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ENGINEERING FLIGHT TEST
AH-1G HELICOPTER (HUEYCOBRA)

PHASE D

PART 1
HANDLING QUALITIES

FINAL REPORT

RODGER L. FINNESTEAD
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PROJECT PILOT

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DECEMBER 1970

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US ARMY AVIATION SYSTEMS TEST ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA 93523

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ABSTRACT

The Phase D, Part 1 airworthiness and qualification handling qualities tests of the AH-1G helicopter were conducted at Edwards Air Force Base, California, and auxiliary test sites during the period 13 June 1968 through 29 July 1969. Handling qualities were quantitatively evaluated to determine model specification compliance and to obtain mission suitability information for inclusion in technical manuals and other publications. The AH-1G met all contractual requirements of MIL-H-8501A except for paragraphs 3.2.4 (cyclic force gradients), 3.2.7 (cyclic breakout forces), 3.5.4.1 (takeoff and landing in winds), 3.5.5 (autorotational entry) and 3.5.5.1 (aircraft reaction to engine failure). Tests were not conducted to verify compliance with paragraphs 3.5.4.3 (autorotational landings), 3.5.4.4 (autorotational landings) and 3.5.4.5 (autorotational landing with flotation gear) of MIL-H-8501A. By contractual agreement, the handling qualities requirements presented in paragraphs 3.3 (directional and lateral handling qualities) and 3.6 (handling qualities during instrument flight) of MIL-H-8501A were not applicable. The handling qualities of the AH-1G are acceptable throughout the flight envelope except for the four deficiencies for which correction is mandatory for mission accomplishment: excessive cyclic control breakout forces; inadequate directional control; inability to achieve maximum tail rotor blade angle (19 deg) when full left directional control is applied for all conditions with the present directional control/yaw SCAS geometry; and excessive tail rotor horsepower required for hovering and translational flight. In addition, there were five shortcomings for which corrective action is desirable.

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INTRODUCTION

BACKGROUND

1. In October 1965, the Department of the Army directed the US Army Materiel Command (USAMC) to conduct an expedited comparative evaluation of a selected group of three helicopters to fulfill the immediate requirement for an armed helicopter. A flight test program was conducted on the three aircraft by the US Army Aviation Systems Test Activity (USAASTA) at Edwards Air Force Base (AFB), California, from 13 November to 1 December 1965. The AH-1G HueyCobra was the aircraft selected from the evaluation to meet this requirement.

2. On 17 August 1966, USAASTA was directed by the US Army Test and Evaluation Command (USATECOM) to perform Phase B and Phase D testing of the AH-1G helicopter (ref 1, app I). A test plan for the Phase B engineering test was submitted by USAASTA in April 1967 and approved by the US Army Aviation Systems Command (USAAVSCOM). Phase B tests were conducted at different test sites and geographical locations from 3 April 1967 to 3 May 1968 utilizing several aircraft. The results of these tests are contained in references 2 through 8. The test plan for the Phase D program (ref 9) was initially submitted in August 1967 and was approved by USAAVSCOM on 24 October 1968. The Phase D plan of test was amended on 5 November 1968 (ref 10) to include an additional test requested by USAAVSCOM. Two aircraft were used for the Phase D test program to reduce the calendar time. One of the test aircraft was a prototype (aircraft S/N 6615247), and the other was a production model (aircraft S/N 6715695). The results of the Phase D handling qualities tests are presented in this report (Part 1). The Phase D performance capabilities and vibration characteristics are presented in other reports (Part 2 and Part 3). No wing store jettison or armament subsystem firing tests were conducted during the Phase D program since adequate testing had been accomplished in those areas during the AH-1G Phase B program.

TEST OBJECTIVES

3. The objectives of the AH-1G Phase D test program were as follows:

a. To provide information for technical manuals and other service publications.

b. To determine compliance with applicable military specifications.

c. To determine compliance with contract guarantees.

d. To evaluate operational suitability for the armed helicopter mission.

DESCRIPTION

4. The AH-1G helicopter manufactured by Bell Helicopter Company (BHC) was designed specifically to meet the US Army requirements for an armed helicopter. Tandem seating is provided for a two-man crew. The main rotor system is a two-bladed, semi-rigid, "door hinge" type with the stabilizer bar removed. A conventional antitorque rotor is located near the top of the vertical stabilizer. The AH-1G is equipped with a three-axis stability and control augmentation system (SCAS) to improve the aircraft handling qualities. The helicopter is powered by a Lycoming T53-L-13 turboshaft engine rated at 1400 shaft horsepower (shp) at sea level (SL) under standard day, uninstalled conditions. The engine is derated to 1100 shp due to the maximum torque limit of the main transmission. Distinctive features of the AH-1G are: the narrow fuselage (36 inches), the stub midwing with four external store stations, the integral chin turret. The flight control system is of the mechanical, hydraulically boosted, irreversible type with conventional helicopter controls in the aft cockpit (pilot station). The controls in the forward cockpit (copilot/gunner station) consist of conventional antitorque pedals and sidearm collective and cyclic controls. An electrically operated force trim system is connected to the cyclic and directional controls to induce artificial feel and to provide positive control centering. The elevator is synchronized with the cyclic stick. The armament configurations are changed by varying the wing stores and chin turret configuration. The pilot operates the wing stores and can fire the chin turret only in the stowed position. The copilot/gunner operates the flexible turret and can also fire the wing stores in an emergency. The wing stores can be jettisoned by either the pilot or gunner in case of emergency. The design gross weight (grwt) for the AH-1G is 6600 pounds, and the maximum grwt is 9500 pounds. More detailed aircraft information and operating limits of the AH-1G are presented in appendix II.

SCOPE OF TEST

5. During the AH-1G Phase D test program, 256 flights were conducted for a total of 368.8 flight hours of which 227.9 hours were productive test hours. Testing was conducted in California, from 12 June 1968 to 29 July 1969, at Shafter Airport (420-ft elevation), Edwards AFB (2300-foot elevation) and at high-altitude test sites near Bishop (4120-, 7010- and 9500-foot elevations). Testing was conducted to determine aircraft performance, handling qualities and vibration characteristics. Two aircraft were utilized during this test program. An early prototype aircraft (S/N 6615247) was utilized primarily for performance tests although a limited amount of stability and control testing was accomplished. A more current production aircraft (S/N 6715695) was utilized for the majority of stability and control testing. This second test aircraft was utilized not only to decrease total calendar time required for testing, but also to comply with USAASTA policy which recognized the desirability of performing handling qualities tests on a production aircraft. A breakdown of flights and flight hours by individual aircraft is presented in table 1. Of these totals, 83 flights (84.5 productive flight hours) were devoted primarily to quantitative stability and control testing. Throughout the test program, qualitative evaluations of handling qualities were made. This report contains only the results of the handling qualities tests. The various aircraft configurations evaluated during the handling qualities portion of the program are listed in table 2.

Table 1. Test Flights and Productive Flight Time.

Test helicopter	Total Test Flights	Handling Qualities Test Flights	Total Productive Test Hours	Productive Handling Qualities Test Hours
S/N 6615247 (prototype aircraft)[1]	201	28	161.8	18.4
S/N 6715695 (production aircraft)[2]	55	55	66.1	66.1
Total (both aircraft)	256	83	227.9	84.5

[1] Equipped with TAT-102A turret: one 7.62mm minigun (XM134).
[2] Equipped with XM28 turret in the hybrid configuration: one 7.62mm minigun (XM134) and one 40mm grenade launcher (XM129).

Table 2. Aircraft Armament Configurations.

Configuration	Armament Subsystems
Clean	TAT-102A or XM28 turret, no external wing stores
Outboard alternate	TAT-102A or XM28 turret, one XM159 outboard each wing
Heavy scout	TAT-102A or XM28 turret, one XM18 inboard each wing, one XM159 outboard each wing
Heavy hog	TAT-102A or XM28 turret, two XM159 each wing

6. The test program was conducted within the limitations established by the AH-1G Safety-of-Flight Release issued by USAAVSCOM (refs 11 and 12, app I).

7. The empty weight of the test aircraft in a clean configuration with test instrumentation installed was 5790 pounds with the center of gravity (cg) at fuselage station (FS) 205.97 for aircraft S/N 6615247 and 5920 pounds with the cg at FS 200.59 for aircraft S/N 6715695.

8. The AH-1G was evaluated as an armed tactical helicopter, capable of day or night operation from prepared or unprepared areas. The handling qualities of the AH-1G helicopter were evaluated to determine compliance with the requirements of paragraph 3.3.2 of the detail specification (ref 13, app I). The Handling Qualities Rating Scale (HQRS) used throughout this report is presented as appendix III. Specific conditions for each test are presented in the Results and Discussion section of this report.

METHOD OF TEST

9. Test methods and data reduction procedures used in these tests are established engineering flight test techniques and are described briefly in appendix IV. All flights were conducted and supported by USAASTA personnel. Tests were conducted in nonturbulent atmospheric conditions.

10. The flight test data were obtained from test instrumentation located on the pilot panel, copilot/gunner panel, photopanel and with oscillograph records. A detailed listing of the test instrumentation is included in appendix V.

CHRONOLOGY

11. The chronology of the AH-1G Phase D, Part 1 test program is as follows:

Phase B flight test completed on aircraft S/N 6615247	3 May	1968
Phase D flight test commenced on aircraft S/N 6615247	13 June	1968
Aircraft S/N 6715695 received	8 August	1968
Flight test commenced on aircraft S/N 6715695	4 September	1968
Flight test completed on aircraft S/N 6715695	10 October	1968
Flight test completed on aircraft S/N 6615247	29 July	1969
Advance copy submitted	15 April	1970

RESULTS AND DISCUSSION

GENERAL

12. This report presents the results of the engineering Phase D handling qualities flight tests of the AH-1G helicopter. The test data obtained during these tests were used for determining compliance with the detail specification (ref 13, app I), and Military Specification MIL-H-8501A, (ref 14) and to provide information for use in technical manuals and other publications. The AH-1G met all contractual handling qualities requirements of MIL-H-8501A except for paragraphs 3.2.4, 3.2.7, 3.5.4.1, 3.5.5 and 3.5.5.1. Tests were not conducted to verify compliance with paragraphs 3.5.4.3, 3.5.4.4 and 3.5.4.5 of MIL-H-8501A. By contractual agreement, the handling qualities requirements presented in paragraphs 3.3 and 3.6 of MIL-H-8501A were not applicable to the AH-1G (app VI). Aircraft compliance with the vibration characteristics requirement presented in paragraph 3.7 is discussed in Part 3 of this report. There are four deficiencies for which correction is mandatory for adequate mission accomplishment: excessive cyclic control breakout forces; inadequate directional control; inability to achieve maximum tail rotor blade angle (19 degrees) when full left directional control/yaw SCAS geometry; and excessive tail rotor horsepower required for hovering and translational flight. There are five shortcomings for which corrective action is desirable: neutral static longitudinal stability at airspeeds near the limit airspeed (V_L); increase in right directional control displacement with increasing airspeed in a dive; directional instability between 10 and 18 knots at relative wind azimuths between 210 and 230 degrees; deterioration of longitudinal dynamic stability of the AH-1G with the SCAS inoperative; and decrease in lateral-directional damping with the SCAS inoperative.

13. The proposed Military Specification MIL-H-8501B (ref 15, app I) was used in addition to MIL-H-8501A (ref 14) as a guideline for evaluating and analyzing dynamic stability test results. The contractor was not obligated to comply with any portion of MIL-H-8501B.

AIRCRAFT CONTROL SYSTEM RIGGING

14. Prior to testing, the aircraft flight and engine controls were rigged on both test aircraft in compliance with the appropriate

Army publications (ref 16, app I). Subsequent aircraft flight and engine control rigging changes were coordinated with the contractor technical representatives.

CONTROL SYSTEMS

15. The control system breakout forces and force gradients were determined during ground test with the rotor in a static position. Hydraulic and electrical power were provided by external units. The longitudinal, lateral and directional control systems were evaluated with the cyclic friction at the preset value as stated in the organizational maintenance manual (ref 16, app I). Control forces were measured at the center of the cyclic control grip and at the top of the directional control pedals in the aft cockpit (pilot station). Breakout forces (including friction) were determined by recording the force required to obtain initial movement of the control. The force gradients were obtained by continuously recording the force and control position as each control was displaced from trim. Control forces as a function of control position are presented in figures 1 through 3, appendix VII. The cyclic pitch control pattern is presented in figure 4.

16. Control forces measured in flight agreed with the static ground data except where severe maneuvers exceeded the capability of the hydraulic boost system. Whenever this boost saturation occurred, increased cyclic and collective control forces were noted.

17. The results of the cyclic control evaluation are summarized in table 3. The cyclic force gradients were positive, and there were no discontinuities noted. The magnitudes of both the longitudinal (2.5 pounds per inch) and lateral (1.5 pounds per inch) cyclic force gradients were suitable for the armed helicopter mission even though the longitudinal force gradient exceeded the maximum value stated in para 3.2.4, MIL-H-8501A. The cyclic breakout forces (4.5 pounds longitudinally and 3.5 pounds laterally) exceeded the maximum-allowed values stated in paragraph 3.2.4 of MIL-H-8501A and the approved deviation (ref 13, app I). The high breakout forces made precise aircraft control difficult during hovering flight. This condition was objectionable for lateral control inputs. The high breakout forces were not objectionable during forward flight up to maximum airspeed in level flight (V_H). However, at airspeeds in excess of V_H (diving flight), the longitudinal cyclic force characteristics coupled with the neutral to slightly positive static longitudinal stability gradient, discussed in paragraph 28, made it difficult to maintain airspeed and pitch attitude precisely (HQRS 5). However, the ability to attain adequate mission performance (ie,

target tracking and ordnance delivery) will vary with the competence level of each pilot and the magnitude of turbulence in the atmosphere. These two unknown factors (pilot competence level and atmospheric turbulence) could cause the assigned HQRS to vary from 5 to 7. The magnitudes of cyclic breakout forces and force gradients were unaffected by cyclic trim position. The excessive cyclic control breakout forces are unacceptable for satisfactory operational use and reduction is mandatory for adequate accomplishment of the attack helicopter mission.

Table 3. Cyclic Control Breakout Forces and Force Gradients.

Rotor static Force trim ON			
Test	Maximum Allowed by MIL-H-8501A (lb)	Approved Contract Deviation (lb)	Test Results (lb)
Longitudinal breakout force (including friction)	1.5	2.0 (±0.25)	4.5
Longitudinal force gradient	2.0 lb/in.	None	2.5 lb/in.
Longitudinal force at full throw.[1]	8.0	None	18.0
Lateral breakout force (including friction)	1.5	2.0 (±0.25)	3.5
Lateral force gradient	2.0 lb/in.	None	1.5 lb/in.
Limit lateral force at full throw.[1]	7.0	None	18.0

[1] Control displaced from a 50-percent control trim position in both directions.

18. There was no measurable change in the cyclic control force characteristics with the SCAS inoperative. With the force trim system OFF, the lateral and longitudinal force gradients were essentially zero; and breakout forces were only slightly less than those measured with the force trim ON. Turning off either hydraulic system had no effect on the cyclic breakout forces or force gradients.

19. The cyclic control position pattern, presented in figure A, shows that the available longitudinal control is a function of the lateral control position. Similarly, the lateral control is a function of the longitudinal control position. The position of the collective control has no effect on the cyclic control pattern.

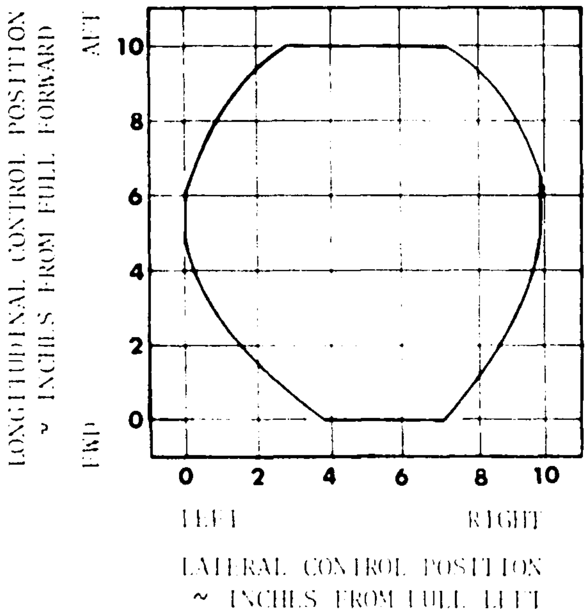


Figure A. Cyclic Pitch Control Pattern.

20. The directional control breakout forces with both boost systems operating and with the number ONE hydraulic boost system inoperative, complied with the requirements of MIL-H-8501A, paragraph 3.3.13, (table 1). The breakout force was 20 pounds with the number TWO hydraulic boost system inoperative. This value (20 pounds) complies with the system failure requirements of MIL-H-8501A, paragraph 3.5.8. At all conditions tested, there were discontinuities in the directional force gradient; thus, the requirement of MIL-H-8501A, paragraph 3.3.11, was not met. These directional force gradient discontinuities occurred at pedal positions not normally encountered in forward flight. The force gradient was zero with the force trim OFF. The directional control system breakout force and force gradient are satisfactory even with the minor discontinuities mentioned above.

Table 4. Directional Control Breakout Forces and Force Gradients.

Rotor static Force trim ON			
Test	Maximum Allowed by MIL-H-8501A (lb)	Contractor Deviation	Test Results (lb)
Directional breakout force (including friction)	7.0	None	5.0
Directional force gradient	None	None	9.0 lb/in.
Directional force at full throw[1]	15.0	None	20.0 to 25.0

[1] Control displaced from a 50-percent control trim position in both directions.

21. Collective control forces were not quantitatively evaluated during this test. However, qualitatively, the collective control forces were satisfactory for operational use.

STATIC TRIM STABILITY

22. Static trim stability characteristics about all three axes were evaluated in climbing, autorotational, diving and level flight. The tests were conducted at each of the configurations and flight conditions listed in appendix VIII. The effect of removing the landing gear cross-tube fairings was evaluated in the clean configuration during level flight and dives. The static trim stability of the aircraft was determined by recording the control positions at various stabilized zero-sideslip flight conditions. The summary of the longitudinal trim curves are presented in figures 5 through 7, appendix VII. The static trim curves which present the various control positions as a function of airspeed are shown in figures 8 through 27.

23. At all conditions tested, the remaining longitudinal control displacement was never less than 1.5 inches (15 percent) from the forward control limit and 2.6 inches (26 percent) from the aft control limit (fig. B). A significant change in longitudinal control

position with cg variation was noted. The longitudinal trim curve characteristics were positive (increasing forward control with increasing speed) from approximately 40 to 170 KCAS and are satisfactory for all conditions tested. The longitudinal control gradient was evaluated qualitatively at airspeeds between hover and 40 KCAS in forward flight. This evaluation at low airspeeds revealed a slight discontinuity in the longitudinal control gradient. This discontinuity was not objectionable to the pilot and did not violate the requirements of paragraph 3.2.10 (MIL-H-8501A). The change in longitudinal control position with airspeed is neutral at airspeeds during high-speed dives at airspeeds in excess of 170 KCAS. At speeds above V_H, this is essentially static longitudinal collective-fixed stability, discussed in paragraph 28. This neutral or negative longitudinal trim stability contributed to the increased pilot workload while maintaining selected airspeed and pitch attitude during dives. There was no significant change in the longitudinal control gradient with gross weight and configuration (wing stores) changes.

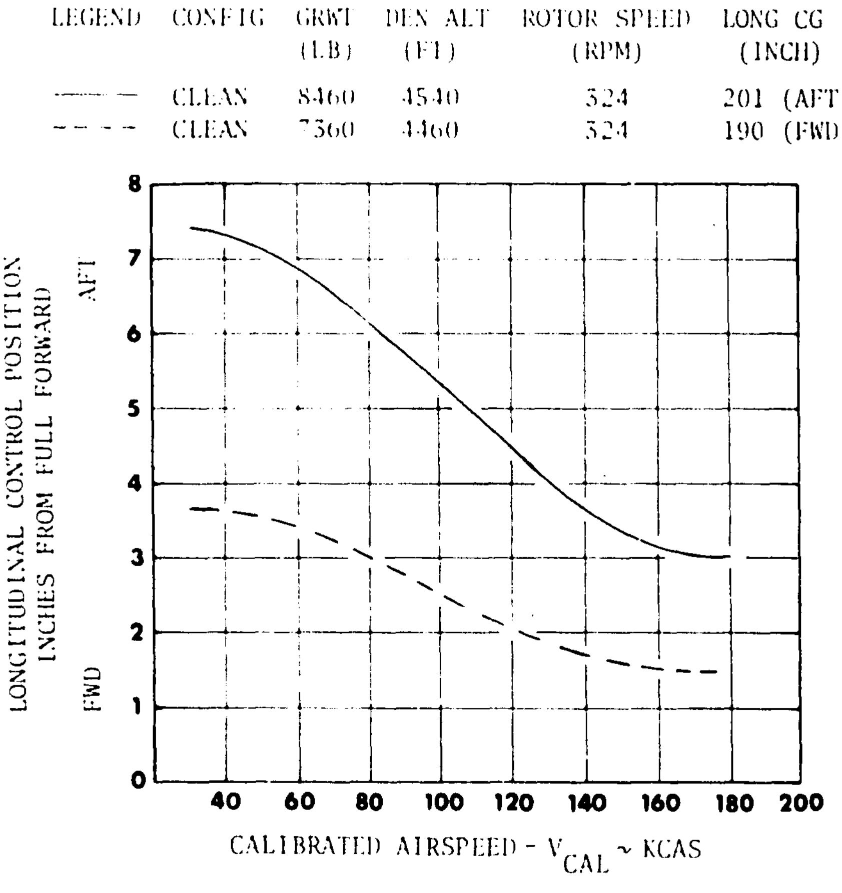


Figure 8. Static Trim Stability.

24. There was a significant change in pitch attitude (as much as 10 degrees) between the forward and the aft cg loadings throughout the airspeed range in all flight conditions. This variation in pitch attitude with cg shift was readily apparent to the pilot but was not objectionable. There were slight variations in aircraft pitch attitude at a given airspeed with configuration and gross weight changes. These variations were small and not apparent to the pilot

25. During zero sideslip stabilized flight at all conditions tested, the remaining lateral control displacement was never less than 4 inches (40.5 percent) from the left control limit and 2.9 inches (29.2 percent) from the right control limit. The lateral cyclic control migration was gradual and was not disconcerting to the pilot as the airspeed was varied between trim points. The lateral control position was farther right at a forward cg loading than at an aft cg loading. Gross weight, symmetrical configuration changes and altitude had no significant effect on lateral control requirements.

26. During stabilized forward flight at airspeeds in excess of 36 KCAS for all conditions tested, the remaining directional control displacement was never less than 1.75 inches (29.3 percent) from full right and 1.3 inches (21.8 percent) from full left. The maximum left directional control displacement occurred at low forward airspeeds (35 KCAS or less). The increasing right directional control was required as airspeed increased from 35KCAS to the airspeed for minimum power required. Increasing left directional control was then required with increasing airspeed up to V_H. As airspeed increased from V_H to V_L, the migration of the directional control displacement was to the right. This increasing right directional control with airspeed contributed to the excessive pilot attention required to maintain zero sideslip during dives. Since the amount of sideslip present affects firing accuracy of the weapons, this characteristic is considered to be a shortcoming which detracts from mission effectiveness. For a given airspeed, an increase in left directional control was required for the following: changing longitudinal cg from forward to aft, increasing gross weight, increasing altitude and symmetrically increasing equivalent flat plate area by adding wing stores. Directional control trim position changes attributed to these variations were not noticeable to the pilot. Since an adequate margin was available in all forward flight conditions, this characteristic is acceptable. Qualitatively there was no significant change in the static directional trim stability with the landing gear cross-tube fairings removed.

STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY

27. The static longitudinal collective-fixed stability characteristics were examined at several different configurations, altitudes and cg loadings. Only the general characteristics noted and significant changes with variations in the above parameters are discussed in this section. These tests were conducted by first trimming the aircraft at the desired airspeed. The aircraft was then stabilized at several airspeeds greater and less than the trim airspeed while maintaining the trim collective control position. The force trim was also maintained at the trim setting. The tests were conducted at each of the configurations and trim conditions listed in appendix VIII. The summary of the longitudinal trim curves are presented in figures 28 through 31, appendix VII. Data were recorded at each stabilized airspeed and are presented in figures 32 through 65.

28. The longitudinal control position gradient was positive (forward cyclic required to maintain an airspeed greater than trim) for all conditions tested at airspeeds from 40 to 170 KCAS. However, the gradient became less positive at higher trim airspeeds and was essentially neutral at airspeeds in excess of 170 KCAS. The neutral static longitudinal collective-fixed stability at airspeeds in excess of 170 KCAS does not meet the requirements of MIL-H-8501A, paragraph 3.2.10. At airspeeds less than 40 KCAS, the static longitudinal collective-fixed stability was similar to the static trim stability discussed in paragraph 25. These data are presented graphically in figure C. The longitudinal control position gradient was more positive at a forward cg loading than at an aft cg loading for a given flight condition. Altitude, gross weight and configuration variations (wing stores) had no significant effect on the longitudinal control position gradient. The high longitudinal friction band masked the longitudinal force gradient, making the measured longitudinal force stability characteristic impractical to evaluate. As a result, the control force data in figures 32 through 65, appendix VII, have had the breakout forces analytically removed. The nearly neutral static longitudinal stability at airspeeds in excess of V_H contributed to the increased pilot effort required to stabilize the aircraft at a desired airspeed and detracted significantly from mission suitability (HQRS 4). This problem was further aggravated by the high longitudinal breakout forces and friction band. The longitudinal control position and force gradients at airspeeds in excess of V_H are minimally acceptable, and an increase of these gradients is desirable for improved service use.

CONFIG	GRWT (LB)	DEN ALT (FT)	ROTOR SPEED (RPM)	LONG CG (INCH)
OUTB'D ALT	8190	4910	324	201(AFT)

NOTE: POSITIVE LONGITUDINAL STABILITY SIGNIFIES AN INCREASING FORWARD CYCLIC REQUIREMENT WITH INCREASING AIRSPEED

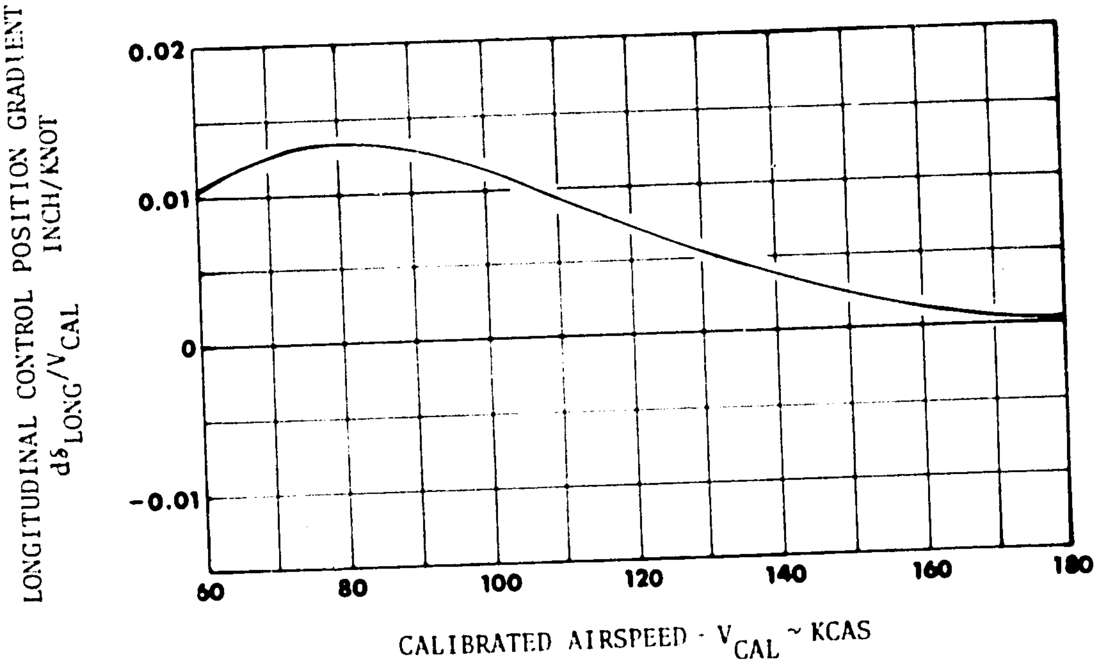


Figure C. Static Longitudinal Collective Fixed Stability.

29. The static longitudinal data presented in the report on the BHC Model 209 helicopter (ref 17, app 1) showed a neutral longitudinal control gradient in a dive. In Part 1 of the AH-1G Phase B report (ref 2), a strong recommendation was made for an increase in the longitudinal stability gradient at high speeds. It was also stated in reference 17, "nominal pilot attention was required to maintain a constant airspeed during high-speed dives."

30. The change in pitch attitude (nose-down attitude change with increased airspeed from trim is defined as positive) with respect to airspeed was neutral in low-speed level flight (60 KCAS trim speed) and became positive with increasing airspeed at a forward cg. These characteristics were similar to those observed during static trim stability testing. The pitch attitude gradient was more positive at an aft cg loading than at a forward cg loading at V_H and V_L. There was no significant change due to the variations in altitude, gross weight or configuration.

31. The changes in lateral cyclic control requirements during these tests were small, and excessive pilot attention was not rerequired to maintain wings-level flight. At airspeeds greater than trim, more right directional control was required. At airspeeds less than trim, more left directional control was required. The directional control trim position changes with varying airspeed required some pilot compensation in order to maintain zero sideslip. This characteristic was most apparent during simulated weapons delivery maneuvers and target tracking tasks. During target tracking, moderate pilot compensation was required in order to achieve desired performance (HQRS 4). This shortcoming detracts from the armed helicopter mission suitability.

32. The longitudinal collective-fixed stability curves with landing gear cross-tube fairings removed are presented in figures 64 and 65 and the summary is presented in figure 31, appendix VII. The removal of these fairings did not significantly affect the longitudinal or lateral control migration characteristics. During flight in this configuration at trim airspeeds approaching V_L, the directional control gradient $(d\delta_{DIR}/d/V_{CAL})$ did not vary with airspeed as with the fairings installed.

STATIC LATERAL-DIRECTIONAL STABILITY

33. Tests were conducted to determine the static directional stability and dihedral effect throughout the airspeed-sideslip envelope. The static directional stability and dihedral effect

were measured by recording data during stabilized flight at various sideslip angles while maintaining a constant heading at selected trim airspeeds and flight conditions. Tests were conducted at each of the configurations and trim conditions listed in appendix VIII. Summaries of the lateral-directional stability data are presented in figures 66 through 69, appendix VII. The test results are presented in figures 70 through 95, appendix VII.

34. Deviation number 1 (ref 13, app I), states that paragraph 3.3 of MIL-H-8501A shall not be applicable as a design guide for the stability and control characteristics. This deviation was interpreted by USAASTA to include virtually all lateral-directional handling qualities. The deviation should have provided specific guidelines to be used in determining acceptable lateral-directional handling qualities. Since inadequate guidance was provided, MIL-H-8501A was used as the criterion against which all lateral-directional stability characteristics were evaluated.

35. The static directional stability and dihedral effects were positive (increasing right directional control, left bank angle and left lateral control with increasing left sideslip) for all conditions tested except autorotation. The variation in directional and lateral control requirements was essentially linear as sideslip was varied about trim. In autorotation at an airspeed of 60 KCAS, the static directional stability was slightly positive while the dihedral effect was neutral. This characteristic does not comply with the requirements of para 3.3.9, MIL-H-8501A. This neutral dihedral effect in autorotation was apparent to the pilot, since directional control inputs did not establish roll rates (HQRS 3). This characteristic does not detract from mission suitability since acceptable performance could be achieved with minimal pilot compensation.

36. As engine power was increased the static lateral-directional stability gradients increased and were greatest during climbing flight at 60 KCAS. The static directional stability and effective dihedral increased as airspeed increased and reached maximum at V_L. The static directional stability gradient ($d\delta_{pedal}/d\beta$) became more positive as the cg location was changed from aft to forward. An increase in density altitude increased the static directional stability and effective dihedral slightly. There was no significant change in the static lateral-directional handling qualities when the aircraft configuration (wing stores) and gross weight were varied.

37. The static lateral-directional handling qualities are satisfactory for all conditions tested. One undesirable feature which was noted is the excessively high dihedral effect at V_L. The resultant roll rate is high for a small directional control input. This characteristic could cause the pilot to easily over control the aircraft when using directional control. In addition, this also contributes to the excessively high roll rates encountered during engine power loss at high airspeed (para 99).

38. The aerodynamic side-force characteristics as indicated by bank angle during steady sideslips were positive at all conditions tested and increased significantly with increasing airspeed. The side-force characteristics were essentially unchanged at all conditions tested except at high gross weight where a reduction in bank angle for a given amount of sideslip at the high airspeeds (140 to 170 knots) was noted.

39. The static lateral-directional stability characteristics for the landing gear cross-tube fairings removed configuration are presented in figures 94 and 95, appendix VII. A summary plot comparing data with the fairings on and off is presented in figure 69, appendix VII. The directional stability was more positive with the fairings removed. There was no significant difference in dihedral effect between the two configurations.

TRANSLATIONAL FLIGHT HANDLING QUALITIES EVALUATION

40. Translational flight is defined as flight in any direction with relative wind azimuths at any value from zero to 360 degrees (measured clockwise from nose of aircraft) at airspeeds between zero and 35 knots either in ground effect (IGE) or out of ground effect (OGE). The objectives of these tests were to evaluate the handling qualities and to determine control margins in translational flight. Deviation number 1 (app VI) is interpreted as exempting the AH-1G from complying with the lateral-directional handling qualities criteria as stated in MIL-H-8501A. Since no other guidance was provided, test results reported herein, where appropriate, are compared to the above specification to permit a basis for evaluation. A secondary purpose of this test was to determine the amount of tail rotor horsepower required to stabilize the aircraft at various combinations of wind azimuths and wind speeds. A calibrated ground pace vehicle was used as an airspeed reference during these tests. Conditions tested are listed in table 5. Results of the translational flight handling qualities are graphically presented in figures 96 and 125, appendix VII. The dashed portion of the faired curves on these plots indicates extrapolated data.

Table 5. Translational Flight Handling Qualities Evaluation.

Test Condition[1]	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
1	8,240	-40	199.6	324
2	8,060	140	200.4	312
3	8,050	5,270	200.7	324
4	7,210	11,120	195.4	324

[1] All tests conducted in the heavy scout configuration with rocket pod fairings removed.

41. Control of skid height, roll attitude and pitch attitude during translational flight was good (HQRS 2) with one exception. This was the abrupt longitudinal trim change for rearward flight in the 10- to 15-knot range for small speed changes. The longitudinal control changes were approximately 1 inch in this speed range (HQRS 5).

42. The directional control capability was significantly less than that required to meet paragraphs 3.3.5 and 3.3.6, MIL-H-8501A. To meet these requirements significantly more tail rotor thrust (directional control), than is presently available, would be required. A directional control margin of 10 percent (0.71 inches for the test aircraft) enabled the pilot to control and maneuver the aircraft in translational flight (HQRS 5). Directional control margins less than 10 percent were inadequate for maneuvering due to the magnitude of average pedal inputs and the control travel limitation problem discussed in paragraph 47 with the yaw SCAS operating.

43. The critical area of insufficient directional control for test condition number 1, table 5, was with wind from 45 to 70 degrees at a velocity of 17 knots. The area (bounded by wind azimuth and velocity) of inadequate directional control increased with combinations of increasing altitude, increasing gross weight and/or decreasing rotor speed. At the most critical condition, number 4 of table 5, the directional control margin was less than 10 percent at all wind azimuths and at velocities from zero to 3 knots. At velocities greater than 3 knots, the area of inadequate directional control was between 30 and 300 degrees. Flight operations

at this gross weight/density altitude condition can not be conducted safely because of inadequate directional control.

44. Directional control of the test aircraft was lost (uncontrolled right yaw) several times during the test at condition number 4, table 5. Recovery of the aircraft was accomplished by reducing power and allowing the skid tubes to lightly contact the ground. The friction between the ground and the skid tubes gradually checked the turning rate of the helicopter. After stopping the turning rate, the collective was lowered and the aircraft landed. The full left directional control pedal was maintained until the yaw rate was arrested.

45. The effect of this major deficiency is well illustrated in the weekly summaries published by the US Army Board for Aviation Accident Research (USABAAR). Between 27 January and 13 July 1969, these summaries noted nine accidents due to loss of left directional control causing major damage (including one accident where flying debris caused major damage to a second aircraft), one accident causing minor damage, one accident in which the damage was not reported and eight incidents.

46. Figure D shows the recommended IGE translational flight envelope. The envelope is based on a directional control margin of 10 percent for any combination of wind velocity and wind azimuth. It is mandatory that the directional control system for the AH-1G be improved to provide better control characteristics.

NOTES: 1. ROTOR SPEED 324 RPM
2. ENVELOPE BASED ON A 10 PERCENT DIRECTIONAL CONTROL MARGIN AT ALL WIND AZIMUTHS

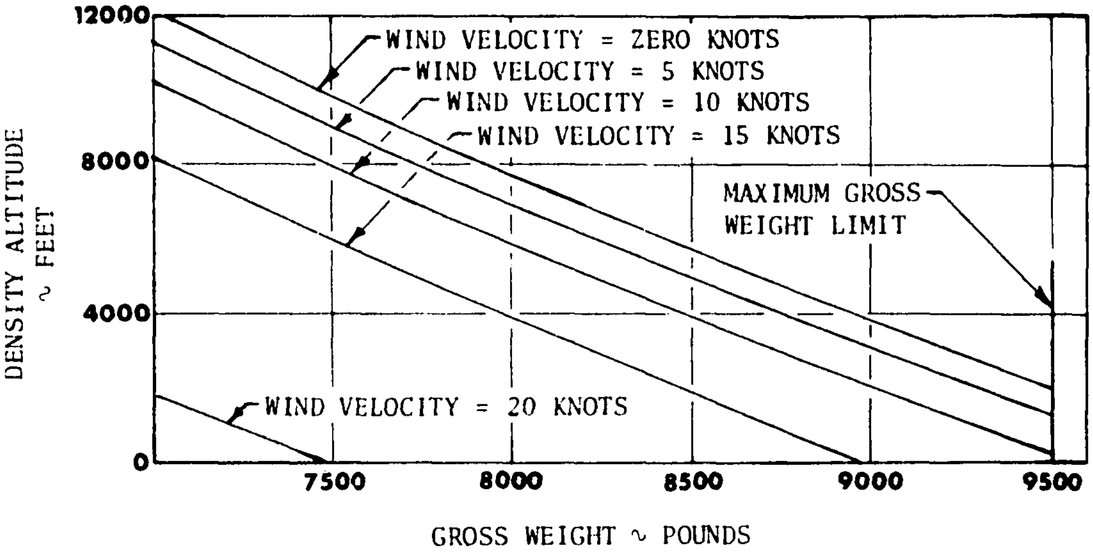


Figure D. Recommended In-Ground-Effect Translational Flight Envelope.

47. The 10-percent directional control position margin is equivalent to a tail rotor blade angle change of 3.0 degrees. Standard rigging of the tail rotor is 19.0 degrees for full left control and -11.0 degrees for full right control with the yaw SCAS actuator centered. Due to a travel limitation in the control linkage between the pedals and the SCAS actuator, the amount of tail rotor blade angle available with full left pedal applied can vary from 19.0 to 16.0 degrees depending on the position of the yaw SCAS actuator. With the yaw SCAS ON, the left pedal margin can be reduced to zero (a tail rotor blade angle of 16.0 degrees) with the yaw SCAS actuator in the most adverse position. This condition is further complicated by the fact that the pilot has no way of knowing how much directional control is available with the yaw SCAS operating. Since the IGE performance is limited by the directional control available, it is mandatory that the directional control be modified so that the maximum tail rotor blade angle of 19 degrees can be achieved regardless of the position of the SCAS actuator.

48. The AH-1G was directionally unstable in wind velocities between 10 and 18 knots at relative wind azimuths between 210 and 330 degrees (clockwise from nose of aircraft) for test conditions 1, 2 and 3, table 5. Rapid and sometimes large directional control excursions were necessary to maintain a heading at these unstable flight conditions (HQRS 6). Also, large changes in longitudinal control were required as the relative wind velocity varied in this area. Pilot recognition and reaction times following small excursions in yaw determined the frequency and magnitude of the directional control inputs. These tests were conducted with the yaw SCAS OFF to provide the pilot with accurate control available information and to insure that a full 19 degrees of tail rotor blade angle was available. Tests were also conducted with the yaw SCAS channel ON to qualitatively evaluate the damping effect. The directional stability was only slightly improved with the directional SCAS operating. This directional instability in translational flight is a shortcoming and detracts from the mission suitability of the aircraft. This instability was encountered under similar conditions and reported in references 3 and 8. Figure E illustrates the area of this instability.

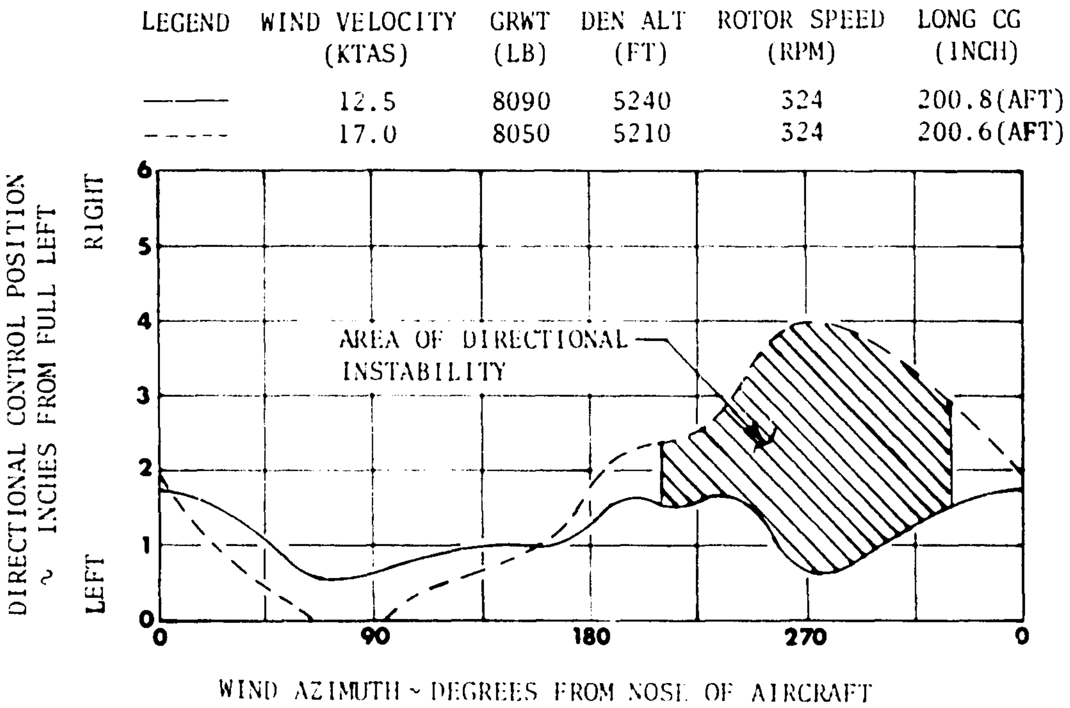


Figure E. Directional Control Position
In-Ground-Effect at Various Wind Azimuths.

49. The AH-1G is further limited by the maximum power transfer capability of the tail rotor drive system. Test results indicate that the tail rotor horsepower required to stabilize the aircraft increased nonlinearly as the directional control approached the left limit. Although a tail rotor drive system torque limit could not be determined, the structural design criteria report (ref 18, app I) for the AH-1G stated that the antitorque drive system design limit was 386 foot-pounds of torque (122 shp at 1654 rpm). Peak tail rotor horsepower encountered during translational flight was 190 horsepower at SL. For a given tail rotor blade pitch angle,

the peak tail rotor horsepower generally decreased as altitude increased. The rapid and sometimes large directional control excursions discussed in paragraph 48 caused large tail rotor torque oscillations. The magnitude of these oscillations were 20 to 160 horsepower for some test conditions. The magnitude of tail rotor horsepower during stabilized hover is presented in reference 19, appendix I. During this test program, *eight* 42-degree gear boxes and *four* 90-degree gear boxes were replaced. Replacement of the 42-degree gear box was required when tail rotor horsepower in excess of 180 horsepower was encountered because of the unacceptable gear wear patterns. The 90-degree gear box required replacement when operated above 180 horsepower for limited periods. The excessive tail rotor horsepower required and resultant antitorque drive system damage are deficiencies and correction is mandatory.

50. Sideward and rearward flights were also conducted with landing gear cross-tube fairings removed. The fairings-off data are presented in figure 125, appendix VII. There was no significant difference in the handling qualities during translational flight as a result of removing the landing gear cross-tube fairings.

DYNAMIC STABILITY

51. The objective of the dynamic stability tests was to evaluate the aircraft short period response characteristics following a gust disturbance. Gust disturbances were simulated by making pulse-type control inputs of 1 inch for 0.5 to 1 second. Following the inputs, the control was returned to trim, and all controls were held fixed until either the aircraft motions damped or recovery action was required. Dynamic stability was evaluated following inputs in both directions for longitudinal, lateral and directional controls. Tests were conducted both with the SCAS ON and OFF. The tests were conducted at each configuration and trim condition listed in appendix VIII.

Longitudinal Dynamic Stability

52. The longitudinal dynamic stability characteristics are summarized in figure 126, appendix VII. The aircraft motions following longitudinal control inputs were analyzed by determining the damping ratios and undamped natural frequencies. Representative time histories are presented for selected trim airspeeds, SCAS ON and for the most critical conditions SCAS OFF in figures 127 through 133.

53. The AH-1G demonstrated strong positive damping of the longitudinal short-period mode with SCAS ON. After the initial response to control input, the pitch attitude, angle of attack and load factor all returned to trim with no overshoot. Correspondingly, pitch rate made one excursion in each direction and then returned to zero. No significant coupling was present in the yaw or the roll axis during or following a longitudinal pulse input. Damping characteristics were similar for both forward and aft pulses. The longitudinal dynamic stability characteristics of the AH-1G with the SCAS ON complied with paragraph 3.2.11 of MIL-H-8501A. These characteristics are highly desirable and enable target-tracking maneuvers for weapon firing to be accomplished with little pilot effort or compensation. The longitudinal stability characteristics SCAS ON significantly enhance the mission suitability (HQRS 1).

54. Longitudinal pulses with SCAS OFF resulted in rapid divergence of pitch rate and pitch attitude for most conditions tested. Recovery action was required in most cases before one complete oscillation. The time history of a longitudinal pulse and resulting oscillating aircraft motions with SCAS OFF are presented in figure 133, appendix VII. In the heavy hog configuration at a gross weight of 7740 pounds and at an aft cg condition, the pitch attitude achieved the double amplitude in less than 10 seconds. There was significant lateral coupling following longitudinal inputs with SCAS OFF. The aircraft rolled to the right during forward inputs and to the left with aft inputs. The lack of positive longitudinal damping and the lateral coupling increased the pilot work load for all forward flight tasks. The aircraft can be safely flown in this condition; and routine maneuvers, such as cruise, approach and landing, can still be preformed with adequate precision (HQRS 4). The suitability for use as a weapons platform and for flight under restricted visibility conditions is significantly reduced (HQRS 6).

Dynamic Lateral-Directional Stability

55. The lateral and directional dynamic stability data are summarized in figures 134 and 142, appendix VII. The aircraft motions following roll and/or yaw inputs were analyzed for damping ratios and undamped natural frequency. Figures 151 and 152 show the lateral-directional damping ratio as a function of both damped natural frequency and calibrated airspeed. Figures 135 through 141 and 143 through 149 show representative time histories of lateral-directional dynamic response characteristics.

56. Damping of the lateral-directional oscillations, commonly referred to as Dutch roll, with SCAS ON was strongly positive. In most cases, the roll and attitude responded to the input and then returned to trim with no overshoot. The heavy hog and clean configurations with SCAS ON demonstrated similar characteristics except during climb where the clean configuration was less damped than the heavy hog configuration. Altitude had no significant effect on damping of the lateral-directional oscillations nor did gross weight or mass distribution, such as the addition of rockets. A summary of the lateral-directional dynamic stability characteristics with SCAS ON is presented in figure F. With SCAS ON, the dynamic lateral-directional stability characteristics comply with the applicable requirements of MIL-H-8501A and are suitable for the intended mission. While the damping was strongly positive it did not limit or degrade the maneuvering capability.

NOTES: 1. SCAS ON
2. ALL CONDITIONS ON AIRCRAFT S/N 6715695 FALL WITHIN SOLID LINE
3. □ DENOTES CONDITIONS TESTED ON AIRCRAFT S/N 6615247 WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

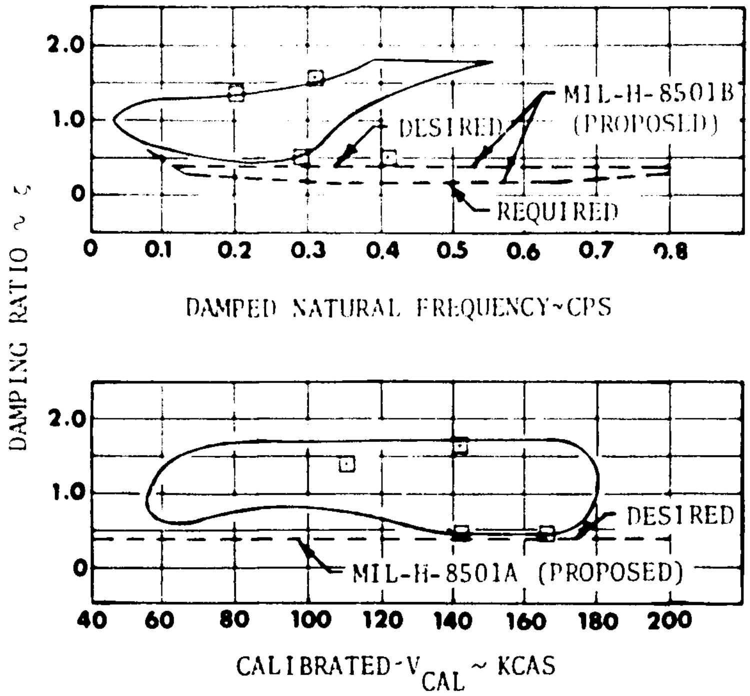


Figure F. Summary of Lateral-Directional Dynamic Stability.

