHA  ELEVTR  HTAIL  REFERENCE INFORMATION
(FCX003)  GAC HST-02G  TBC H=32 BOOSTER  B6W6A4  70.000  0.000  -15.000  SREF  13.3440  INCHES
(FCX143)  GAC HST-02G  TBC H=32 BOOSTER  B6W6H4  70.000  0.000  -15.000  LREF  1.4680  INCHES
(FCX153)  GAC HST-02G  TBC H=32 BOOSTER  B6W7H4  70.000  0.000  -15.000  YRFP  7.8210  INCHES
MACH  0.120  0.180  ZHRP  0.0000  INCHES
SCALE  0.4344  PERCHT

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EFFECT OF WING DIHEDRAL IN YAW, ALPHA=70.0 deg.

SIDE SLIP ANGLE, BETA, DEGREES

LIFT COEFFICIENT, CL

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  ALPHA  ELEV    HTAIL  REFERENCE INFORMATION
(FCX003) GAC HST-020  TBC H-32 BOOSTER  B6W6H4  70.000 0.000 -15.000  REF 13.3440 IN.
(FCX143) GAC HST-020  TBC H-32 BOOSTER  B6W6H4  70.000 0.000 -15.000  LEFF 1.4660 INCHES
(FCX153) GAC HST-020  TBC H-32 BOOSTER  B6W7H4  70.000 0.000 -15.000  OREF 9.8520 INCHES
MACH 0.120

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EFFECT OF WING DIHEDRAL IN YAW, ALPHA=70. DEG.

SIDE SLIP ANGLE, BETA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHAELEV ELEV TAIL
(FCX083) O GAC HST-020 TBC H-32 BOOSTER B6M4H4 70.000 0.000 -15.000
(FCX143) △GAC HST-020 TBC H-32 BOOSTER B6M4H4 70.000 0.000 -15.000
(FCX153) □GAC HST-020 TBC H-32 BOOSTER B6M7H4 70.000 0.000 -15.000

REFERENCE INFORMATION
SREF 13.3440 56.1 INCHES
LACF 1.4690 INCHES
BREF 9.6520 INCHES
XHREF 7.8810 INCHES
YHREF 0.0000 INCHES
ZHREF 1.9870 INCHES
SCALE 0.4348 PERCENT

MACH 0.120

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EFFECT OF WING DIHEDRAL IN YAW. ALPHA=70. DEG.

SIDE SLIP ANGLE, BETA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR MTAIL
(FC3063) GAC HST-020 TBC H-32 BOOSTER B6W4H4 70.000 0.000 -15.000
(FC3143) GAC HST-020 TBC H-32 BOOSTER B6W6H4 70.000 0.000 -15.000
(FC3193) GAC HST-020 TBC H-32 BOOSTER B6W7H4 70.000 0.000 -15.000

REFERENCE INFORMATION
SREF 13.3440 SQ.IN.
LREF 1.4680 INCHES
XREF 9.6520 INCHES
YREF 7.6220 INCHES
ZREF 0.0000 INCHES
SCALE 0.6346 PERCENT

MACH 0.120
EFFECT OF WING DIHEDRAL IN YAW, ALPHA = 70. DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL
(FCX083) GAC HST-020 TBC H-32 BOOSTER 86W4M4 70.000 0.000 -15.000
(FCX143) GAC HST-020 TBC H-32 BOOSTER 86W4M4 70.000 0.000 -15.000
(FCX133) GAC HST-020 TBC H-32 BOOSTER 86W7M4 70.000 0.000 -15.000

REFERENCE INFORMATION
SREF 13.3440 INCHES
LREF 1.4000 INCHES
BREF 9.6920 INCHES
XHMP 7.8210 INCHES
YHMP 0.0000 INCHES
ZHMP 1.5670 INCHES
SCALE 0.4346 PERCENT

MACH 0.120

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EFFECT OF WING DIHEDRAL IN YAW. ALPHA=70. DEG.

YAWING MOMENT COEFFICIENT, CLN (STABILITY AXIS)

DATA SET  SYMBOL  CONFIGURATION DESCRIPTION  ALPHA  ELEVTR HTAIL  REFERENCE INFORMATION
(FC0603)  C       GAC HST-020 TBC H-32 BOOSTER  B6W4H4  70.000  0.000  -15.000  MREF 13.3440 SQ. IN.
(FC0140)  C       GAC HST-020 TBC H-32 BOOSTER  B6W6H4  70.000  0.000  -15.000  LREF 1.4600 INCHES
(FC0153)  C       GAC HST-020 TBC H-32 BOOSTER  B6W7H4  70.000  0.000  -15.000  BREF 0.4320 INCHES

MACH  0.120

REFERENCE INFORMATION
BREF  0.4320 INCHES
LREF  1.4600 INCHES
WHRP  1.5080 INCHES
VHRP  0.0000 INCHES
SCALE  0.4586 PERCENT

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EFFECT OF WING DIHEDRAL IN YAW, ALPHA=0, DEG.