57. In most conditions tested, the lateral-directional dynamic stability with the SCAS OFF was well below that value contained in the proposed specification, MIL-H-8501B (ref 13, app I), for an armed tactical helicopter. The yaw/roll oscillations or dutch roll had a period of approximately 4 seconds. The worst condition was the climb, clean configuration, at a 7210-pound grwt and an aft cg loading. A time history of this condition is presented in figure 141, appendix VII. The aircraft oscillations were divergent in roll and yaw for this test condition. At most conditions tested, damping ratios were less than 0.2. A summary of lateral-directional dynamic stability with SCAS OFF is presented in figure G. This low damping of the lateral-directional motions with SCAS OFF resulted in objectionable, uncomfortable aircraft motions, particularly at higher airspeeds. In addition, this characteristic, aggravated by the excessively high lateral breakout forces discussed in paragraph 17, resulted in a pilot induced oscillation in the roll axis at high speeds. This characteristic seriously detracts from mission suitability and makes satisfactory, effective completion of most missions questionable during SCAS OFF operations. The aircraft can be safely returned to base and landed. However, precise flight tasks are very difficult to perform (HQRS 6).

NOTES:
1. SCAS OFF
2. ALL CONDITIONS TESTED ON AIRCRAFT S/N 6715695 FALL WITHIN SOLID LINE
3. ☐ DENOTES CONDITIONS TESTED ON AIRCRAFT S/N 6615247 WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

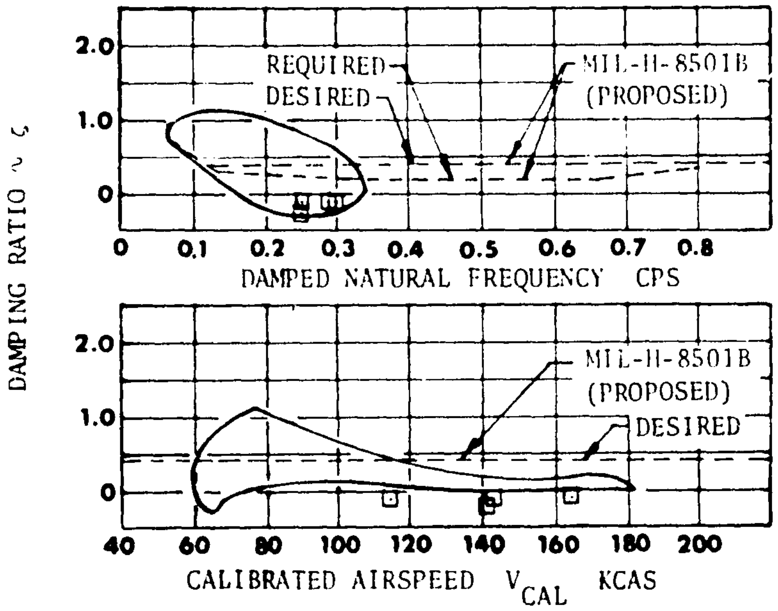


Figure G. Summary of Lateral-Directional Dynamic Stability.

58. The results of these tests agree closely with those described in reference 17, appendix I, with SCAS ON. However, with SCAS OFF, test results indicated a degradation in lateral-directional dynamic stability characteristics from the reference.

59. Lateral-directional dynamic stability characteristics were also evaluated for the clean configuration with the landing gear cross-tube fairings removed, with SCAS ON and OFF. A comparison of the clean configuration with fairings on and off is presented in figure 150, appendix VII. Time histories of lateral and directional pulses SCAS OFF are presented in figures 151 and 152.

60. With SCAS ON, the removal of the fairings had no significant effect on lateral-directional damping at airspeeds less than 160 KCAS (HQRS 2). At airspeeds in excess of 160 KCAS, the lateral-directional coupling increased and damping decreased (para 83). The increased lateral-directional coupling and decreased damping caused the pilot workload to increase beyond a tolerable limit when performing target tracking maneuvers (HQRS 7). An airspeed limit of 160 KCAS is recommended in order to maintain an effective target tracking capability when the landing gear cross-tube fairings are not installed.

61. With SCAS OFF, the removal of the landing gear cross-tube fairings significantly degraded the dynamic lateral-directional characteristics. Dutch roll oscillations were induced by either lateral or directional control inputs. The oscillations for most conditions were divergent and had a period of about 4 seconds and a negative damping ratio of 0.2. The rates in both axes increased rapidly to unacceptable levels (50 deg/sec in roll and 25 deg/sec in yaw). A limit of 115 KCAS is recommended when landing gear cross-tube fairings are not installed, and the SCAS is inoperative. Flight during periods of restricted visibility, such as at night or during instrument conditions with the fairings removed and with SCAS OFF, is not recommended (HQRS 8).

CONTROLLABILITY IN FORWARD FLIGHT

62. Controllability was evaluated in level flight, dive, autorotation, climb and hover throughout the flight envelope. The hover tests were performed at several different gross weights, rotor speeds and density altitudes. Controllability tests were also conducted in forward flight with the landing gear cross-tube fairings removed.

63. The objective of these tests was to evaluate the ability to control the aircraft by quantitatively evaluating the aircraft

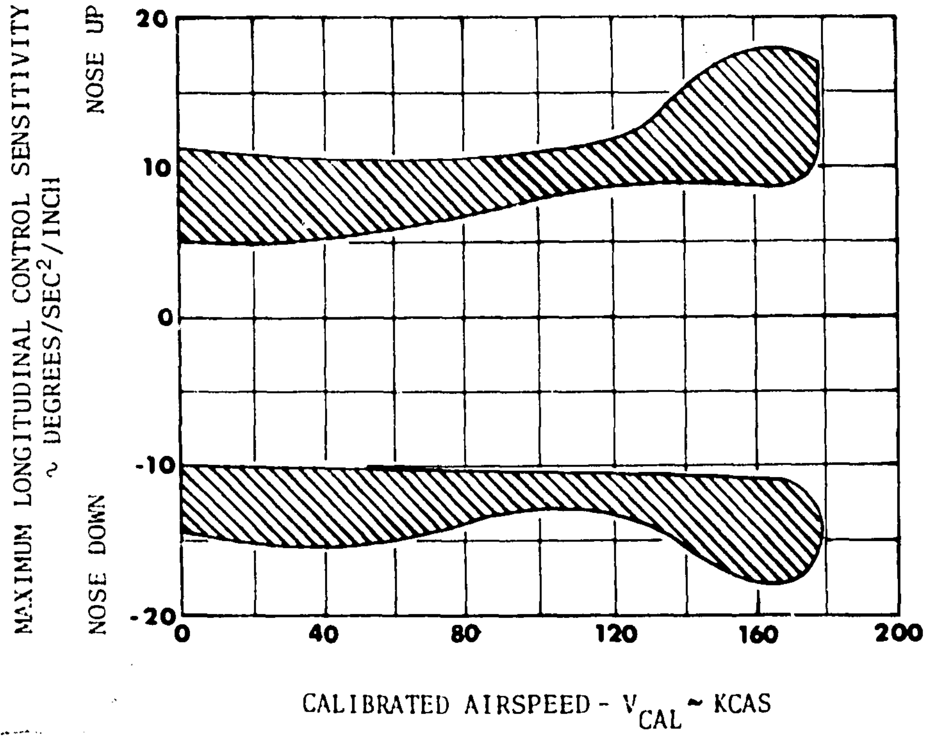
reaction to a given control input. This was accomplished by measuring the aircraft attitude displacements, rates and angular accelerations that resulted per inch of control input. Step-type control inputs were utilized which consisted of rapidly displacing the control to the desired position (maximum input time of 0.2 seconds) and then holding this position until the maximum rate was reached or recovery action was necessary. The magnitude of the step inputs was varied (usually a minimum of three inputs in each direction). An adjustable, rigid control fixture was used to assist in achieving the desired inputs. The forward flight controllability test data are presented in figures 169 through 243, appendix VII. The forward flight controllability test results are summarized by presenting data for a 1-inch control input at the various flight conditions and airspeeds tested. These summaries are presented in figures 156 through 168. The dashed portion of the faired curves on these plots (figs. 156 through 168) indicates extrapolated data. Typical time histories of step inputs are presented in figures 280 through 286.

64. Controllability characteristics are discussed in terms of control sensitivity, control response and attitude displacement. Control sensitivity is defined as the maximum angular acceleration which results from a 1-inch control step input. Control response is defined as the angular rate which results from a 1-inch control step input. Attitude displacement is discussed in terms of aircraft displacement at 1 second after a control input.

Longitudinal

65. The longitudinal controllability test conditions are presented in table VII, appendix VIII. A portion of these tests were conducted with the SCAS OFF.

66. In the heavy hog configuration the longitudinal sensitivity was essentially constant at 10 deg/sec^2/inch at all forward flight speeds up to V_L. In the clean configuration, however, longitudinal sensitivity was a constant 10 deg/sec^2/in. at airspeeds up to 0.8 V_H and then increased with increasing airspeed to a value of 17 deg/sec^2/in. at V_L. The time required to achieve the peak angular acceleration following a 1-inch step input did not exceed 0.5 second. In general, the forward step inputs resulted in slightly greater angular accelerations than did aft step inputs. Longitudinal control sensitivity with SCAS OFF was the same as with SCAS ON and was not a function of altitude. Only minor variations in longitudinal control sensitivity with changes in gross weight and cg were noted. The average value of sensitivity during climb and autorotation was approximately 9 deg/sec^2/inch. Figure 11 summarizes longitudinal control sensitivity for all conditions tested.



NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

Figure H. Longitudinal Control Sensitivity.

67. The longitudinal controllability characteristics were also evaluated in terms of maximum response as defined in paragraph 64. The longitudinal response of the aircraft was slightly greater for a forward input than for an aft input. With SCAS ON, the longitudinal response averaged 7 deg/sec/in. and was not a function of configuration, gross weight, airspeed or altitude. The time required to achieve maximum rate (SCAS ON) was 1 second or less for all conditions tested. Maximum response was slightly higher at an aft cg than at a forward cg at airspeeds approaching V_L. In figure J, the maximum pitch rate data for all conditions tested are summarized.

NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

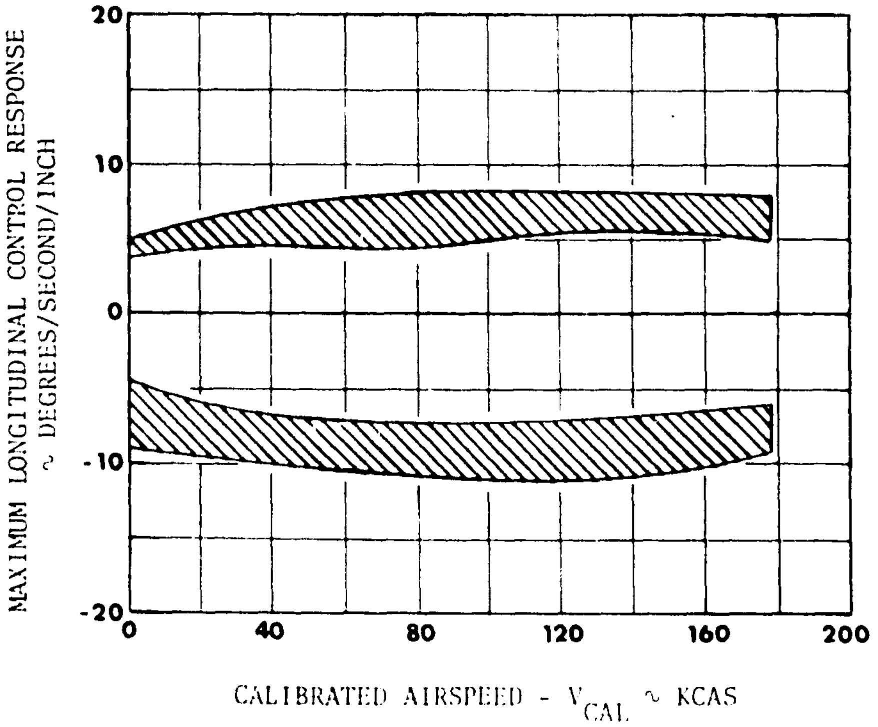


Figure J. Longitudinal Control Response.

68. Pitch rate at 1 second following a 1-inch longitudinal step input is presented for comparison of SCAS ON and SCAS OFF tests. This presentation is necessary because with SCAS OFF the maximum response was not achieved before recovery was necessary. The longitudinal response characteristics with SCAS OFF were similar to those for the SCAS ON condition except for the following differences:

a. At airspeeds greater than 80 KCAS, the pitch rate at 1 second after the control input was greater with SCAS OFF. (A constant 6 deg/sec/in. with SCAS ON as compared to a maximum of 13 deg/sec/in. at V_L with SCAS OFF).

b. At V_L and at an aft cg loading, the response was significantly greater with SCAS OFF.

c. In all cases tested with SCAS OFF, a maximum response was not achieved since rate continued to increase until recovery was necessary.

69. The response resulting from an aft step input is in compliance with paragraph 3.2.11.1, MIL-H-8501A, as shown in figure 155, appendix VII, both the cg normal acceleration and the angular pitch velocity became concave downward in less than 2 seconds. The cg normal acceleration became concave downward at an average time of 1.56 seconds and the pitch rate at an average time of 0.3 second.

70. Pitch attitude displacement characteristics were determined by measuring pitch attitude change from trim at 1 second following a 1-inch step input. This was done both with SCAS ON and OFF. Figure K presents the summary of the SCAS ON data. Generally with SCAS ON, the displacement was a constant 5 degrees/inch and increased slightly between V_H and V_L. There was no change in displacement at 1 second with variations of configuration, gross weight and altitude. With SCAS OFF, the displacement increased with increasing airspeed. The only difference noted with a change in configuration with SCAS OFF was a slightly greater displacement in the clean configuration than in the heavy hog configuration.

NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

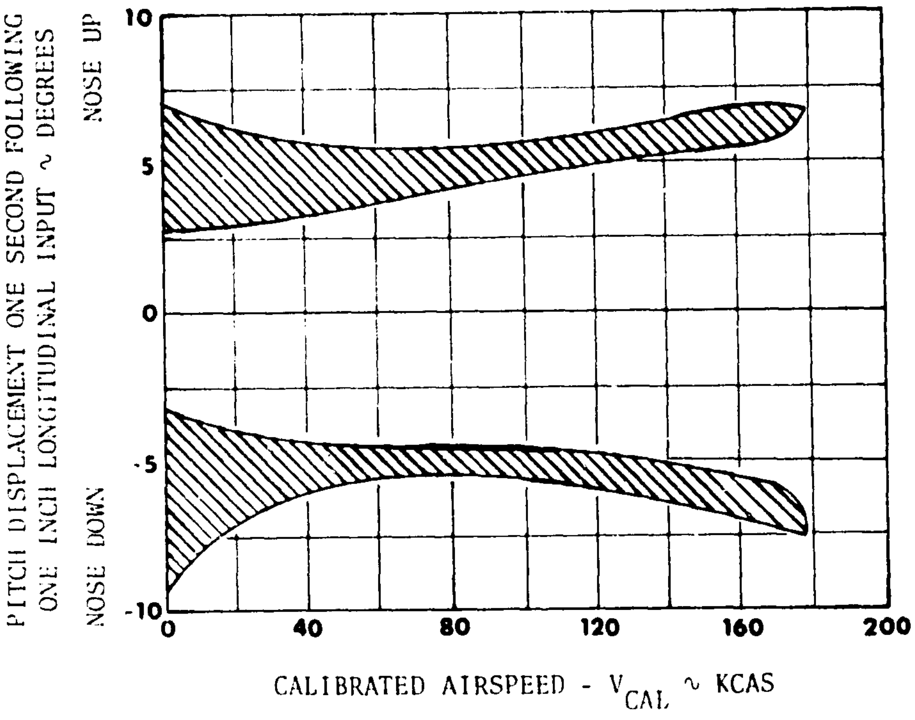


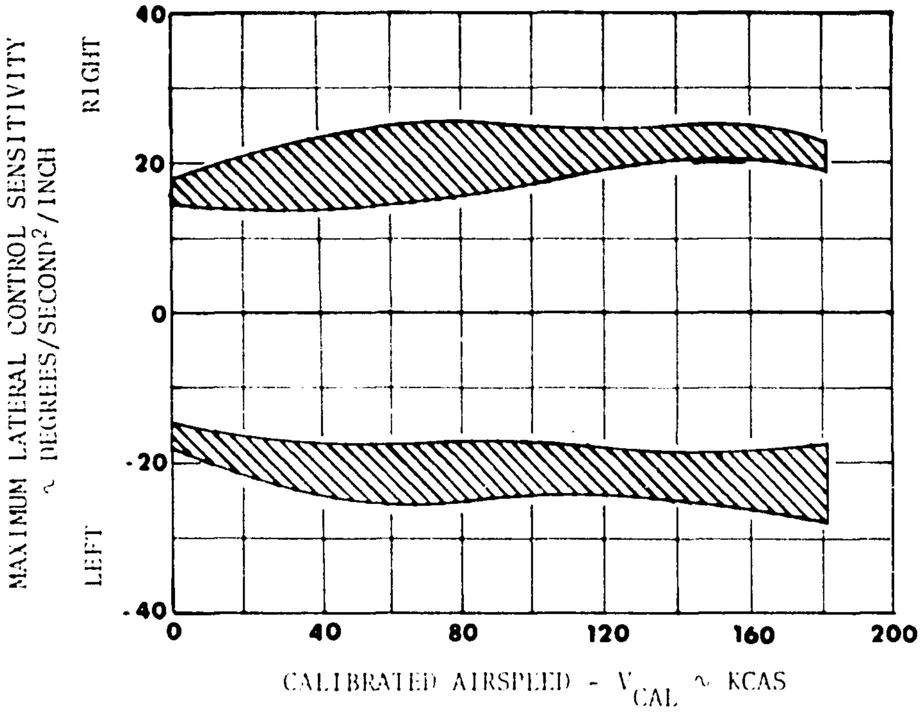
Figure K. Pitch Attitude Displacement.

71. Longitudinal controllability characteristics are considered to be satisfactory. Qualitatively, no objectionable characteristics were observed, and the aircraft reactions to longitudinal control inputs were highly satisfactory. During simulated target tracking maneuvers with SCAS ON, it was determined that a desired pitch attitude could be precisely maintained, and attitude changes could be easily and accurately accomplished (HQRS 2). The high level of pilot effort required to maintain an airspeed during dives was caused by the control force characteristics and the shallow static longitudinal stability gradients. The insensitivity of the longitudinal controllability characteristics to variations in weight, cg, configuration and altitude is highly desirable, and contributes significantly to mission suitability. The characteristics with the longitudinal SCAS OFF are good with little increase in pilot effort required for satisfactory mission accomplishment. A mildly annoying characteristics with SCAS OFF was a slight amount of control cross-coupling. A forward control input resulted in a right roll, and an aft control input resulted in a left roll.

Lateral

72. The lateral controllability characteristics were determined to be satisfactory. The lateral controllability test conditions are presented in table VIII, appendix VIII. A portion of these tests were conducted with the SCAS OFF. In all cases tested, the aircraft reacted in the proper direction with a lateral control step input, and no apparent hesitation nor discontinuities in resultant rates were noted. The sensitivity and response was greater with a left lateral control input than with a right control input. The deviation to MIL-H-8501A discussed in paragraph 34 also applies to this section.

73. The lateral control sensitivity at airspeeds less than 100 KCAS was approximately 16 deg/sec^2/in. and was independent of altitude, gross weight or configuration. The time required to reach maximum angular acceleration was in all cases less than 0.5 second. At a given flight condition, the lateral sensitivity in climb was greater than that in level flight, and in autorotation it was less than in level flight. The maximum values of roll acceleration were achieved during climbs and in dives at V_L and were on the order of 25 to 30 deg/sec^2/inch. Lateral control sensitivity characteristics with SCAS OFF were similar to those obtained with SCAS ON. Lateral control sensitivity data with SCAS ON are shown in figure L.



NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

Figure 1. Lateral Control Sensitivity.

74. The maximum lateral control response with SCAS ON varied 10 deg/sec/in. at mid airspeeds (70 to 120 KCAS) to 20 deg/sec/in. at V_L in the clean configuration. Lateral control response was not a function of altitude or gross weight, but in the heavy hog configuration, higher maximum roll rates occurred than in the clean configuration (fig. 157, app VII). The time required to achieve maximum roll rate was approximately 1 second at all conditions tested with SCAS ON.

75. Lateral control response characteristics with SCAS OFF were similar to those observed with SCAS ON, except, as in the case of pitch response, a peak rate could not be achieved prior to initiating recovery due to the high rates and large roll displacements which occurred. Therefore, the SCAS OFF data are presented in terms of rate at 1 second after control input. The lateral control response characteristics are summarized in figure M. With SCAS ON, the AH-1G meets the requirements of paragraph 3.3.15 of MIL-H-8501A except for those areas, as indicated in figure M, where maximum roll rates exceeded 20 deg/sec/inch.

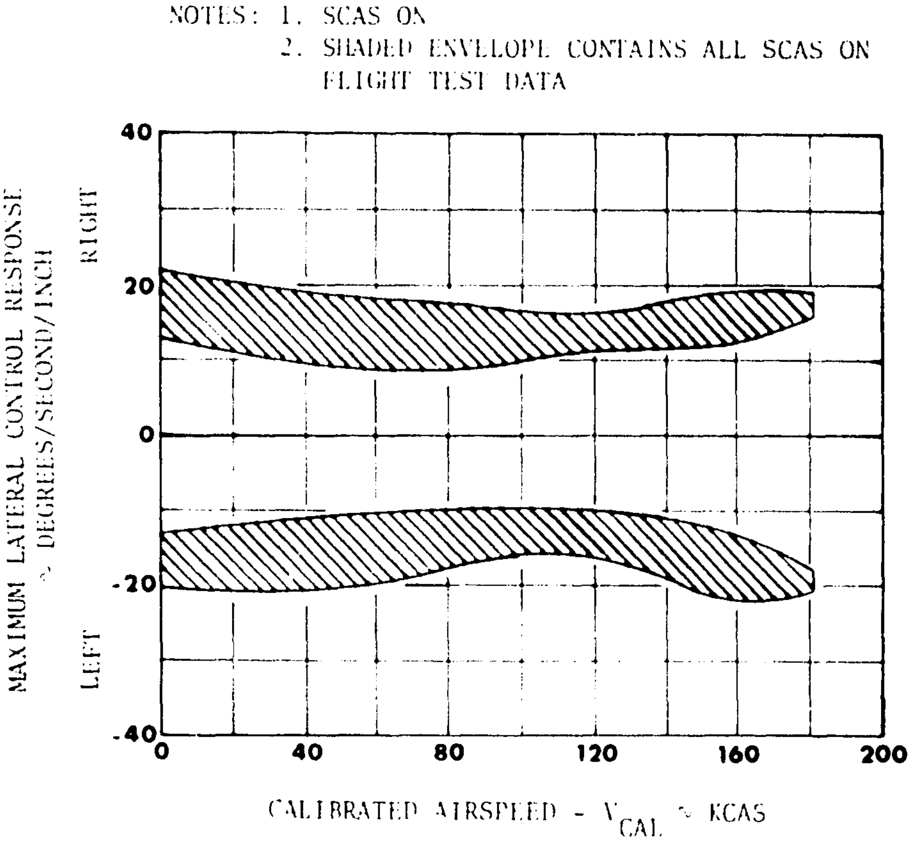


Figure M. Lateral Control Response.

76. The roll attitude displacement at 1 second following a 1-inch control input varied from 7 to 15 deg/inch. In general, the only parameters affecting the displacement were increased gross weight and loaded rocket pods, both of which decreased displacement. Roll attitude displacement characteristics were essentially the same for SCAS ON and SCAS OFF. Data with SCAS ON are summarized in figure N.

NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

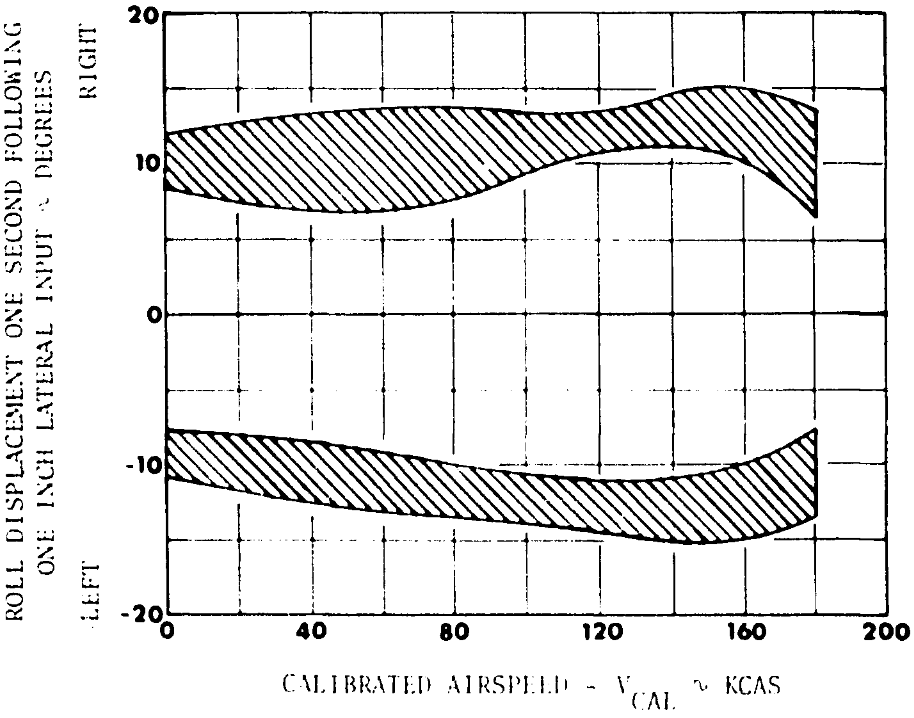


Figure N. Roll Attitude Displacement.

77. Qualitatively, the lateral controllability characteristics of the AH-1G in forward flight are satisfactory with SCAS ON. No objectionable characteristics were noted, and the aircraft reacts rapidly to a control input. The relatively high roll rates and roll accelerations observed, while in some cases exceed the

maximum values stated in MIL-H-8501A, are satisfactory for an attack helicopter. These characteristics contribute to the ability to make rapid turns and minimize time in return-to-target maneuvers (HQRS 2). However, these rates (22deg/sec/in.) are approaching the maximum allowable from a qualitative standpoint. A phenomenon was noted where an increase in engine torque resulted from a left control input, and a decrease in engine torque resulted from a right control input. This is discussed in detail in the Performance portion of the AH-1G Phase B report (ref 19, app I). No significant control coupling was encountered during the lateral controllability tests.

Directional

78. Directional controllability characteristics were investigated at the same conditions as longitudinal and lateral controllability and were generally satisfactory. The directional controllability test conditions are presented in table IX, appendix VIII. A portion of these tests were conducted with the SCAS OFF. In all cases, the directional inputs resulted in an initial yawing of the aircraft in the proper direction.

79. The directional control sensitivity decreased with increasing airspeed and was minimum at V_L. Sensitivity was greater in the clean configuration than in the heavy hog configuration at all airspeeds. Increasing gross weight and increasing altitude, in a given configuration, resulted in a significant decrease in control sensitivity, particularly at high airspeeds. In all cases tested, the maximum yaw acceleration occurred at 0.5 second or less after the control input. SCAS OFF characteristics were generally the same as SCAS ON. Data are summarized for all conditions tested (SCAS ON) in figure 0.

NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

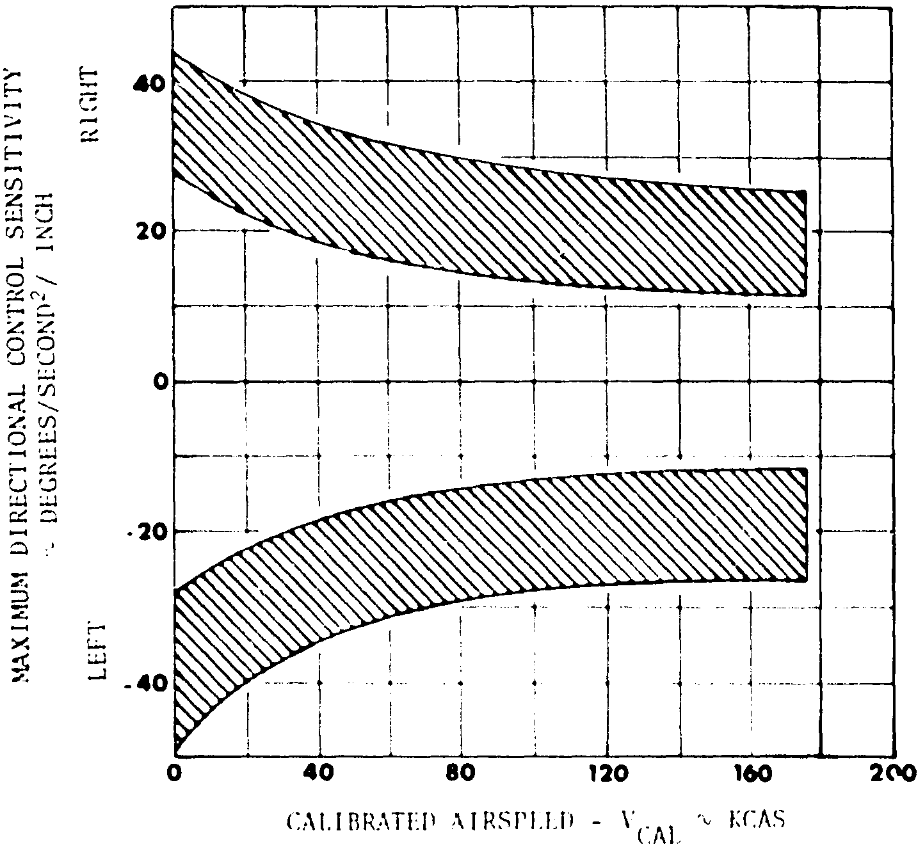


Figure O. Directional Control Sensitivity.

80. As with sensitivity, the directional control response was maximum at low airspeeds and decreased with increasing airspeed. Time to reach the maximum rate varied from 0.8 second (low altitude, light weight) to 1.5 seconds (high altitude, heavy weight). Differences in gross weight and configuration had no significant effect on the maximum yaw rate. Increasing density altitude resulted in a decreasing response. There was no significant change in directional control response characteristics with SCAS OFF when compared to corresponding SCAS ON condition. A summary of maximum directional control response is presented in figure P.

NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

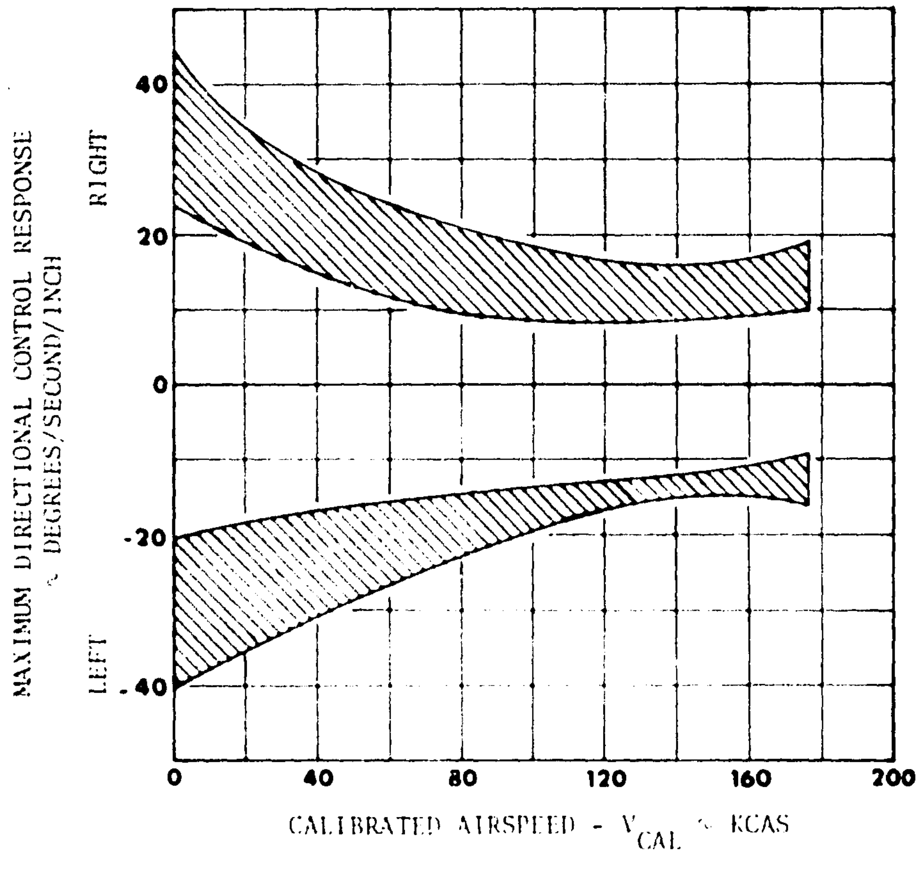
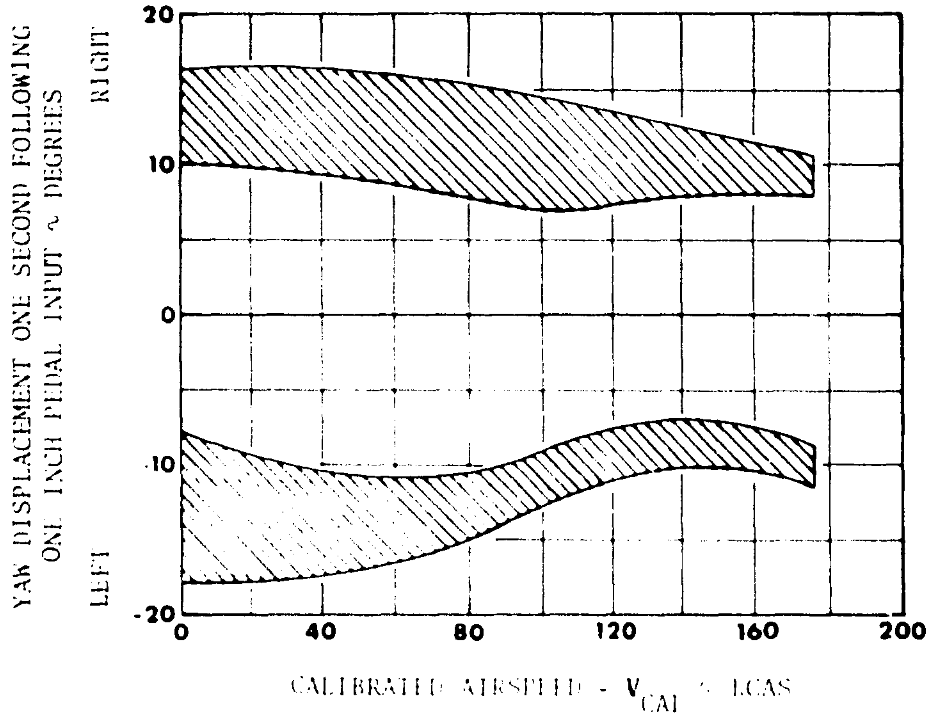


Figure P. Directional Control Response.

81. Yaw attitude displacement was defined at 1 second after a 1-inch pedal input. This displacement was maximum at low airspeeds and minimum at V_L. The heavy hog configuration had a slightly lower yaw displacement than did the clean configuration at all airspeeds. Increased gross weight or altitude also reduced the yaw displacement at 1 second. With SCAS OFF, the yaw characteristics were similar to those with SCAS ON except that all yaw displacements were decreased by 5 to 6 deg/inch. Figure Q presents a summary of the yaw displacement characteristics for all SCAS ON conditions tested.



NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

Figure 9. Yaw Attitude Displacement.

82. The directional controllability characteristics were good. During simulated tracking maneuvers, it was determined that, except for the characteristic of changing directional control trim with airspeed discussed in paragraphs 26 and 31, minimal pilot effort was required to maintain an adequate performance level (HQRS 2). One characteristic which was undesirable was the resultant high roll rate which occurred during forward flight at high speeds following a directional control step input. The roll was always in the same direction as the control input and was greater to the right than to the left. This phenomenon is due to the very high effective dihedral at this flight condition and, in fact, prevented the buildup of significant sideslip angle during directional step inputs at high speed. SCAS ON or OFF had no significant effect on this roll-yaw coupling.

LANDING GEAR CROSS-TUBE FAIRINGS EFFECTS

83. Controllability tests were conducted with landing gear cross-tube fairings removed at trim airspeeds of $0.8V_H$, V_H and V_L. Tests were conducted to investigate both lateral and directional characteristics. Only slight variations were noted between the two configurations in the yaw axis; however, a large increase in sensitivity and response was noted in the lateral axis with landing cross-tube fairing removed. With the fairings removed, the lateral sensitivity was more than 20 deg/sec^2/in. greater than with fairings installed. The time to achieve maximum acceleration was essentially unchanged. The lateral response was approximately 10 deg/sec/in. greater, and time to maximum rate was 0.7 second as compared to 1 second with the fairings installed. Figure 164, appendix VII, illustrates the comparison between fairings on and off for lateral sensitivity and response. The maximum value of 24 deg/sec/in. lateral control response does not meet the requirement of paragraph 3.3.15 of MIL-H-8501A and is qualitatively determined to be excessive. The excessive roll rate and decrease in lateral-directional damping (para 60) made precise maneuvering of the aircraft extremely difficult when performing normal flight tasks (HQRS 5). However, pilot workload reached an intolerable level when performing maneuvers where precise attitude and coordinate flight were required to accomplish the intended mission for this aircraft (HQRS 7).

HOVER CONTROLLABILITY

84. Hover controllability tests were conducted primarily in the clean configuration. The hover controllability conditions tested are presented in tables X through XII, appendix VIII. A portion of these tests was also conducted with the SCAS OFF. The C_T range flown during these hovering tests was 0.0037 to 0.0052. These tests were conducted IGE at a skid-height range from 5 to 15 feet at mid cg loading. The hover controllability data are presented in figures 247 through 279, appendix VII. These data are summarized as a function of thrust coefficient (C_T) in figures 244 through 246.

Longitudinal

85. With SCAS ON, the longitudinal controllability characteristics varied slightly with C_T. The aircraft reaction was generally greater following a forward control input than with an aft input. The longitudinal sensitivity was approximately 10 deg/sec^2/in., and time to reach maximum acceleration was approximately 0.2 second. The maximum response was essentially constant throughout the C_T

range at 5 deg/sec/inch. The time to reach maximum pitch rate varied from 0.8 to 1.0 second depending on the C_T. The longitudinal displacement at 1 second following control input remained relatively constant at 3.5 deg/in. as C_T varied. This exceeded the minimum value (2.05 deg/in.) required by paragraph 3.2.13 of MIL-H-8501A. There was no significant change in the longitudinal controllability characteristics in hover due to configuration change. The longitudinal controllability characteristics with the SCAS OFF were essentially the same as with SCAS ON except that the maximum pitch rate and resultant pitch attitude change were slightly greater.

86. The longitudinal controllability characteristics during hover were satisfactory. In all cases, the helicopter reacted in the desired direction to a cyclic control step input, and the resultant rates and accelerations were satisfactory. Precision hovering required an unnecessarily high amount of pilot effort due to the high cyclic breakout forces discussed in paragraph 17.

Lateral

87. The lateral control sensitivity with SCAS ON was approximately 16.5 deg/sec^2/in., and the time required to achieve maximum acceleration was a constant 0.15 second. Maximum roll response varied from 18 to 21 deg/sec/in., and time required to achieve maximum rate varied from 0.75 to 0.9 second. Lateral controllability characteristics were essentially unaffected by variations in C_T store configuration, ordnance loading and sense of the input (left or right).

88. The lateral controllability characteristics changed only slightly when the SCAS was not operating. The maximum acceleration per inch of lateral cyclic control input was less in most cases, and the time to reach peak roll acceleration increased to approximately 0.35 second. The maximum roll rate and resultant roll attitude change were greater with SCAS OFF than with SCAS ON. The time to reach maximum roll rate remained the same (0.75 to 0.9 second).

89. The maximum allowable roll rate stated in paragraph 3.3.15 of MIL-H-8501A was exceeded slightly in some cases; however. no tendency to overcontrol was noted. In addition, the lateral controllability characteristics in hover comply with the requirement stated in paragraphs 3.3.16 and 3.3.18 of MIL-H-8501A.

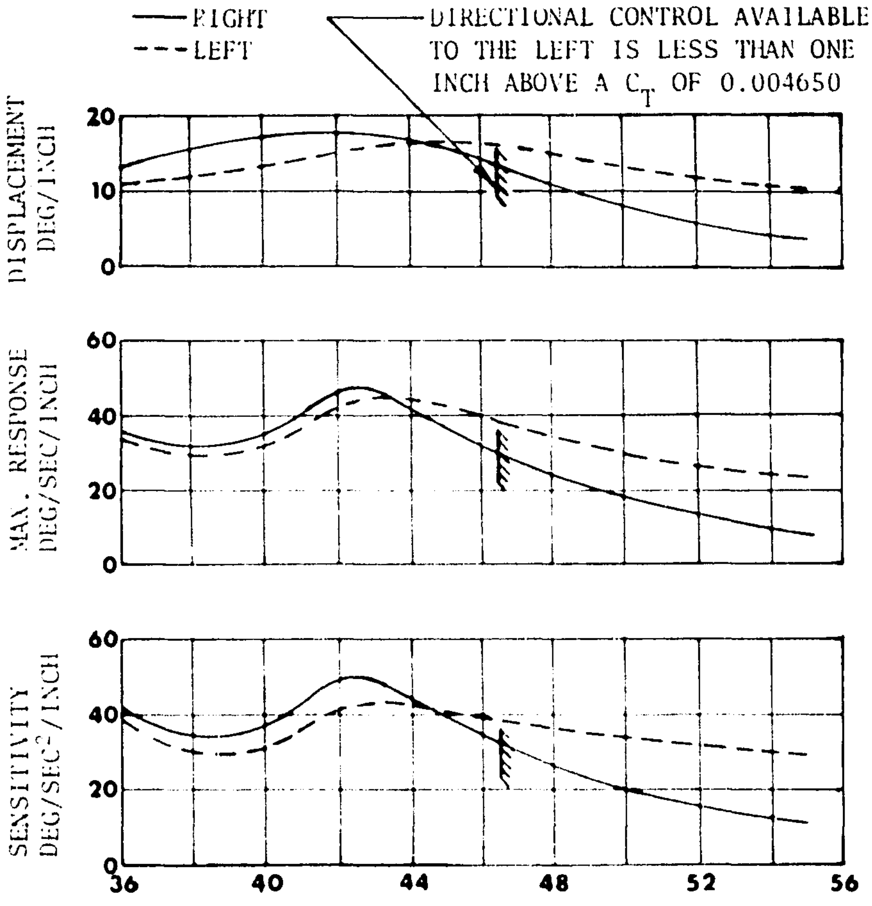
90. The lateral controllability characteristics in hover were similar to the longitudinal controllability in that the aircraft reacted in the proper direction to a control step input, and the resultant rates and accelerations were satisfactory. The high

control breakout forces had a more detrimental effect on pilot effort required for precise hovering in the lateral axis than in the longitudinal axis (para 86).

91. The maximum tail rotor horsepower recorded during recovery from a left lateral step input during the controllability tests ranged between 200 to 260 horsepower. The magnitude of the tail rotor horsepower depended on the dynamic characteristics of the aircraft as well as the magnitude of the control input during recovery. Tail rotor horsepower was maximum at SL and decreased with altitude for a given control input. The 42- and 90-degree gear boxes were replaced several times during the tests because of unacceptable gear wear patterns. There was insufficient directional control to maintain a constant heading during recovery from a right lateral step input. This problem is related directly to the translational handling qualities discussed in paragraphs 42 through 46.

Directional

92. The directional controllability characteristics in hover varied significantly with variations in main rotor C_T. Figure R presents the results of this test. When hovering at a C_T greater than 0.00465, less than 1 inch of left directional control remained; hence, inputs were limited to the available control travel. The yaw displacement requirement of paragraph 3.3.5 of MIL-H-8501A was not met except within the very limited range of C_T values as indicated in figure R. Directional control margin was inadequate when the average directional control position was less than 10 percent from the control limit. In order to comply with the directional axis requirement of MIL-H-8501A, a significant increase in tail rotor thrust is required. The directional controllability characteristics are considered to be unacceptable, and correction is mandatory. With SCAS OFF, the aircraft reaction to a directional control step input was generally less than with SCAS ON.



MAIN ROTOR THRUST COEFFICIENT - C_T x 10^{-4}

Figure R. Directional Hovering Controllability.

93. A related problem to the insufficient directional control problem is the tail rotor power transfer limitation discussed in paragraph 49. Tail rotor horsepower was measured for directional control inputs during most of the directional controllability testing. The change in tail rotor horsepower required to initiate a directional heading change was generally found to be a function of pedal input magnitude. Peak tail rotor horsepower encountered when arresting turns varied from 210 to 225 horsepower. The tail rotor horsepower required to arrest a turn rate was a function of the following parameters: yaw rate, yaw angular acceleration and rate of pedal control input. These high horsepowers resulted in the unacceptable gear wear patterns of the 42- and 90-degree gear boxes as discussed in paragraph 49. Figures 287 through 289, appendix VII, present the tail rotor horsepower encountered during hover controllability tests.

94. The directional controllability of the AH-1G is poor and jeopardizes safe mission accomplishment where insufficient left directional control exists to either develop an adequate left yaw rate or to satisfactorily arrest a right yaw rate. For the C_T range where more than 10 percent of left directional control remains, an HQRS of 5 is assigned for the directional controllability in hover. For the C_T range where less than 10 percent of left directional control remains, an HQRS of 10 is assigned.

MANEUVERING STABILITY

95. Maneuvering stability tests were conducted to evaluate the longitudinal control characteristics of the AH-1G. The two techniques used during this test were wind-up turns and symmetrical pull-ups. For both techniques, the aircraft was first stabilized at a trim airspeed in level flight, and the collective and force trim settings were maintained throughout the maneuver. During the wind-up turns, the helicopter was stabilized at increasing increments of normal acceleration in a constant-airspeed, coordinated turn. During the symmetrical pull-ups, climbs and dives were performed establishing increasing increments of normal acceleration in a symmetrical pull-up as the helicopter passed through the level flight attitude at the trim airspeed and altitude. The aircraft was evaluated at two airspeeds: 0.8 V_H and V_H. The configurations tested were: clean wing, forward and aft cg loading at 7800 pounds and aft cg loading at 7000 pounds. The average density altitude for these tests was 5000 feet. The results of these tests are presented in figure 291, appendix VII. Also, a summary of the maneuvering stability is presented in figure 290.

96. The helicopter possessed positive maneuvering stability. As the load factor was increased, an increase in aft longitudinal force (pull) and aft longitudinal control position was required. Higher gradients were experienced at the forward cg loading than at the aft cg loading. Extrapolation of these data indicates that both the longitudinal control position gradient and longitudinal force gradient would be stable throughout the cg envelope of the aircraft. Increasing gross weight caused both the control position and force gradients to increase as did decreasing airspeed. No feedback was noticed in the cyclic control as was indicated in references 2 and 17, appendix I.

97. There was little or no lateral control variation from trim with increasing load factor during the symmetrical pull-ups. However, there was some right displacement of the lateral control from trim in the wind-up turns as load factor was increased. The magnitude of this right lateral control displacement was larger in wind-up turns to the right. The lateral control was approximately 1.0 inch from trim at the highest attained load factor. A summary of lateral control displacement during maneuvering stability tests is presented in figure 292, appendix VII. This lateral control migration with normal acceleration was not noticeable to the pilot. The maximum bank angles attained were 72 degrees (left bank) in a left wind-up turn and 68 degrees (right bank) in a right wind-up turn. These values were obtained at the light gross weight (7000 pounds) and aft cg loading. The maneuvering stability characteristics are rated highly desirable. The control position and force gradients were adequate and displayed no discontinuities. An apparent change in stick force per g caused some concern during high-speed, constant-g pullouts. When normal acceleration was maintained at 2g's or above during the pullout, the rapid decrease in airspeed during the maneuver resulted in a trim change which reduced the stick force noticeably. For trimmed dive conditions, a decrease of 50 to 60 knots in airspeed during a constant-g pullout reduced the stick force to approximately zero. This characteristic should be noted in the AH-1G operator's manual (ref 20, app I) and should be considered in follow-on control system designs.

AIRCRAFT REACTION TO ENGINE FAILURE

98. The aircraft reactions following a sudden engine failure were evaluated to determine the adequacy of pilot cues, identify the recovery techniques required to establish autorotation and determine MIL-H-8501A compliance. Sudden engine failure was simulated by rapidly rotating the throttle to the ground idle position. All tests were initiated from stabilized wings-level flight. Following the simulated engine failure, all flight controls were held fixed for 2 seconds or until recovery was necessary to evaluate recognition cues, required pilot actions and effect of delay times. All tests were conducted with SCAS ON. Results of these tests are summarized in figures 293 through 297, appendix VII. Time histories of several simulated engine failures are presented in figures 298 through 301. Tests were conducted under conditions as shown in table 13, appendix VIII.

Aircraft Motions Following Simulated Engine Failures

99. The initial reaction of the aircraft following simulated engine failures was, for all cases, an immediate yaw to the left as the rotor rpm began to decrease. This was followed by a left roll. The initial yaw acceleration was a function of the engine torque at the instant of failure. A slight pitch-up tendency was controlled by the SCAS before being sensed by the pilot. The left roll induced by the left yaw reaction (dihedral effect) was slight at low speeds (60 to 80 KCAS) and was controlled by the lateral SCAS so that no roll rates were sensed by the pilot. At airspeeds greater than 80 KCAS, the roll rates saturated the lateral SCAS and resulted in increasing left roll rates with increasing airspeed. At approximately 120 KCAS with a cruise power setting, the roll rate reached 25 to 28 deg/sec in 2 seconds or less. Since the dihedral effect becomes greater with increasing airspeed, the time to reach the maximum acceptable roll rate (25 to 28 deg/sec) was decreased and reduced the time before recovery was initiated. At maximum airspeeds evaluated, the yaw/roll reaction became very severe. Heavy buffeting of the tail boom and vertical stabilizer was encountered at 170 KCAS with a 0.5-second delay.

Engine Failure Cues

100. The reactions and indications sensed by the pilot following sudden engine failure are strong and clear: audible (loss of engine noise, low rpm audio signal, change of rotor sound), visual (engine and rotor instruments, low rpm warning light, attitude change) and kinesthetic (yaw and roll accelerations).

Delay Time Evaluation

101. The time available for pilot recognition and reaction to sudden engine failure (delay time) was evaluated for all conditions. For each condition, the critical control input was determined. For full-power climbs at 65 KCAS, the delay time possible was greater than 2 seconds. Aircraft attitudes and rates were not objectionable during full-power climb, and controlling rotor rpm decay (approximately 27 rpm/sec) with the collective was the critical pilot action. For level flight conditions at, or near, the airspeed for minimum power required (65 to 75 KCAS) delays in excess of 2 seconds for all controls are possible. Aircraft attitude and rotor rpm decay were easily controlled. For all level flight conditions at airspeeds between 60 and 120 KCAS,

a 2-second delay on all controls was achieved. At approximately 120 KCAS, the maximum tolerable left roll rate (25 to 28 deg/sec) was reached and recovery action was required. As the airspeed was further increased, the maximum tolerable delay time on the cyclic and directional controls decreased. At 150 KCAS with the engine developing maximum power, recovery action (aft and right cyclic and right directional control) was required after approximately 1 second for all configurations and gross weights. At V_L (165 to 175 KCAS) for the minimum usable test altitude, the maximum delay time recorded was 0.7 second. Because of the severity of the aircraft reaction following sudden engine failure, the requirement for pilot response of less than 1 second is unacceptable. Qualitative results of other tests (ref 21, app I) indicated that 1-second delays were acceptable at all airspeeds for engine torque settings less than 35 psi. Additional testing is necessary to quantitatively evaluate the effects of reduced engine power on simulated engine failure maneuvers.

Recovery Technique

102. The recovery technique following sudden engine failure was similar for all conditions. For the lower airspeeds (60 to 100 KCAS), only small cyclic inputs were required to control aircraft attitude, and a smooth lowering of the collective was adequate to control the rotor rpm decay and establish autorotation. At the higher airspeeds (100 KCAS to V_L), prompt control of the aircraft attitude (yaw and roll to the left) followed by a positive cyclic flare was essential. The cyclic flare reduced the rate of descent and checked rotor rpm decay rate while reducing the airspeed to the desired autorotation value. The collective was lowered smoothly after the flare was established so that the rotor rpm was in the normal range when the autorotational airspeed was reached.

Rotor RPM Decay Characteristics

103. The rotor rpm decay rate varied from 17 to 27 rpm/sec depending on the collective setting (or engine torque) at the time of simulated engine failure. Airspeed with R/C had no measurable effect on the decay rate (figs. 293 through 297, app VII). Minimum rotor speeds of 260 to 280 rpm were common for delay times of 2 seconds. The lowest rotor rpm encountered during the tests was 249 rpm for a 1.8-second delay at 120 KCAS at 10,000 feet. The rotor rpm responded quickly to recovery action by the pilot.

Effects of Gross Weight, Center of Gravity, Density Altitude and Wing-Stores Configuration

104. The aircraft reactions following a simulated engine failure were basically similar for all conditions tested. The aircraft reaction to failure at light grwt was quicker than at heavy grwt. The aircraft response to control inputs and susceptibility to control feedback were less during aircraft recovery at light grwt. The aircraft reactions at the medium grwt (8500 pounds) was less objectionable than either the heavy grwt (9500 pounds) or light (7500 pounds) grwt. Maximum rotor loading (gross weight times normal acceleration) was more difficult to attain at light weight; and, consequently, the maximum rotor speeds attainable during aircraft recovery were much lower (300 to 310 rpm). The reactions with forward cg loadings were more objectionable due to the increased nose-down attitude at the high airspeeds and the reduced amount of aft cyclic control available to effect recovery. Density altitude effects were not significant since the more critical high airspeeds were beyond the envelope limits. The external stores configurations tested (clean and four XM159 rocket pods installed) were not noticeably different.

Effects of Landing Gear Cross-Tube Fairings Removed

105. Reactions of the AH-1G following sudden engine failure were also evaluated with landing gear cross-tube fairings removed. No significant differences in the aircraft reactions were observed at airspeeds less than 160 KCAS: the maximum permitted airspeed for this configuration.

Limitations

106. The following characteristics and reactions were encountered which limited the testing and are the basis for operational limitations:

a. Unacceptable left roll rates encountered at the high-speed, high-power conditions with a marginally acceptable pilot recognition and reaction time of 1 second.

b. Heavy buffeting of the tail boom and vertical fin, at or near the limit airspeed conditions, following simulated engine failures at high-power settings.

c. Heavy control feed-back during recovery from high-speed, simulated engine failures where the maximum tolerable aircraft attitudes and rates were recorded.

d. Large main rotor flapping angles (70 percent of total available before hub and mast contact) were recorded during limit condition recoveries. The magnitude of the main rotor flapping angle can be increased to a dangerous level by lowering the collective before a positive flare and a resultant increased normal acceleration is established.

107. To limit the operation of the AH-1G at conditions where the reactions following sudden engine failure are unacceptable, the following should be accomplished:

a. Limit indicated engine torque to 35 psi for dive airspeeds greater than 150 KCAS.

b. Mark all airspeed indicators with yellow caution ARC between 150 and 190 knots.

c. Mark all torquemeters with a yellow caution stripe at 35 psi.

d. Revise paragraphs 4-15 through 4-25, 7-17, 8-26 and 8-38 of the AH-1G pilot's handbook (ref 20, app I) in accordance with the preceding discussion.

MISCELLANEOUS

Trim Change Accompanying SCAS Disengagement

108. Tests were conducted to evaluate the aircraft reactions following SCAS disengagement. These tests were conducted at trim airspeeds between 55 KCAS and V_L in the heavy hog configuration. In all cases tested, the aircraft reacted with a gradual nose-up pitching motion and a slight right roll when SCAS was disengaged. The rates observed were very small and did not exceed the requirement of paragraph 3.5.9(a), MIL-H-8501A. No significant aircraft reaction was observed during subsequent SCAS reengagement during trimmed, stabilized flight. It is most probable that SCAS disengagement in stabilized flight would initially be undetected by the pilot except for the illumination of the appropriate warning lights and the decrease in aircraft dynamic stability as discussed in paragraph 57. The aircraft reactions following SCAS "hardovers" were not investigated during these tests. The results of the contractor in-flight SCAS qualification tests are presented in reference 22, appendix I.

SCAS Pylon Coupling

109. SCAS pylon coupling was not encountered during the Phase D program. This would indicate that the problem previously encountered during Phase B testing (ref 2, app I) had been alleviated. However, a small amount of undamped aircraft motion was encountered at maximum power settings (topping power). These small, but annoying aircraft oscillations were probably due to engine oscillation and not SCAS pylon coupling. These oscillations were eliminated by reducing engine output power slightly below topping power.

Airspeed Calibration

110. Airspeed calibration tests were conducted to determine the position error of the standard and test (boom) airspeed systems in climbing, diving, autorotational and level flight. The methods used to calibrate the test airspeed system were a combination of the trailing bomb, pacer aircraft and ground speed course. The calibration was conducted in the clean configuration only, and the data are presented in figures 302 through 304 appendix VII.

111. The standard airspeed system was calibrated using the trailing bomb and pacer aircraft methods, and the results are presented in figure 299, appendix VII. In addition to the data gathered during this evaluation, the test results include data from the AH-1G Phase B test reports (ref 2, 4 and 5, app I). The test configurations were clean, basic and outboard alternate. The position error in climbing and autorotational flight was less than 3 knots from 55 to 100 knots indicated airspeed (KIAS) and was acceptable. This airspeed band includes the airspeed for maximum glide. Higher position errors were present from 30 to 55 KIAS, but these errors are not deemed significant since the helicopter is normally accelerating or decelerating through this airspeed band.

112. The standard airspeed system calibration for level and diving flight was compared to the position errors listed in the operator's manual (ref 18, app I). This comparison is presented in figure 8 and shows essentially the same position error from 40 to 170 KIAS. For the airspeed ranges from 30 to 40 KIAS and 170 to 190 KIAS, there is a difference of 2 knots or less between the two sources of data. The airspeed position errors determined during this test are satisfactory for the aircraft's mission and should be incorporated into the operator's manual.

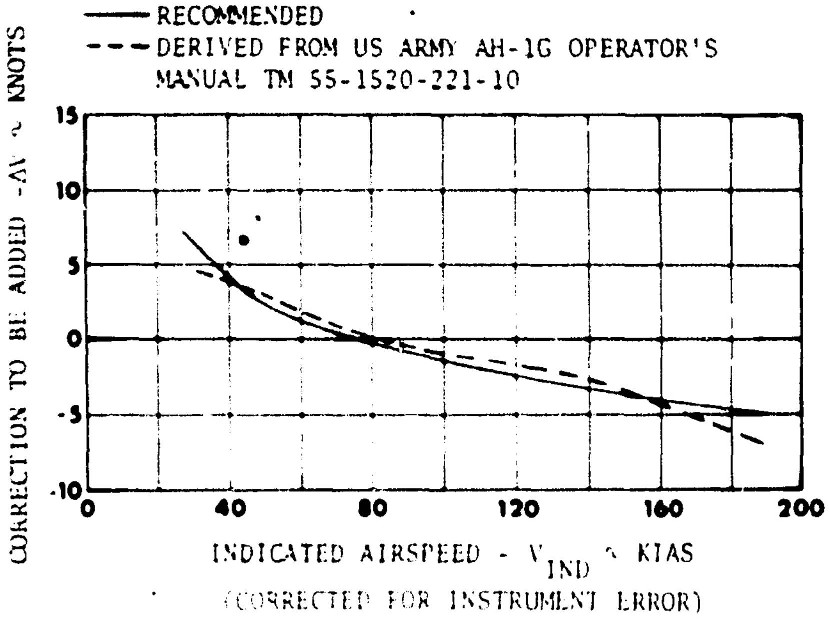


Figure 5. Standard Airspeed System Calibration.

CONCLUSIONS

GENERAL

113. The handling qualities of the AH-1G are acceptable throughout the published flight envelope except for the deficiencies as listed in paragraph 118.

114. The deviation from MIL-H-8501A referred to in the AH-1G contract pertaining to the lateral-directional handling qualities does not establish adequate alternate standards for design or evaluation (paras 34 and 40).

115. A directional control margin of 10-percent total pedal travel is the minimum acceptable for operating the AH-1G (para 42).

116. The dynamic stability handling qualities of the AH-1G are unacceptable at airspeeds in excess of 160 KCAS with the landing gear cross-tube fairings removed and with the SCAS ON (paras 60 and 83).

117. The dynamic stability handling qualities of the AH-1G are unacceptable at airspeeds in excess of 115 KCAS with the landing gear cross-tube fairings removed and with the SCAS inoperative (para 61).

DEFICIENCIES AND SHORTCOMINGS AFFECTING MISSION ACCOMPLISHMENT

118. Correction of the following deficiencies is mandatory for successful accomplishment of the intended mission:

a. The excessive cyclic control breakout forces (para 17).

b. Inadequate directional control (paras 43 through 46).

c. Inability to achieve maximum tail rotor blade angle (19 degrees) when full directional control is applied for all conditions with the present directional control/yaw SCAS geometry (para 47).

d. The excessive tail rotor horsepower required for hovering and translational flight (paras 49, 91 and 93).

119. Correction of the following shortcomings is desirable for successful accomplishment of the intended mission:

a. Neutral static longitudinal stability at airspeeds approaching V_L (para 28).

b. Increase in right directional control with increasing airspeed in dive (paras 26 and 31).

c. Directional instability between 10 and 19 knots at relative wind azimuths between 210 and 230 degrees (para 48).

d. The poor longitudinal dynamic stability characteristics with the SCAS not operating (para 54).

e. The decrease in lateral-directional damping with the SCAS OFF (para 57).

MILITARY SPECIFICATION COMPLIANCE

120. All stability and control handling qualities specified in reference 12, appendix I, are complied with except for the following paragraphs of MIL-H-8501A (not including paras 3.3, 3.6 and 3.7).

Paragraph	Item
3.2.10	Neutral static longitudinal stability at airspeeds above 170 KCAS.
3.2.4	Longitudinal breakout force is greater than the force gradient required to produce the first inch of longitudinal control displacement from trim.
3.2.7	Longitudinal breakout forces in excess of approved deviation from MIL-H-8501A.
3.5.4.1	Insufficient directional control to perform vertical climb throughout present flight envelope.
3.5.5 and 3.5.5.1	Insufficient time to recognize and institute corrective action following engine failure within the present flight envelope.
3.5.4.3, 3.5.4.4 and 3.5.4.5	Tests not conducted to check compliance.

121. All portions of paragraph 3.3 of MIL-H-8501A were met except the following. The contractor was not obligated to meet the following portions of MIL-H-8501A:

Paragraph	Item
3.3.2, 3.3.3, 3.3.5 and 3.3.6	Insufficient directional control during translational flight.
3.3.9	Neutral dihedral effect in autorotation.
3.3.11	Lateral breakout forces greater than the force gradient to produce the first inch of longitudinal control displacement from trim.
3.3.13	Lateral breakout forces in excess of approved deviation from MIL-H-8501A.
3.3.15	Angular roll rate is greater than 20 degrees/second/inch for some flight conditions.

RECOMMENDATIONS

122. The handling qualities and flight envelope limitations presented in this report are recommended for inclusion in the operator's manual.

123. Correct deficiencies on a priority basis.

124. Correct shortcomings at the earliest convenience.

125. Restrict the operational flight envelope to conditions which provide a 10-percent directional control margin (para 42).

126. Initiate action to increase directional control margins and improve the torque transfer capability of the tail rotor drive system (paras 46 and 49).

127. Revise deviation 1 of MIL-H-8501A granted in the AH-1G contract, pertaining to the lateral-directional handling qualities, to include adequate standards for design and evaluation (para 34).

128. Incorporate the following flight envelope limitations:

a. Limit airspeed to 160 KCAS (SCAS ON) and 115 KCAS (SCAS OFF) when landing gear cross-tube fairings are not installed (paras 60, 61 and 83).

b. Mark airspeed indicators (pilot and copilot) with a yellow caution arc between 150 KIAS and limit airspeed (para 107).

c. Mark engine torque meters (pilot and copilot) with a yellow stripe at 35 psi (para 107).

d. Mark airspeed indicators (pilot and copilot) with a yellow caution arc between 150 KIAS and limit airspeed (para 107).

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APPENDIX II. BASIC AIRCRAFT INFORMATION AND OPERATING LIMITS

AIRFRAME

Rotor System

The 540 "door hinge" main rotor assembly is a two-bladed, semi-rigid, underslung feathering axis type rotor. The assembly consists basically of two all-metal blades, blade grips, yoke extensions, yoke trunnion, and rotating controls. Control horns for cyclic and collective control input are mounted on the trailing edge of the blade grip. Trunnion bearings permit rotor flapping. The blade grip to yoke extension bearings permit cyclic and collective pitch action.

Tail Rotor

The tail rotor is a two-bladed, delta-hinge type employing preconing and underslinging. The blade and yoke assembly is mounted to the tail rotor shaft by means of delta-hinge trunnion. Blade pitch angle is varied by movement of the tail rotor control pedals. Power to drive the tail rotor is supplied by a takeoff on the lower end of the main transmission.

Transmission System

The transmission is mounted forward of the engine and coupled to the engine by a short drive shaft. The transmission is basically a reduction gear box which transmits engine power at reduced rpm to the main and tail rotors by means of a two-stage planetary gear train. The transmission incorporates a free-wheeling unit at the input drive. This provides a disconnect from the engine in case of a power failure to allow the aircraft to make an autorotional landing.

Synchronized Elevator

The synchronized elevator, which has an inverted airfoil section, is located near the aft end of the tail boom and is connected by control tubes and mechanical linkage to the fore and aft cyclic control system. Fore and aft movements of the cyclic control stick produce a change in the synchronized elevator attitude.

Control Systems

A dual hydraulic control system is provided for the cyclic and collective controls. The directional controls are powered by a single servo cylinder which is operated by system No. 1. The hydraulic system consists of two hydraulic pumps, two reservoirs, relief valves, shut-off valves, pressure warning lights, lines, fittings, and manual, dual tandem, servo actuators incorporating irreversible valves. Tandem power cylinders incorporating closed center four-way manual servo valves and irreversible valves are provided in the lateral, fore and aft cyclic and collective control system. A single power cylinder incorporating a closed center four-way manual servo valve is provided in the directional control system. The cylinders contain a straight-through mechanical linkage.

Force Trim

A magnetic brake and force gradient device is incorporated in the cyclic control and directional pedal controls. These devices are installed in the flight control system between the cyclic stick and the hydraulic power cylinders and between the directional pedals and the hydraulic power cylinder. The force trim control can be turned off by depressing the left button on the top of the cyclic stick. The gradient is accomplished by springs and magnetic brake release assemblies which enable the pilot to trim the controls as desired.

Cyclic Control Stick

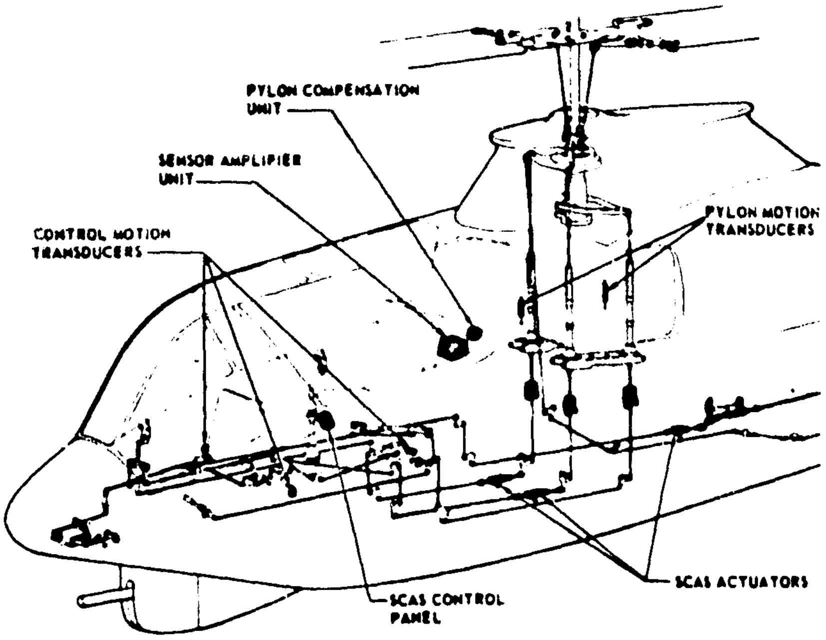
The pilot and gunner cyclic stick grip each have a force trim switch and a SCAS release switch. The pilot's cyclic stick has a built-in operating friction. The cyclic control movements are transmitted directly to the swash plate. The fore and aft cyclic control linkage is routed from the cyclic stick through the SCAS actuator, to the dual boost hydraulic actuator and then to the right horn of the fixed swash plate ring. The lateral cyclic is similarly routed to the left horn.

Collective Pitch Control

The collective pitch control is located to the left of the pilot and is used to control the vertical mode of flight. Operating friction can be induced into the control lever by hand tightening the friction adjuster. The pilot and gunner collective pitch controls have a rotating grip-type throttle.

Tail Rotor Pitch Control Pedals

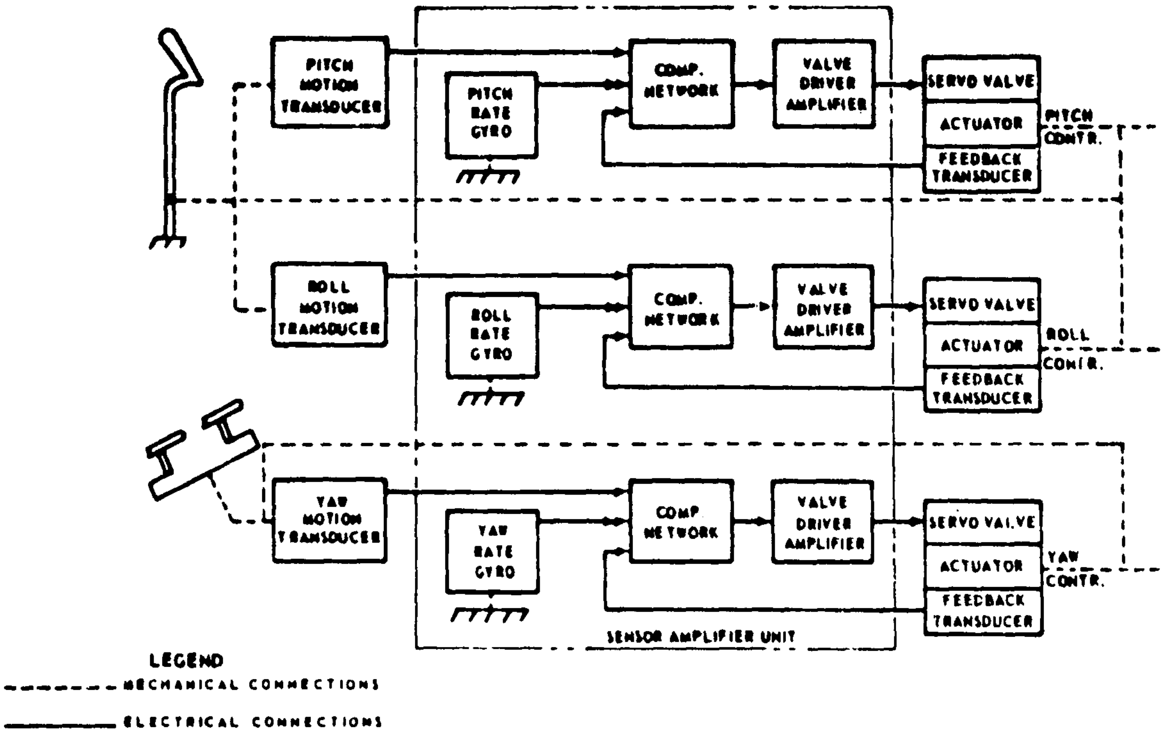
Tail rotor pitch control pedals alter the pitch of the tail rotor blades and thereby provide the means for directional control. The force trim system is connected to the directional controls and is operated by the force trim switch on the cyclic control grip.



Flight Controls Schematic

Stability and Control Augmentation System (SCAS)

The SCAS is a three-axis, limited-authority, rate-referenced stability augmentation system. It includes an electrical pilot input which augments the pilot's mechanical control input. This system permits separate consideration of airframe displacements caused by external disturbances from displacements caused by pilot input. The SCAS is integrated into the fore, aft, lateral and directional flight controls to improve the stability and handling qualities of the helicopter. The system consists of electro-hydraulic servo actuators, control motion transducers, a sensor/amplifier unit and a control panel. The servo actuator movements are not felt by the pilot. The actuators are limited to a 25-percent authority and will center and lock in case of electrical and/or hydraulic failure.



Interrelation of SCAS Components

ENGINE

Engine Description

The T53-L-13 engine, rated at 1400 shp, is a successor to the T53-L-11 engine. The additional power has been achieved with no change in the basic T53-L-11 engine envelope mounting and connection points and with a 6-percent increase in basic engine weight.

The performance gain is accomplished thermodynamically by the mechanical integration of a modified axial compressor, a two-stage compressor turbine and a two-stage power turbine into the T53-L-11 engine configuration.

Replacement of the first two compressor stators and changing of the first two stages of compressor rotor blades and disks results in an approximate 20-percent increase in mass air flow through the engine. This is accomplished without the use of inlet guide vanes.

An inlet flow fence, located on the outer wall of the inlet housing in the area of the previously used inlet guide vanes, provides the desired inlet conditions for the transonic compressor during acceleration at low speeds. At compressor speeds up to 70 percent, the fence is in the extended position. Above 70 percent, the flow fence is retracted into the outer wall of the inlet housing. Similar to a piston ring, the circumference of the flow fence is changed by the action of a piston actuator powered by compressor discharge pressure.

The specification for this engine allows the use of JP-4 or JP-5 type fuel for satisfactory operation throughout the engine's operating envelope. During this program, JP-4 fuel was used.

Engine Power Control System

The fuel control for the T53-L-13 engine is a hydro-mechanical type of fuel control. It consists of the following main units:

a. Dual-element fuel pump.

b. Gas producer speed governor.

c. Power turbine speed topping governor.

d. Acceleration and deceleration control.

e. Fuel shut-off valve.

f. Transient air bleed control.

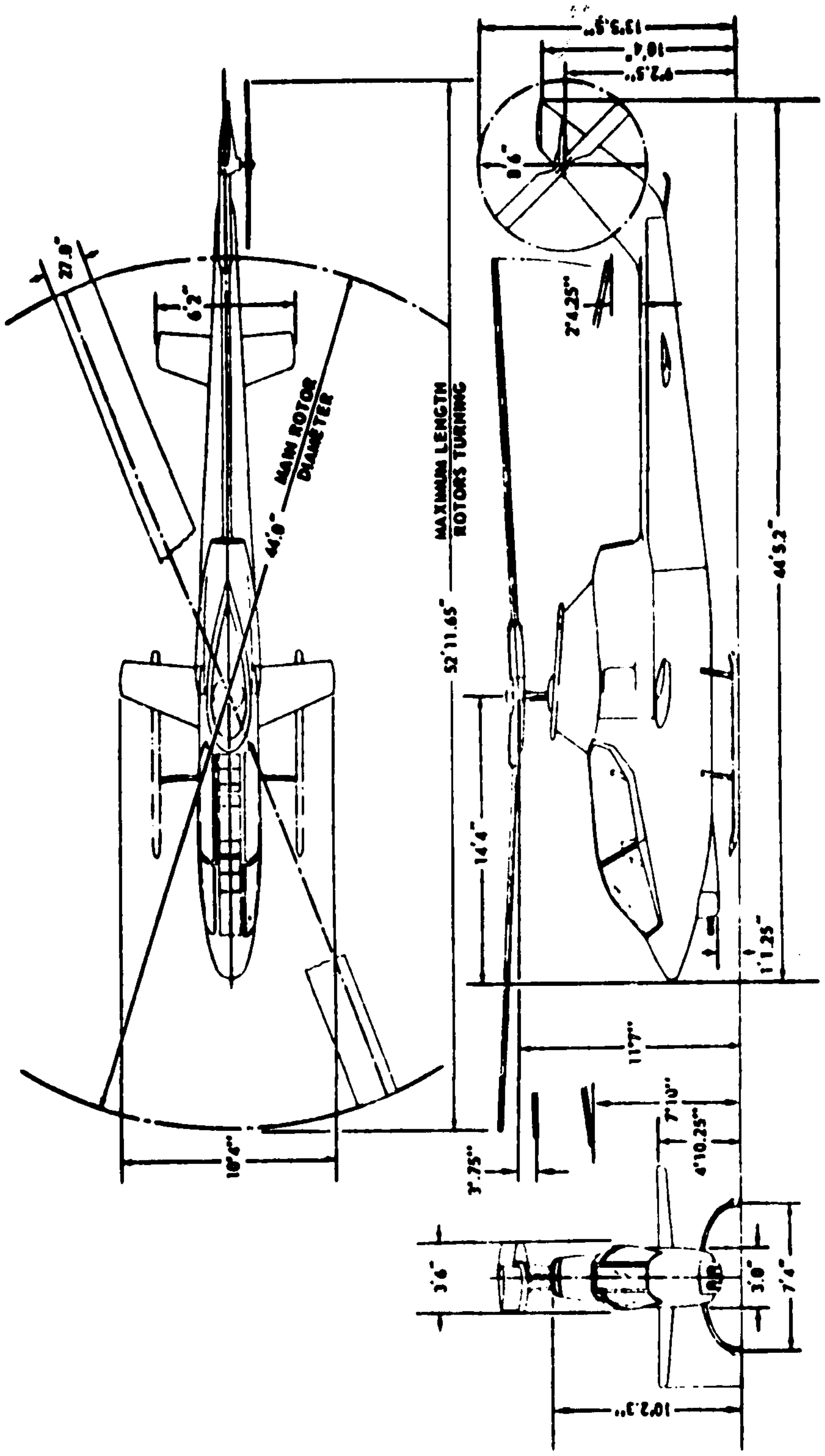
An air bleed control is incorporated within the fuel control to provide for opening and closing the compressor interstage air bleed in response to the following signals present in the power control:

a. Gas producer speed.

b. Compressor inlet air temperature.

c. Fuel flow.

The fuel control is designed to be operated either automatically or in an emergency mode. In the emergency position, fuel flow is terminated to the main metering valve and is routed to the manual (emergency) metering and dump valve assembly. While in the emergency mode, fuel flow to the engine is controlled by the position of the manual metering valve which is directly connected to the power control (twist grip). During the emergency operation, there is no automatic control of fuel flow during acceleration and deceleration; thus, EGT and engine acceleration must be pilot-monitored.



Three-view drawing - AH-1G

BASIC AIRCRAFT INFORMATION

Airframe Data

Overall length (rotor turning)	637.2 inches
Overall width (rotor trailing)	124.0 inches
Center line of main rotor to center line of tail rotor	320.7 inches
Center line of main rotor to elevator hinge line	198.6 inches
Elevator area (total)	15.2 square feet
Elevator area (both panels)	10.9 square feet
Elevator airfoil section	Inverted Clark Y
Vertical stabilizer area	18.5 square feet
Vertical stabilizer airfoil section	Special camber
Vertical stabilizer aerodynamic center	FS 499.0
Wing area:	
Total	27.8 square feet
Outboard of BL 18.0 (both sides)	18.5 square feet
Wing span	10.33 feet
Wing airfoil section:	
Root	NACA 0030
Tip	NACA 0024
Wing angle of incidence	14 degrees

Main Rotor Data

Number of blades	2
Diameter	44 feet
Disc area	1520.5 square feet
Blade chord	27 inches
Rotor solidity	0.0651
Blade area (both blades)	99 square feet
Blade airfoil	9.33 percent symm special section
Linear blade twist	-0.455 deg/ft
Hub precone angle	2.75 degrees
Main rotor inertia	2900 slugs-ft^2

Antitorque Rotor Data

Number of blades	2
Diameter	8.5 feet
Disc area	56.74 square feet
Blade chord	8.41 inches
Rotor solidity	0.105
Blade airfoil	NACA 0010 modified
Blade twist	Zero degrees

For this test, the AH-1G with skid gear fairings removed: same as standard configurations (Normal limit for operational use: 160 KCAS)

All other configurations: 190 KCAS below a 4000-foot density altitude; decrease 8 KCAS per 1000 feet above 4000 feet

Gross Weight/Center of Gravity Envelope

Forward center of gravity limit: Below 7000 pounds, FS 190.0; linear increase to FS 192.1 at 9500 pounds

Aft center of gravity limit: Below 8270 pounds, FS 201.0; linear decrease to FS 200 at 9500 pounds

Sideslip Limits

Five degrees at V_L with linear increase to 20 degrees at 60 KCAS

Rotor and Engine Speed Limits (Steady State)

Power on:	
Engine rpm	6400 to 6600
Rotor rpm	314 to 324
Power off:	
Rotor rpm	294 to 339
Rotor rpm transient lower limit	250
Power on during dives and maneuvers:	
Rotor rpm	314 to 324

Temperature and Pressure Limits

Engine oil temperature	93°C
Transmission oil temperature	110°C
Engine oil pressure	25 to 100 psi
Transmission oil pressure	30 to 70 psi
Fuel pressure	5 to 20 psi

T53-L-13 Engine Limits

Normal rated EGT (maximum continuous)	625°C
Military rated EGT (30-minute limit)	645°C
Starting and acceleration EGT (5-second limit)	675°C
Maximum EGT for starting and acceleration	760°C
Torque pressure limit	50 psi

Transmission Drive System Ratios

Engine to main rotor	20.383:1.0
Engine to antitorque rotor	3.990:1.0
Engine to antitorque drive system	1.535:1.0

Test Aircraft (S/N 6615247) Control Displacements

Longitudinal cyclic control: Full forward to full aft with SCAS nulled	9.07 inches
Lateral cyclic control: Full left to full right with SCAS nulled	10.00 inches
Directional (pedal) control: Full left to full right with SCAS nulled	7.07 inches
Collective control: Full up to full down with SCAS nulled	9.30 inches

Test Aircraft (S/N 6615247) SCAS Authority

Longitudinal SCAS authority:
±12.5 percent or ±1.13 inches of longitudinal cyclic control displacement

Lateral SCAS authority:
±12.5 percent or ±1.25 inches of lateral cyclic control displacement

Directional SCAS authority:
±12.5 percent or ±0.88 inch of directional (pedal) control displacement

Test Aircraft (S/N 6715695) Control Displacements

Longitudinal cyclic control: Full forward to full aft with SCAS nulled	10.08 inches
Lateral cyclic control: Full left to full right with SCAS nulled	9.90 inches
Directional (pedal) control: Full left to full right with SCAS nulled	5.97 inches
Collective control: Full up to full down with SCAS nulled	8.98 inches

Test Aircraft (S/N 6715695) SCAS Authority

Longitudinal SCAS authority:
±12.5 percent or ±1.26 inches of longitudinal cyclic control displacement

Lateral SCAS authority:
±12.5 percent or ±1.24 inches of lateral cyclic control displacement

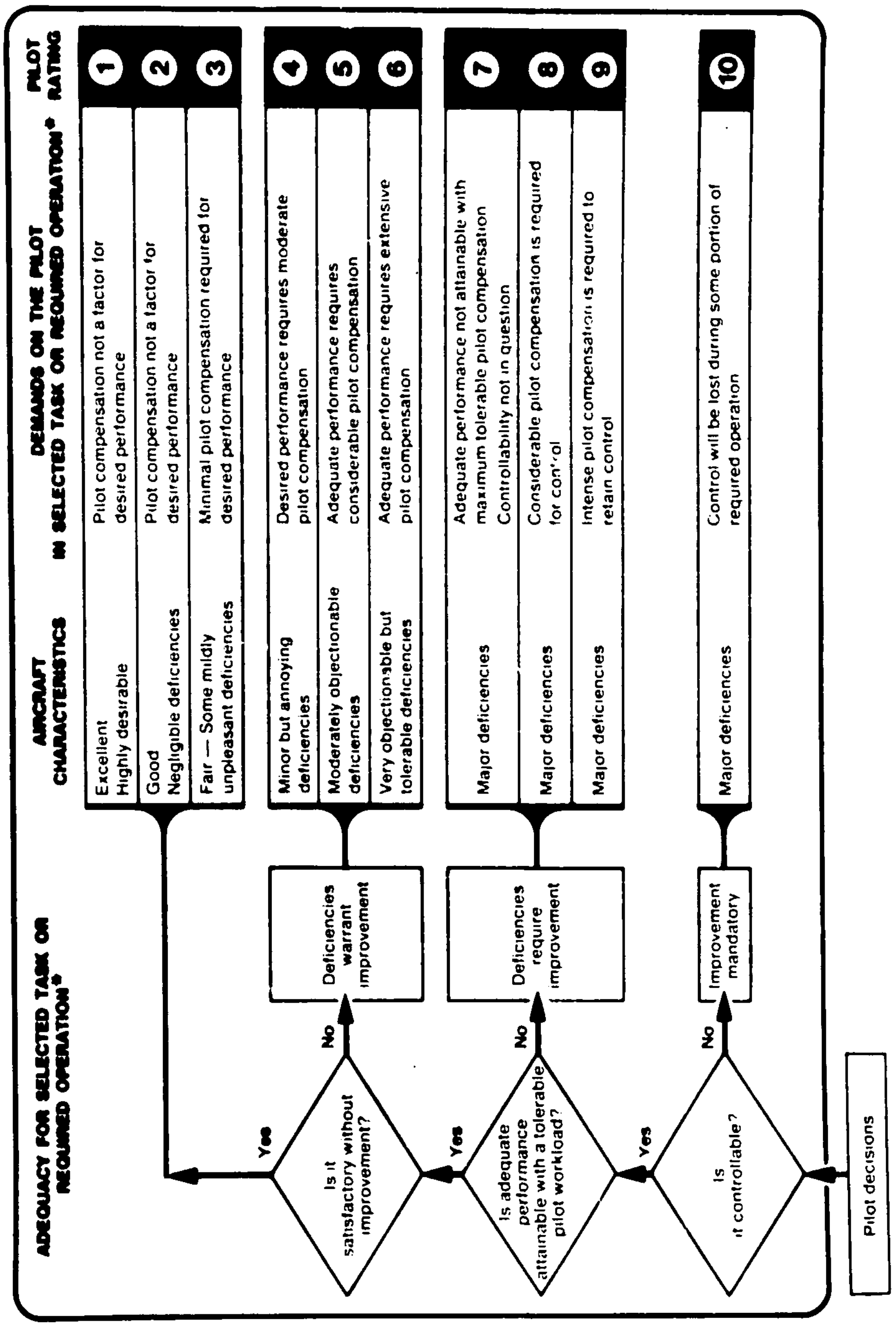
Directional SCAS authority:
±12.5 percent or ±0.75 inch of directional (pedal) control displacement

OPERATING LIMITATIONS

Limit Airspeed (V_L)

Any configuration with XM159 rocket pods: 180 KCAS below a 3000-foot density altitude; decrease 8 KCAS per 1000 feet above 3000 feet

APPENDIX III. HANDLING QUALITIES RATING SCALE



AIRCRAFT CHARACTERISTICS	DEMANDS ON THE PILOT IN SELECTED TASK OR REQUIRED OPERATION*	PILOT RATING
Excellent Highly desirable	Pilot compensation not a factor for desired performance	1
Good Negligible deficiencies	Pilot compensation not a factor for desired performance	2
Fair — Some mildly unpleasant deficiencies	Minimal pilot compensation required for desired performance	3
Minor but annoying deficiencies	Desired performance requires moderate pilot compensation	4
Moderately objectionable deficiencies	Adequate performance requires considerable pilot compensation	5
Very objectionable but tolerable deficiencies	Adequate performance requires extensive pilot compensation	6
Major deficiencies	Adequate performance not attainable with maximum tolerable pilot compensation Controllability not in question	7
Major deficiencies	Considerable pilot compensation is required for control	8
Major deficiencies	Intense pilot compensation is required to retain control	9
Major deficiencies	Control will be lost during some portion of required operation	10

APPENDIX IV. TEST TECHNIQUES AND DATA REDUCTION PROCEDURES

INTRODUCTION

Nondimensional Method

1. Tests were flown at different combinations of gross weight and density altitude to determine if variation in these parameters caused a change in handling qualities. Correlation of these data were accomplished by summarizing the data as a function of main rotor thrust coefficient where applicable. Each individual test flight was flown at a constant main rotor thrust coefficient (C_T). A constant C_T was maintained by either increasing altitude as fuel was consumed (for flights conducted at altitude) or adding ballast to the aircraft as fuel was consumed (for flights conducted in ground effect). The equation used to determine the nondimensional main rotor thrust coefficient was:

$$\text{Thrust coefficient} = C_T = \frac{\text{GRWT}}{\rho A (\Omega R)^2} \qquad (1)$$

Instrumentation

2. All instrumentation in both aircraft was calibrated prior to commencing the test program. All quantitative data obtained during this flight test program were derived from special sensitive instrumentation. A detailed tabulation of the instrumentation is given in appendix V. Data were obtained from four aircraft sources and two ground support sources. The aircraft sources were: oscillograph, photopanel, pilot's panel (hand recorded), and engineer's panel (hand recorded). The ground support sources were: ground station and ground speed reference vehicle.

Weight and Balance

3. A high degree of control was maintained on weight and balance of the test helicopter. Variations in empty weight and cg, because of changes in helicopter component instrumentation, were defined by periodically weighing the helicopter.

4. The empty weight of test aircraft, S/N 615247, in the clean configuration without instrumentation installed could not be determined since the aircraft was partially instrumented when it was delivered to USAASTA at the beginning of the program. In addition, the aircraft

was not a production model and was not representative of a standard AH-1G. The empty weight of test aircraft, S/N 715695, in the clean configuration without instrumentation installed was 5805 pounds, and the longitudinal cg was 201.4 inches. This aircraft is considered to be representative of the production model aircraft. This weighing was performed with following conditions prevailing: engine and transmissions full of oil, trapped fuel not drained, ammunition boxes with covers and ammunition chutes installed for chin turret, four wing store pylon stations installed, air conditioning system not installed and weight and center of gravity adjusted for removal of jack pads. The fuel load of the aircraft was defined by measuring the fuel specific gravity and temperature after each fueling and by using an external sight gage on the calibrated fuel cell to determine fuel volume. Fuel used in flight was recorded by a calibrated fuel-used system, and the results were cross-checked with the sight gage reading following each flight. Helicopter loading and cg were controlled by using ballast.

Flight Control Systems

5. Control breakout forces, control force gradients and control force friction band were measured on the ground with the rotor in a static position. Hydraulic pressure and electrical power were supplied by ground support equipment during these tests. Breakout forces and control force characteristics were determined by using an electrical strain gage bridge mounted in the appropriate location on each control. The control was displaced from the trim condition at a rate of 0.1 to 0.2 inch/second. A continuous record of control position and control force was made during the test. The breakout forces and control force friction band were also checked during flight.

STATIC STABILITY CHARACTERISTICS

Static Trim Stability

6. The static trim stability was investigated using the following technique. The helicopter was trimmed at various airspeeds (minimum of 5 points) over an airspeed range. The range of the airspeed flown for each flight condition depended on density altitude, gross weight and cg. While the aircraft was stabilized at each trim airspeed, all control forces, control positions and aircraft attitudes were recorded. Altitude was varied during each test flight to maintain a constant thrust coefficient for each trim airspeed.

Static Longitudinal Collective-Fixed Stability

7. The static longitudinal collective-fixed stability was investigated using the following method. The aircraft was first stabilized at the desired trim conditions. The helicopter was then stabilized at several airspeeds greater and less than the trim airspeed in ascending or descending flight. The airspeed was then varied by use of the longitudinal control. The trim collective control position, control trim force position and trim engine power were maintained as airspeed was varied about each trim airspeed. At each stabilized point the control positions, control forces and aircraft attitudes were recorded. Altitude was varied as fuel was consumed during each test flight to maintain a constant thrust coefficient for each trim airspeed.

Static Directional Stability and Effective Dihedral

8. The static directional stability and effective dihedral tests were conducted using the following technique. The aircraft was first stabilized at a trim airspeed at or near zero angle of sideslip. Sideslip angle was then varied and stabilized at different values (left or right of trim) until the limits of the sideslip envelope were achieved. The trim collective control position, control trim force position and trim airspeed were held constant as angle of sideslip was varied about each trim condition. At each stabilized point control positions, control forces and attitudes were recorded. Altitude was varied as fuel was consumed during each test flight to maintain a constant thrust coefficient for each trim airspeed.

Translational Flight Handling Qualities Evaluation

9. The translational handling qualities were investigated by conducting tests at various combinations of wind azimuth and airspeed. When the aircraft was stabilized in translational flight, parameters necessary to determine gross weight, ambient air conditions, azimuth, airspeed and directional control (pedal) with SCAS in nulled position were recorded. A ground vehicle with a calibrated speedometer was used as a reference when attempting to stabilize the helicopter at the desired airspeed and azimuth. Ambient wind velocity and direction were incorporated into the analysis when determining the airspeed and wind azimuth. Tests were conducted with wind velocities less than 4 knots. A constant thrust coefficient was maintained for each test condition by adding ballast as fuel was consumed.

Dynamic Stability

10. Dynamic stability characteristics of the AH-1G were tested by using the following techniques. The aircraft was first trimmed at the desired flight condition and airspeed. Gust disturbances were then simulated by making pulse-type control inputs of 1 inch for 0.5 to 1.0 second. The control was then returned to trim at which time all controls were held fixed until the aircraft motions damped out or recovery action was required. All resulting aircraft motions, as well as the control input, were recorded on the oscillograph. Altitude was varied as fuel was consumed during each test flight to maintain a constant thrust coefficient for each trim airspeed. Oscillations were evaluated by determining the resultant damping ratio and damped natural frequency. Times for the aircraft oscillations to damp were obtained from the timing lines on the oscillograph. The damped natural frequency and the damping ratio were derived for all conditions tested by two methods. These were the logarithmic decrement method and time ratio method.

11. The logarithmic decrement method was used for lightly damped to unstable aircraft motion. The range of damping ratios determined by this method was from -0.5 to +0.5. The damping ratio is a function of the amplitude and the damped natural frequency is a function of the period.

$$\ln \frac{X_m}{X_o} = - \frac{\pi m \zeta}{\sqrt{1 - \zeta^2}} \qquad (2)$$

$$\omega_d = \frac{2\pi}{P} \qquad (3)$$

12. The time ratio method was used to analyze the heavily damped aircraft motion which was usually characterized by one excursion from trim. The range of damping ratios determined by this method was from 0.5 to 1.8. Anything more heavily damped than 1.8 was considered "deadbeat," and no accurate means was available to determine either damping ratio or undamped natural frequency. When using the time ratio method, the undamped natural frequency was determined by the damping ratio and the damped natural frequency by means of the following formula:

$$\omega_d = \omega_n \sqrt{1 - \zeta^2} \quad (0<\zeta<1) \tag{4}$$

$$\omega_d = \omega_n \sqrt{\zeta^2 - 1} \quad (\zeta>1) \tag{5}$$

13. Each flight condition was given a description as far as the kind of damping characteristic that it represented. These descriptions along with the damping ratio range are listed below:

Description	Damping Ratio Range
Negatively damped	$\zeta < 0$
Neutrally damped	$\zeta = 0$
Lightly damped	$\zeta = 0.1$ to 0.4
Heavily damped	$\zeta = 0.5$ to 1.8
Dead beat	$\zeta > 1.8$

Controllability

14. Aircraft controllability characteristics were investigated using the following technique. The aircraft was first stabilized at the desired flight condition and airspeed. Step-type control inputs were then initiated and held until the maximum rate was reached or recovery action was necessary. The magnitude of these step-type control inputs was varied (usually a minimum of 2 inputs in each direction) until a maximum control displacement of approximately 1.0 inch was realized. An adjustable, rigid control fixture was used to assist in achieving the desired inputs. Resultant aircraft motions as well as the control input were recorded on the oscillograph. The maximum angular accelerations were derived by differentiating the rate trace at the inflexion point.

Airspeed Calibration

15. The test airspeed indicator system (boom) and standard airspeed system were calibrated by comparing readings to a known reference. A calibrated trailing bomb was suspended from the helicopter with a cable approximately 50 feet in length. The aircraft was then stabilized at various airspeeds in level flight, climb and autorotation. By comparing the airspeed, corrected for instrument errors, of both systems to the bomb system, the error was defined.

16. The test boom airspeed indicator system was calibrated at higher airspeeds, both in level flight and dive using a T-28 pacer aircraft. The test and pacer aircraft were stabilized at the same airspeed, and data were recorded in each aircraft simultaneously. Since the position error of the pacer was known, the calibrated airspeed of the aircraft was readily computed.

17. The test boom airspeed indicator system was calibrated in level flight over a measured ground course. Two passes were flown on reciprocal headings at each airspeed to average wind effects. This method provided a cross-check on the trailing bomb method described in paragraph 15.

18. The test airspeed system consisted of a boom with a non-swiveling pitot-static head mounted just aft and below the nose of the aircraft. This pitot-static system was connected to the sensitive airspeed and altimeter indicators on various instrument panels. This system was used in place of the standard pitot-static system since the standard system was not accurate when both systems were installed on the aircraft.

APPENDIX V. TEST INSTRUMENTATION

USA S/N 6715695

All instrumentation was installed in the test helicopter prior to the start of the test program. This instrumentation provided data from three sources: pilot panel, copilot/engineer panel and a 50-channel oscillograph. All instrumentation was calibrated. The flight test instrumentation was installed and maintained by the Instrumentation Branch, Logistics Division, USAASTA. The following test parameters were presented.