SIDE SLIP ANGLE, BETA, DEGREES

LATERAL FORCE COEFFICIENT, CY

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL REFERENCE INFORMATION

FCX354 GAC HST-O20 TBC H-32 BOOSTER 88W4H4V3 0.000 0.000 -15.000 13.3440 39.1 IN.

FCX354 GAC HST-O20 TBC H-32 BOOSTER 88W4H4V3 0.000 0.000 -15.000 1.4400 INCHES

FCX354 GAC HST-O20 TBC H-32 BOOSTER 88W4H4V3 0.000 0.000 -15.000 9.650 INCHES

FCX354 GAC HST-O20 TBC H-32 BOOSTER 88W4H4V3 0.000 0.000 -15.000 7.8810 INCHES

FCX354 GAC HST-O20 TBC H-32 BOOSTER 88W4H4V3 0.000 0.000 -15.000 0.0000 INCHES

FCX354 GAC HST-O20 TBC H-32 BOOSTER 88W4H4V3 0.000 0.000 -15.000 1.3570 INCHES

SCAL 0.4346 PERCNT

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Effect of Wing Dihedral in Yaw, Alpha=0° Deg.

YAWING MOMENT COEFFICIENT, CLN (STABILITY AXIS)

SIDE SLIP ANGLE, BETA, DEGREES

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL

(FCX24) GAC HST-020 TBC H-32 BOOSTER 0.000 0.000 -15.000

(FCX374) GAC HST-020 TBC H-32 BOOSTER 0.000 0.000 -15.000

(FCX844) GAC HST-020 TBC H-32 BOOSTER 0.000 0.000 -15.000

REFERENCE INFORMATION

SREF 13.3440 SQ. IN.
LREF 1.4680 INCHES
BREF 9.6650 INCHES
XMRP 7.8210 INCHES
YMRP 0.0000 INCHES
ZMRP 1.5670 INCHES
SCALE 0.0346 PERCENT

MACH 0.120

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EFFECT OF WING DIHEDRAL IN YAW, ALPHA=0, DEG.

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  ALPHA  ELEVTR  HTAIL  REFERENCE INFORMATION
(FCRX24)  GAC HST-020  TBC H-32 BOOSTER  88W4H4Y3  0.000  0.000  -15.000  59.3440  IN.
(FCRX34)  GAC HST-020  TBC H-32 BOOSTER  88W6H4Y3  0.000  0.000  -15.000  1.4880  INCHES
(FCRX36)  GAC HST-020  TBC H-32 BOOSTER  88W7H4Y3  0.000  0.000  -15.000  9.0000  INCHES

MACH  0.120

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EFFECT OF WING DIHEDRAL IN YAW, ALPHA = 0, DEG.

DATA SET SYMBOL CONFIGURATION DESCRIPTION ALPHA ELEVTR HTAIL REFERENCE INFORMATION
(FCX324) GAC HST-020 TBC H-32 BOOSTER BSW4H4V3 0.000 0.000 -15.000 SREF 13.3440 34.1" IN.
(FCX374) GAC HST-020 TBC H-32 BOOSTER BSW6H4V3 0.000 0.000 -15.000 LREF 1.4660 INCHES
(FCX394) GAC HST-020 TBC H-32 BOOSTER BSW7H4V3 0.000 0.000 -15.000 ZMREF 9.6520 INCHES
  YMREF 0.0000 INCHES
  ZMREF 1.5970 INCHES
SCALE 0.4340 PERCENT

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EFFECT OF WING DIHEDRAL IN YAW, ALPHA = 0. DEG.
EFFECT OF WING DIHEDRAL IN YAW, ALPHA = 0, DEG.
EFFECT OF WING DIHEDRAL IN YAW, ALPHA = 0. DEG.

YAWING MOMENT COEFFICIENT, CYN (BODY AXIS)

DATA SET SYMBOL  CONFIGURATION DESCRIPTION  ALPHA  ELEV TR  MAIL
(FCX222)  GAC MST-020 TBC H-32 BOOSTER B5W4H4V3  0.000  0.000  -15.000
(FCX374)  GAC MST-020 TBC H-32 BOOSTER B5W6H4V3  0.000  0.000  -15.000
(FCX384)  GAC MST-020 TBC H-32 BOOSTER B5W7H4V3  0.000  0.000  -15.000

REFERENCE INFORMATION
SREF  13.3440  SQ. IN.
LREF  1.4660  INCHES
BREF  9.6820  INCHES
XREF  7.6800  INCHES
YREF  0.0000  INCHES
ZREF  1.5970  INCHES
SCALE  0.4348  PERCENT

MACH  0.120

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EFFECT OF WING DIHEDRAL IN YAW, ALPHA=0 DEG.

YAWING MOMENT COEFFICIENT, CLN (STABILITY AXIS)

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MACH 0.120

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