Pilot Panel

(Boom system) airspeed
(Boom system) altitude
Rate of climb
Rotor speed
Gas producer speed
(Standard system) torque pressure
Longitudinal control position
Lateral control position
Pedal control position
Collective control position
Center of gravity normal acceleration
Angle of sideslip

Photo 1. Pilot Panel for Aircraft S/N 6715695

Engineer Panel

(Boom system) airspeed
(Boom system) altitude
Outside air temperature
Rotor speed
Fuel used total
Oscillograph correlation counter

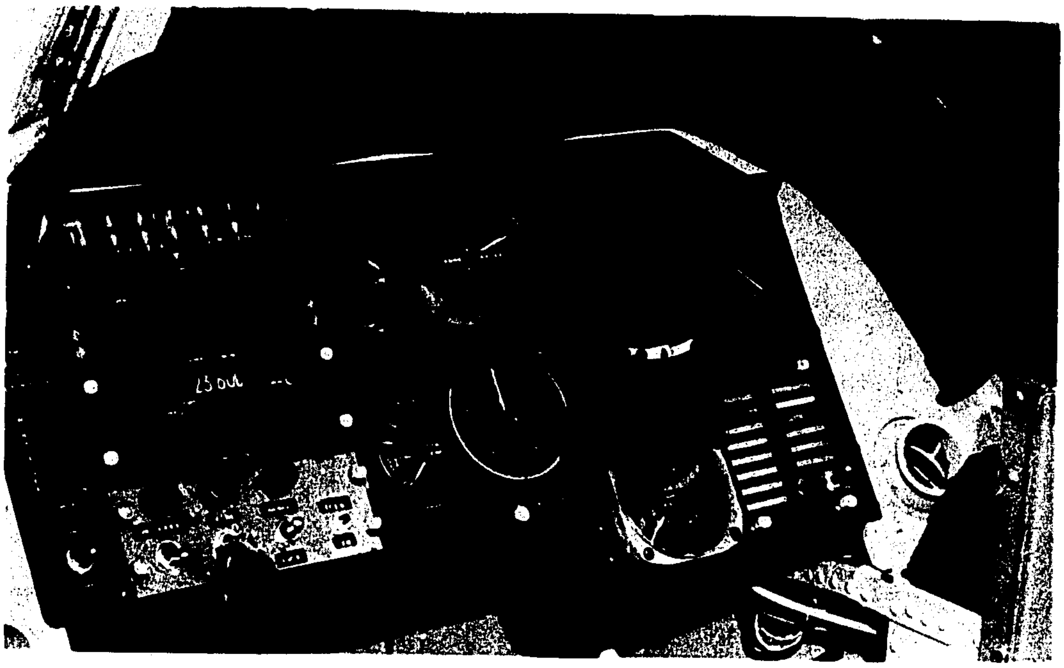


Photo 2. Engineer Panel for Aircraft S/N 6715695.

Oscillograph

Longitudinal control position
Lateral control position
Directional control position
Collective control position
Pitch attitude
Roll attitude
Yaw attitude
Pitch rate
Roll rate
Yaw rate
Angle of attack
Angle of sideslip
CG normal acceleration
Longitudinal SCAS position
Lateral SCAS position
Directional SCAS position
Rotor blip
Lateral and vertical vibration sensors (pilot seat)
Lateral and vertical vibration sensors (copilot/gunner seat)
Lateral and vertical vibration sensors (copilot/gunner site mounting)
Pilot event
Engineer event

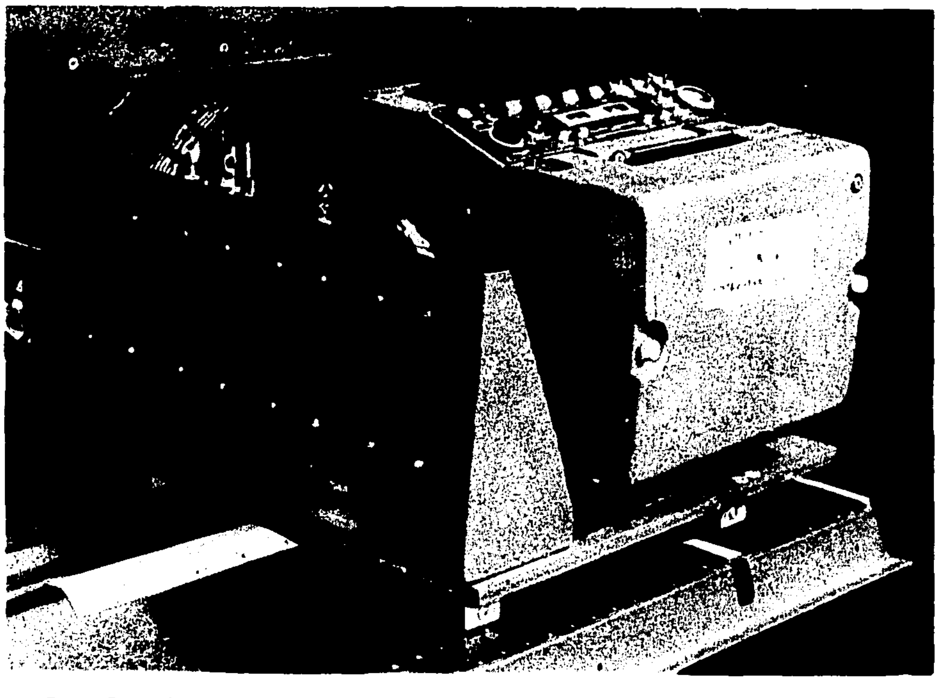


Photo 3. 50-Channel Oscillograph Installed in Aircraft S/N 6715695.

USA S/N 6615247

Flight test instrumentation was installed in the test helicopter prior to the start of this evaluation. This instrumentation provided data from four sources: pilot panel, copilot/engineer panel, photopanel and a 24-channel oscillograph. All instrumentation was calibrated. Some of the instrumentation was used for only a portion of the test program. The flight test instrumentation was installed and maintained by the Instrumentation Branch, Logistics Division, USAASTA. The following test parameters were presented:

Pilot Panel

(Standard system) airspeed
(Boom system) airspeed
(Boom system) altitude
Rate of climb
Gas producer speed
(Standard system) torque pressure
Exhaust gas temperature
Longitudinal control position
Lateral control position
Pedal control position
Collective control position
CG normal acceleration
Angle of sideslip

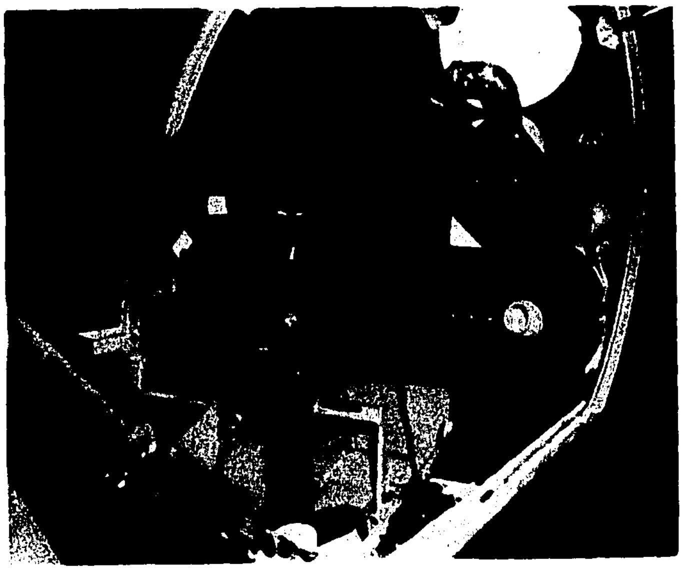


Photo 4. Pilot Panel for Aircraft S/N 6615247.

Engineer Panel

(Boom system) altitude
Outside air temperature
Rotor speed
Gas producer speed
Fuel used total
Torque pressure (high)
Torque pressure (low)
Exhaust gas temperature
Oscillograph correlation counter
Photopanel correlation counter
Fuel temperature
Engine fuel flow

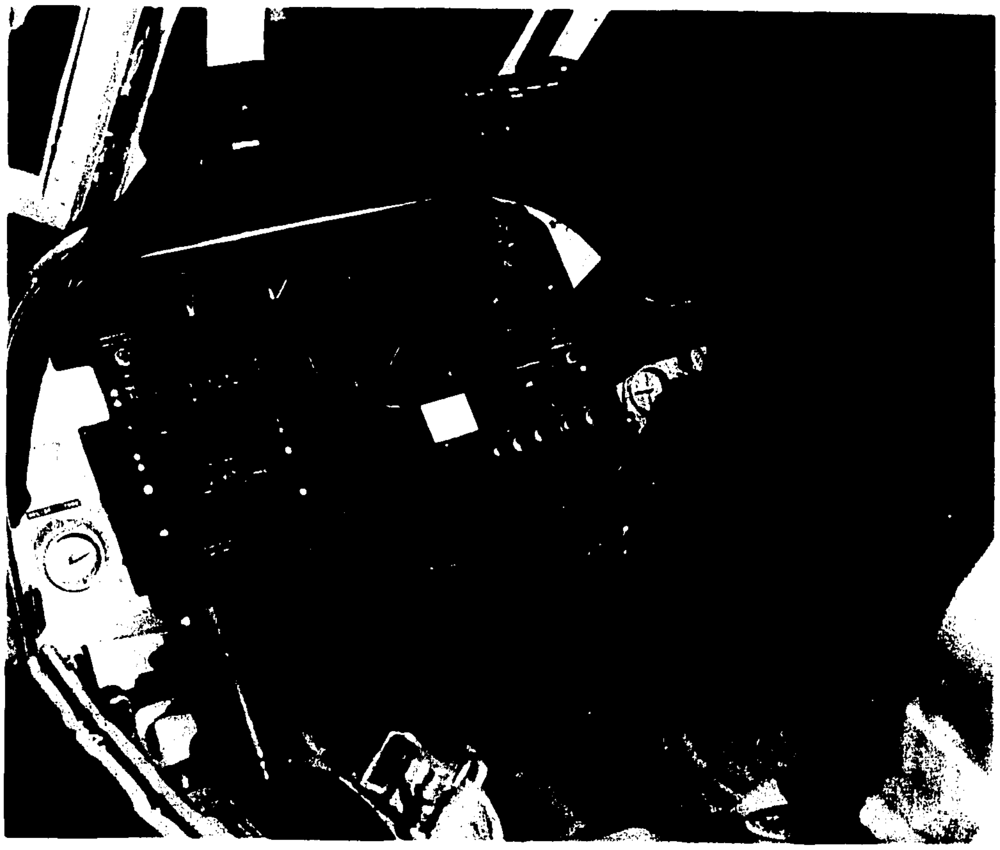


Photo 5. Engineer Panel for Aircraft S/N 6615247.

Photopanel

(Boom system) airspeed
(Standard system) airspeed
(Boom system) altitude
Rotor speed
Gas producer speed
Fuel used total
Torque pressure (high)
Torque pressure (low)
Exhaust gas temperature
Compressor inlet temperature
Compressor inlet total pressure
Inlet guide vane position
Bleed band position (light)
Fuel pressure at nozzle
Time (10-second stopwatch)
Oscillograph correlation counter
Photopanel correlation counter
Engineer event
Pilot event

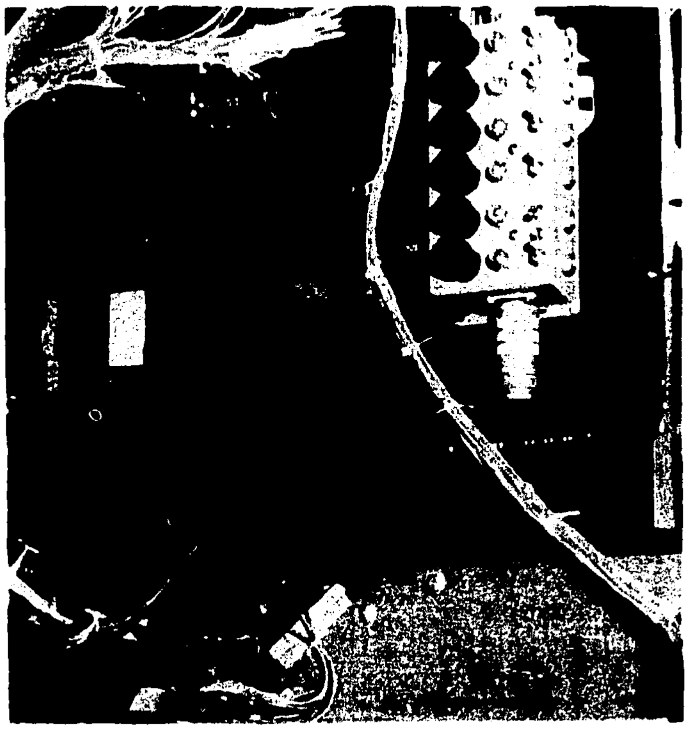


Photo 6. Photopanel Installed in Aircraft S/N 6615247.

Oscillograph

Longitudinal control position
Lateral control position
Directional control position
Collective control position
Pitch attitude
Roll attitude
Yaw attitude
Pitch rate
Roll rate
Yaw rate
CG normal acceleration
Angle of sideslip
Angle of attack
Tail rotor torque
Main rotor flapping angle
Linear rotor speed
Photopanel correlation blip
Engineer event
Pilot event

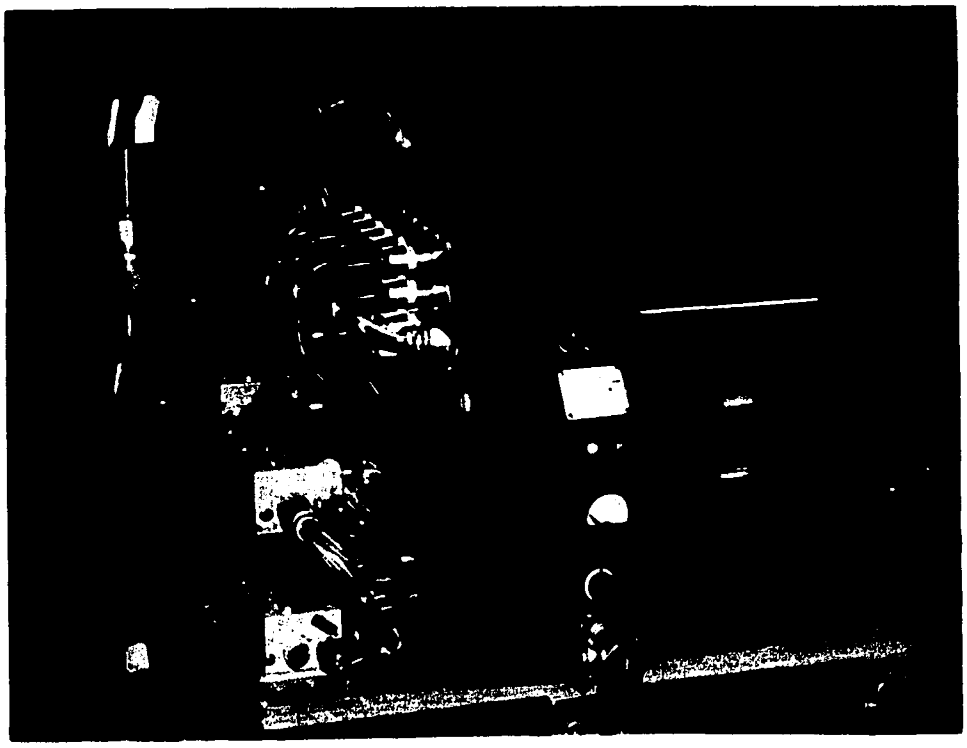


Photo 7. 24-Channel Oscillograph Installed in Aircraft S/N 6615247.

APPENDIX VI. APPROVED HANDLING QUALITIES DEVIATION FROM MIL-H-8501A

1. The model specification states that MIL-H-8501A shall be used as a design guide for the stability and control characteristics for the AH-1G aircraft, except for paragraph 3.6 "Instrument Flight Conditions".

2. The deviations from MIL-H-8501A are presented in the following statements:

Contractor Deviation Number	Model Specification Paragraph Number (ref 13, app I)	Subject
42	3.3.2.1	Cyclic Breakout Force

Requirement: Paragraphs 3.2.4, 3.2.7 and 3.3.11 specifies that the cyclic breakout force shall be not less than 0.5 pounds nor more than 1.5 pounds. Also, the breakout force shall not be greater than the force produced by the trim force gradient in the first inch of stick travel.

Deviation: The breakout force for the pilot cyclic shall be 2.0 ±0.25 pounds.

Reason: The design values of the aircraft cyclic breakout force are such that: (1) to prevent stability augmentation system feedback and (2) cyclic stick flop. The aircraft handling qualities test conducted by ATA pilots have shown that the aircraft performed in accordance with MIL-H-8501 as defined in BHC Specification 209-947-042, Handling Qualities Demonstration.

1	3.3.2.1	Control Characteristics

Requirement: Specification MIL-H-8501 shall be used as a design guide for the stability and control characteristics for this aircraft, except for paragraph 3.6 (Instrument Flight Conditions).

Deviation: Those requirements of MIL-H-8501, paragraph 3.3 pertaining to control continuity shall not be applicable.

Reason: Aerodynamic discontinuities due to airflow pattern affect tail rotor thrust during some phases of sideward and rearward flight. Increased tail rotor rigging to compensate for the disturbance results in over torque of the tail rotor drive system.

APPENDIX VII. TEST DATA

FIGURE No. 1
LONGITUDINAL CYCLIC CONTROL FORCES
AH-1G USA [illegible]

NOTES:
1. ROTOR STATIC AND CYCLIC FRICTION AT A PRESET LEVEL IN ACCORDANCE WITH REF.12 APP I
2. HYDRAULIC AND ELECTRICAL POWER PROVIDED BY GROUND POWER UNITS
4. NO.1 & NO.2 BOOST SYSTEMS ON.
5. SOLID SYMBOL DENOTES TRIM POINT
6. ○ DENOTES COLLECTIVE = 4.40 INCHES FROM FULL DOWN
7. ▽ DENOTES COLLECTIVE = 8.64 INCHES FROM FULL DOWN
8. CONTROL POSITIONS
   LATERAL = 5.11 INCHES FROM FULL LEFT
   DIRECTIONAL = 2.99 INCHES FROM FULL LEFT
9. TOTAL CONTROL DISPLACEMENTS
   LONGITUDINAL = 10.83 INCHES FROM FULL FORWARD
   LATERAL = 9.80 INCHES FROM FULL LEFT
   DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
   COLLECTIVE = 8.98 INCHES FROM FULL DOWN
3. FORCES MEASURED AT CENTER OF GRIP

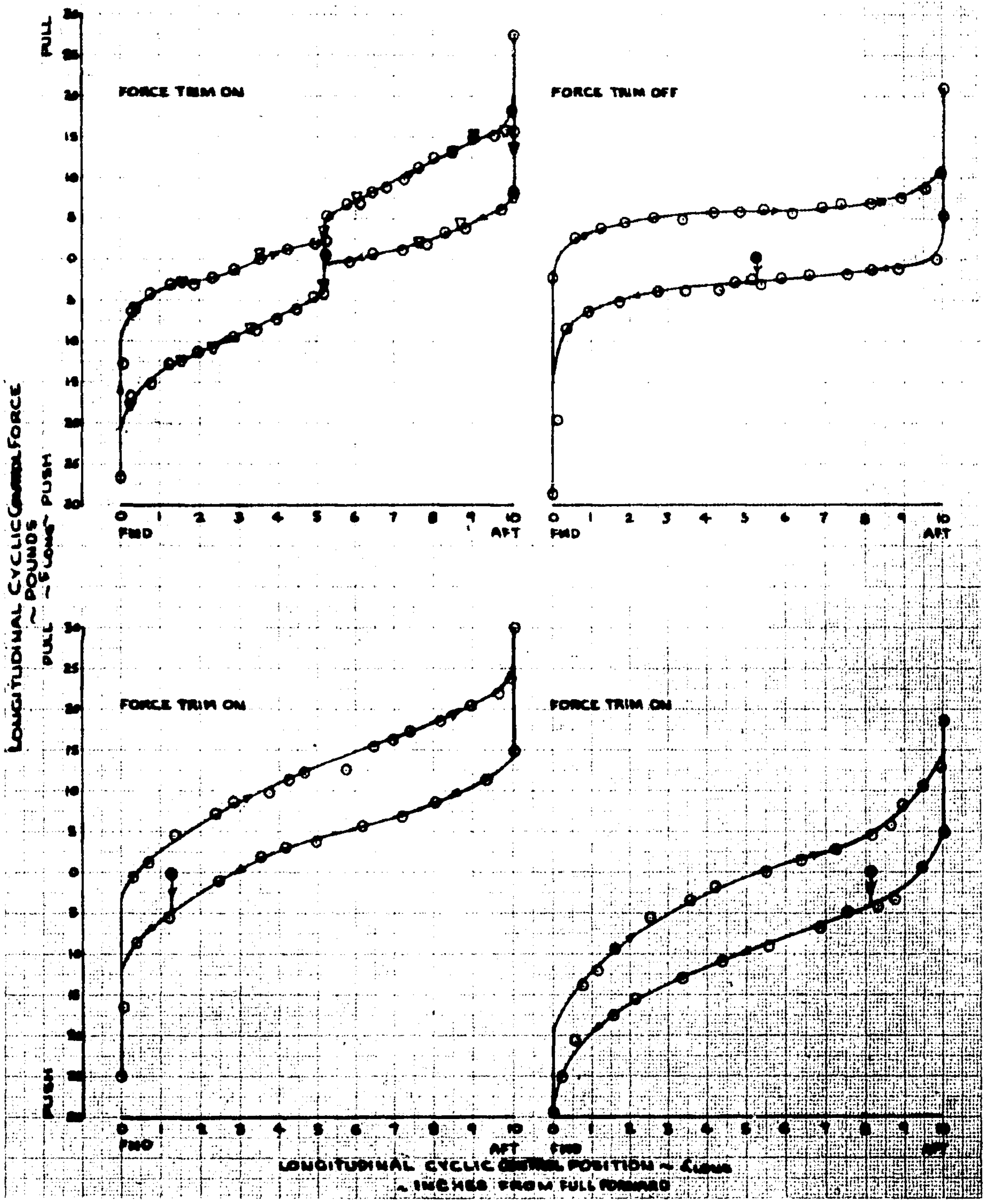


FIGURE No. 2
LATERAL CYCLIC CONTROL FORCES
AH-1G USA S/N 715695

NOTES:
1. ROTOR STATIC AND CYCLIC FRICTION AT A PRESET LEVEL IN ACCORDANCE WITH REF 12 APP I
3. HYDRAULIC AND ELECTRICAL POWER PROVIDED BY GROUND POWER UNITS
4. NO. 1 & NO. 2 BOOST SYSTEMS ON
5. SOLID SYMBOLS DENOTE TRIM POINT
6. O DENOTES COLLECTIVE = 4.61 INCHES FROM FULL DOWN
7. ▽ DENOTES COLLECTIVE = 8.50 INCHES FROM FULL DOWN
8. CONTROL POSITIONS:
   LONGITUDINAL = 4.64 INCHES FROM FULL FWD.
   DIRECTIONAL = 2.99 INCHES FROM FULL LEFT
9. TOTAL CONTROL DISPLACEMENTS:
   LONGITUDINAL = 10.08 INCHES FROM FULL FWD.
   LATERAL = 9.90 INCHES FROM FULL LEFT
   DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
   COLLECTIVE = 8.98 INCHES FROM FULL DOWN
2. FORCES MEASURED AT CENTER OF GRIP

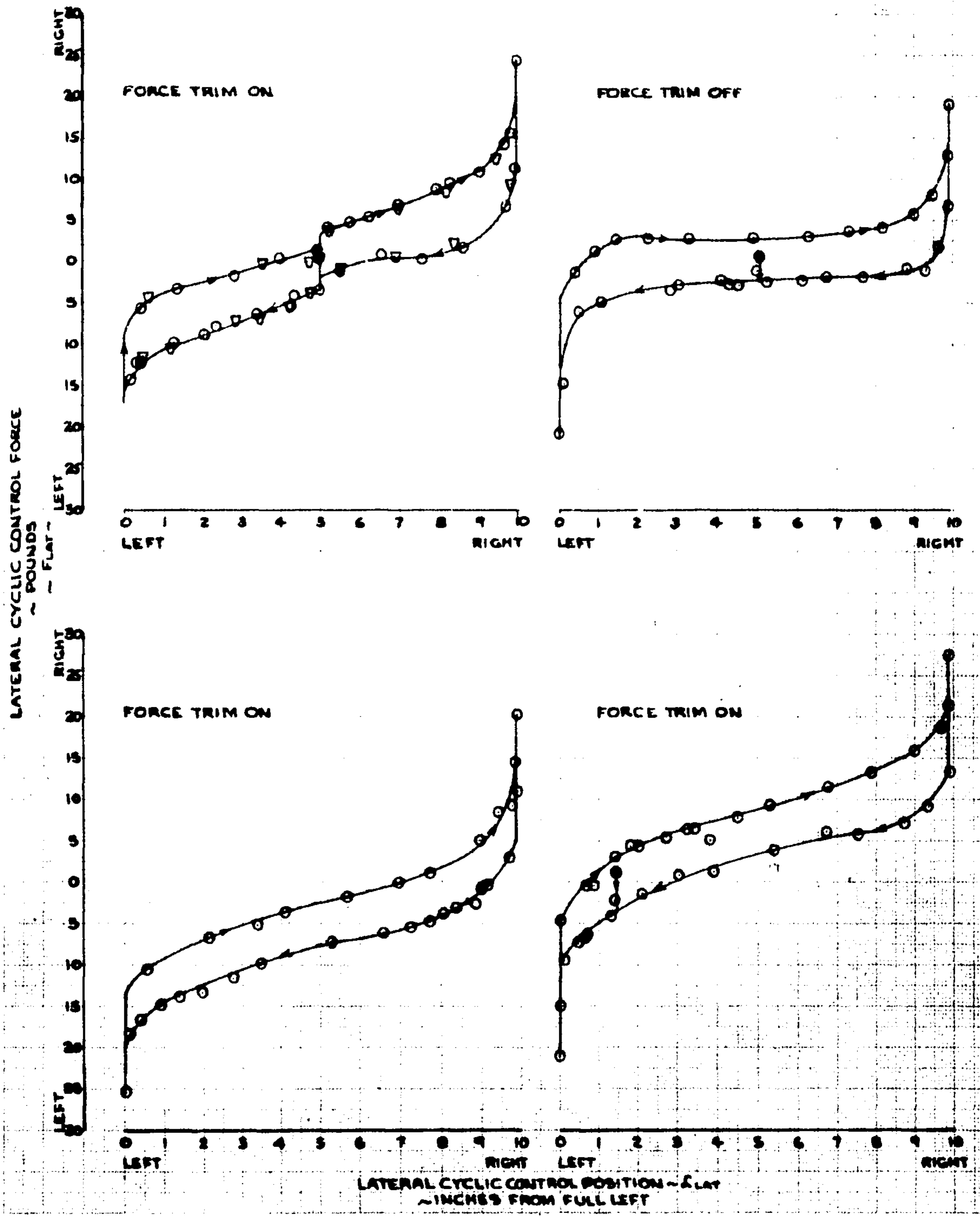


FIGURE NO. 3
DIRECTIONAL CONTROL FORCES
AH-1G USA S/N 715695

NOTES: 1. ROTOR STATIC AND CYCLIC FRICTION AT A
PRESET LEVEL IN ACCORDANCE WITH REF. 12 APP. I
2. HYDRAULIC AND ELECTRICAL POWER PROVIDED
BY GROUND POWER UNITS
4. SOLID SYMBOLS DENOTE TRIM POINT
5. ○ DENOTES COLLECTIVE = 4.61 INCHES
FROM FULL DOWN
6. ▽ DENOTES COLLECTIVE = 8.50 INCHES
FROM FULL DOWN

7. CONTROL POSITIONS:
LONGITUDINAL = 4.64 IN. FROM FULL FWD.
LATERAL = 5.31 IN. FROM FULL LEFT
8. TOTAL CONTROL DISPLACEMENTS:
LONGITUDINAL = 10.03 IN. FROM FULL FWD.
LATERAL = 9.90 IN. FROM FULL LEFT
DIRECTIONAL = 5.97 IN. FROM FULL LEFT
COLLECTIVE = 8.98 IN. FROM FULL DOWN
9. FORCES MEASURED AT THE TOP OF THE PEDAL

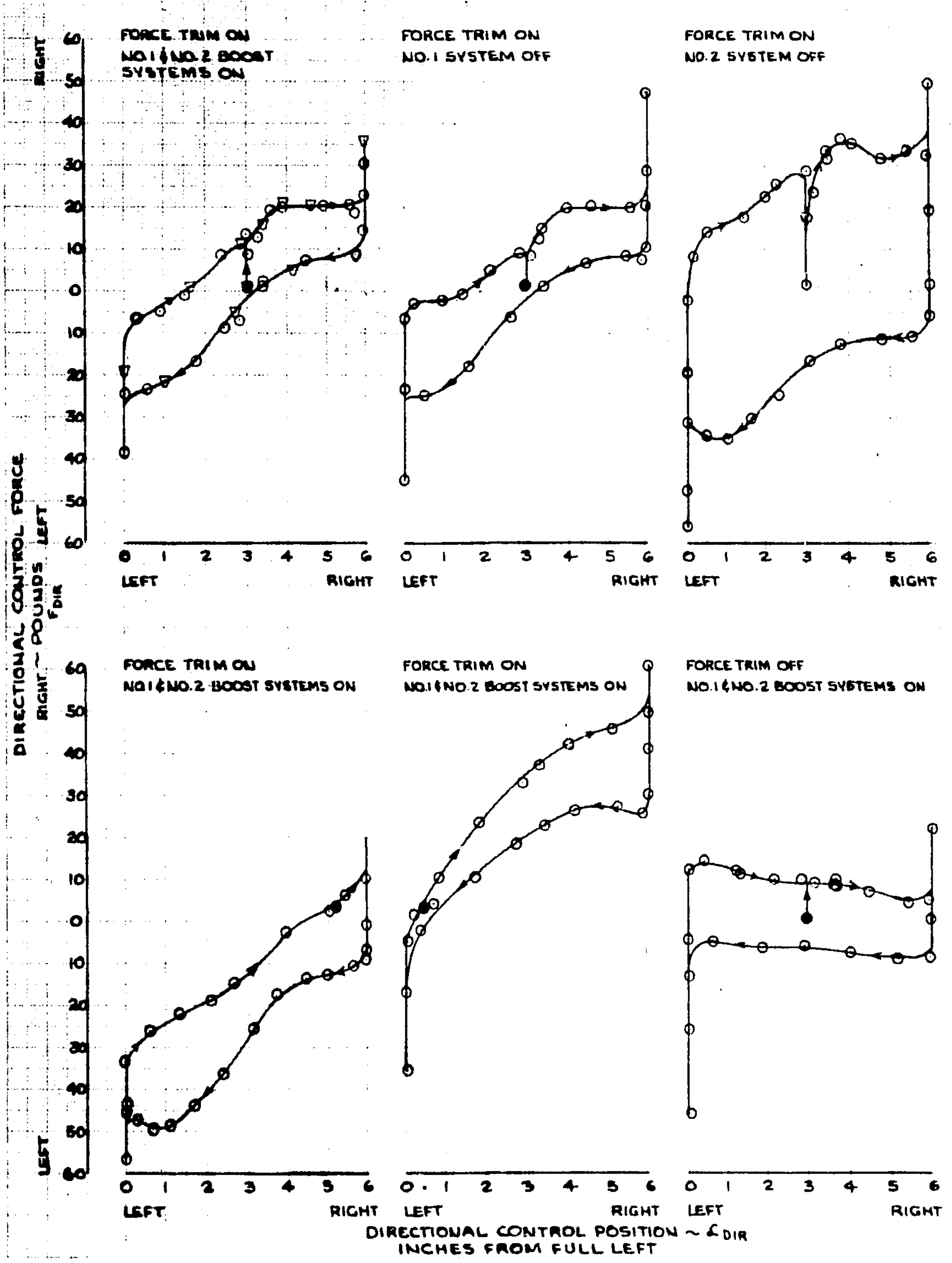


FIGURE NO. 4

CYCLIC PITCH CONTROL PATTERN

AH-1G USA S/N 715695

NOTES: 1. ROTOR STATIC
2. HYDRAULIC AND ELECTRICAL POWER PROVIDED BY GROUND POWER UNITS
3. NO. 1 & NO. 2 BOOST SYSTEMS ON
4. ○ DENOTES COLLECTIVE = 4.64 INCHES FROM FULL DOWN
5. ▽ DENOTES COLLECTIVE = 8.50 INCHES FROM FULL DOWN
6. CONTROL POSITION:
DIRECTIONAL = 2.96 INCHES FROM FULL LEFT
7. TOTAL CONTROL DISPLACEMENTS:
LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

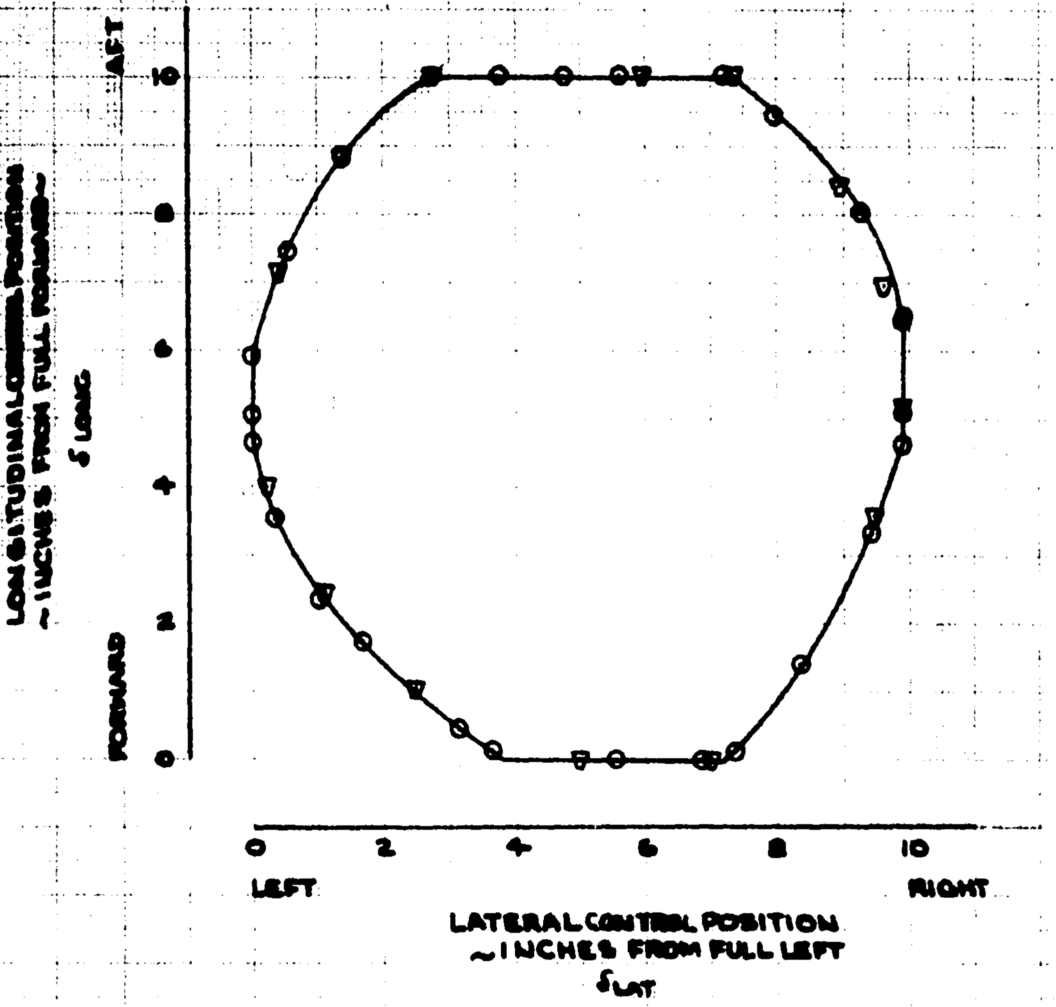


FIGURE NO. 5

SUMMARY OF CONTROL POSITIONS IN FORWARD FLIGHT

AH-1G USA S/N 15695

SYM.	AVG. ALT. H_p~FT.	AVG. GRWT. ~LB	AVG. LONG. C.G.~IN.	ROTOR RPM	CONFIG.	FLT. COND.	THRUST COEFF. ~C_T
○	5360	8530	200.8(AFT)	323.5	HVY. HOG	LEVEL FLT/DIVE	0.004985
△	4590	8460	200.8(AFT)	324.0	CLEAN		0.004807
□	4440	9580	200.0(AFT)	325.0	HVY. HOG		0.005394
◇	4960	8620	191.8(FWD)	324.0	HVY. HOG		0.004961
○	4980	8470	191.4(FWD)	324.0	CLEAN		0.004878
△	3720	8600	200.8(AFT)	324.0	OUTB'D ALT.		0.004712
□	4040	8570	201.0(AFT)	324.5	HVY. SCOUT		0.004671
◇	3500	9555	200.0(AFT)	324.5	HVY. SCOUT		0.005246
▽	6480	9480	200.0(AFT)	325.0	OUTB'D ALT.		0.005650
○	14100	8420	200.9(AFT)	323.0	CLEAN	LEVEL FLT	0.006498
▽	14760	8600	200.7(AFT)	323.0	HVY. HOG		0.006775
○	13800	8410	200.9(AFT)	324.0	OUTB'D ALT.		0.006383

NOTES: 1. POINTS DERIVED FROM FIGURES 9 THROUGH 20 APPENDIX VII

2. POSITIVE LONGITUDINAL STABILITY SIGNIFIES AN INCREASING FORWARD CYCLE REQUIREMENT WITH INCREASING AIRSPEED

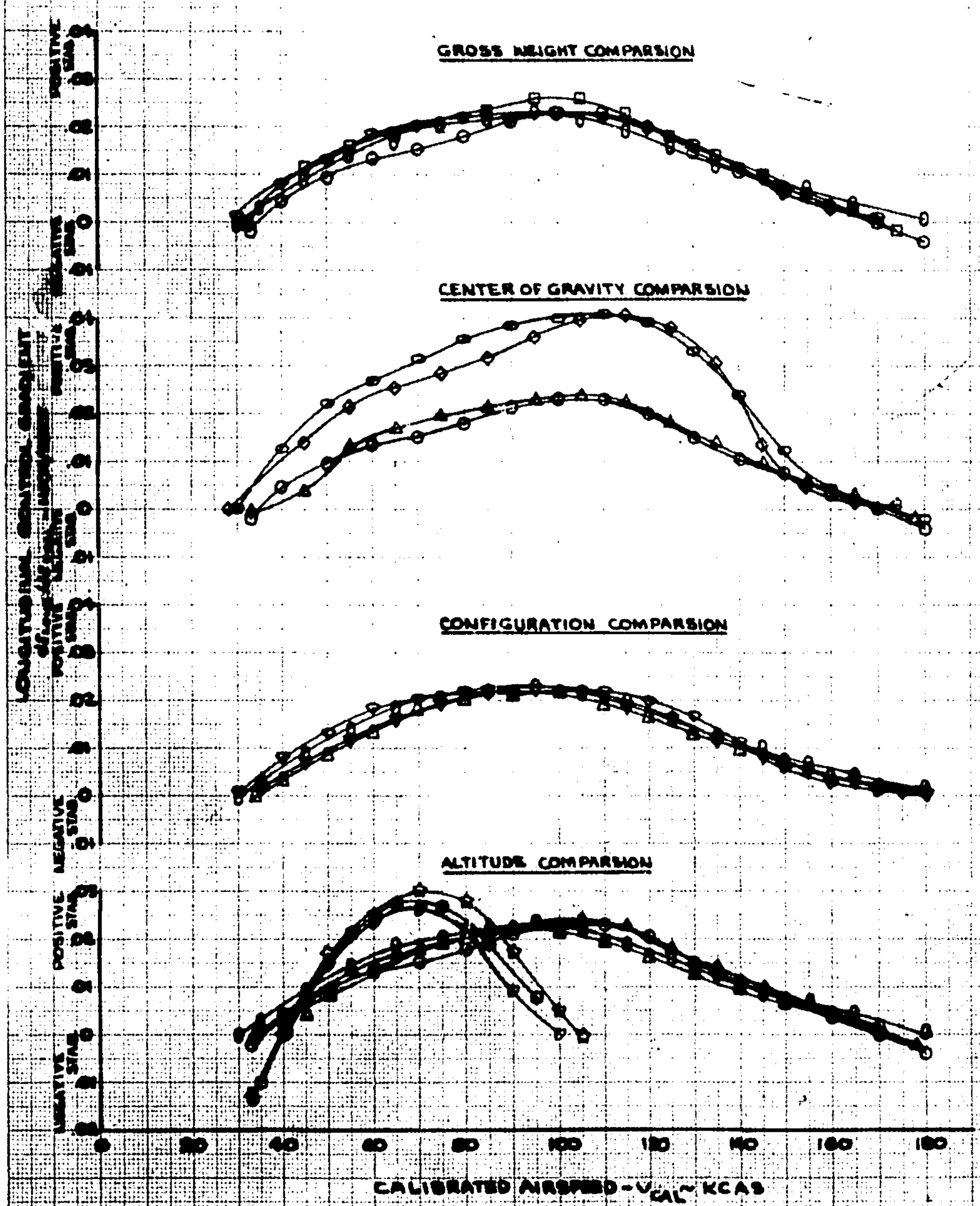


FIGURE NO. 6
SUMMARY OF CONTROL POSITIONS IN CLIMB & AUTOROTATION
AH-1G USA S/N 66-15695

SYM.	AVG. ALT. H_D ~ FT.	AVG. GRWT. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	FLT. COND.	THRUST COEFF. ~ C_T
○	5470	9320	200.2 (AFT)	324.0	HVY. HOG	CLIMB	0.005446
▽	4950	9290	200.1 (AFT)	331.0	↓	AUTO.	0.005121
◇	6000	9280	201.0 (AFT)	324.0	↓	CLIMB	0.004919
D	6920	9310	201.0 (AFT)	320.0	↓	AUTO.	0.005048
△	5660	8350	191.5 (FWD)	324.0	↓	CLIMB	0.004808
○	5770	8340	191.5 (FWD)	324.0	↓	AUTO.	0.004930
△	5470	8170	201.1 (AFT)	323.5	CLEAN	CLIMB	0.004790
⬭	4950	8170	201.1 (AFT)	317.0	↓	AUTO.	0.004910
□	6000	8240	191.2 (FWD)	328.0	↓	CLIMB	0.004778
◇	5000	8290	191.2 (FWD)	329.0	↓	AUTO.	0.004777

NOTES: 1. POINTS DERIVED FROM FIGURES 21 THROUGH 26, APPENDIX III.
2. POSITIVE LONGITUDINAL STABILITY SIGNIFIES AN INCREASING FORWARD CYCLIC REQUIREMENT WITH INCREASING AIRSPEED.

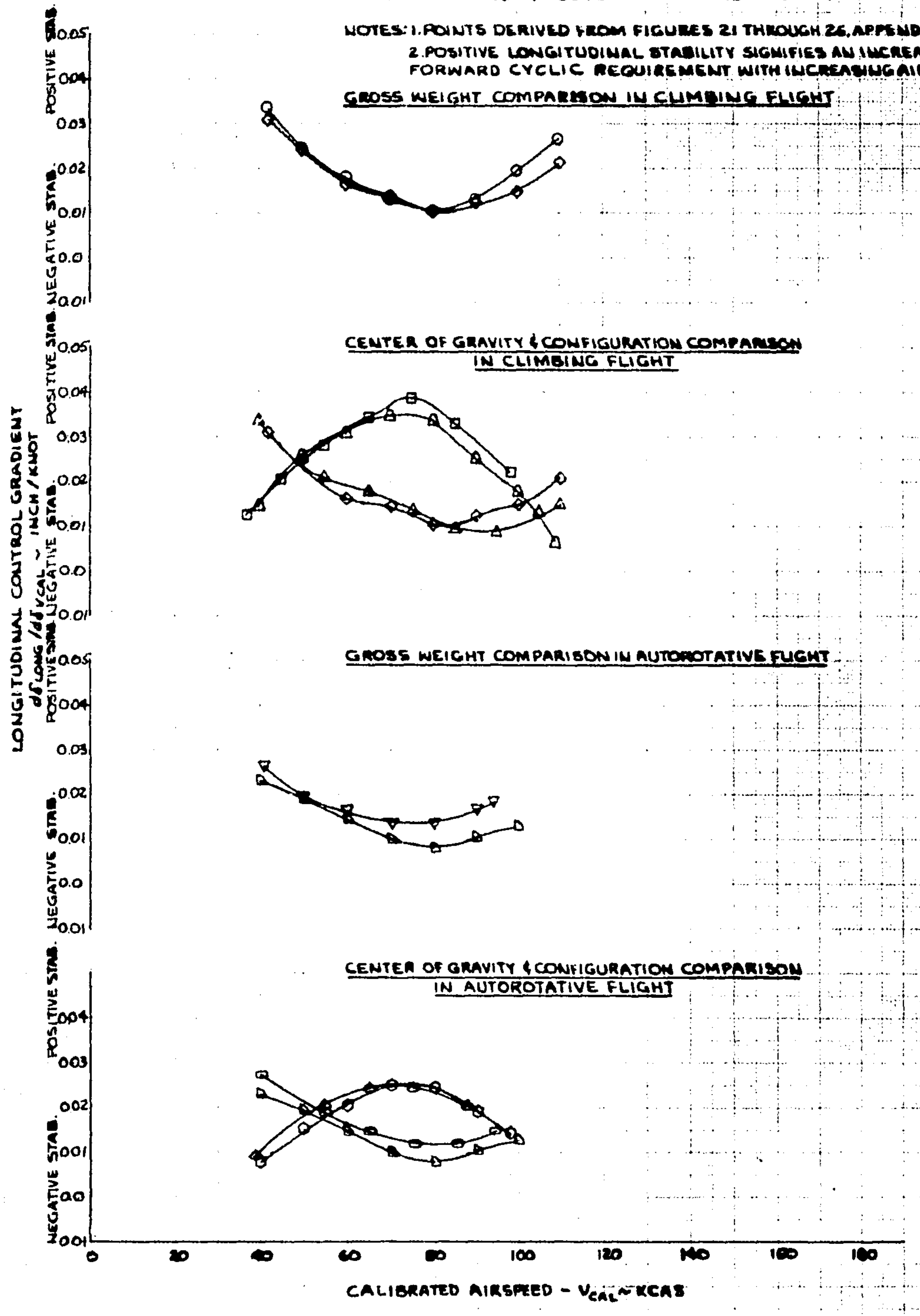


FIGURE No. 7

SUMMARY OF CONTROL POSITIONS IN FORWARD FLIGHT

AH-1G

SYM	AVG. ALT. H_p ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	FLT. COND.	THRUST COEFF. C_T	AIRCRAFT S/N
▲	4540	[illegible]	200.5(AFT)	324	CLEAN	LEVEL FLT/DIVE	0.0046[illegible]	715698
○	[illegible]	[illegible]	199.8(AFT)	323	CLEAN(SKID TIPS FAIRING OFF)	LEVEL FLT/DIVE	0.004[illegible]	615347

NOTE: 1. OPEN SYMBOLS DENOTE LEVEL FLIGHT
CROSSED SYMBOLS DENOTE DIVE

2. POINTS DERIVED FROM FIGURES 10 THROUGH 27, APPENDIX VII

3. POSITIVE LONGITUDINAL CYCLIC STABILITY SIGNIFIES AN INCREASING FORWARD CYCLIC REQUIREMENT WITH INCREASING AIRSPEED

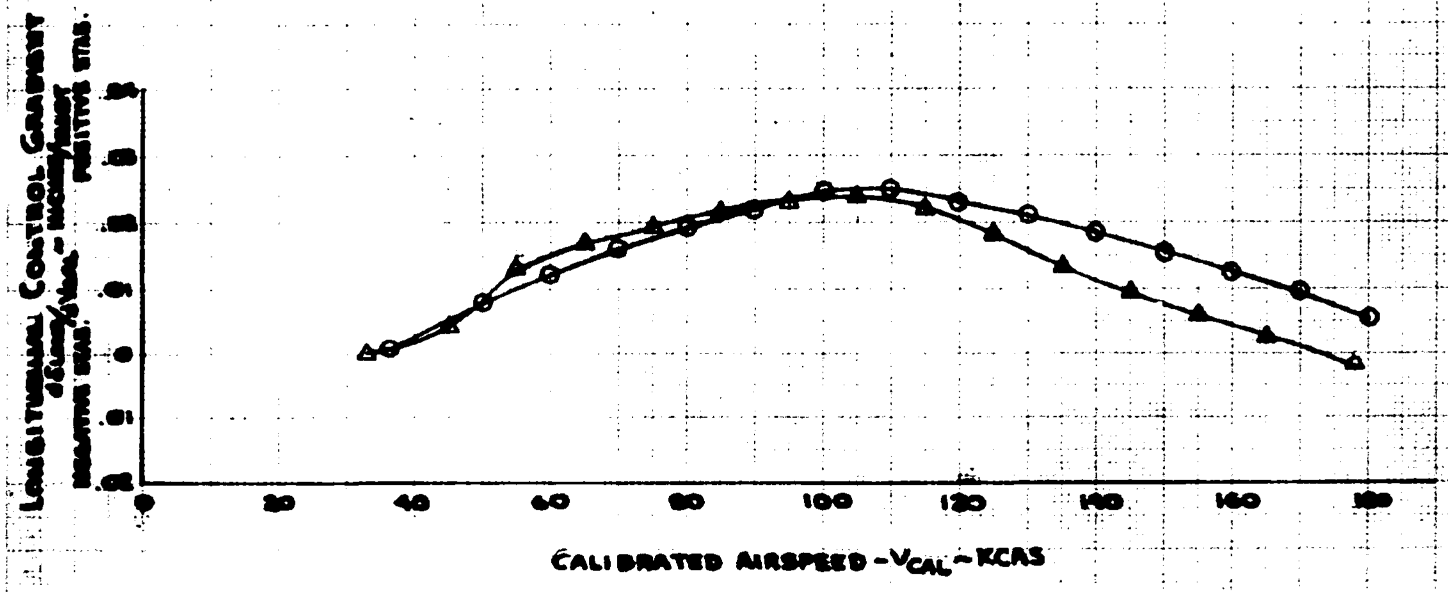


FIGURE No. 8

STATIC TRIM STABILITY

AH-1G USA S/N 71-5695

CLEAN CONFIGURATION

SYM	AVG. ALT. H_p ~ FT.	AVG. G.W. ~ LB.	AVG. LONG C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C_T	FLT. COND.
○	4460	7360	190.3 (FWD)	323.5	0.004188	LEVEL FLT.
▽	5220	7210	190.2 (FWD)	321.0	0.004261	DIVE

NOTES: 1. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

2. TOTAL CONTROL DISPLACEMENT:

LONGITUDINAL = 10.08 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

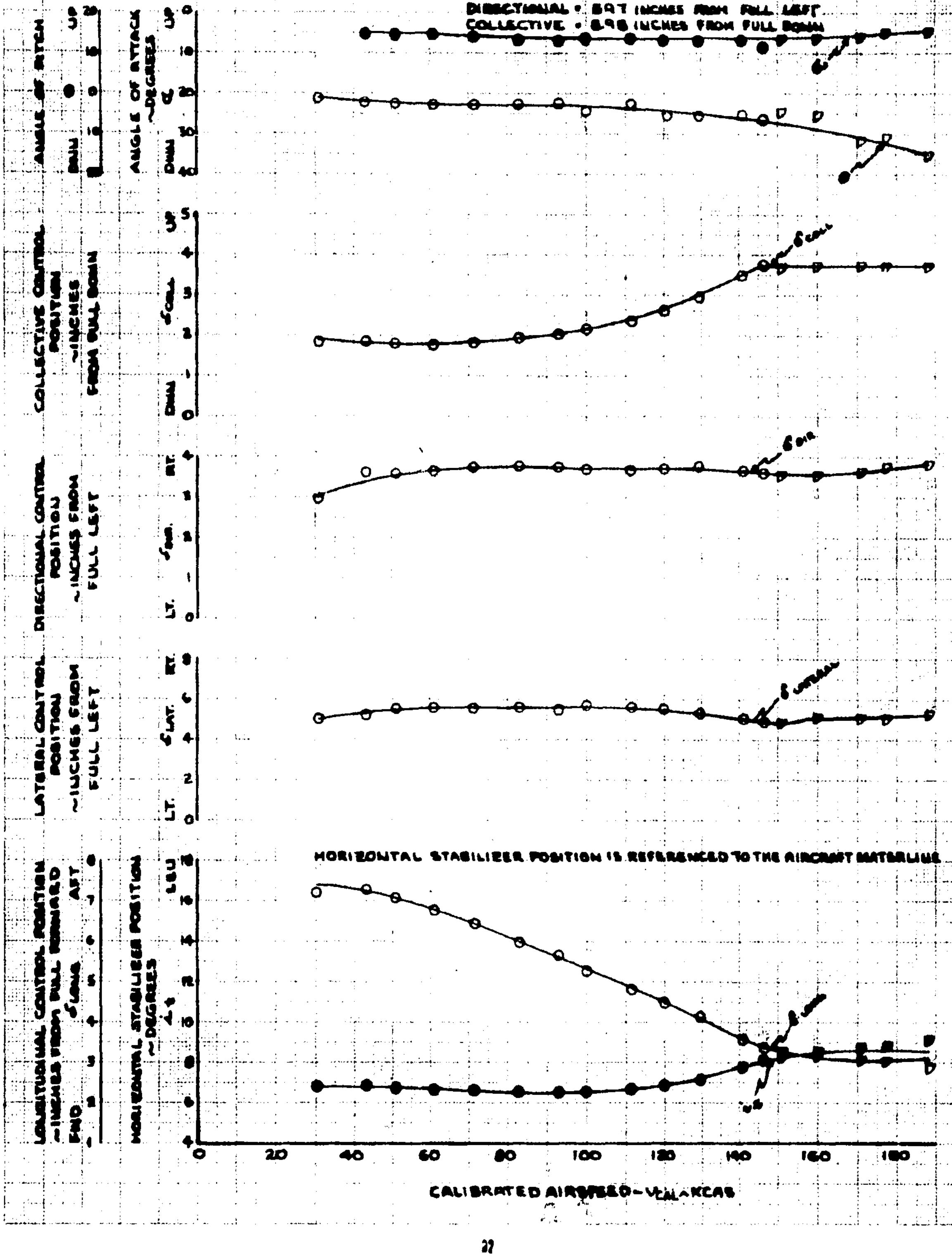


FIGURE No. 9
STATIC TRIM STABILITY
AH-1G USA S/N 67-15695
CLEAN CONFIGURATION

SYM	AVG. ALT. Hp~FT	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	THRUST COEFF. ~ C_T	FLT. COND.
○	4980	8470	191.4 (FWD)	324	0.004878	LEVEL FLT.
▽	5440	8240	191.2 (FWD)	324	0.004812	DIVE

NOTES: 1. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.08 IN. FROM FULL FORWARD
LATERAL = 9.90 IN. FROM FULL LEFT
DIRECTIONAL = 5.97 IN. FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

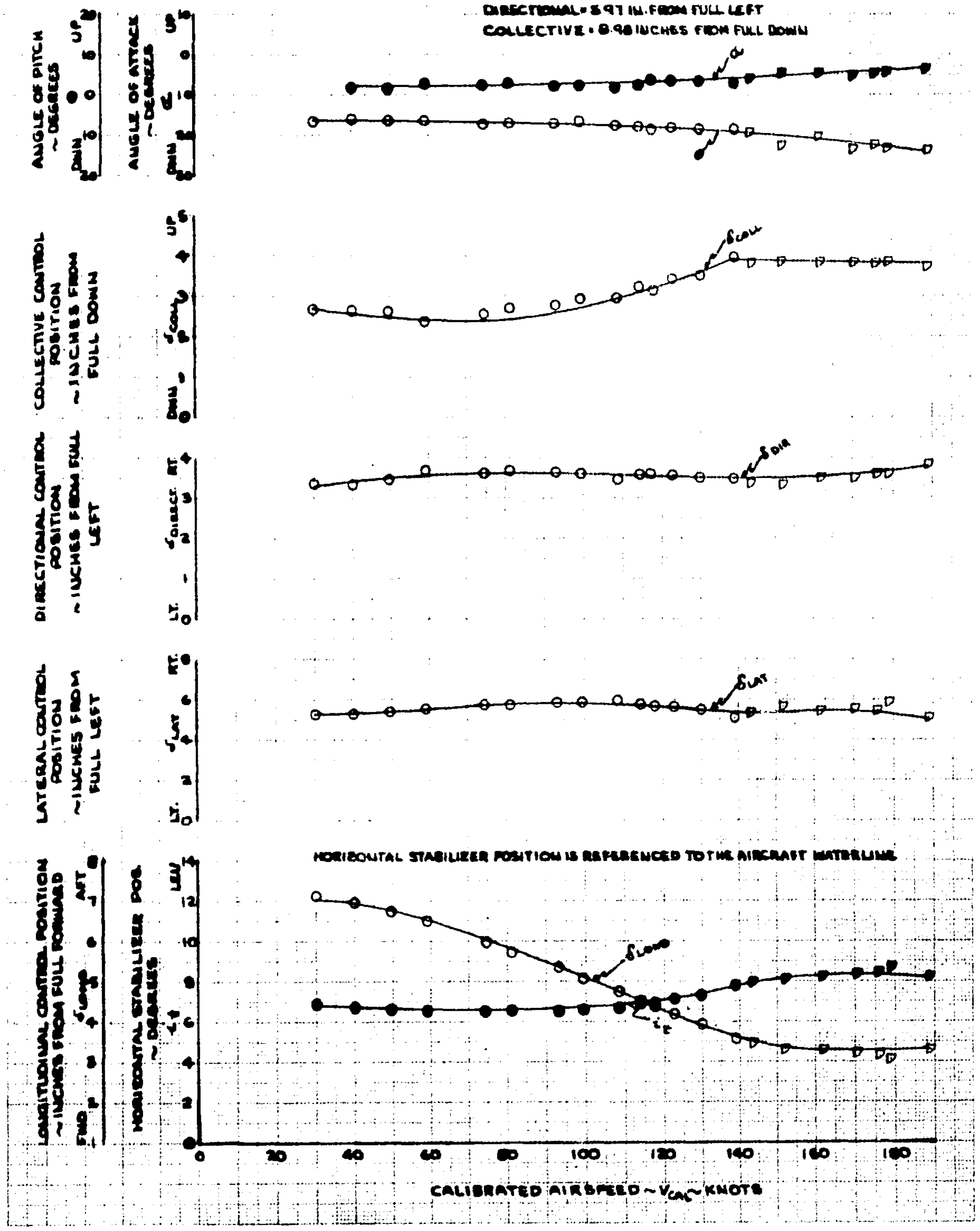


FIGURE No. 10
STATIC TRIM STABILITY

AH-1G USA [illegible]

CLEAN CONFIGURATION

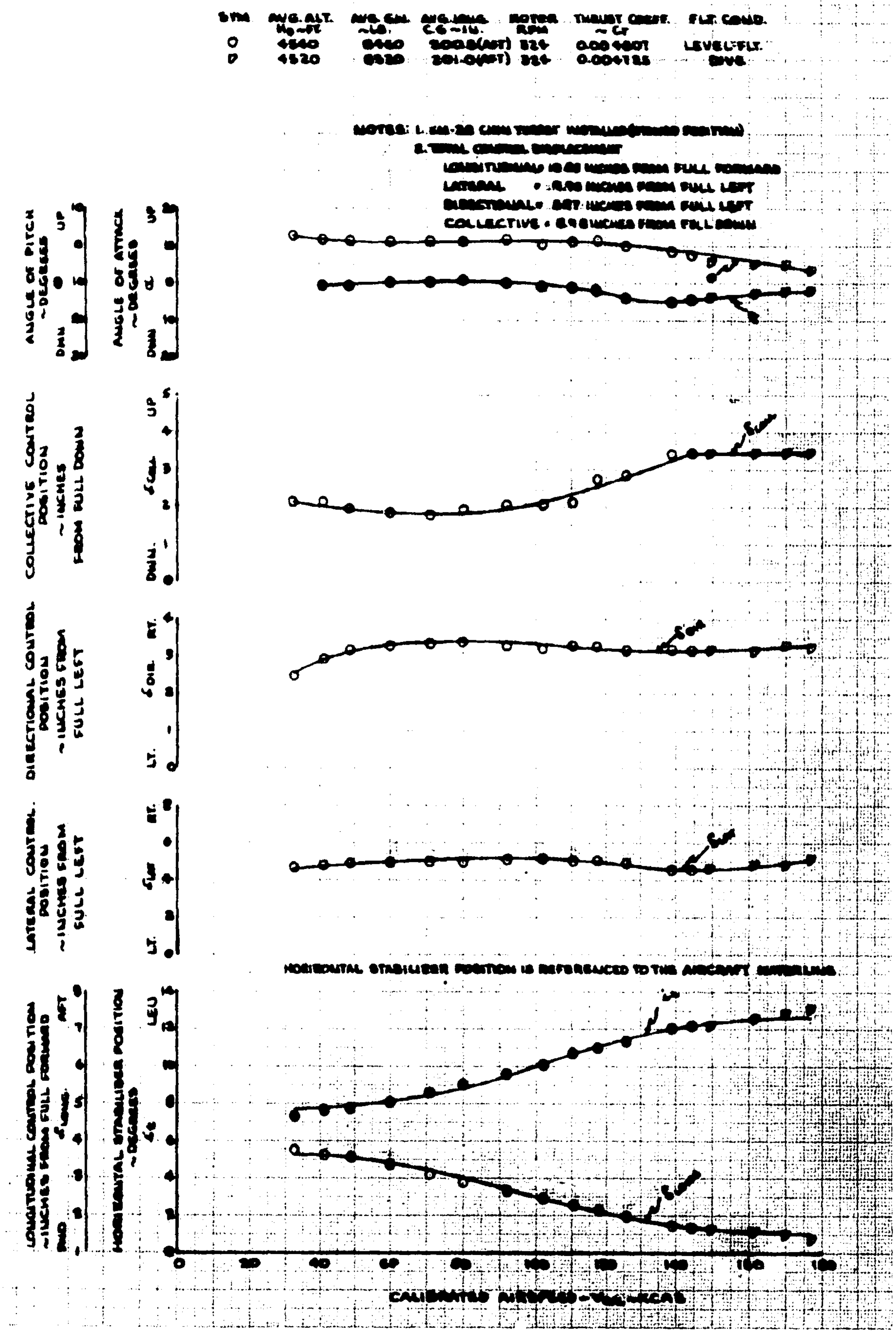


FIGURE NO. 11
STATIC TRIM STABILITY
AH-1G USA S/N 715695
CLEAN CONFIGURATION

SYM	AVG ALT. Hp~FT.	AVG G.W. ~LB.	AVG LONG. C.G.~IN.	ROTOR RPM	THRUST COEFF. ~CT	FLT. COND.
○	16100	8420	200.4(AFT)	323.0	0.006498	LEVEL FLT.

NOTES: 1. XM-28 GUN TURRET INSTALLED (STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

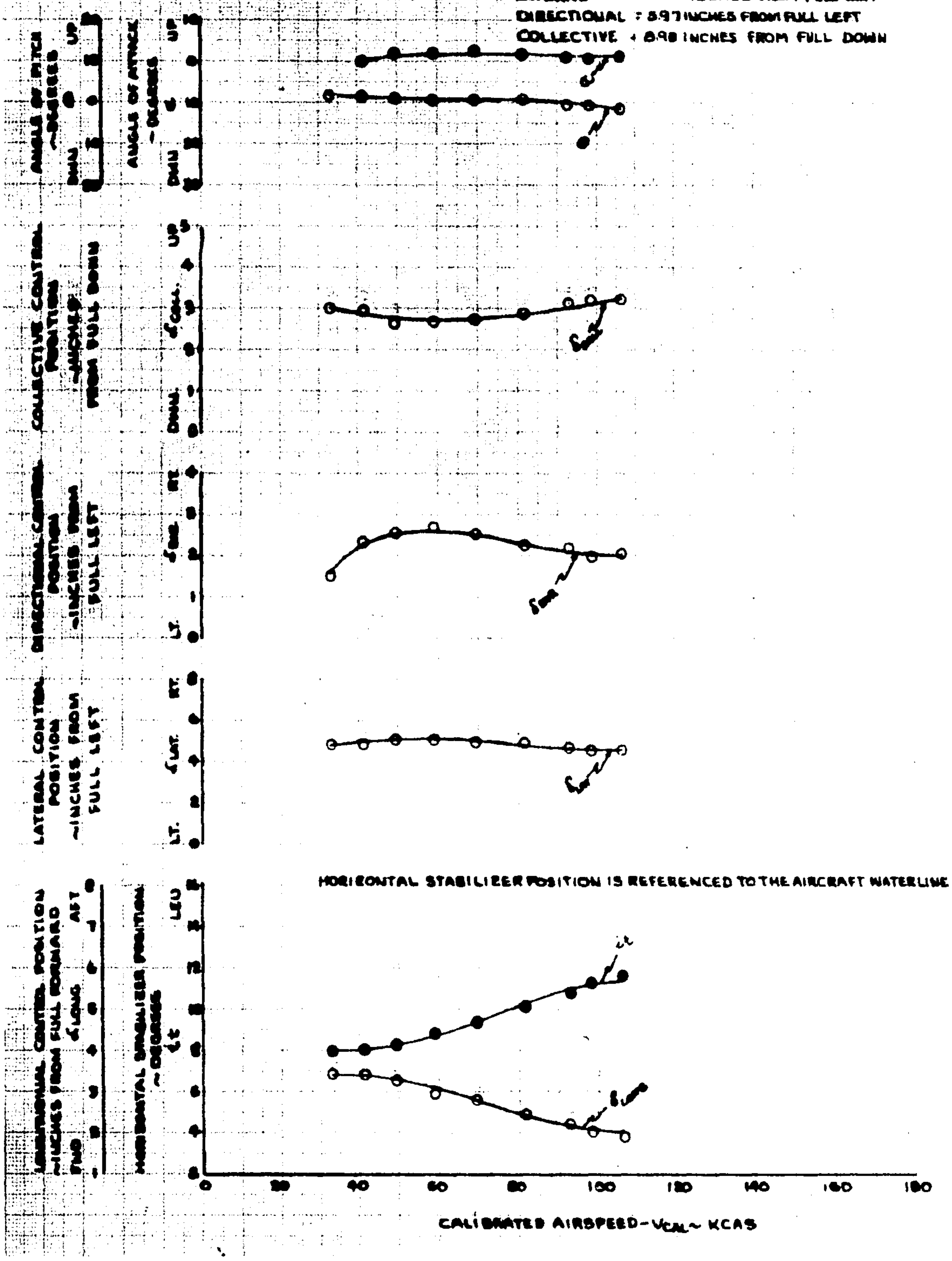
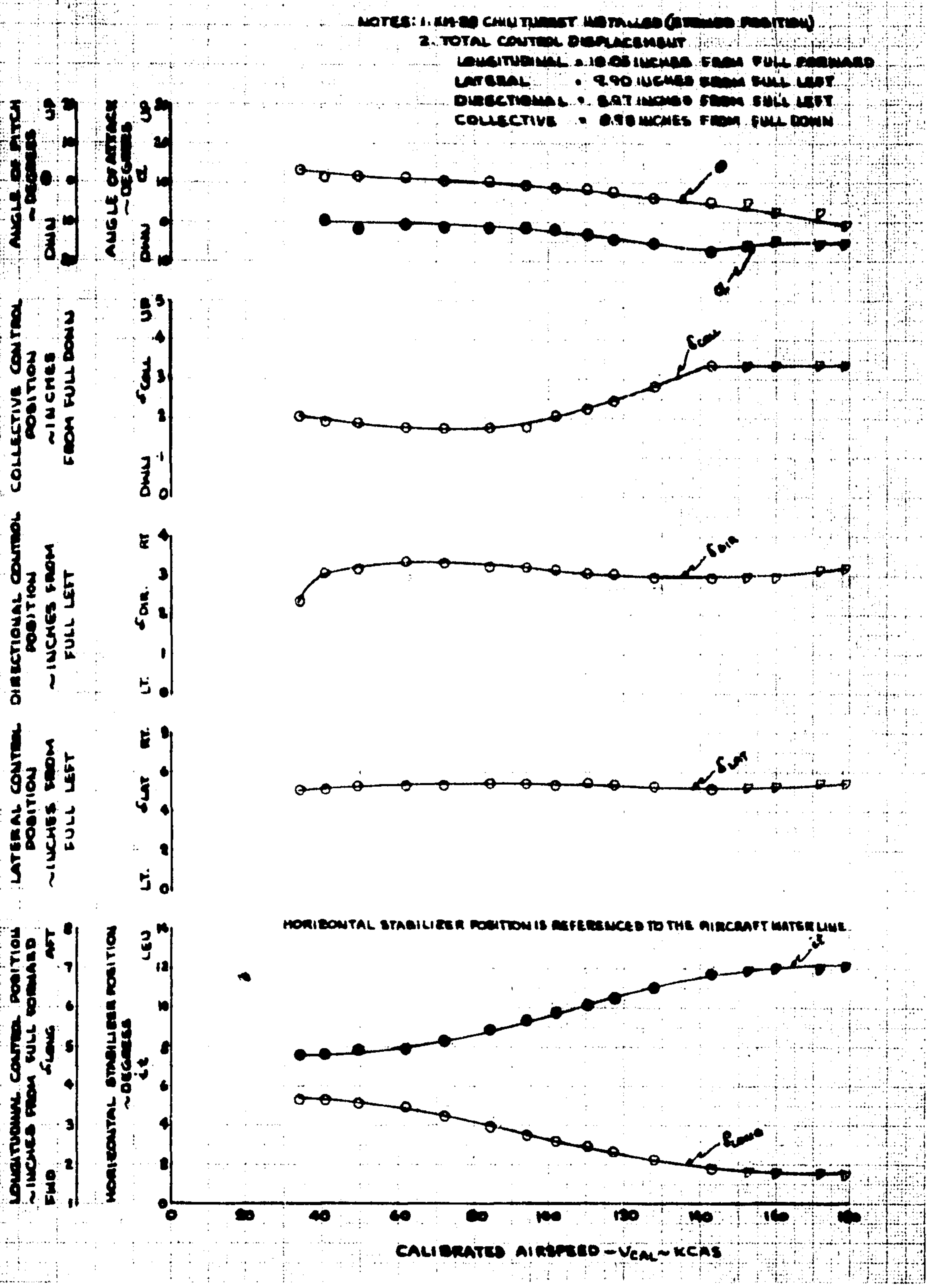


FIGURE NO. 12
STATIC TRIM STABILITY
AH-1G USA S/N [illegible]
OUT G'D ALTERNATE CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp~FT	AVG. GW ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	THRUST COEF. ~CT	FLT. COND.
○	3720	8500	200.7(AFT)	3240	0.004712	LEVEL FLT.
▽	4060	8160	200.9(AFT)	3235	0.004697	DIVE



NOTES: 1. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.05 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATER LINE.

CALIBRATED AIRSPEED ~ V_{CAL} ~ KCAS

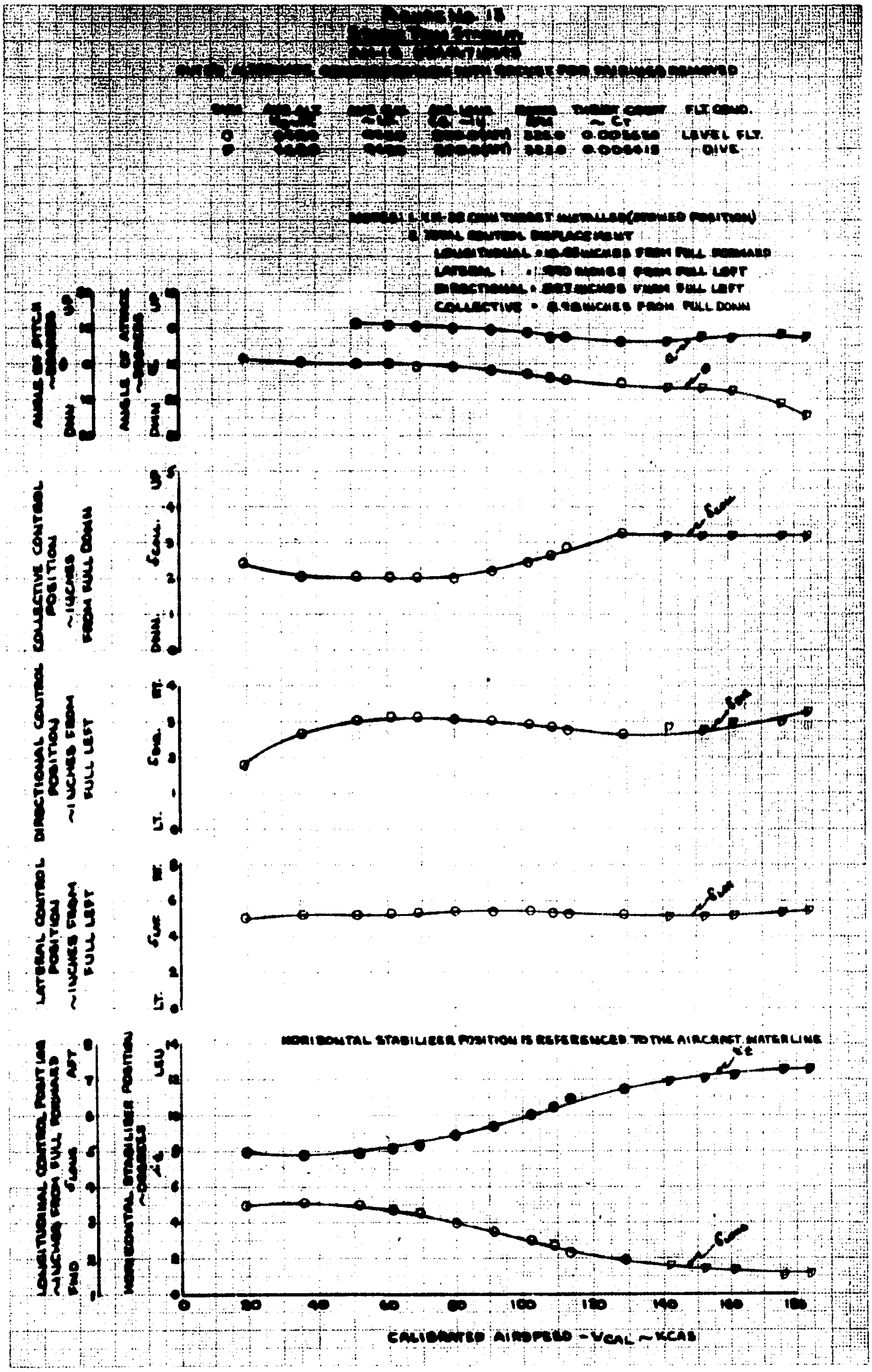
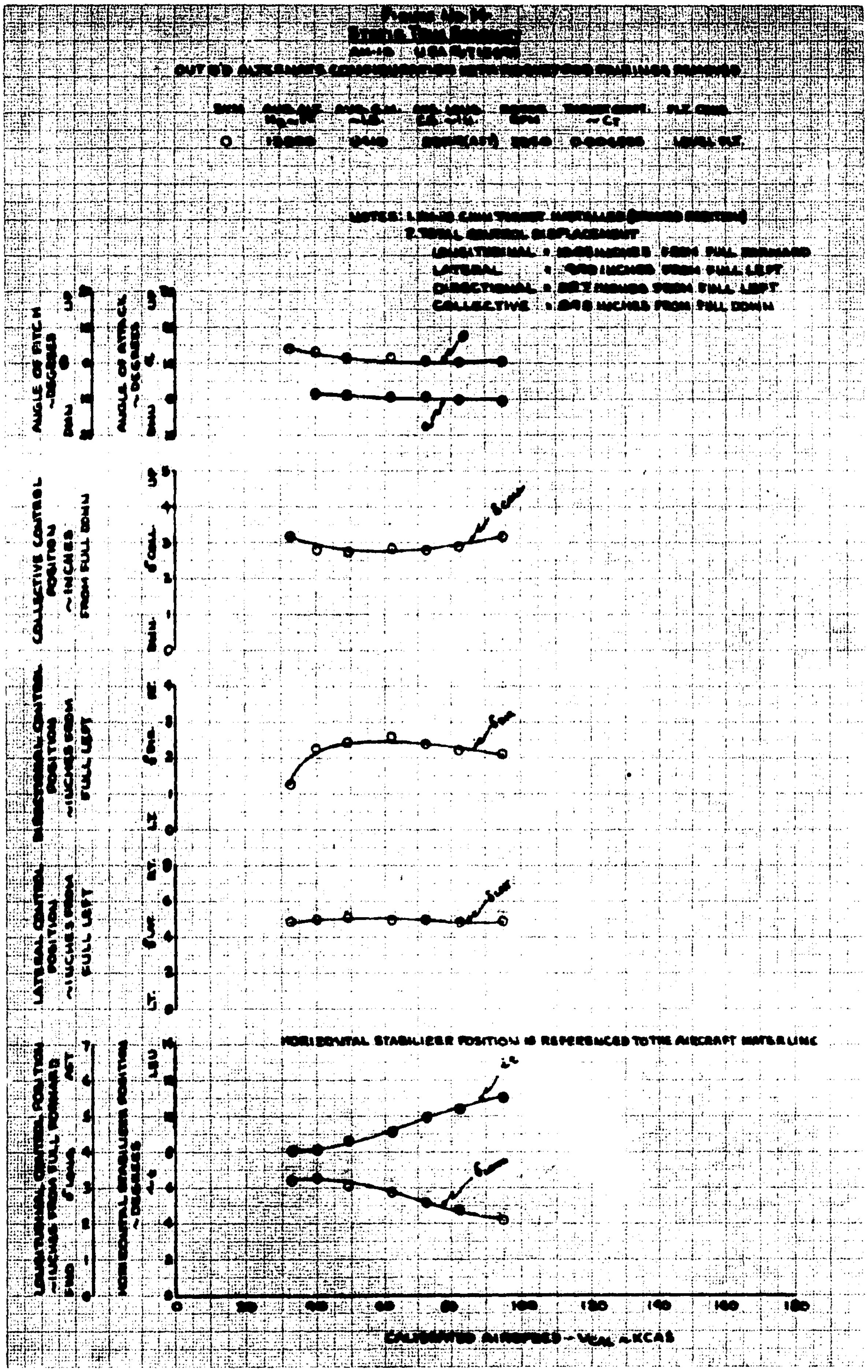


FIGURE No. 15
FLT. COND.
~ CT
LEVEL FLT.
DIVE
NOTES: 1. XM-28 GUN TURRET INSTALLED(STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = INCHES FROM FULL FORWARD
LATERAL = INCHES FROM FULL LEFT
DIRECTIONAL = INCHES FROM FULL LEFT
COLLECTIVE = INCHES FROM FULL DOWN
ANGLE OF PITCH ~DEGREES
DWN
UP
θ
ANGLE OF ATTACK ~DEGREES
COLLECTIVE CONTROL POSITION ~INCHES FROM FULL DOWN
δ_{COLL}
DIRECTIONAL CONTROL POSITION ~INCHES FROM FULL LEFT
δ_{DIR}
LT.
RT.
LATERAL CONTROL POSITION ~INCHES FROM FULL LEFT
δ_{LAT}
LONGITUDINAL CONTROL POSITION ~INCHES FROM FULL FORWARD
FWD
AFT
δ_{LONG}
HORIZONTAL STABILIZER POSITION ~DEGREES
HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE
i_s
0
20
40
60
80
100
120
140
160
180
CALIBRATED AIRSPEED - V_{CAL} ~ KCAS


AH-1G
NOTES:
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = INCHES FROM FULL FORWARD
LATERAL = INCHES FROM FULL LEFT
DIRECTIONAL = INCHES FROM FULL LEFT
COLLECTIVE = INCHES FROM FULL DOWN
ANGLE OF PITCH ~DEGREES
DN
UP
ANGLE OF ATTACK ~DEGREES
COLLECTIVE CONTROL POSITION ~INCHES FROM FULL DOWN
δ_{COLL}
DIRECTIONAL CONTROL POSITION ~INCHES FROM FULL LEFT
LT.
RT.
δ_{PED}
LATERAL CONTROL POSITION ~INCHES FROM FULL LEFT
δ_{LAT}
LONGITUDINAL CONTROL POSITION ~INCHES FROM FULL FORWARD
FWD
AFT
δ_{LONG}
HORIZONTAL STABILIZER POSITION ~DEGREES
LEU
HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE
0
20
40
60
80
100
120
140
160
180
CALIBRATED AIRSPEED ~ V_{CAL} ~ KCAS

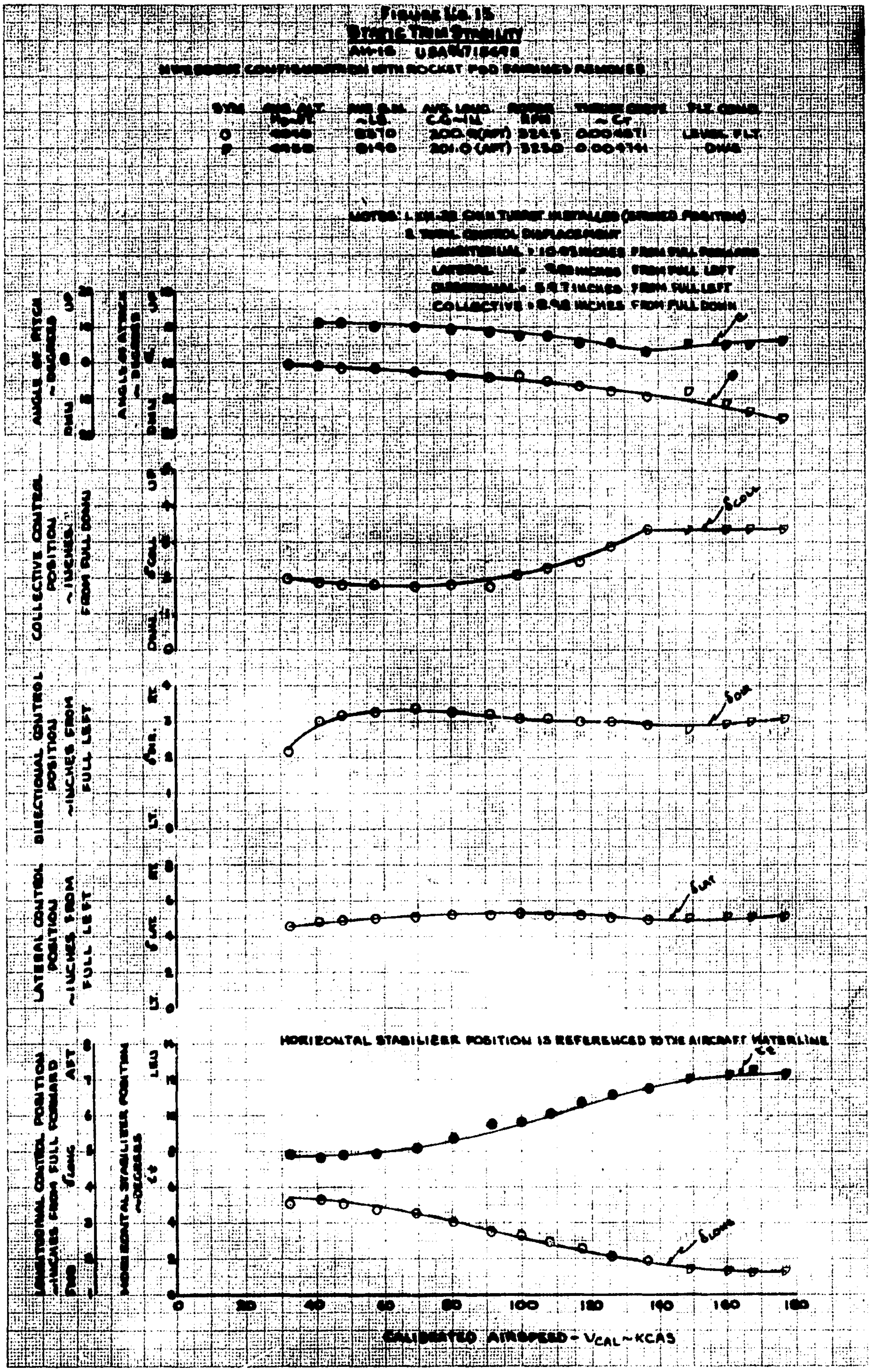


FIGURE NO. 15
STATIC TRIM STABILITY
AH-1G USA S/N 71-15698
[illegible] CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SYM | AVG. ALT. Hp~FT. | AVG. G.W. ~LB. | AVG. LONG. C.G.~IN. | ROTOR RPM | THRUST COEFF. ~CT | FLT. COND.
○ | [illegible] | 8870 | 200.9(AFT) | 324.5 | 0.004871 | LEVEL FLT.
● | [illegible] | 8140 | 201.0(AFT) | 323.0 | 0.004741 | DIVE
NOTES: 1. XM-28 GUN TURRET INSTALLED (STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.93 INCHES FROM FULL FORWARD
LATERAL = [illegible] INCHES FROM FULL LEFT
DIRECTIONAL = 5.57 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN
ANGLE OF PITCH ~DEGREES θ DN UP
ANGLE OF PITCH ~DEGREES DN UP
COLLECTIVE CONTROL POSITION ~INCHES FROM FULL DOWN δCOLL DN UP
DIRECTIONAL CONTROL POSITION ~INCHES FROM FULL LEFT δDIR LT. RT.
LATERAL CONTROL POSITION ~INCHES FROM FULL LEFT δLAT LT. RT.
LONGITUDINAL CONTROL POSITION ~INCHES FROM FULL FORWARD δLONG FWD AFT
HORIZONTAL STABILIZER POSITION ~DEGREES iH LEU TEU
HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE
δCOLL
δDIR
δLAT
δLONG
iH
0
20
40
60
80
100
120
140
160
180
CALIBRATED AIRSPEED ~ VCAL ~ KCAS

FIGURE No 16

STATIC TRIM STABILITY

AH-1G USA 66/15246

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp~FT.	AVG G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	THRUST COEFF. ~ C_T	FLT. COND.
○	3500	9555	200.0(AFT)	324.5	0.005246	LEVEL FLT.
▽	5260	9585	200.1(AFT)	324.0	0.005461	DIVE

NOTES: 1. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.85 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

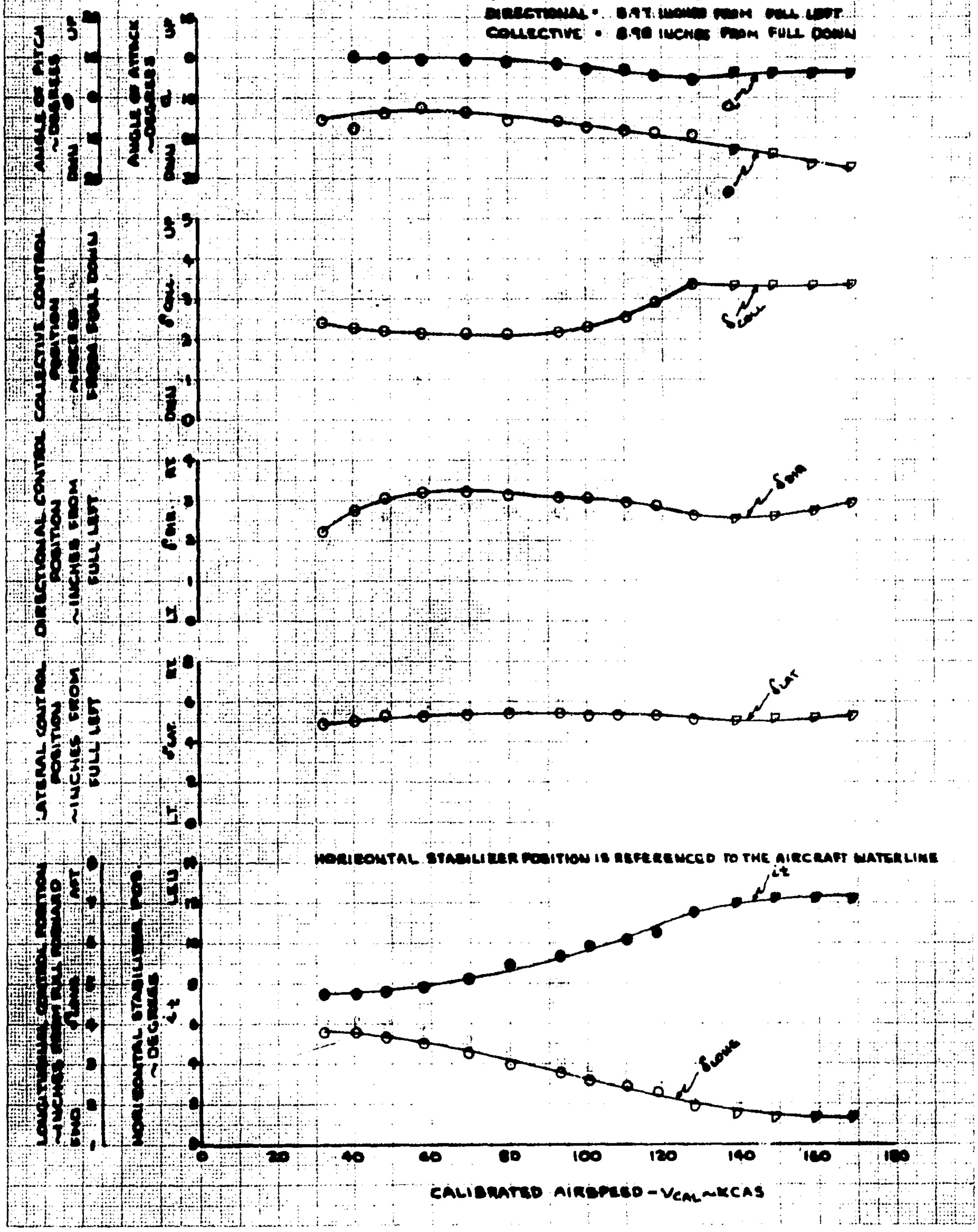


FIGURE No. 17

STATIC TRIM STABILITY

AH-1G USA S/N 71-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H_p ~ FT.	AVG. GW. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C_T	FLT. COND.
○	4960	8620	191.8 (FWD)	324.0	0.004961	LEVEL FLT.
◐	4760	8630	191.6 (FWD)	323.5	0.004837	DIVE

NOTES: 1. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

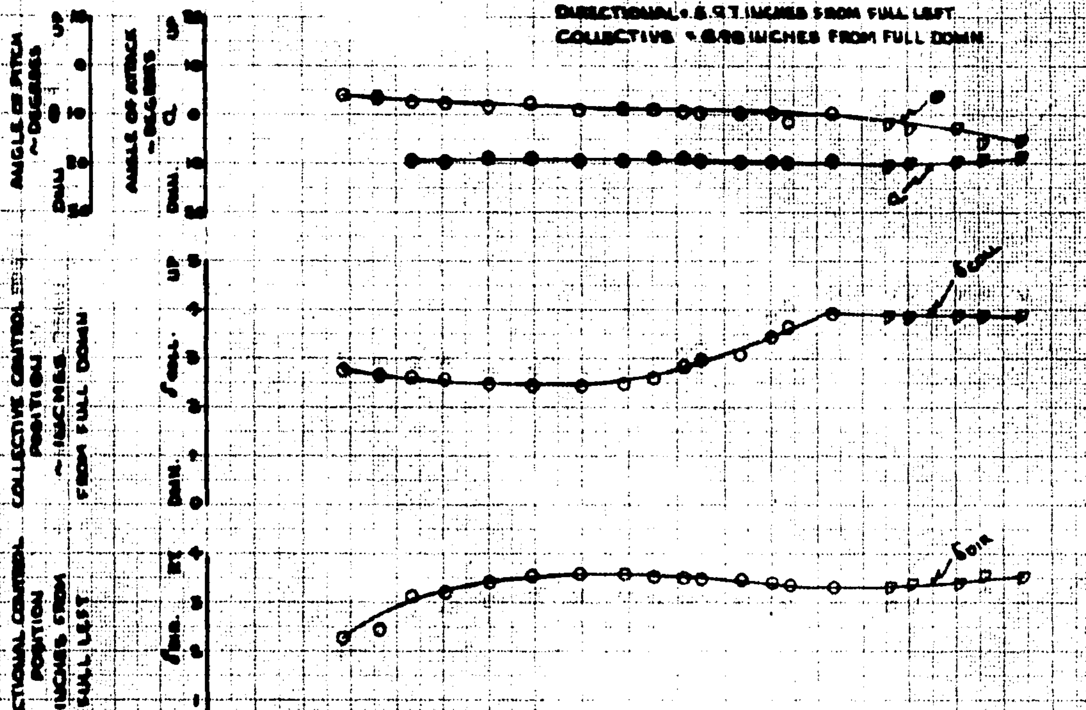
2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.08 INCHES FROM FULL FORWARD

LATERAL = 9.80 INCHES FROM FULL LEFT

DIRECTIONAL = 6.97 INCHES FROM FULL LEFT

COLLECTIVE = 6.98 INCHES FROM FULL DOWN



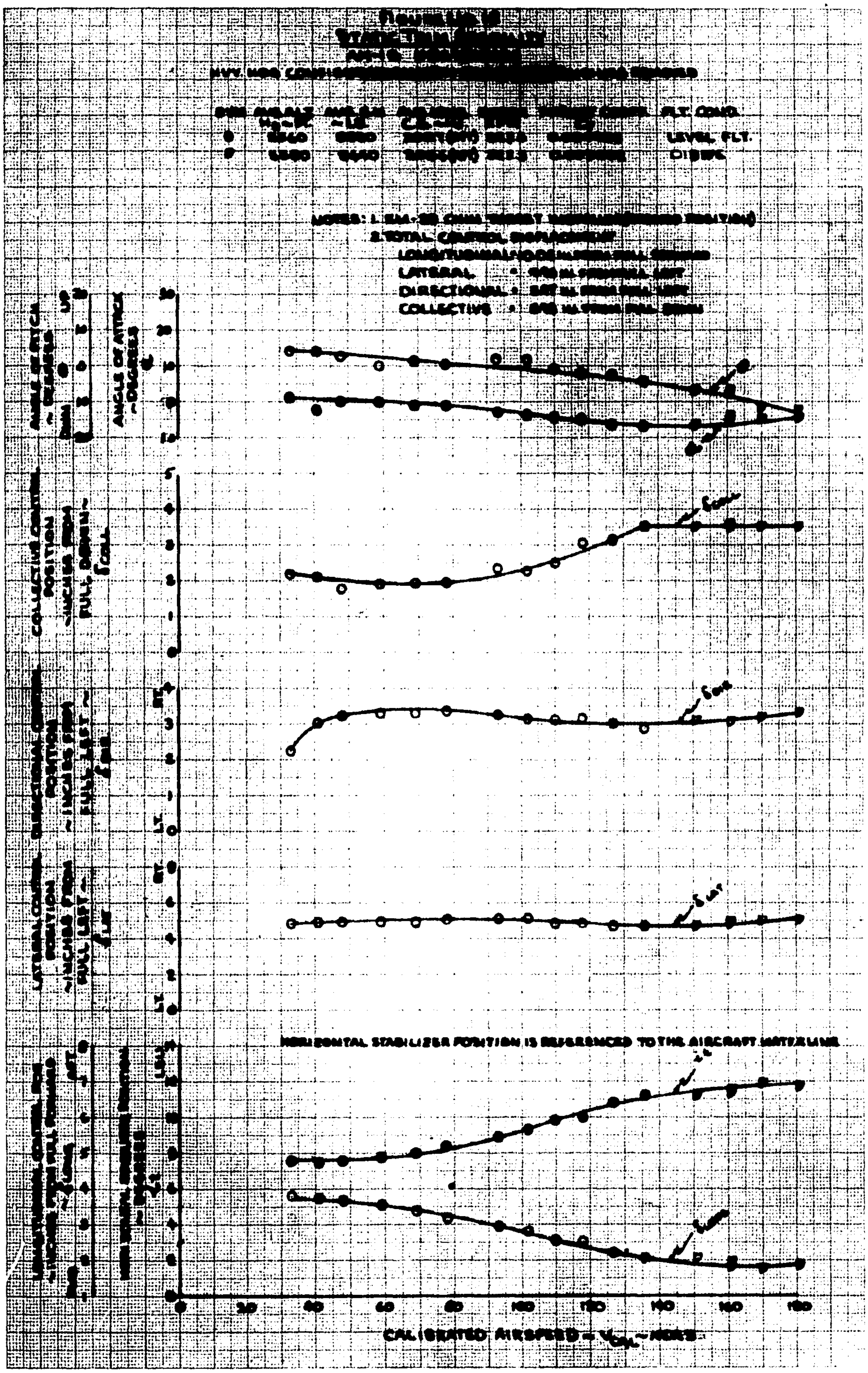

FLT. COND.
LEVEL FLT.
DIVE
NOTES:
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL
LATERAL
DIRECTIONAL
COLLECTIVE
ANGLE OF PITCH ~ DEGREES
ANGLE OF ATTACK ~ DEGREES
COLLECTIVE CONTROL POSITION ~ INCHES FROM FULL DOWN ~
DIRECTIONAL CONTROL POSITION ~ INCHES FROM FULL LEFT ~
LATERAL CONTROL POSITION ~ INCHES FROM FULL LEFT ~
LONGITUDINAL CONTROL POSITION ~ INCHES FROM FULL FORWARD
HORIZONTAL STABILIZER POSITION ~ DEGREES
HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE
0
20
40
60
80
100
120
140
160
180
CALIBRATED AIRSPEED ~ V_{CAL} ~ KNOTS

FIGURE NO. 19

STATIC TRIM STABILITY

AH-1G USA S/N 71-15695

HVY. HOG CONFIGURATION WITH ... FAIRINGS REMOVED

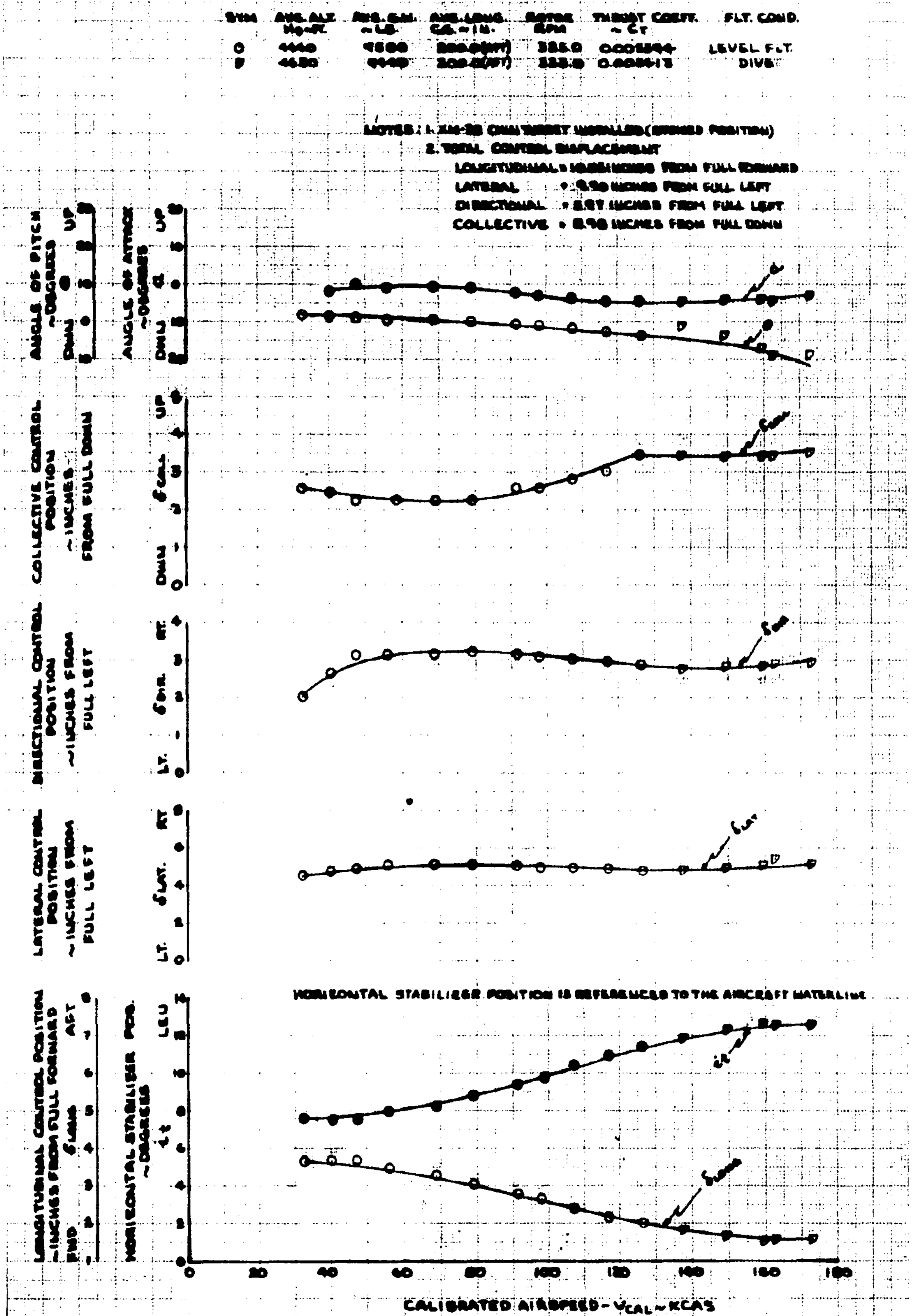


FIGURE NO. 20

STATIC TRIM STABILITY

AH-1G [illegible]

HVY. HOG CONFIGURATION WITH ROCKET [illegible] REMOVED

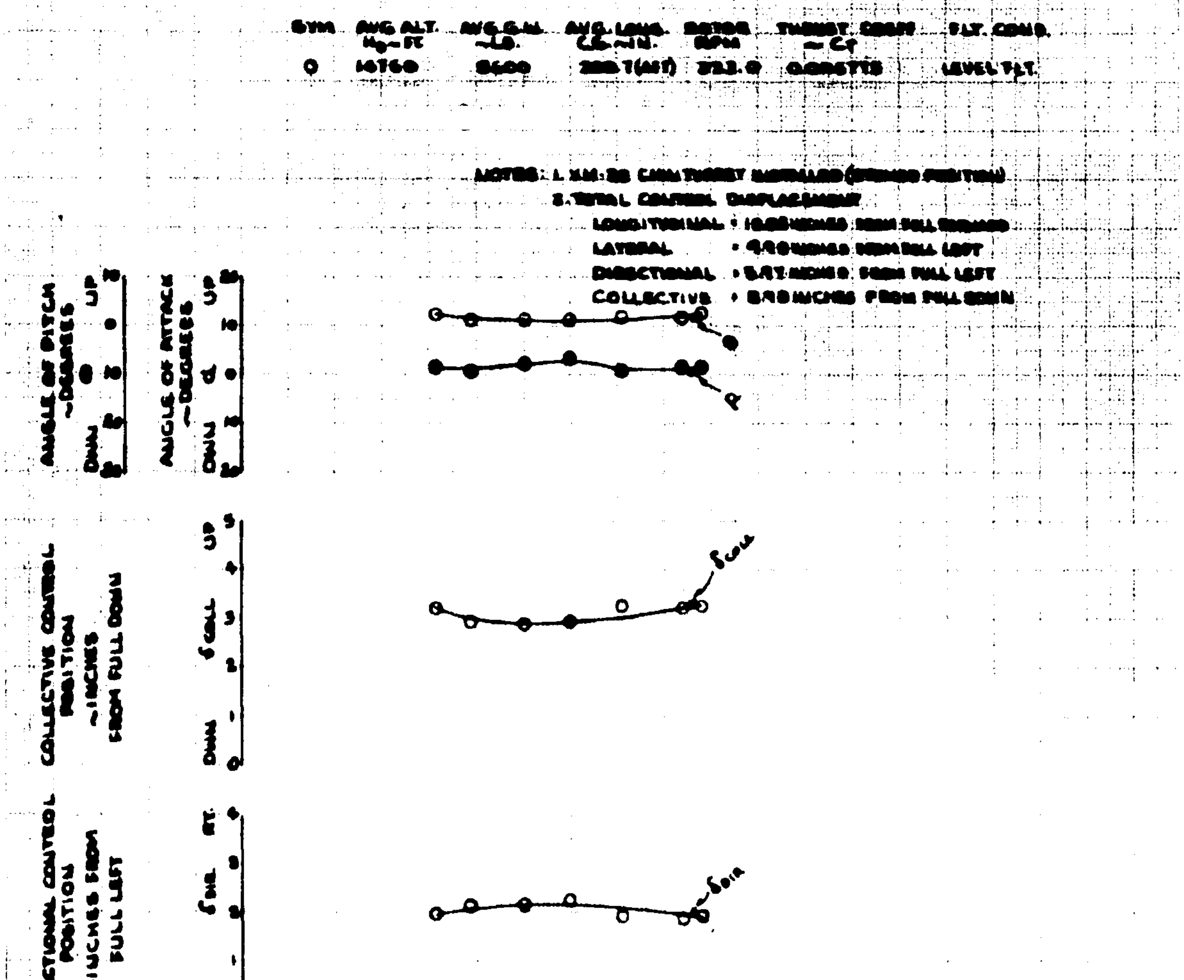
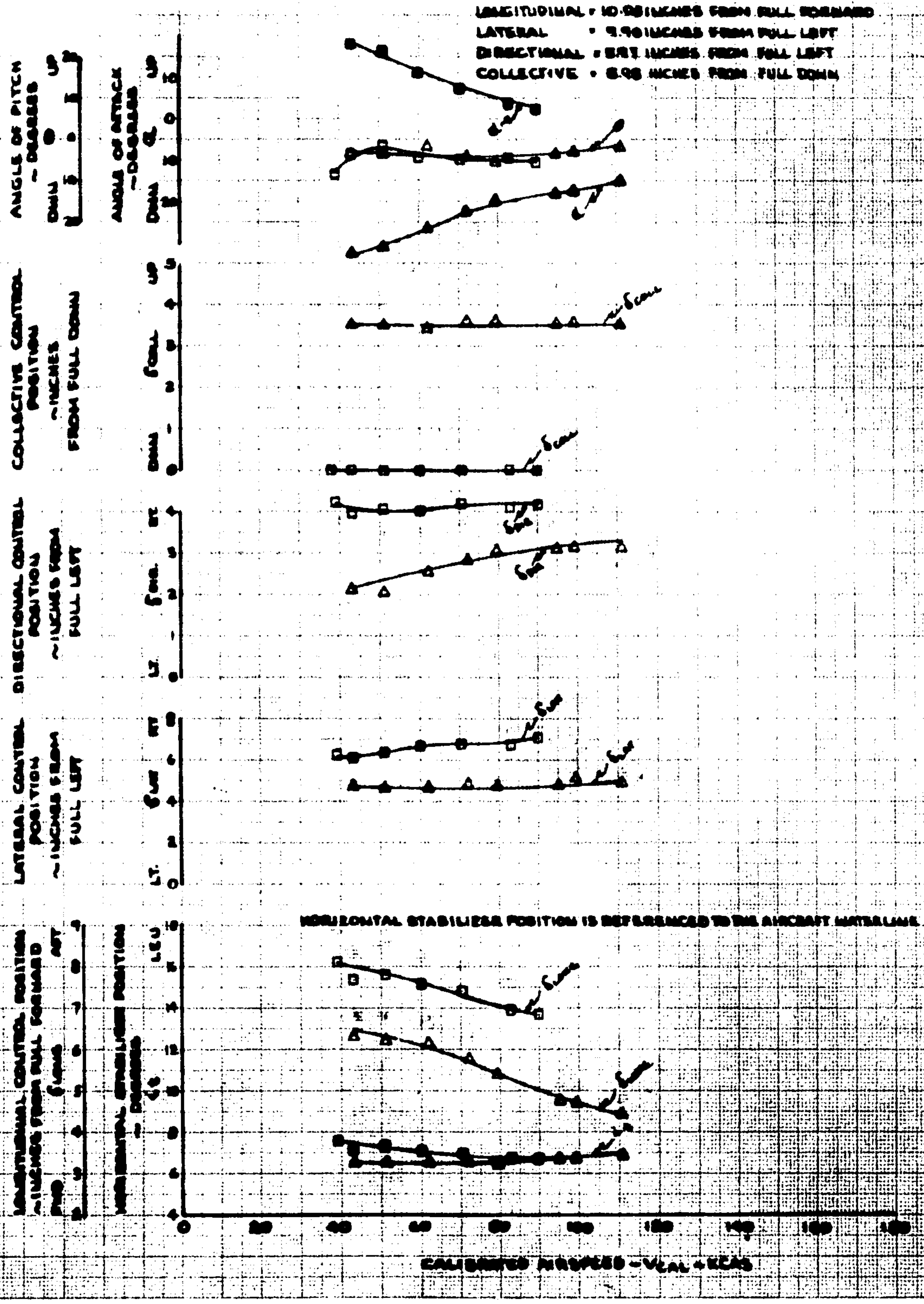


FIGURE NO 21
STATIC TRIM STABILITY
AH-1G USA S/N 15695
CLEAN CONFIGURATION

SYM	AVG. ALT. H_p ~ FT	AVG G.W. ~LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C_T	FLT. COND.
▲	6850	6990	190.0 (FWD)	323.0	0.004288	CLIMB
◻	6660	7090	190.1 (FWD)	321.0	0.004378	AUTOROTATION

NOTES: 1. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.98 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.87 INCHES FROM FULL LEFT
COLLECTIVE = 5.98 INCHES FROM FULL DOWN



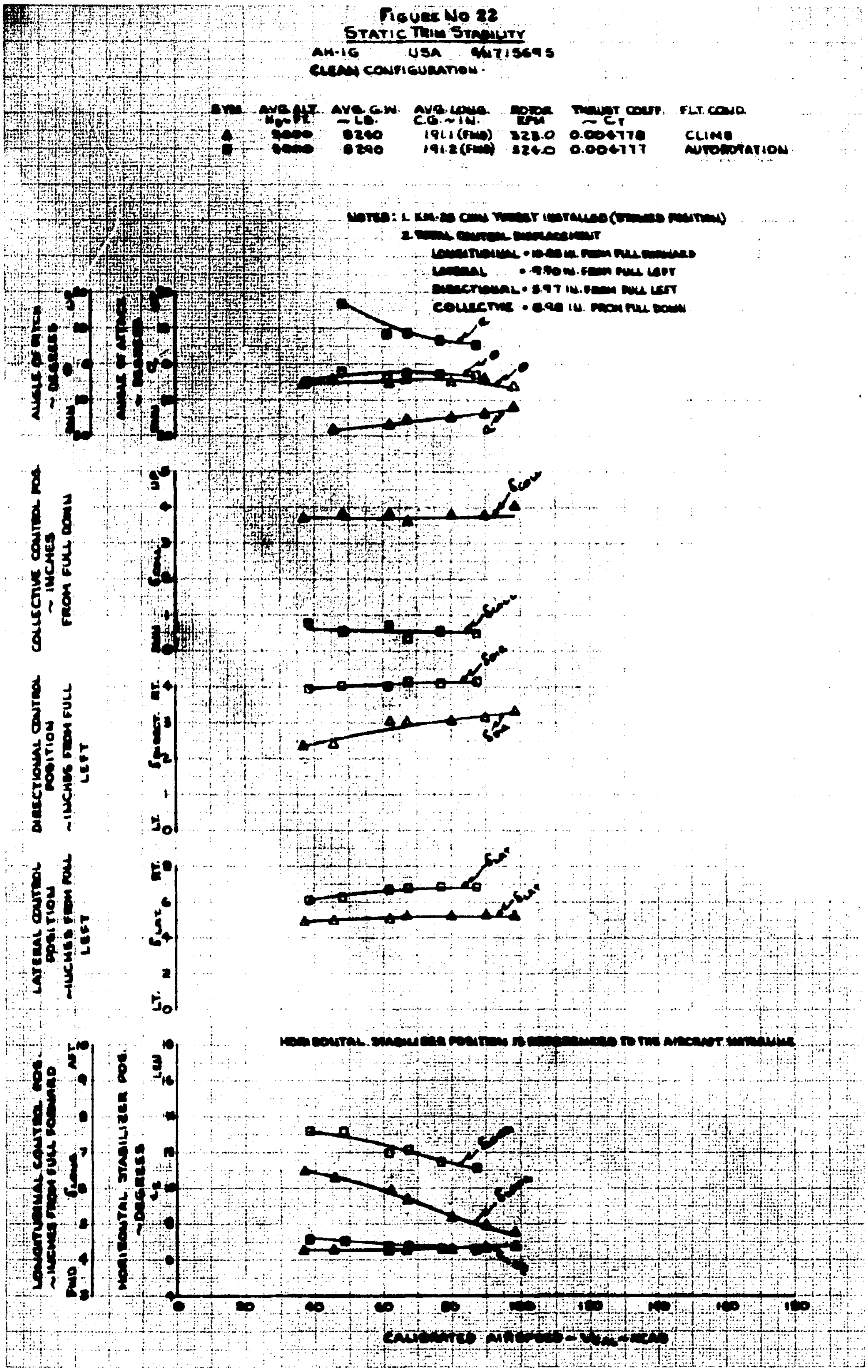


FIGURE NO 22

STATIC TRIM STABILITY

AH-1G USA S/N 71-15695

CLEAN CONFIGURATION

FIGURE NO. 25
STATIC TRIM STABILITY
AH-1G USA S/N [illegible]
CLEAN CONFIGURATION

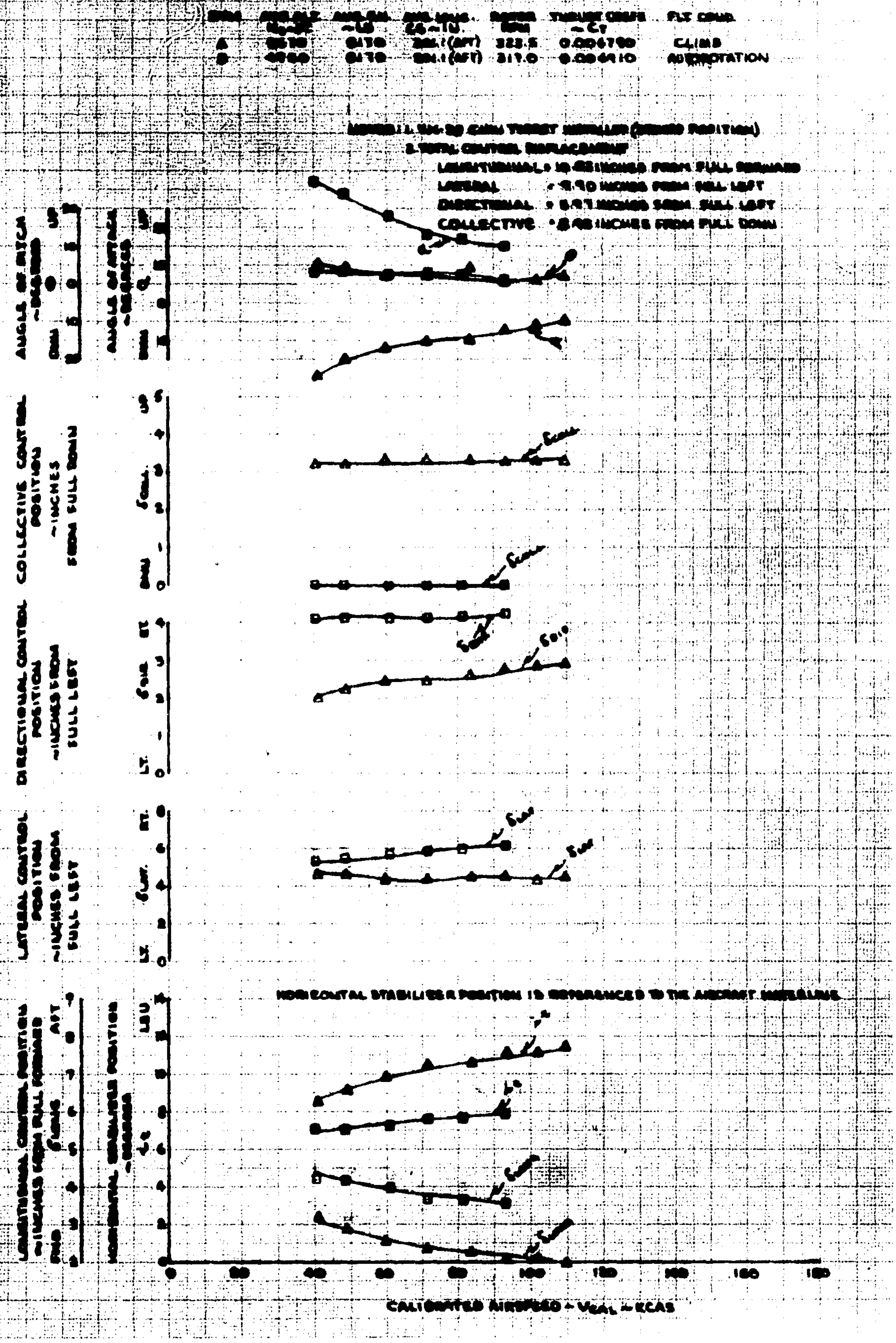
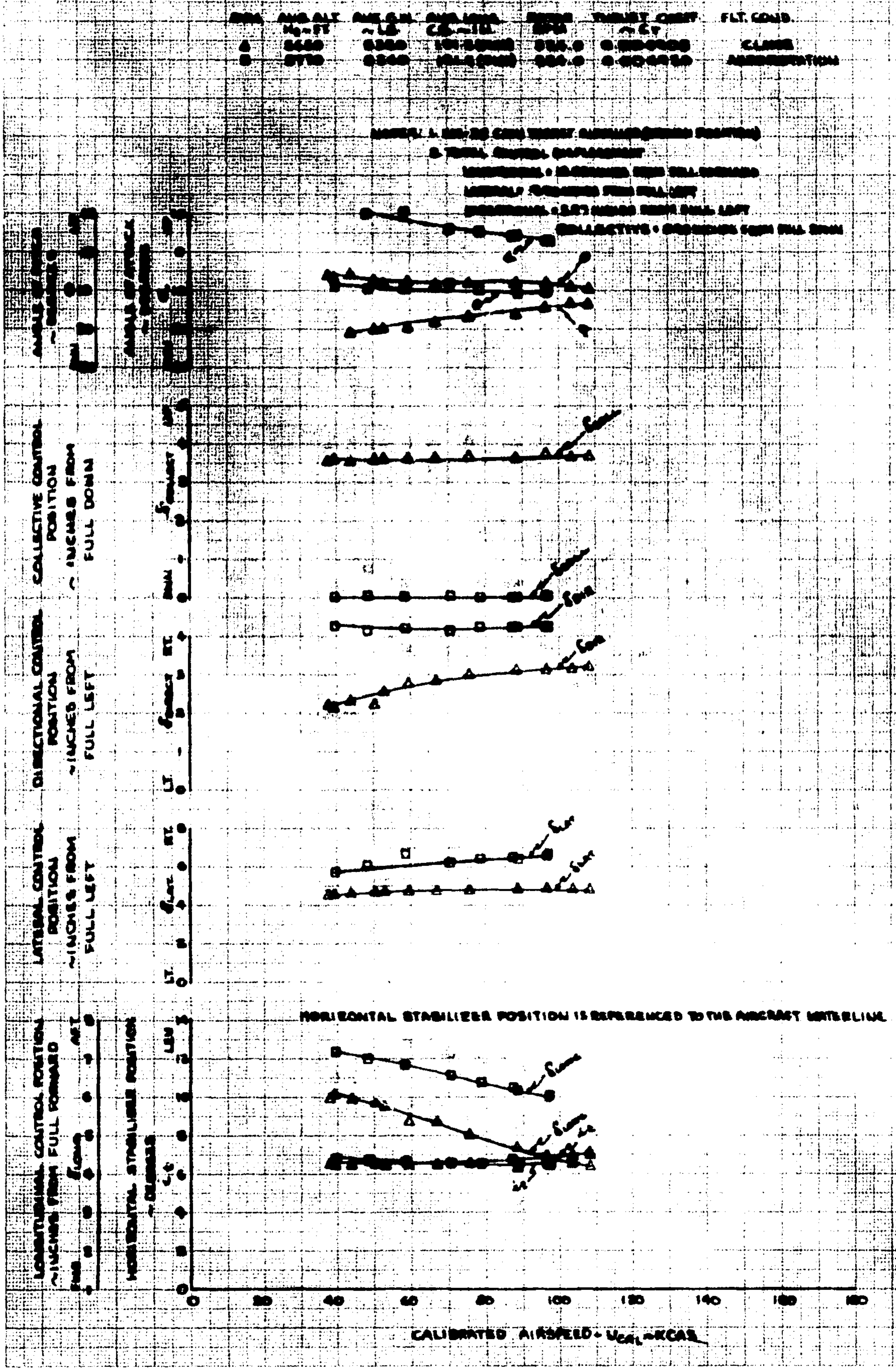


FIGURE NO. 24

STATIC TRIM STABILITY

AH-1G USA S/N 71-15698



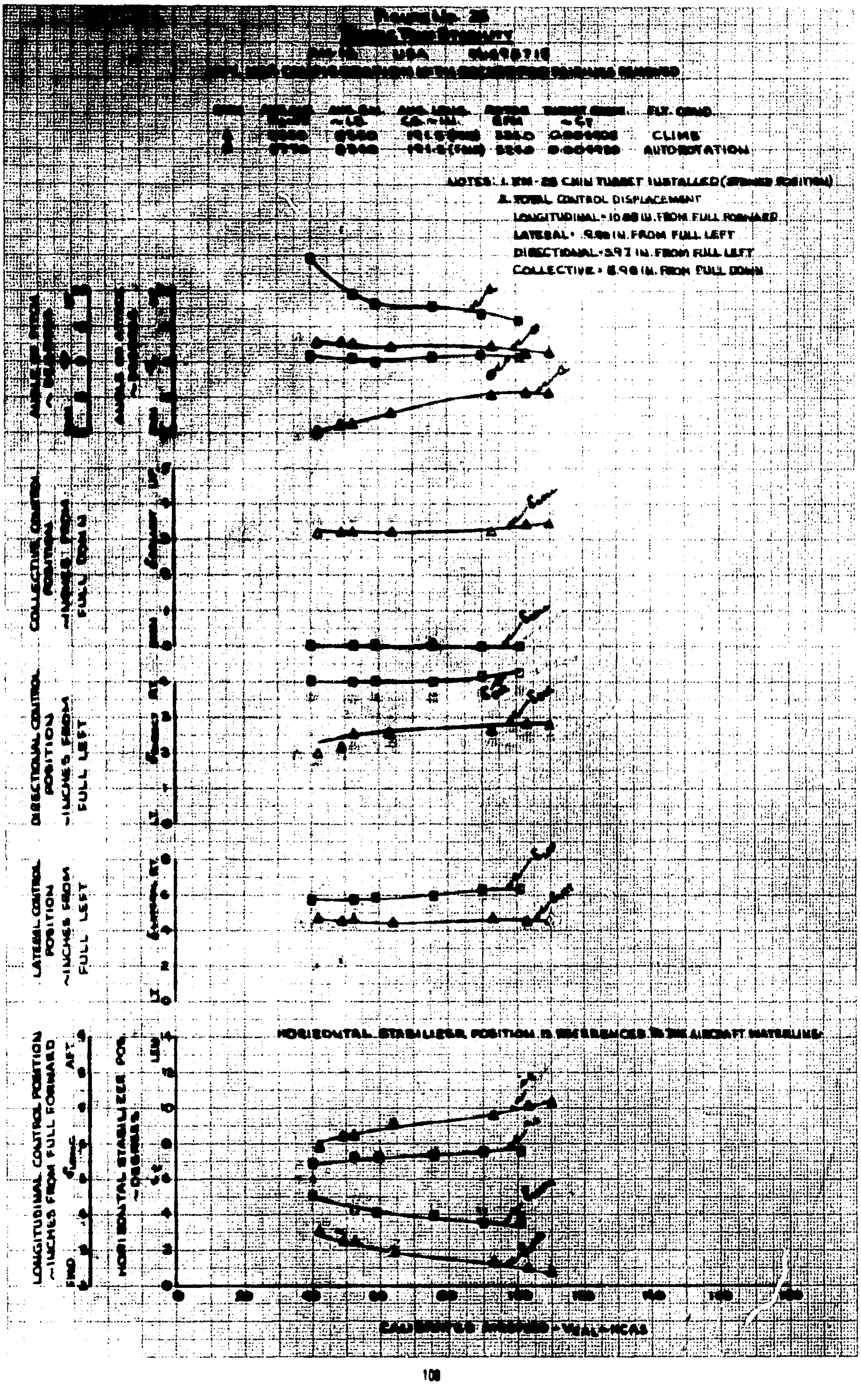

USA
CLIMB
AUTOROTATION
NOTES: 1. XM-28 CHIN TURRET INSTALLED
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL - 10.88 IN. FROM FULL FORWARD
LATERAL - 9.90 IN. FROM FULL LEFT
DIRECTIONAL - 5.97 IN. FROM FULL LEFT
COLLECTIVE - 8.98 IN. FROM FULL DOWN
COLLECTIVE CONTROL POSITION ~INCHES FROM FULL DOWN
DIRECTIONAL CONTROL POSITION ~INCHES FROM FULL LEFT
LATERAL CONTROL POSITION ~INCHES FROM FULL LEFT
LONGITUDINAL CONTROL POSITION ~INCHES FROM FULL FORWARD
FWD
AFT
HORIZONTAL STABILIZER POS. ~DEGREES
HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE
LT
RT
0
20
40
60
80
100
120
140
160
180
CALIBRATED AIRSPEED ~ VCAL ~ KCAS

FIGURE NO. 26
STATIC TRIM STABILITY
AH-1G USA S/N 15246
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp ~ FT	AVG. GW ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF ~ C_T	FLT. COND.
▲	5610	9320	200.1(AFT)	324.0	0.005448	CLIMB
■	4950	9280	200.2(AFT)	331.0	0.005181	AUTOROTATION

NOTES: 1. XM-28 GUN TURRET INSTALLED (STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT:
LONGITUDINAL = 10.6 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.83 INCHES FROM FULL LEFT
COLLECTIVE = 6.9 INCHES FROM FULL DOWN

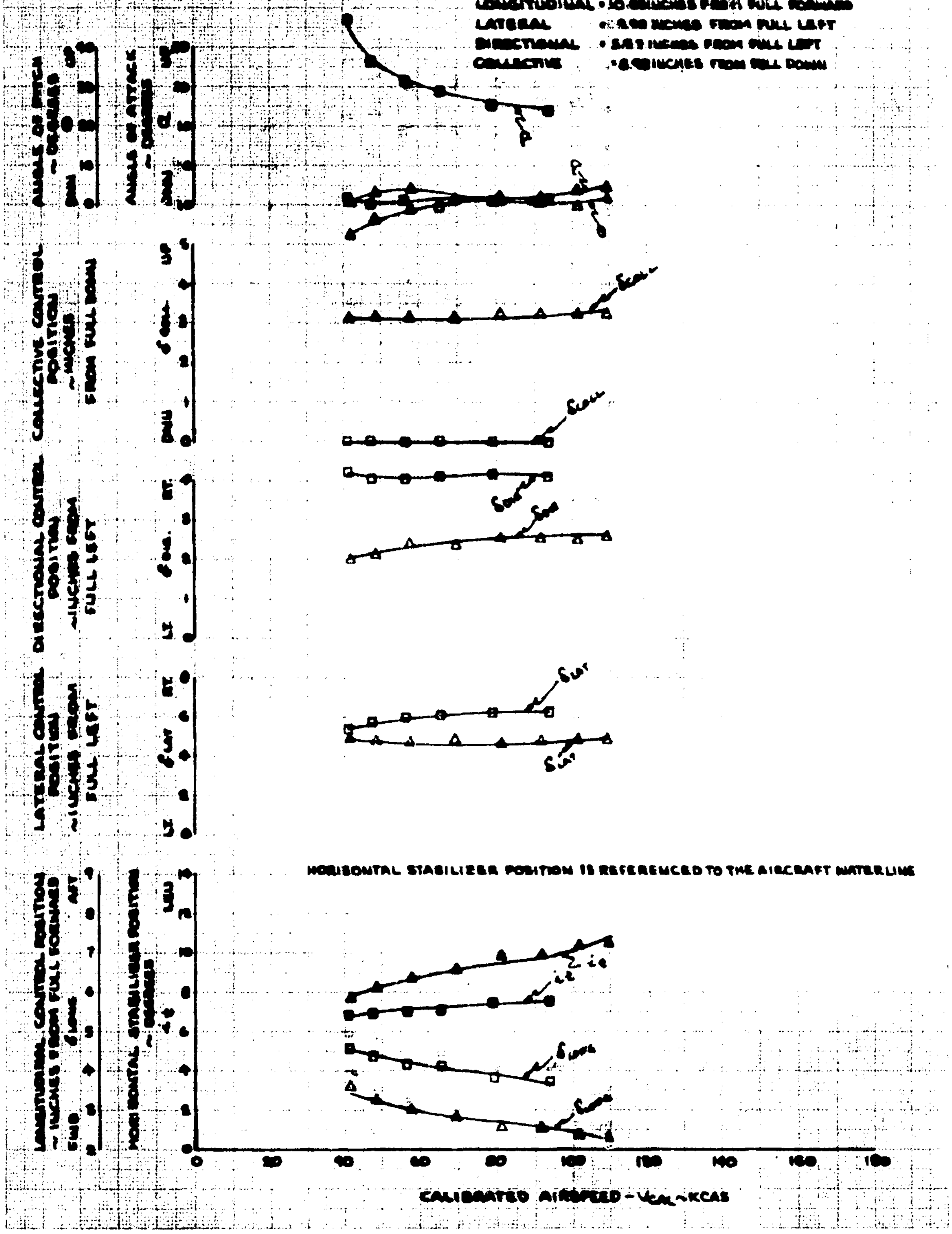


FIGURE NO. 27

STATIC TRIM STABILITY

AH-1G USA 6615247

CLEAN CONFIGURATION SKID TUBE FAIRINGS OFF

SYM	AVG. ALT. H_p ~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	THRUST COEFF. ~C_T	FLT. COND.
○	3080	8840	199.9(AFT)	323.0	0.004866	LEVEL FLT.
▽	3190	8665	199.8(AFT)	322.0	0.004287	DIVE

NOTES: 1. TAT 102 CHIN TURRET INSTALLED (STOWED POSITION).
2. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 9.07 IN. FROM FULL FORWARD
LATERAL = 10.00 IN. FROM FULL LEFT
DIRECTIONAL = 7.07 IN. FROM FULL LEFT
COLLECTIVE = 9.30 IN. FROM FULL DOWN

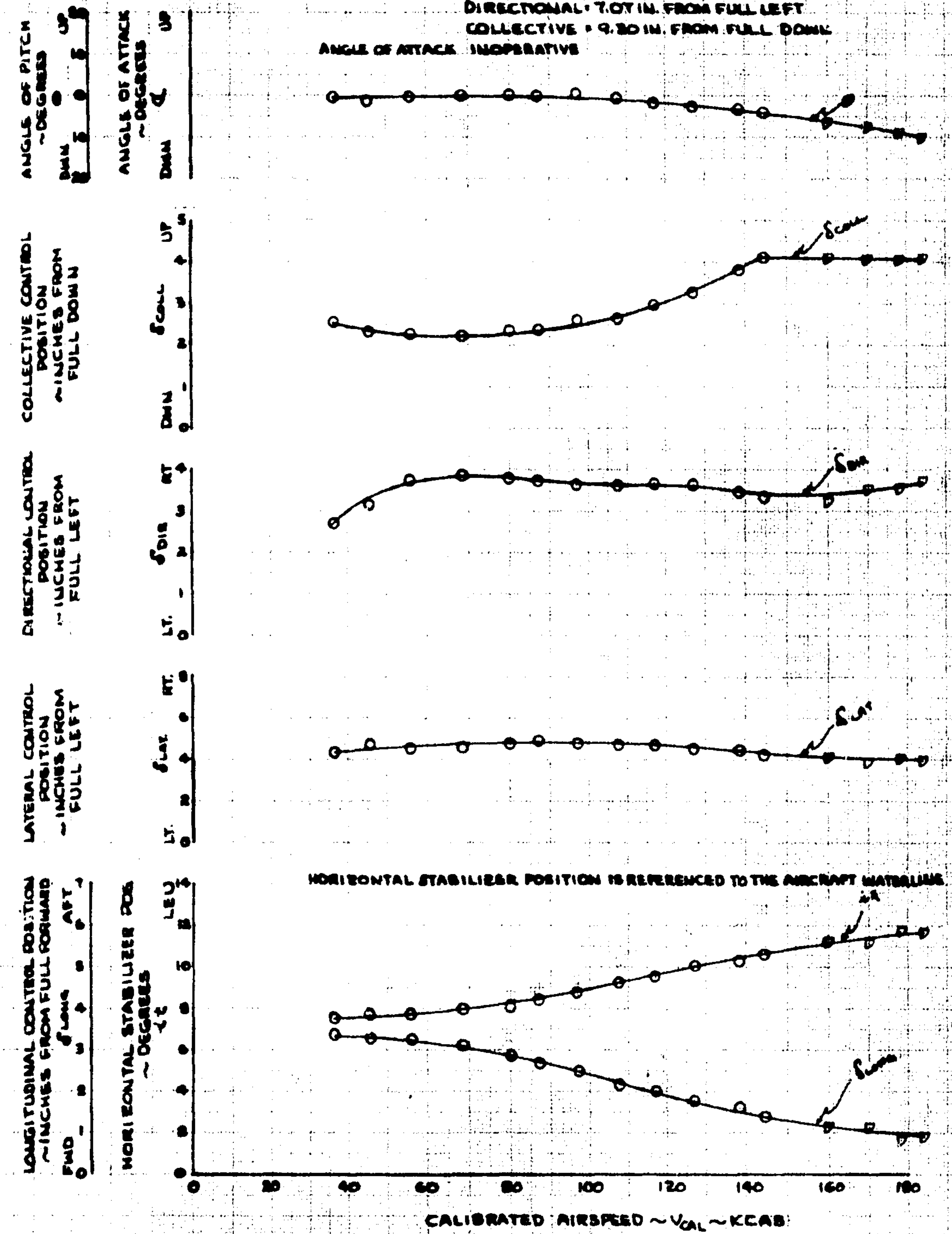


FIGURE NO 28

SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 71-15695

GROSS WEIGHT COMPARISON

SYM	AVG ALT. H_p ~ FT.	AVG GROSS WT. ~ LB.	AVG LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C_T
○	5810	8460	[illegible] (AFT)	[illegible]	HVY. [illegible]	[illegible]
□	6020	9140	[illegible] (AFT)	[illegible]	HVY. [illegible]	[illegible]
⬮	[illegible]	8010	201.0(AFT)	[illegible]	HVY. [illegible]	[illegible]
◆	ST	[illegible]	[illegible] (AFT)	[illegible]	HVY. [illegible]	[illegible]
▼	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	OUTBD ALT.	[illegible]
△	4970	8190	201.0(AFT)	[illegible]	OUTBD ALT.	[illegible]

NOTES: 1. POINTS DERIVED FROM FIGURES [illegible] THROUGH [illegible], [illegible] THROUGH [illegible], AND 56 THROUGH 61, APPENDIX VII

2. OPEN SYMBOLS DENOTE LEVEL FLIGHT

3. CROSSED SYMBOLS DENOTE DIVE

4. FLAGGED SYMBOLS DENOTE CLIMB

5. TAILED SYMBOLS DENOTE AUTOROTATION

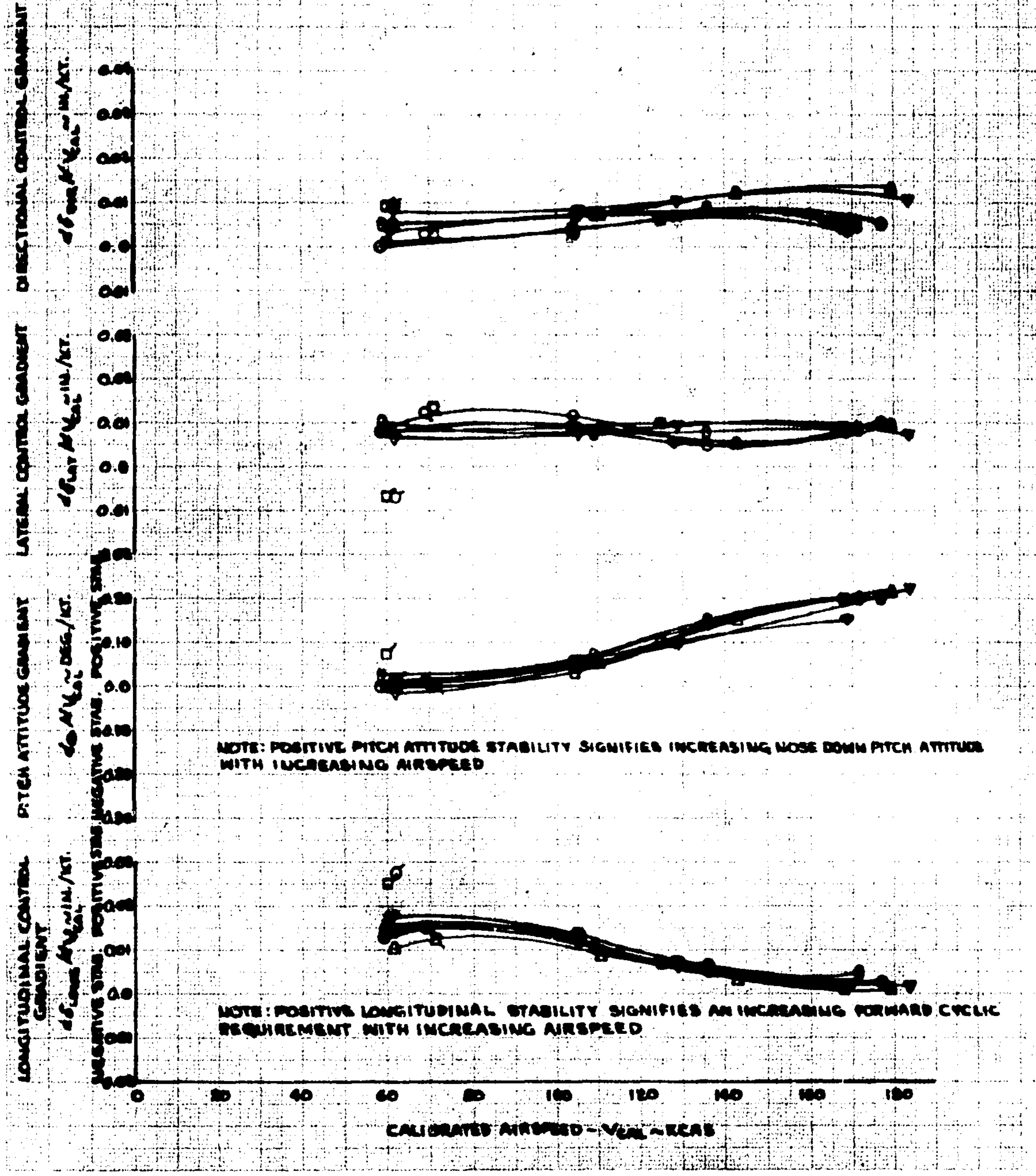


FIGURE NO. 29

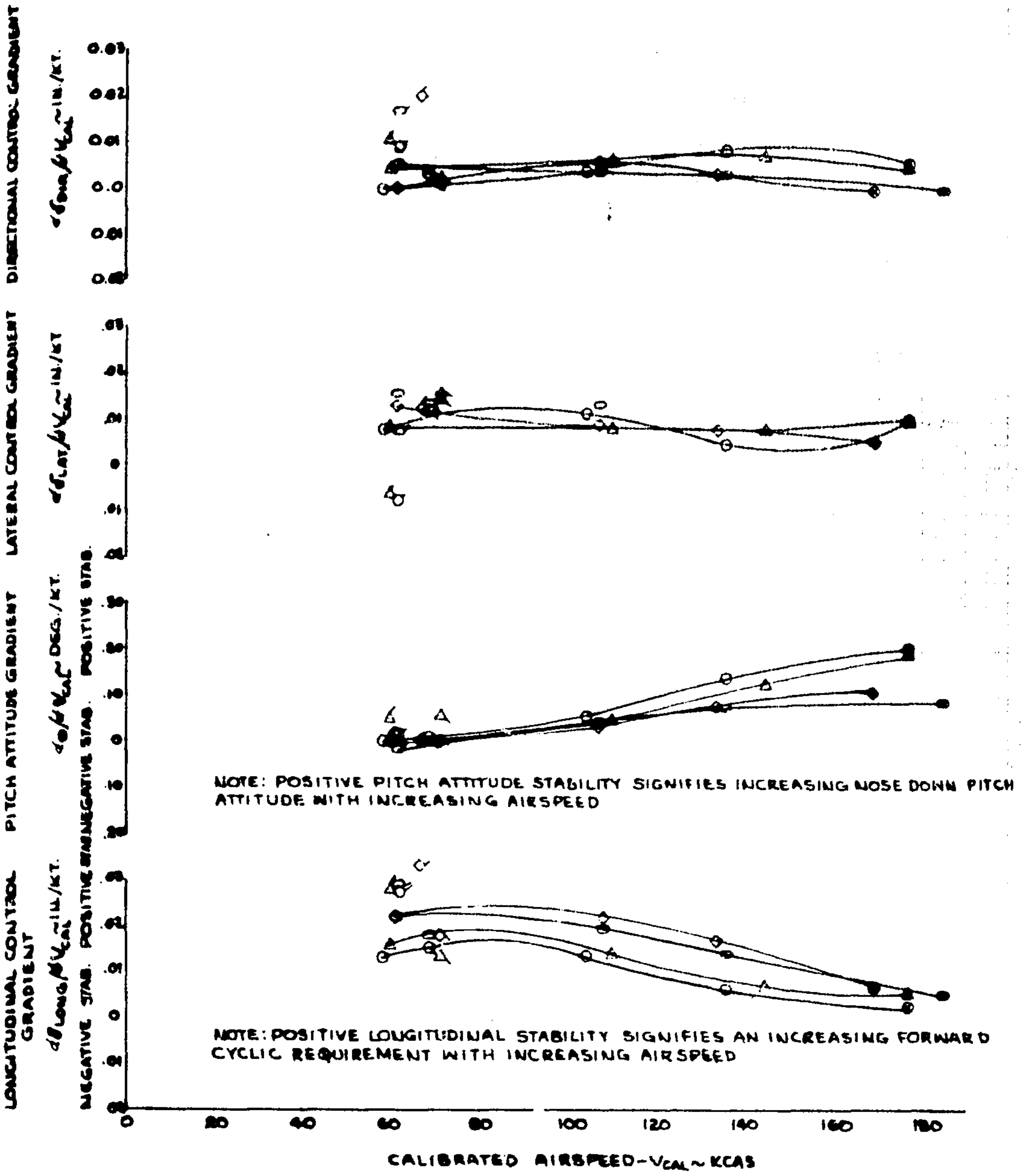
SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 715695

CENTER OF GRAVITY COMPARISON

SYM	AVG. ALT. H_p ~FT.	AVG. GROSS WT. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~C_T
○	5810	8460	200.8(AFT)	322.0	HVY. HOG	0.004982
▲	5730	8180	201.0(AFT)	322.5	CLEAN	0.004817
◆	6760	8160	191.0(FWD)	322.5	HVY. HOG	0.004961
⊖	5960	8280	191.1(FWD)	324.0	CLEAN	0.004814

NOTES:
1. POINTS DERIVED FROM FIGURES 35 THROUGH 40 AND 53 THROUGH 58, APPENDIX III
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION



NOTE: POSITIVE PITCH ATTITUDE STABILITY SIGNIFIES INCREASING NOSE DOWN PITCH ATTITUDE WITH INCREASING AIRSPEED

NOTE: POSITIVE LONGITUDINAL STABILITY SIGNIFIES AN INCREASING FORWARD CYCLIC REQUIREMENT WITH INCREASING AIRSPEED

FIGURE NO. 50

SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USA S/N 715695
ALTITUDE COMPARISON

SYM	AVG. ALT. H_D ~FT.	AVG. GROSS WT. ~LB	AVG. LONG C.G. ~IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~C_T
▲	5780	8400	201.1 (AFT)	322.5	CLEAN	0.004817
●	5320	8015	201.0 (AFT)	324.5	HVY SCOUT	0.004649
○	5310	8460	200.8 (AFT)	322.0	HVY. HOG	0.004982
△	4970	8190	201.0 (AFT)	324.0	OUTB'D ALT	0.004773
◇	15620	8150	201.1 (AFT)	322.5	CLEAN	0.006381
▽	14640	8570	200.7 (AFT)	323.5	HVY. HOG	0.006700
○	14650	8180	201.7 (AFT)	323.5	OUTB'D ALT	0.006402

NOTES: 1. POINTS DERIVED FROM FIGURES 38 THROUGH 43, 45 THROUGH 50, 56 THROUGH 58, 62 AND 63, APPENDIX III
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION

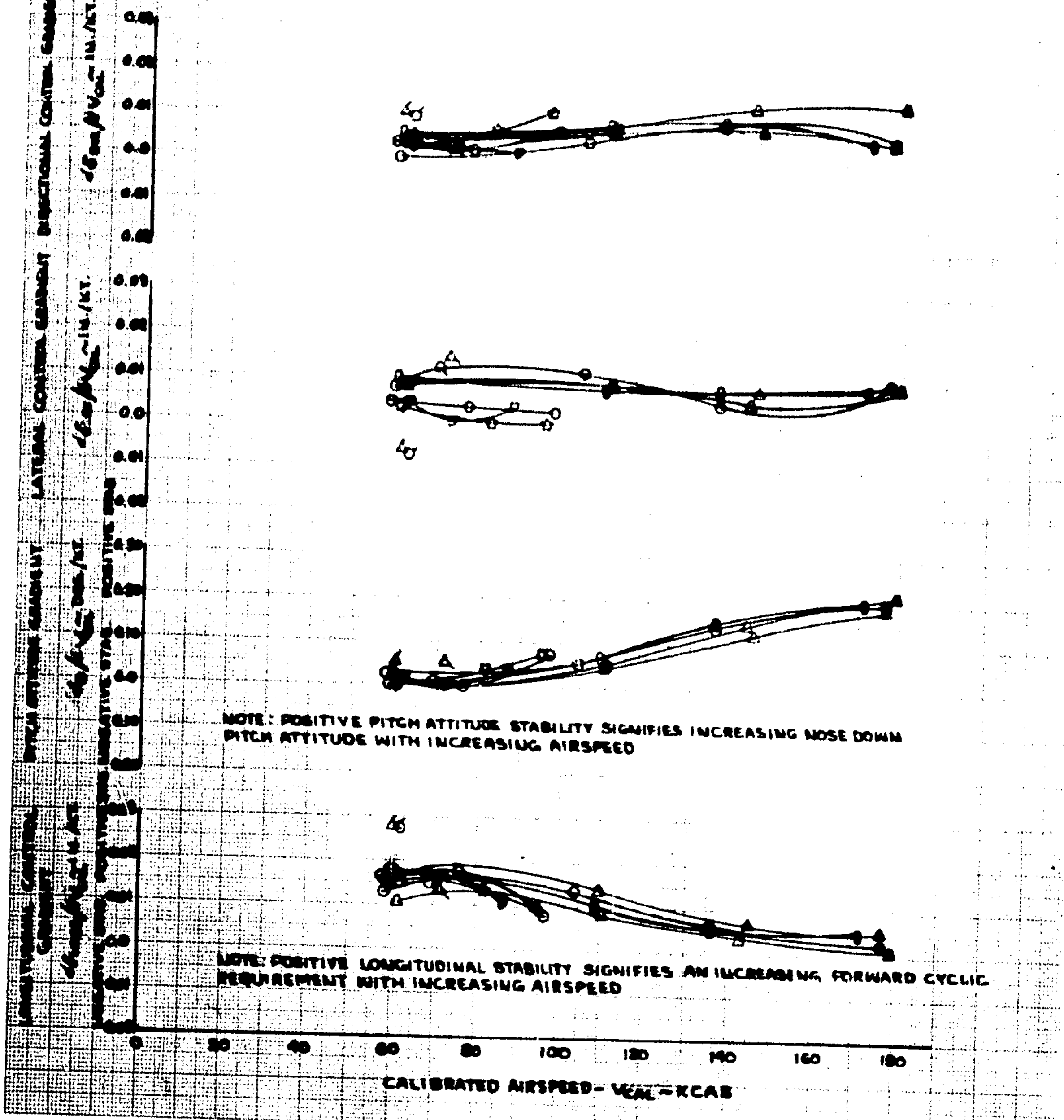


FIGURE NO. 31
SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G

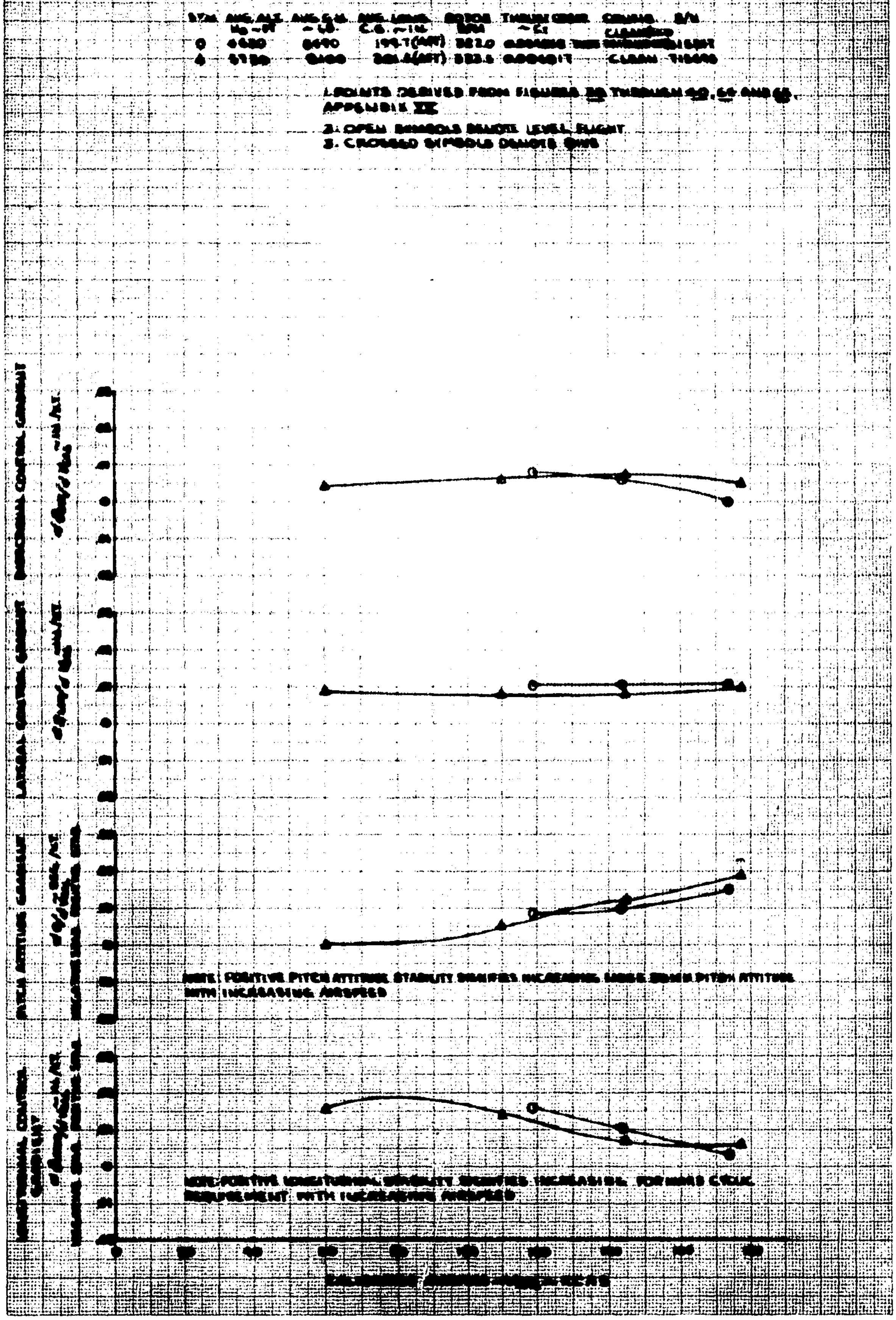


FIGURE NO. 32

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA 71-15695

CLEAN CONFIGURATION

SYM	AVG. ALT. Hp ~ FT	AVG. G.W. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
●	4580	7440	190.6(FWD)	324.0	LEVEL FLT.	0.00[illegible]
○	[illegible]960	7325	190.7(FWD)	325.0	LEVEL FLT.	0.004873

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 GUN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.[illegible] INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.90 INCHES FROM FULL DOWN

4. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

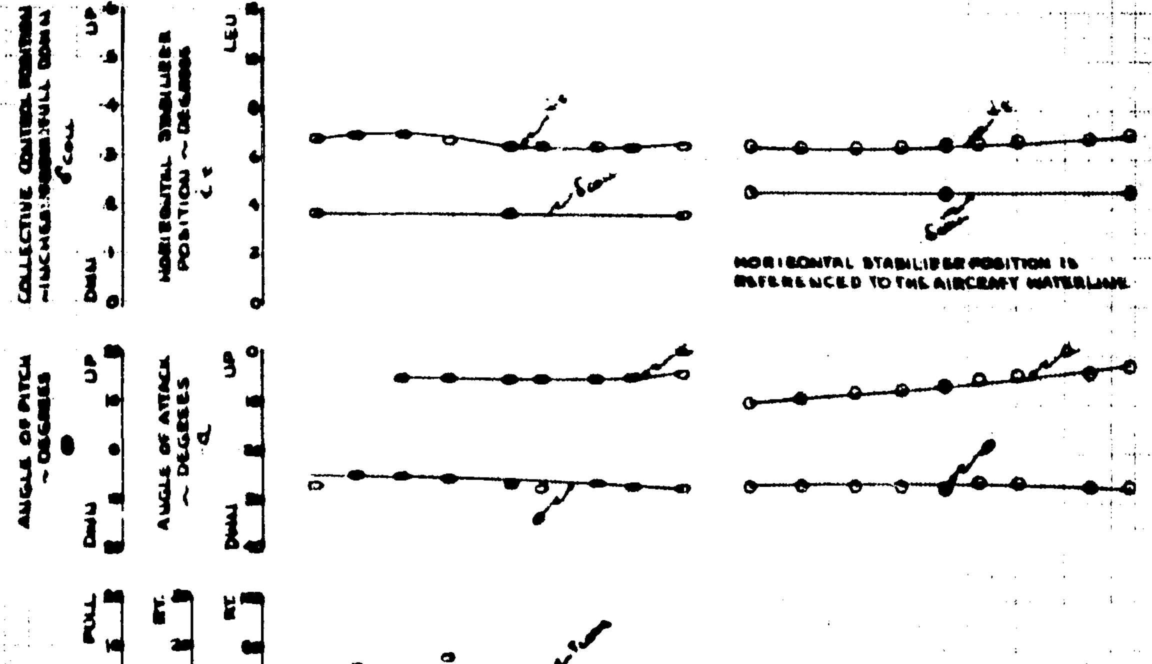


FIGURE NO. 25

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

SYM.	AVG. ALT. Hp~FT.	AVG. C.G. ~[illegible]	AVG. LONG. C.G.~IN.	ROTOR SPEED RPM	FLT. COND.	THRUST COEFF. ~CT
▼	5510	[illegible]	[illegible]	[illegible]	LEVEL FLT.	[illegible]
◆	5610	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES: 1. [illegible]

2. [illegible]

[illegible] CONTROL DISPLACEMENT [illegible]

LONGITUDINAL [illegible] FULL FORWARD

LATERAL [illegible] FULL LEFT

DIRECTIONAL [illegible] FULL LEFT

COLLECTIVE [illegible] FULL DOWN

3. [illegible] FROM ALL CONTROL FORCE DATA

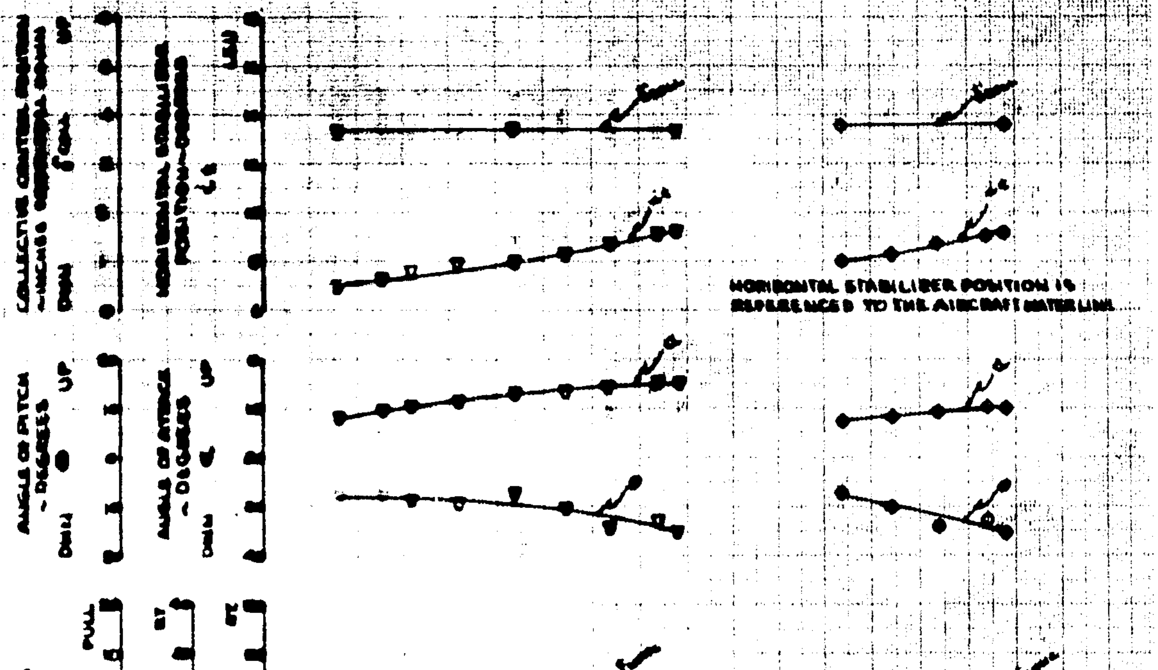


FIGURE NO. 54

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

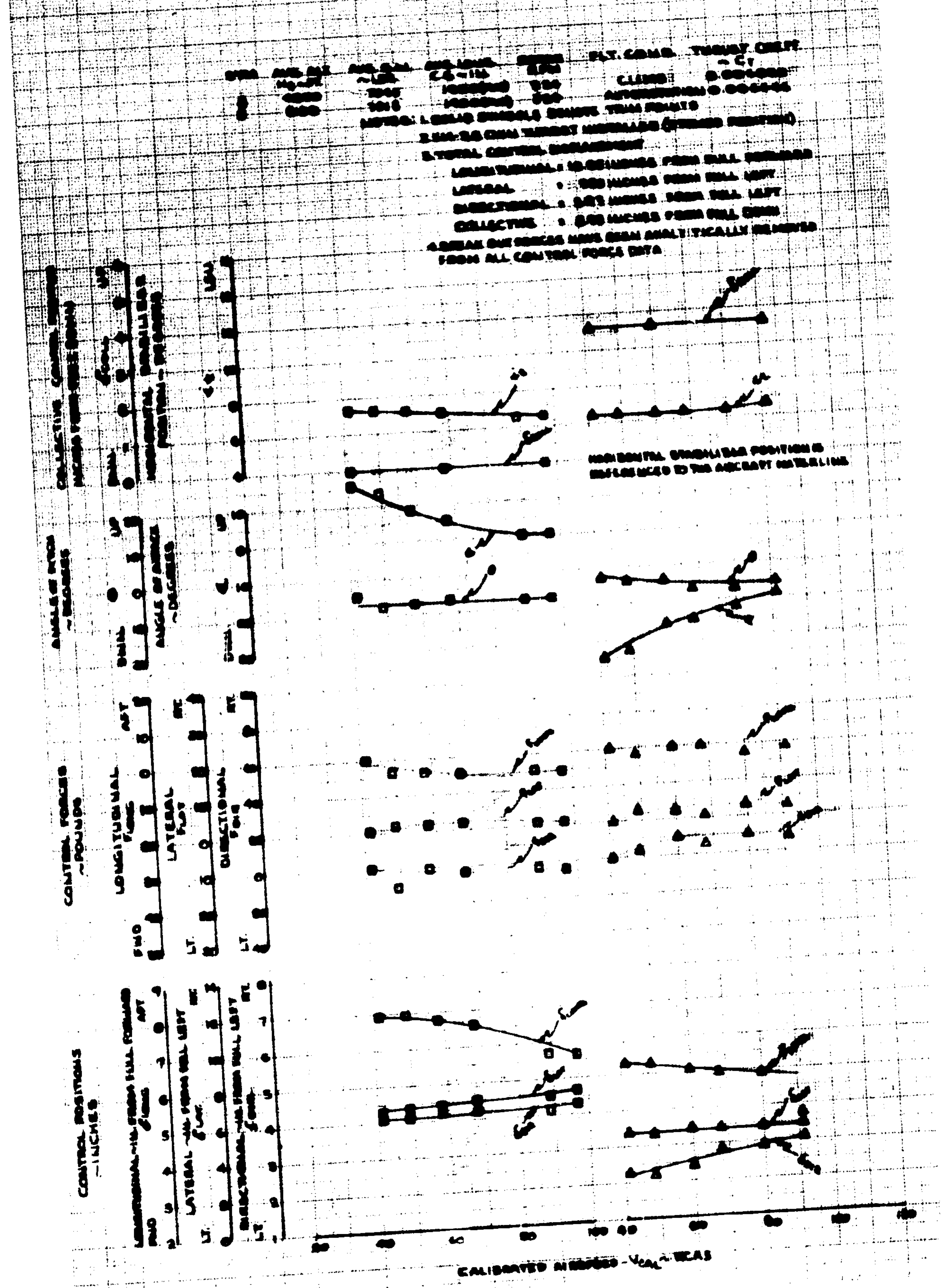


FIGURE NO. 35

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

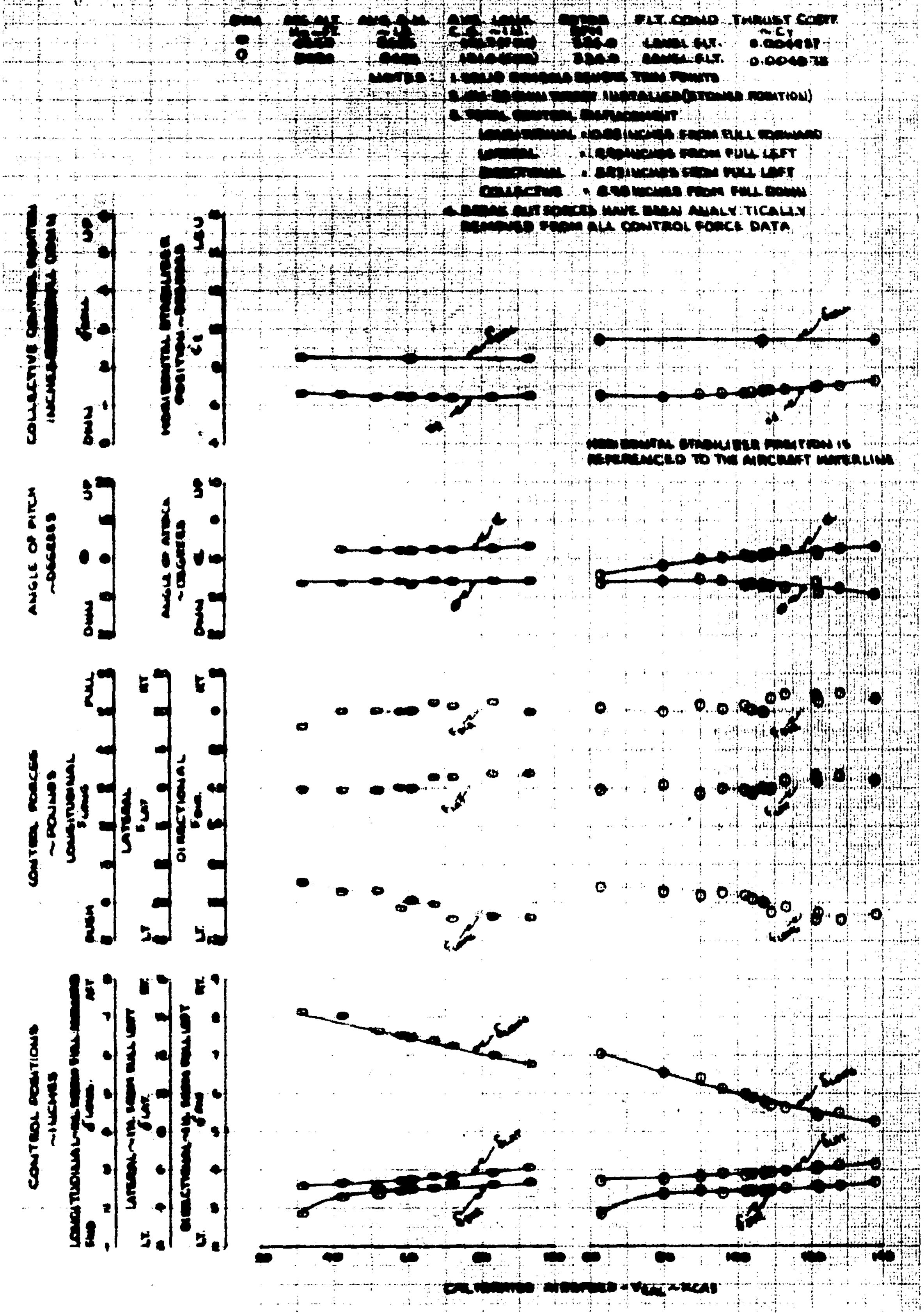


FIGURE No. 36

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

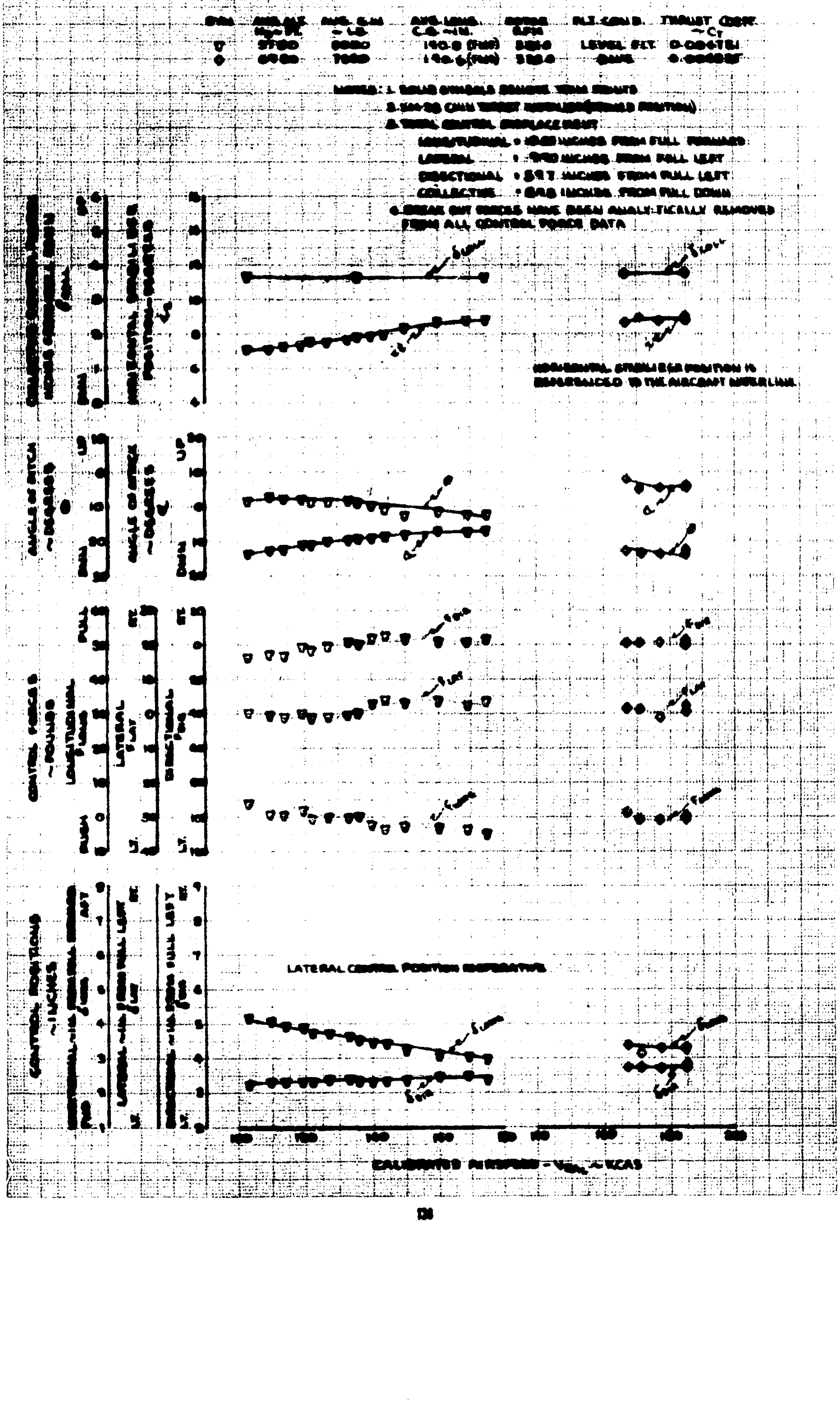


FIGURE No. 37

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA 67-15643

CLEAN CONFIGURATION

SYM	AVG. ALT H_p ~ FT	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEF. ~ C_T
△	6770	8100	191.1 (FWD)	324.0	CLIMB	[illegible]
□	6400	[illegible]	191.1 (FWD)	324.0	AUTOROTATION	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 GUN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.86 INCHES FROM FULL FORWARD

LATERAL = 9.80 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 6.98 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

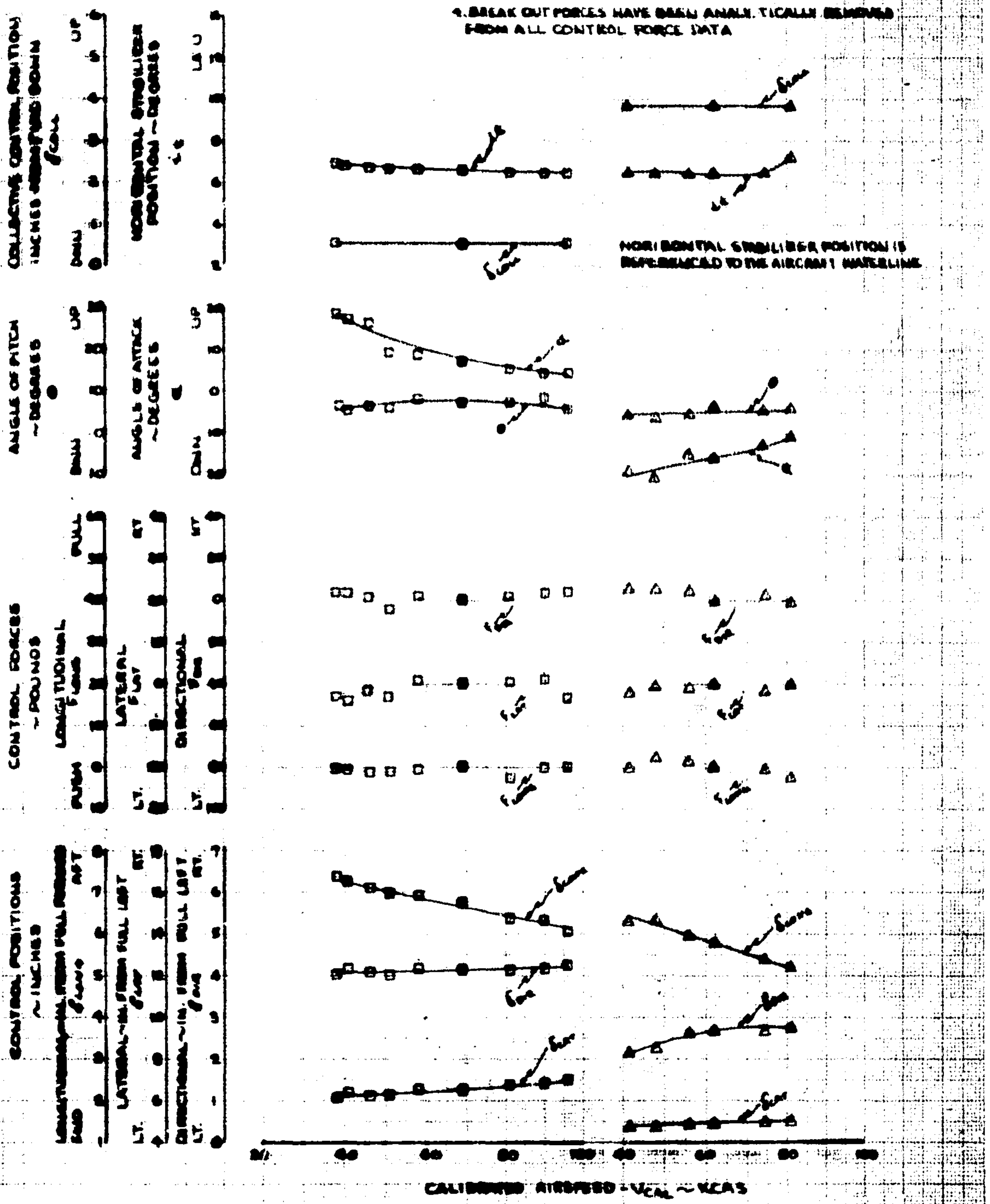


FIGURE No. 38

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 15695

CLEAN CONFIGURATION

SYM.	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~CT
●	7[illegible]	[illegible]	201.8(AFT)	[illegible]	LEVEL FLT.	0.00[illegible]
○	[illegible]	[illegible]	201.3(AFT)	324.0	LEVEL FLT.	0.004[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 GUN TURRET INSTALLED (STOWED POSITION).

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.85 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

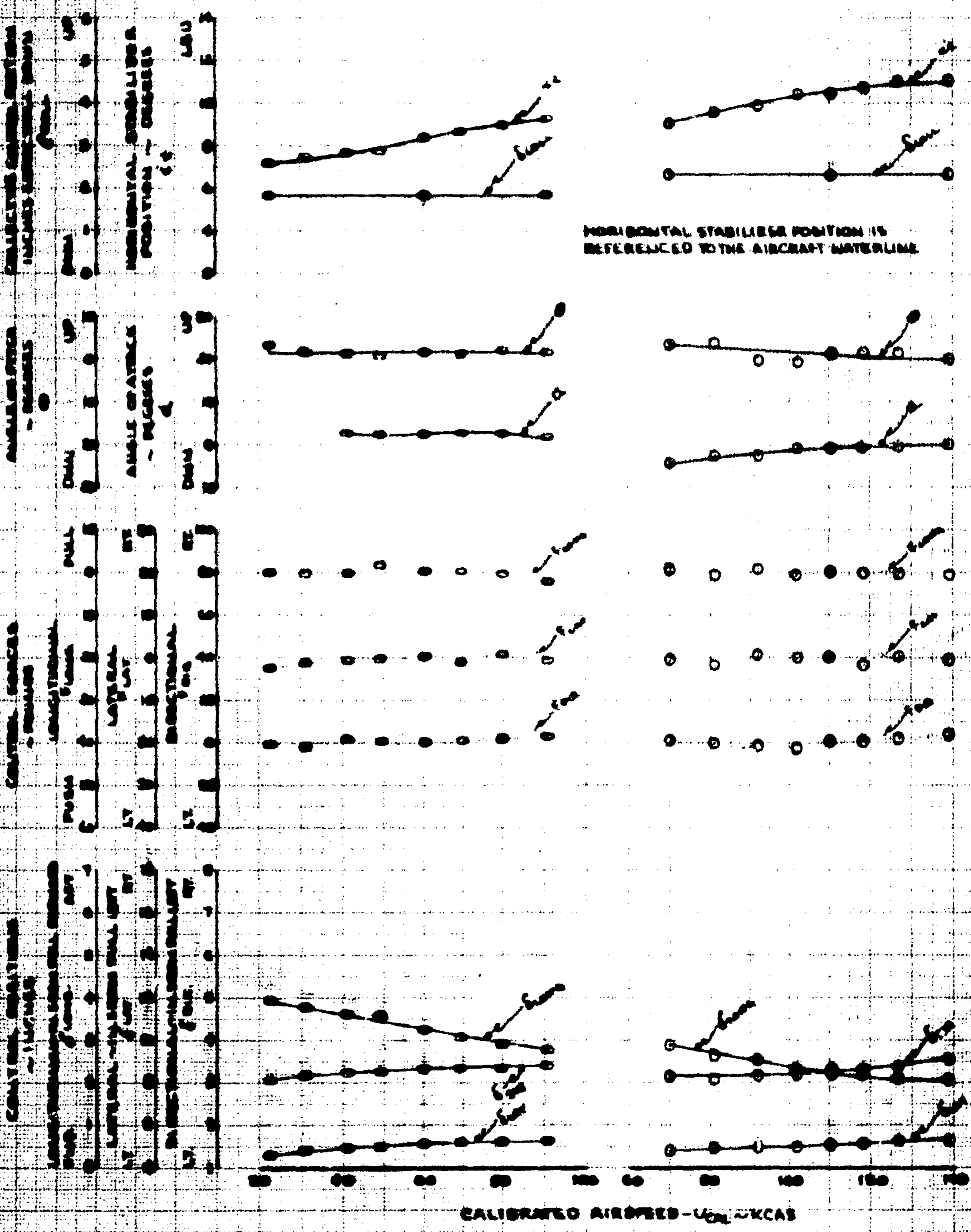


FIGURE NO. 39

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

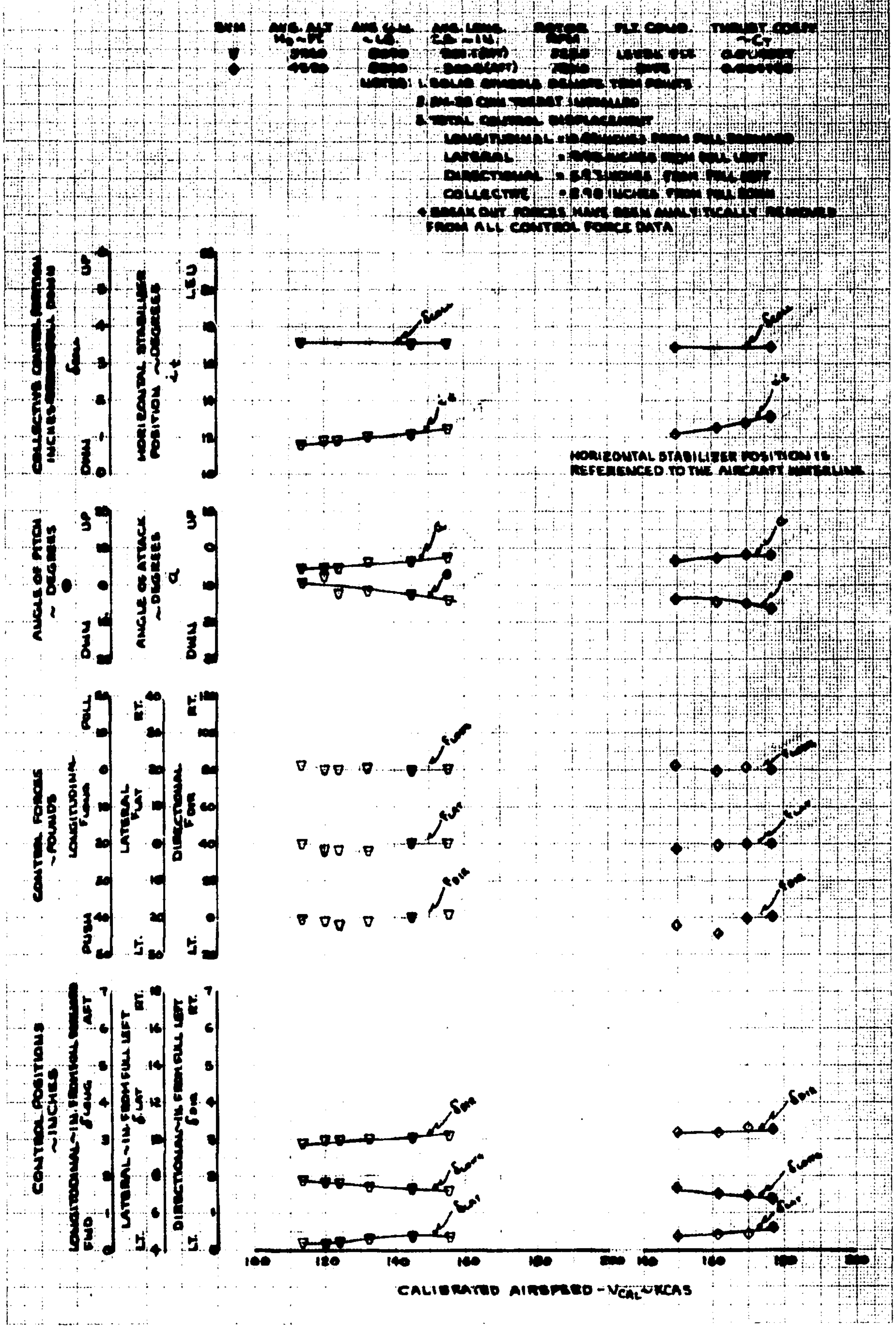


FIGURE NO. 40

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

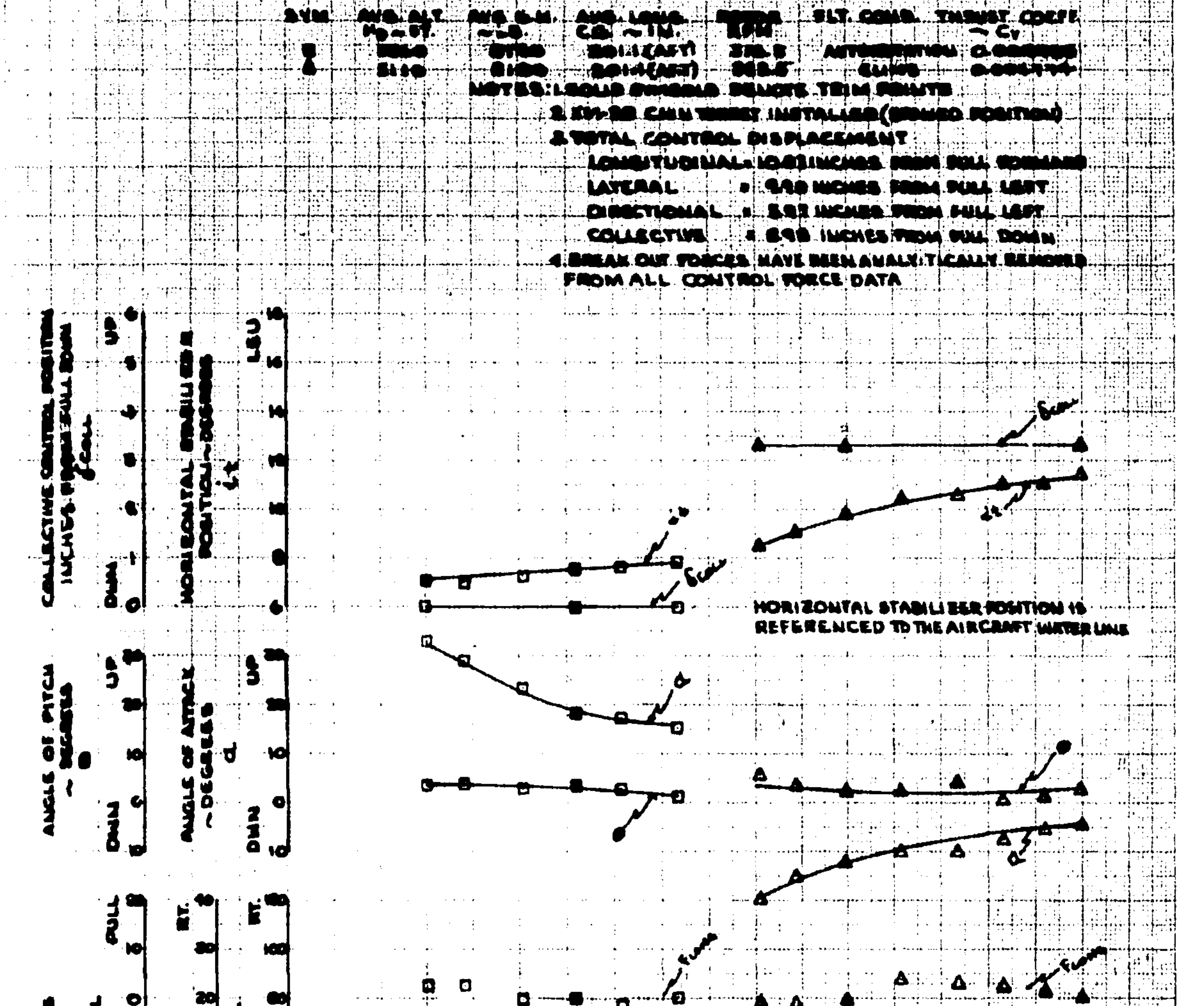


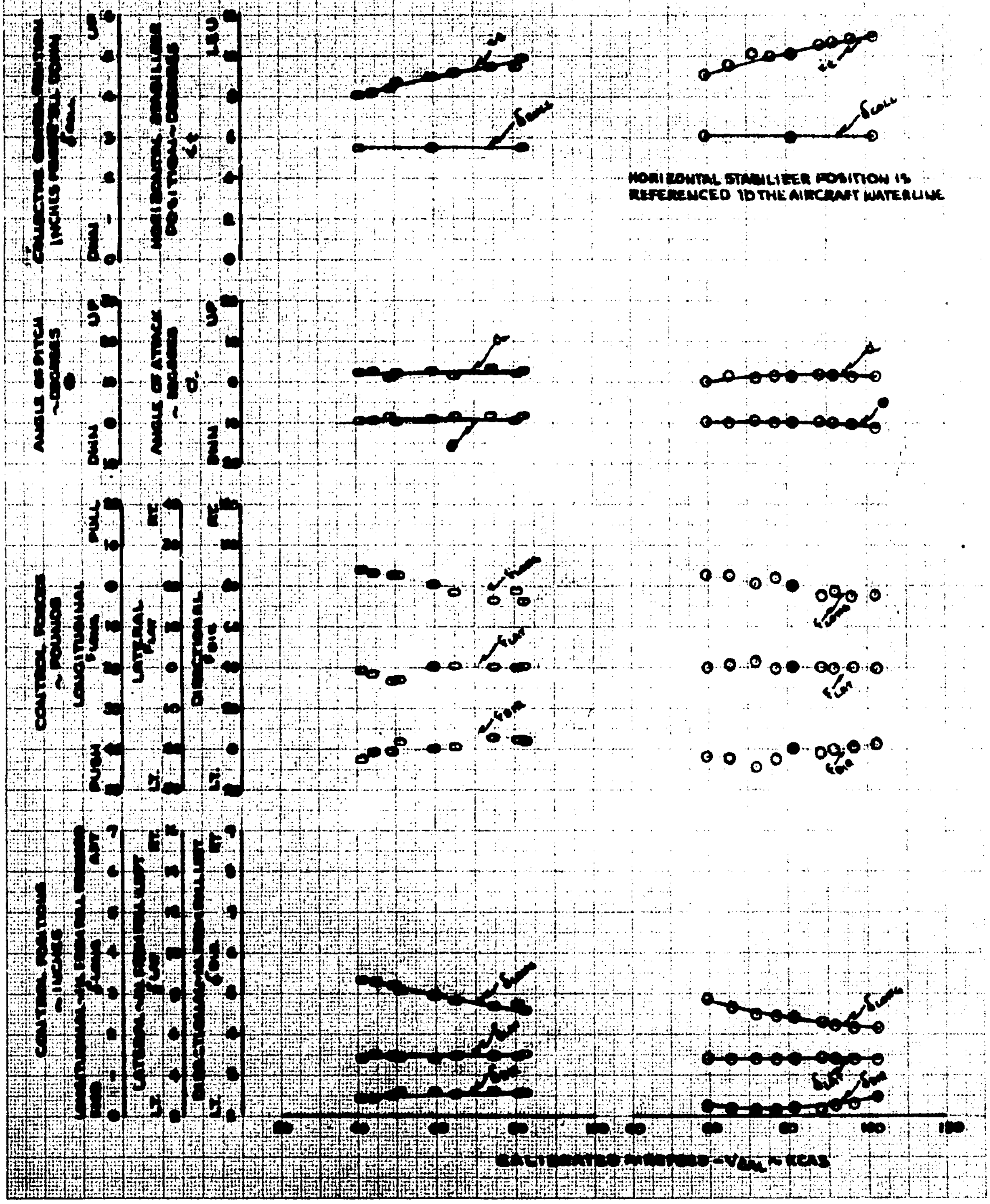
FIGURE NO. 41

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 15095
CLEAN CONFIGURATION

SYM	AVG. ALT. H_p ~ FT	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND	THRUST COEFF. ~ C_T
●	15000	9295	201.0 (AFT)	324.0	LEVEL FLT.	.006565
○	15640	9160	201.1 (AFT)	323.0	LEVEL FLT.	.006572

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 12.03 INCHES FROM FULL FORWARD
LATERAL = 12.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.27 INCHES FROM FULL LEFT
COLLECTIVE = 8.80 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



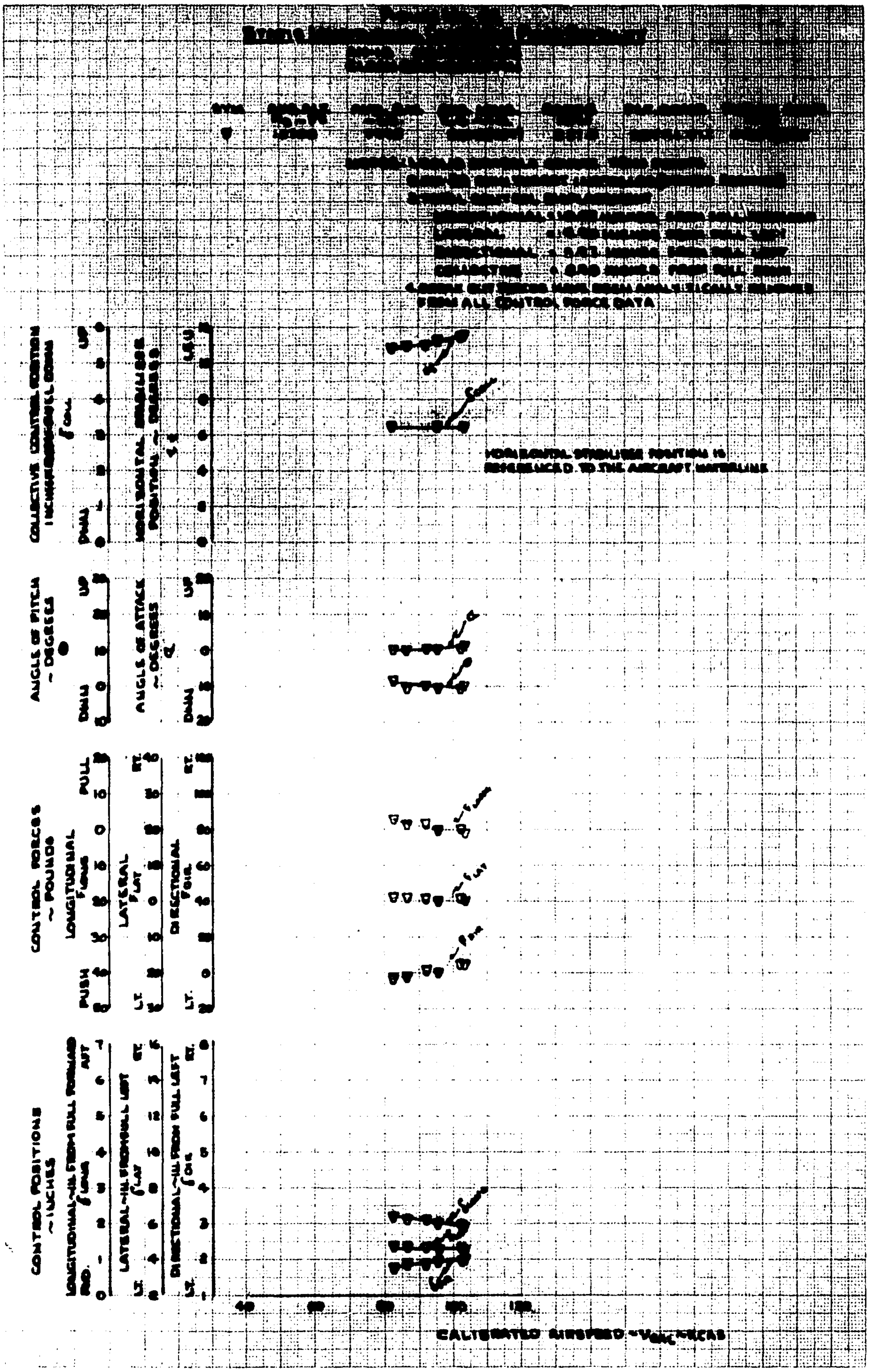

CONTROL POSITIONS ~INCHES
LONGITUDINAL~IN. FROM FULL FORWARD
FWD.
AFT
δ_{LONG}
0
1
2
3
4
5
6
7
LATERAL~IN. FROM FULL LEFT
LT.
RT.
δ_{LAT}
DIRECTIONAL~IN. FROM FULL LEFT
LT.
RT.
δ_{DIR}
CONTROL FORCES ~POUNDS
LONGITUDINAL
F_{LONG}
PUSH
PULL
LATERAL
F_{LAT}
LT.
RT.
DIRECTIONAL
F_{DIR}
LT.
RT.
ANGLE OF PITCH ~DEGREES
θ
DWN
UP
ANGLE OF ATTACK ~DEGREES
α
DWN
UP
COLLECTIVE CONTROL POSITION INCHES FROM FULL DOWN
δ_{COLL}
DWN
UP
HORIZONTAL STABILIZER POSITION ~ DEGREES
i_s
LEU
HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE.
FROM ALL CONTROL FORCE DATA
40
60
80
100
120
CALIBRATED AIRSPEED ~V_{CAL}~KCAS

FIGURE NO. 45
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USA S/N [illegible]
OUTSD ALTERNATE CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. Hp ~ FT	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
●	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLT.	[illegible]
○	6150	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLT.	0.004690

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = [illegible] INCHES FROM FULL FORWARD
LATERAL = [illegible] INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = [illegible] INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

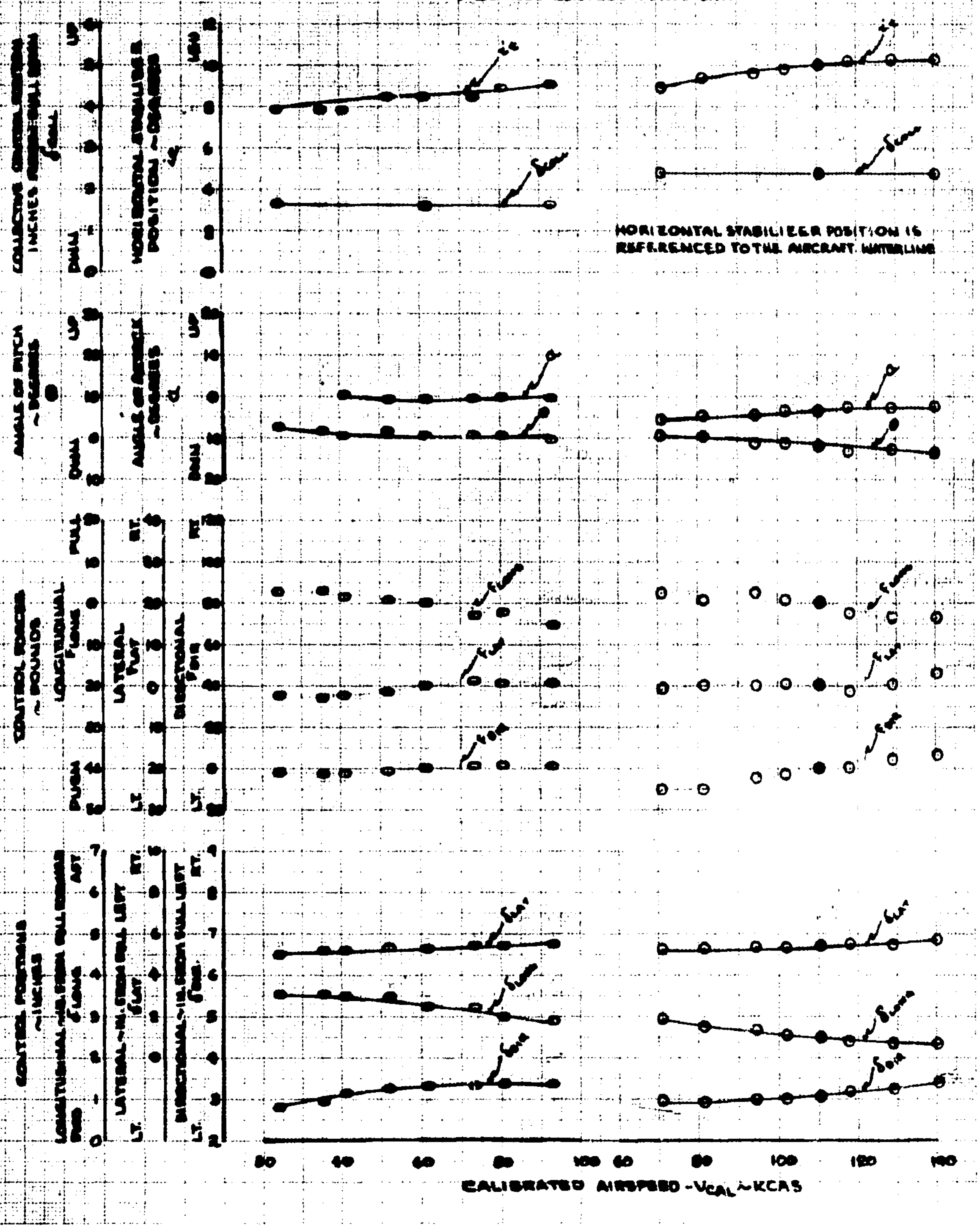


FIGURE No. 44

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

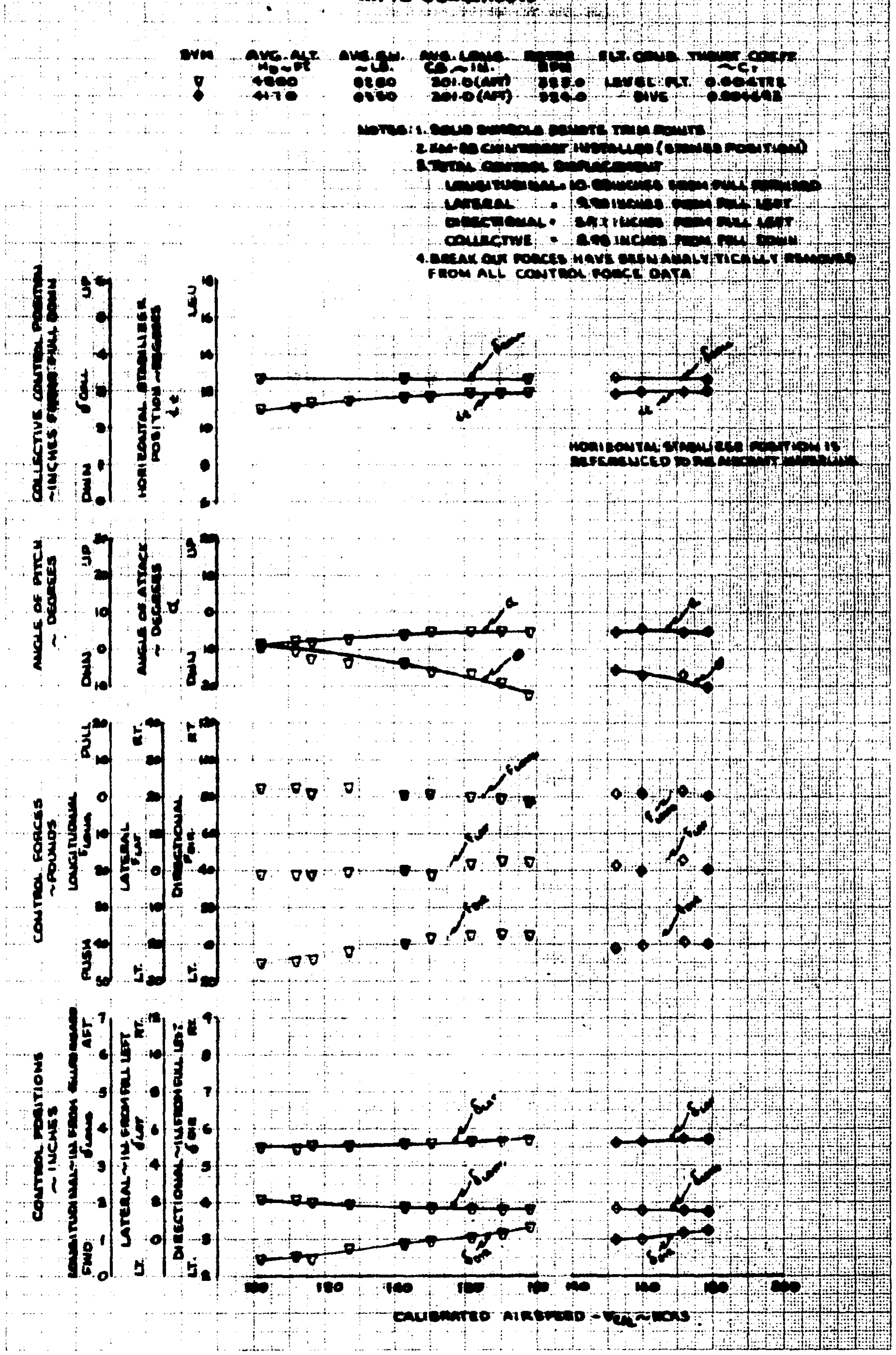


FIGURE No. 45

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

OUTB'D ALTERNATE CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H_D ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF ~ C_T
●	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLT.	[illegible]
○	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

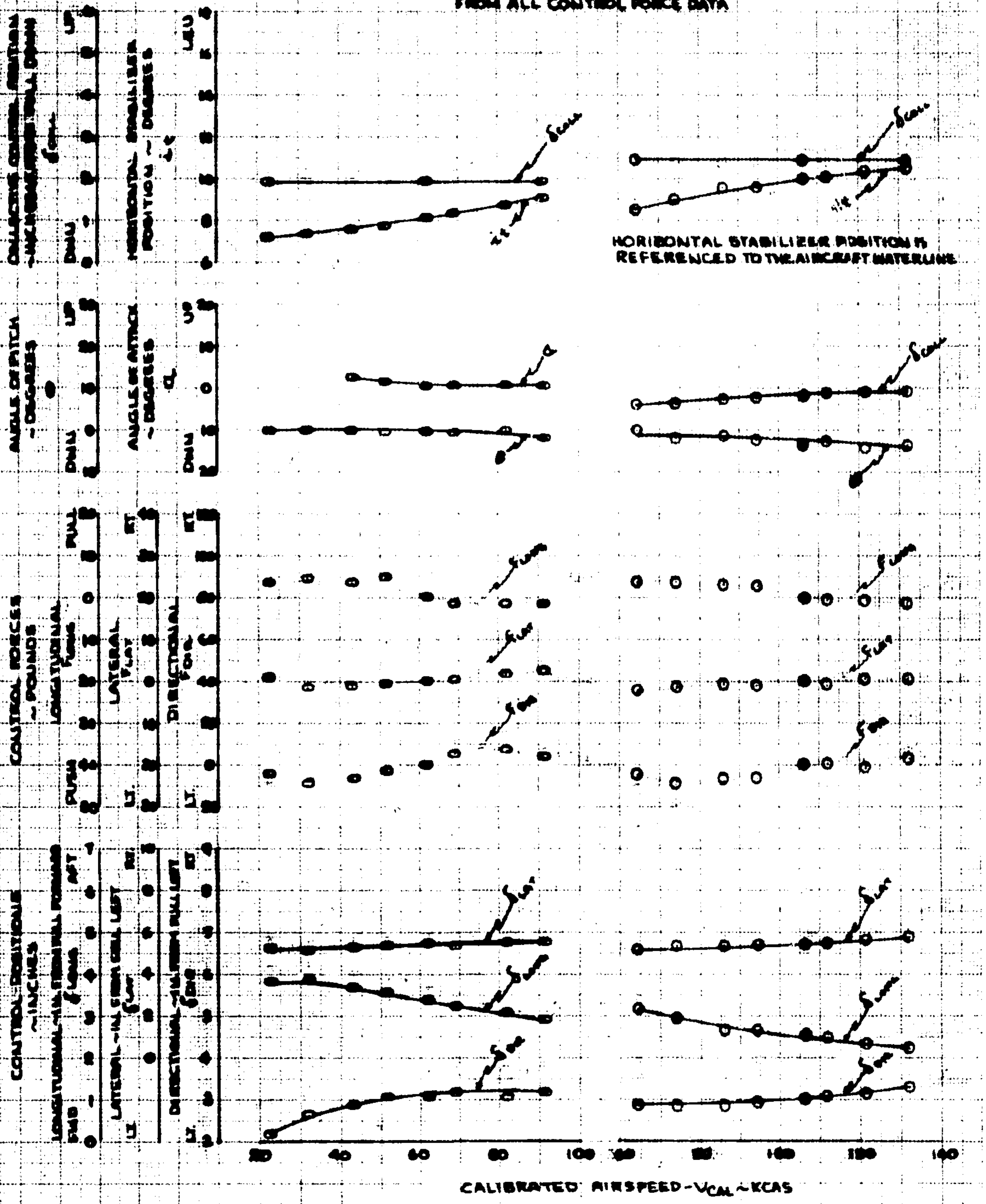
LONGITUDINAL = 10.[illegible] INCHES FROM FULL FORWARD

LATERAL = [illegible] INCHES FROM FULL LEFT

DIRECTIONAL = [illegible] INCHES FROM FULL LEFT

COLLECTIVE = [illegible] INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

CALIBRATED AIRSPEED - V_{CAL} ~ KCAS

FIGURE NO. 46

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

OUT OF ALTERNATE CONFIGURATIONS WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp ~ FT.	AVG. GW. ~ LB	AVG. LONG. C.G ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF ~ C_T
▼	6780	9050	[illegible] (FWD)	[illegible]	LEVEL FLT.	[illegible]
◆	9130	9390	[illegible] (AFT)	[illegible]	DIVE	0.00[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 GUN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

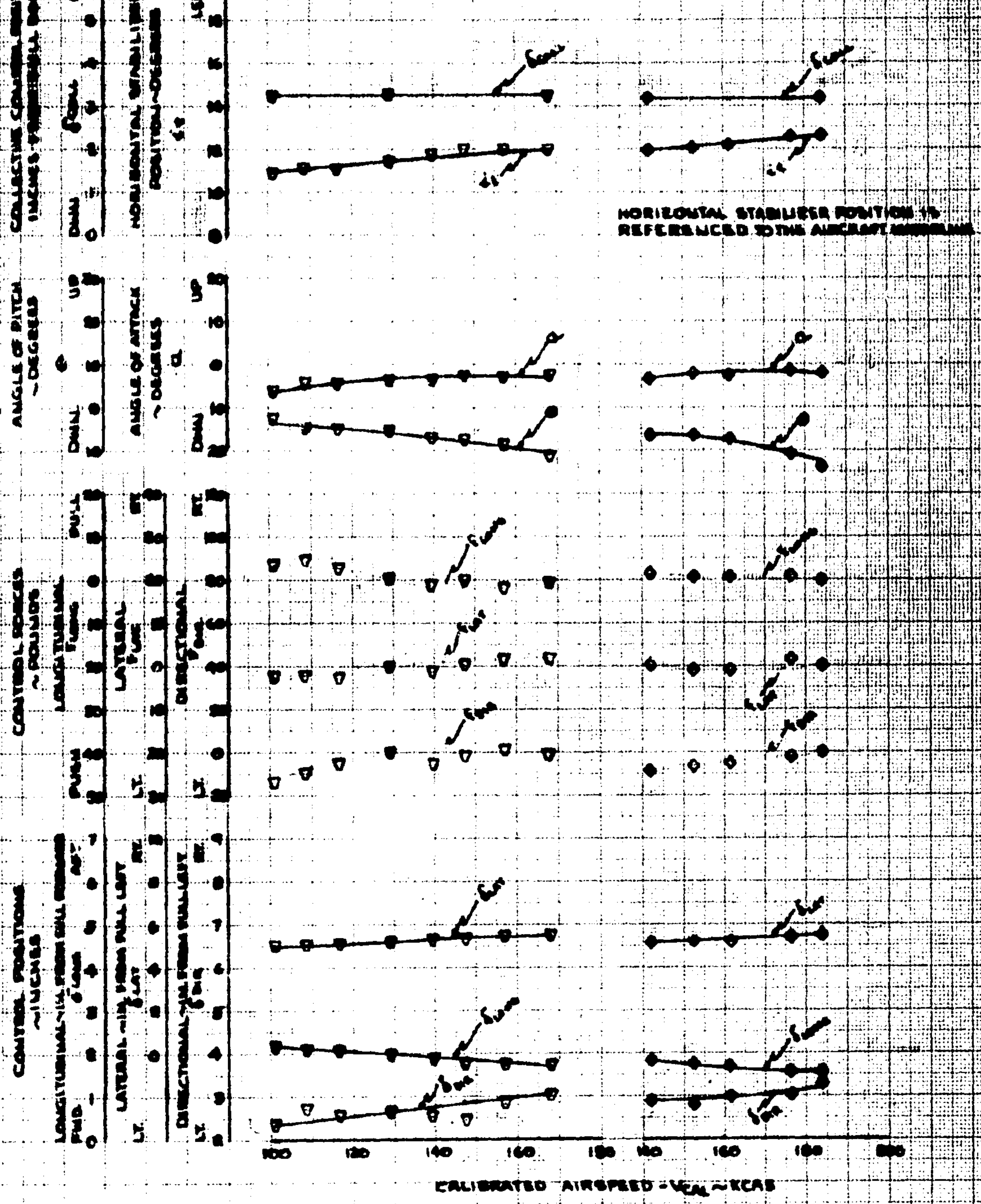
LONGITUDINAL = [illegible] INCHES FROM FULL FORWARD

LATERAL = [illegible] INCHES FROM FULL LEFT

DIRECTIONAL = [illegible] INCHES FROM FULL LEFT

COLLECTIVE = [illegible] INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

CALIBRATED AIRSPEED ~ V_{CAL} ~ KCAS

FIGURE NO. 41
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USA S/N 71-15695
OUTBOARD ALTERNATE CONFIGURATION WITH TURRET FOR FAIRINGS REMOVED

SYM	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF ~C_T
●	16380	8580	200.9(AFT)	324.0	LEVEL FLT.	0.006404
○	14960	8170	201.1(AFT)	324.0	LEVEL FLT.	0.006535

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 ARM TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.88 INCHES FROM FULL FORWARD
LATERAL = 10.50 INCHES FROM FULL LEFT
DIRECTIONAL = 5.87 INCHES FROM FULL LEFT
COLLECTIVE = 6.98 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

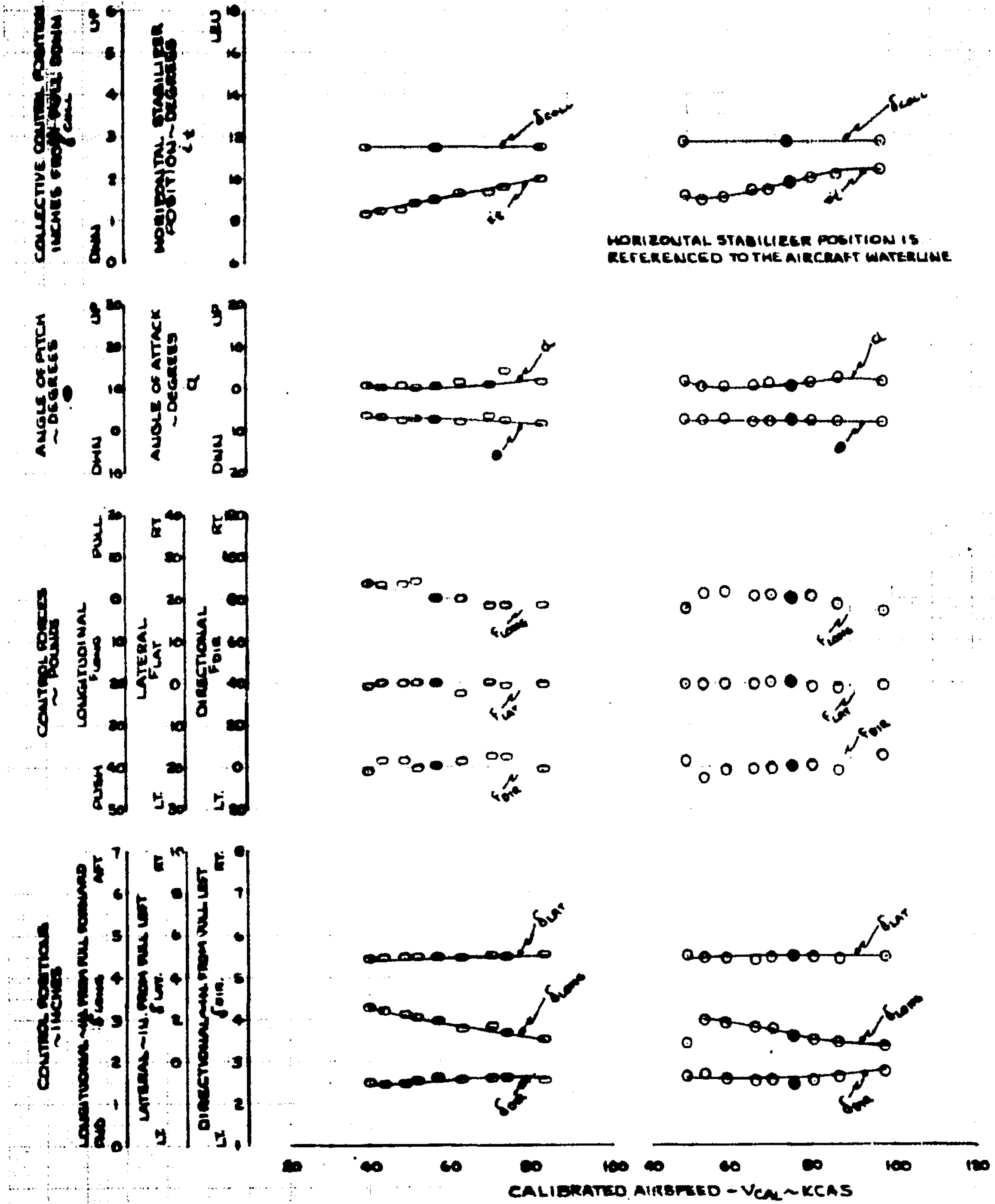


FIGURE NO. [illegible]

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

[illegible]

[illegible]

[illegible]

NOTES: 1. [illegible]
2. [illegible]
3. TOTAL CONTROL [illegible]
LONGITUDINAL [illegible]
LATERAL [illegible] FULL LEFT
DIRECTIONAL [illegible] FULL LEFT
COLLECTIVE [illegible] FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

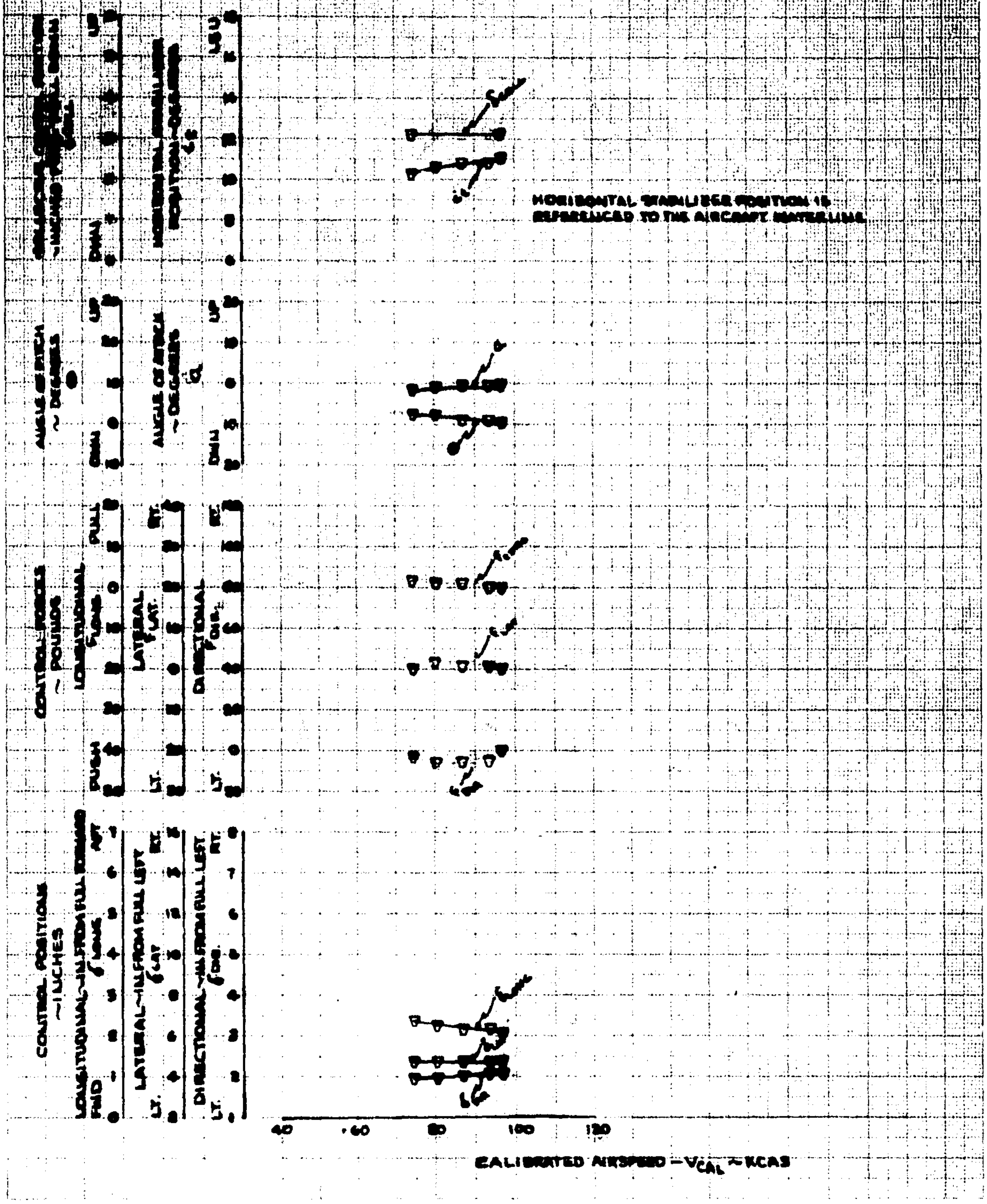


FIGURE NO. 49

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

HVY. SCOUT CONFIGURATION WITH [illegible] REMOVED

SYM	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF ~C_T
●	[illegible]	[illegible]	[illegible] (FWD)	[illegible]	LEVEL FLT.	[illegible]
○	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 ARM TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = [illegible] INCHES FROM FULL FORWARD

LATERAL = [illegible] INCHES FROM FULL LEFT

DIRECTIONAL = [illegible] INCHES FROM FULL LEFT

COLLECTIVE = [illegible] INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

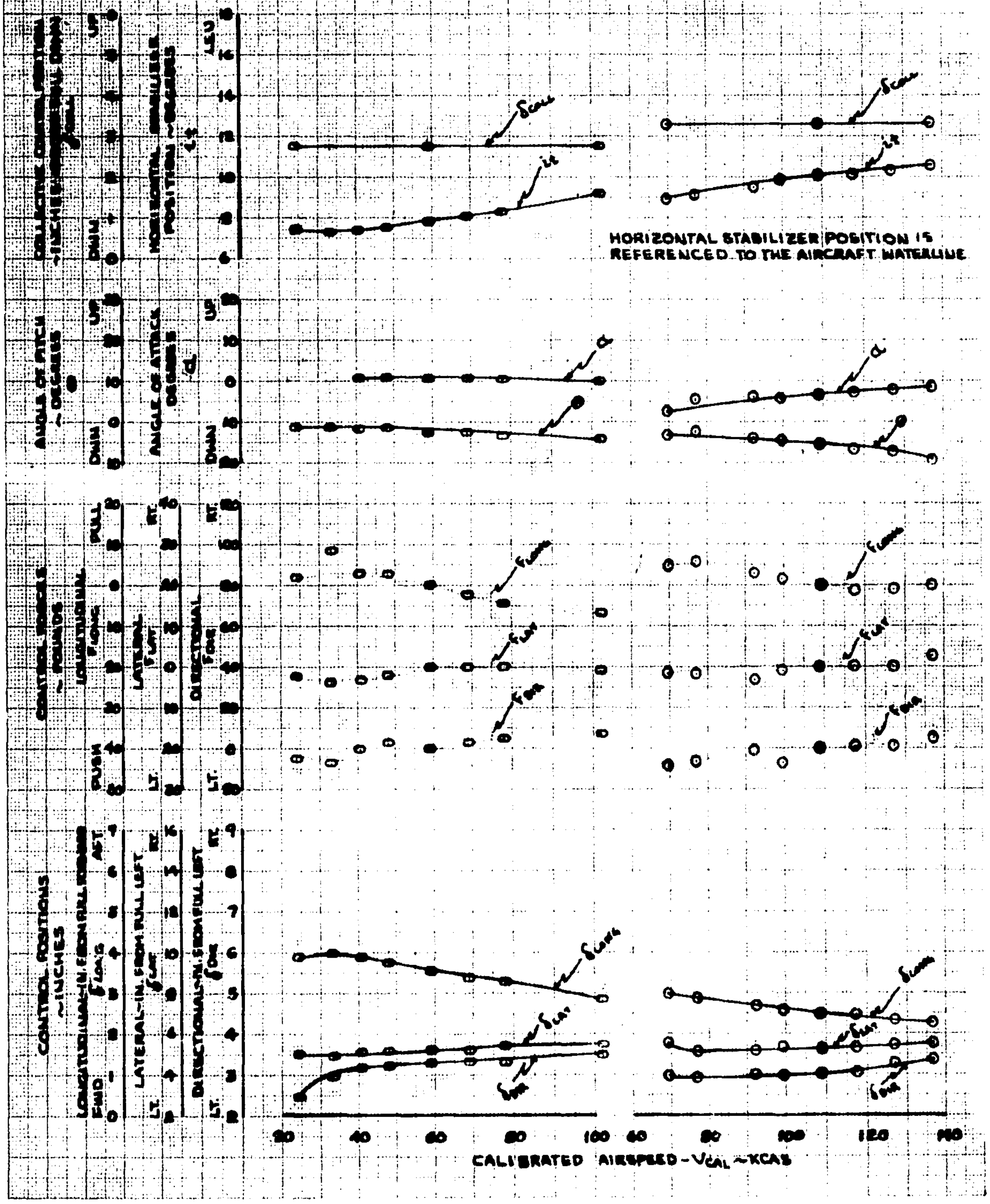


FIGURE NO. 50

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 71-15695

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

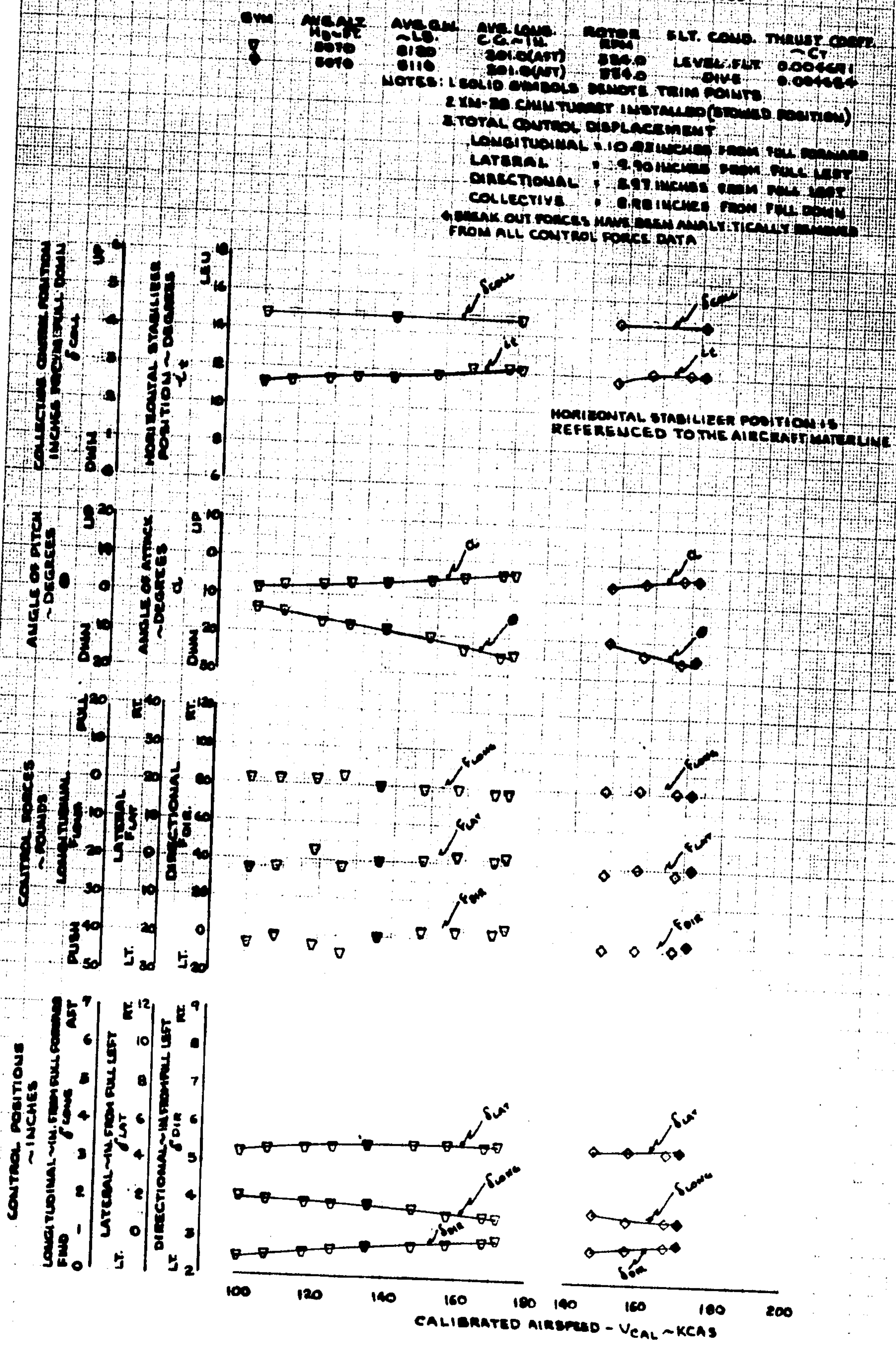


FIGURE No. 51

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA 66-15695

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H_p ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
○	7230	9070	208.3(AFT)	324.0	LEVEL FLT.	0.005595
⊖	6650	9150	200.8(AFT)	324.0	LEVEL FLT.	0.005569

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.05 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL FORWARD
DIRECTIONAL = 5.97 INCHES FROM FULL FORWARD
COLLECTIVE = 8.98 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

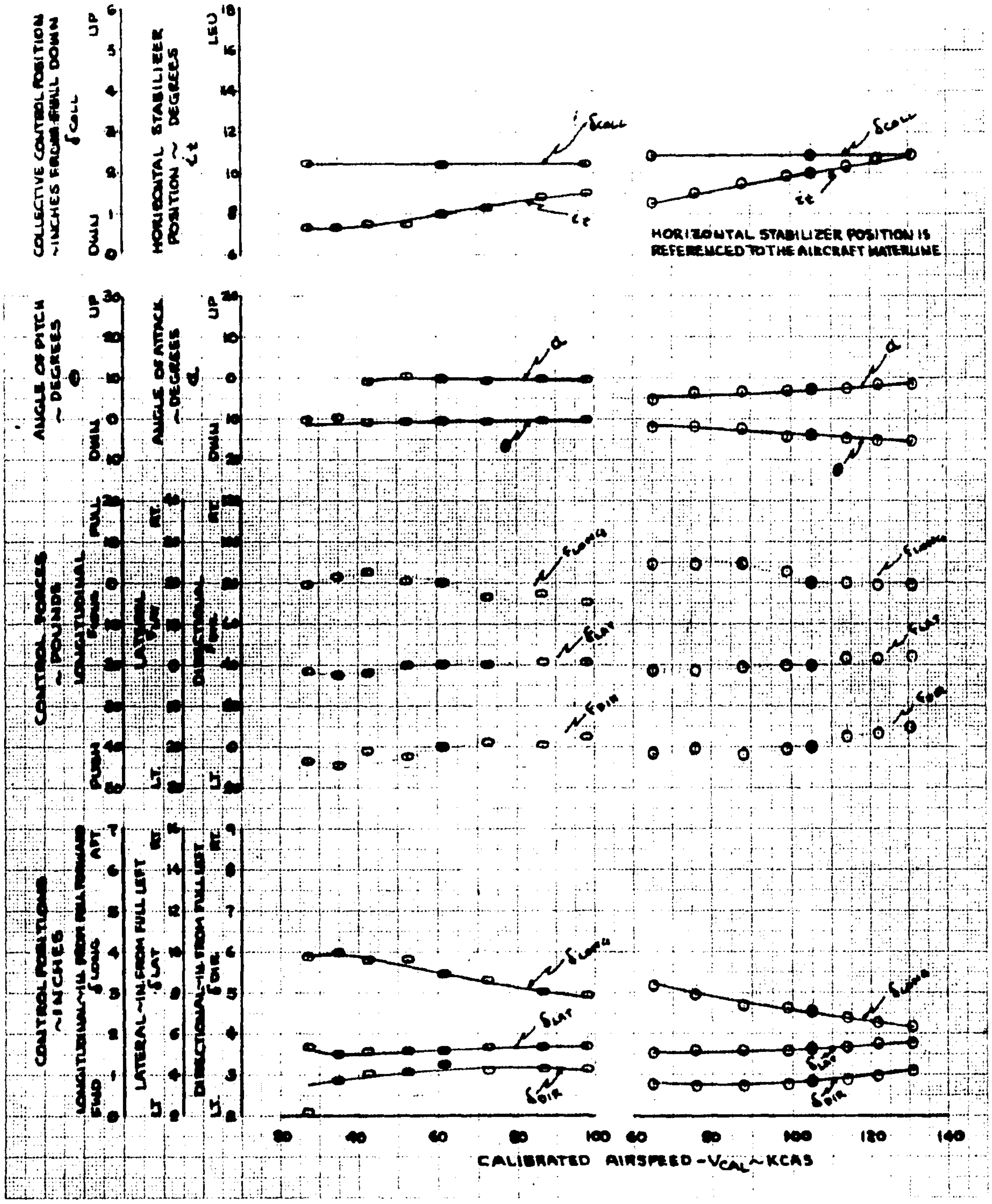


FIGURE NO. 52

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ CT
▽	[illegible]	9520	200.2 (AFT)	324.0	LEVEL FLT.	0.00[illegible]
◆	[illegible]	9310	200.2 (AFT)	324.0	DIVE	0.006183

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 GUN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

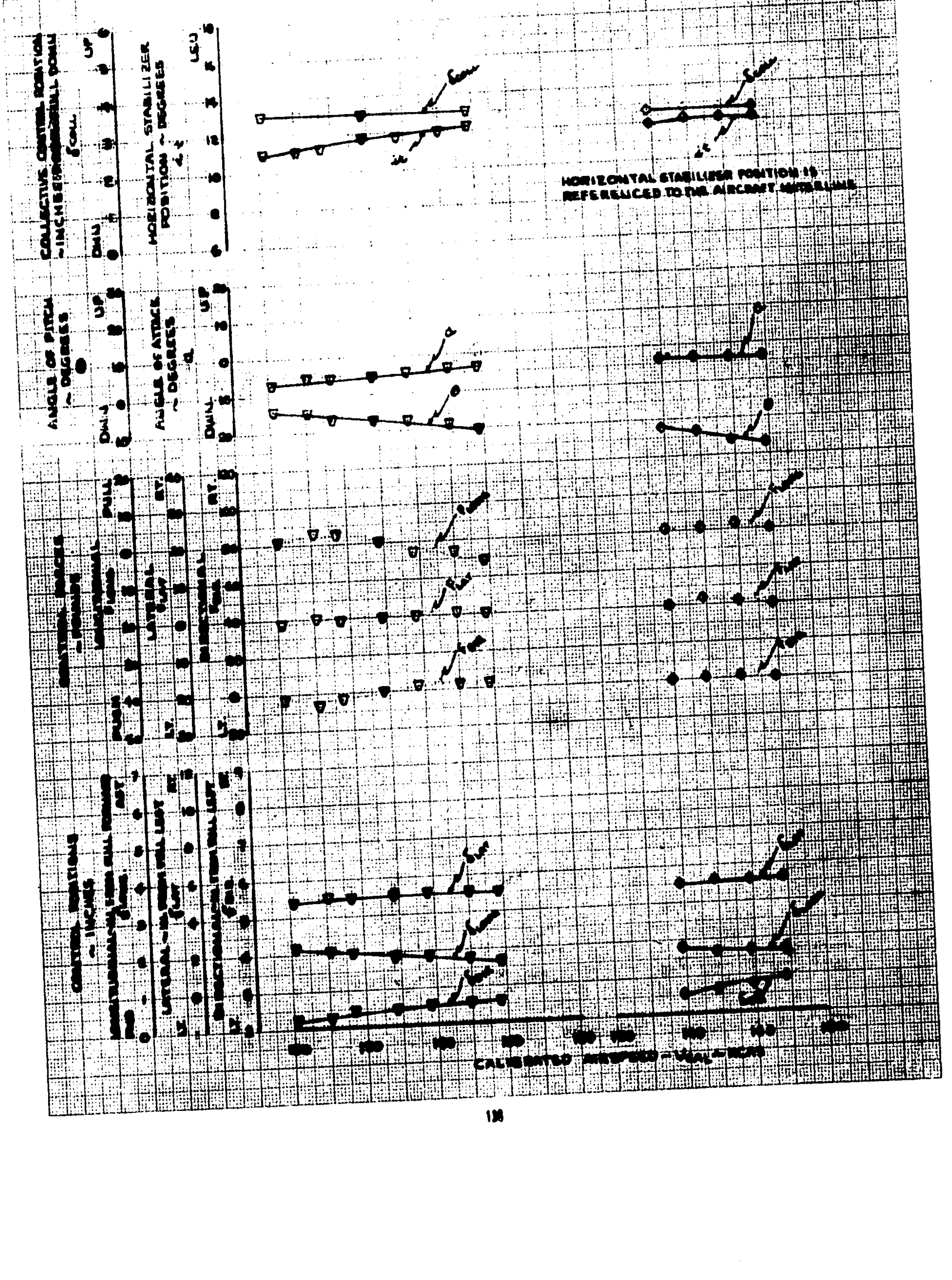
LONGITUDINAL = 10.[illegible] INCHES FROM FULL FORWARD

LATERAL = [illegible] INCHES FROM FULL LEFT

DIRECTIONAL = [illegible] INCHES FROM FULL LEFT

COLLECTIVE = [illegible] INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE.

FIGURE NO. 38

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
●	5480	8806	191.0(MID)	325.0	LEVEL FLT.	0.004875
○	6160	8845	191.2(MID)	323.0	LEVEL FLT.	0.004968

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.08 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

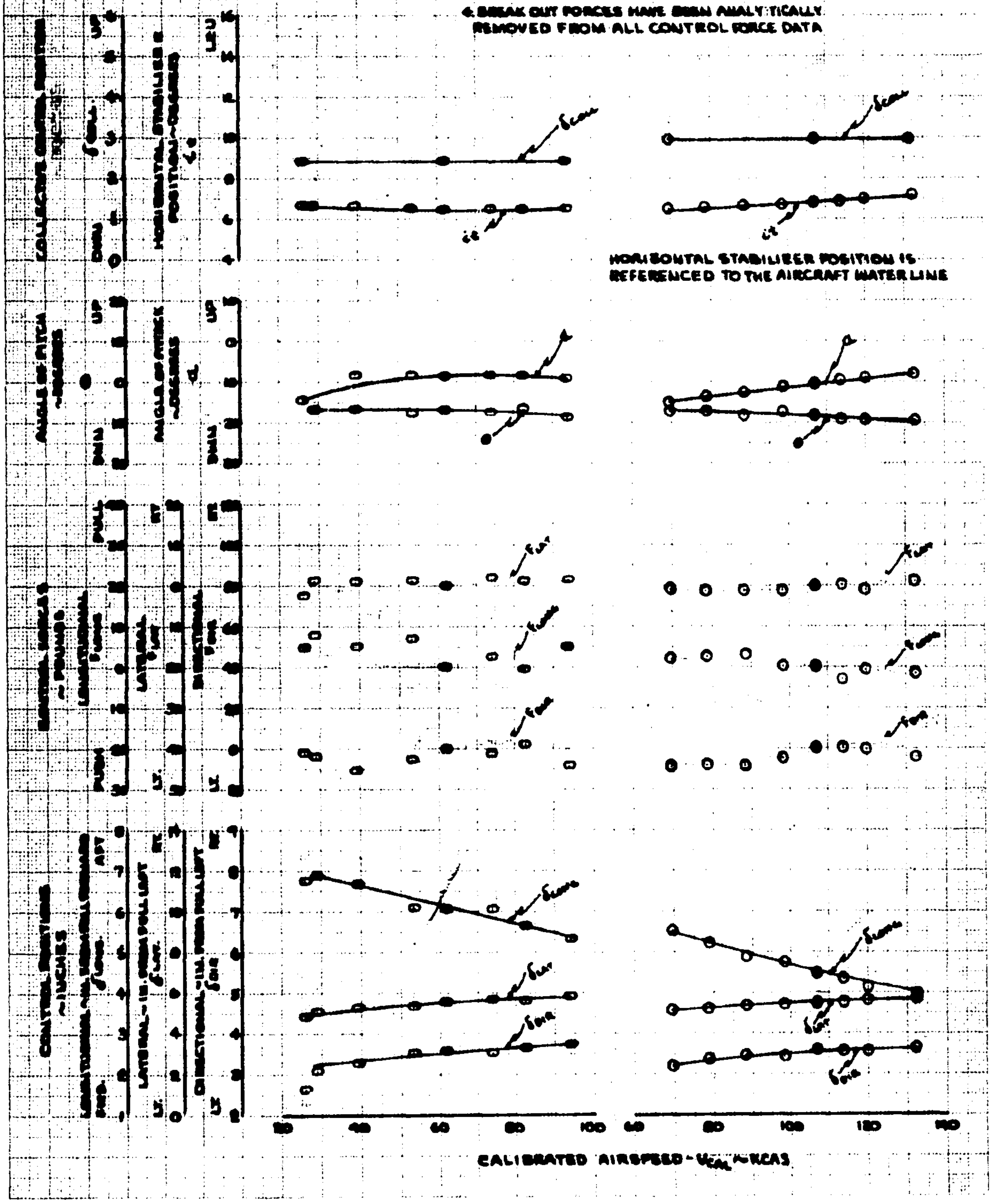


FIGURE NO. 54

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA[illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. Hp~FT.	AVG. GW ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF ~C_T
▽	7160	8150	191.0(MID)	323.0	LEVEL FLT.	0.00[illegible]
◆	6540	7940	190.8(MID)	318.0	DIVE	0.006010

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.85 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.87 INCHES FROM FULL LEFT
COLLECTIVE = 8.58 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

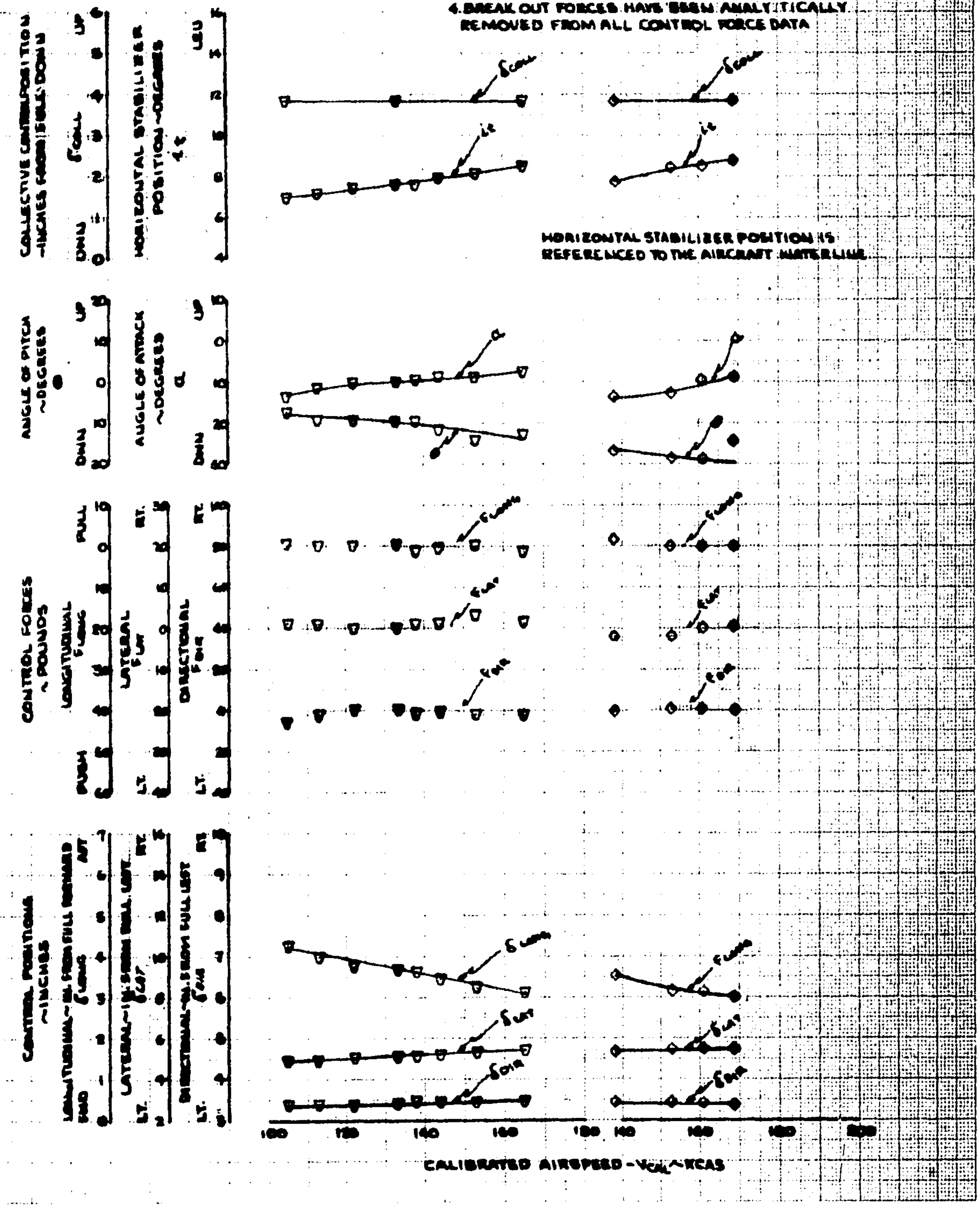


FIGURE No. 55

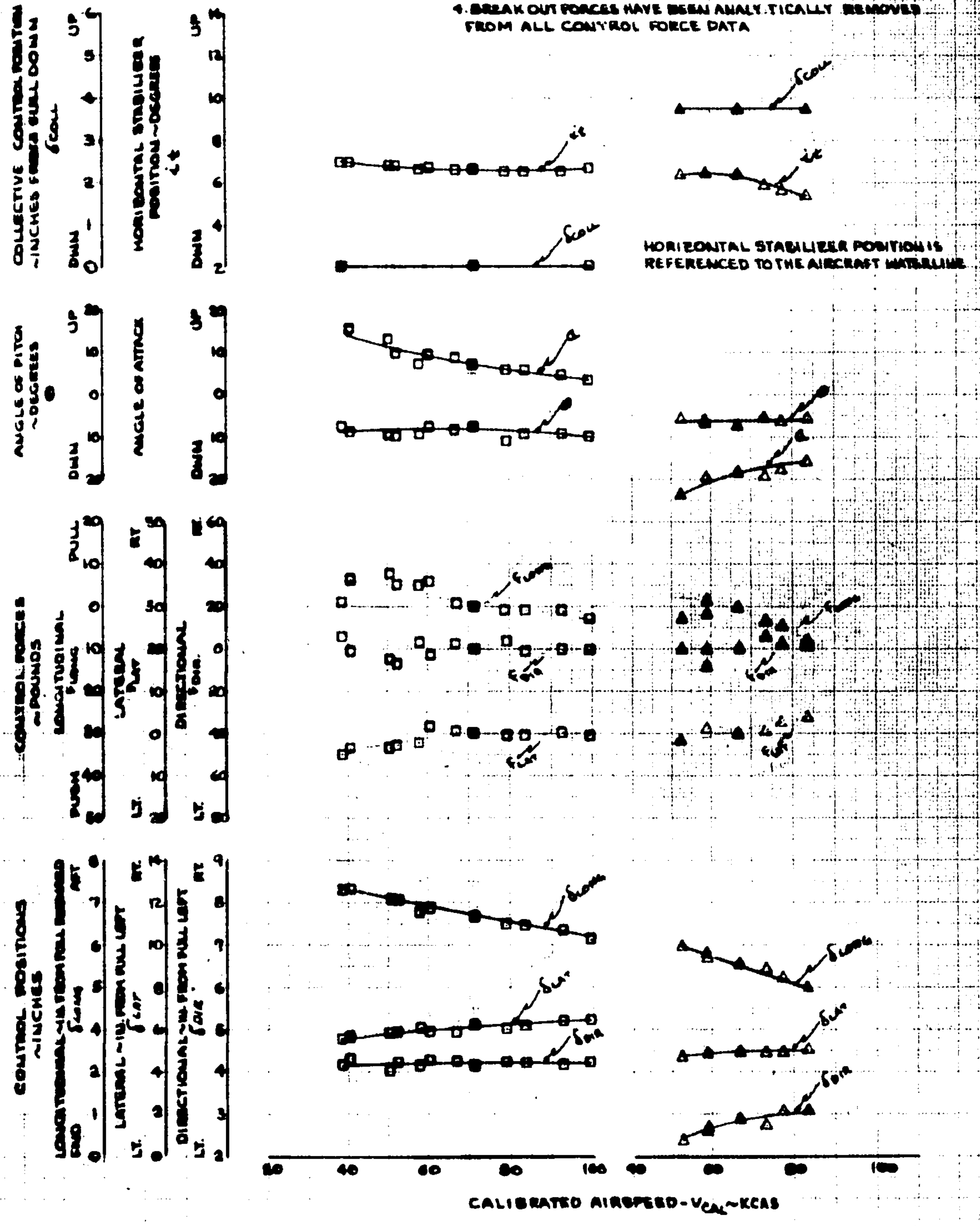
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA[illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~CT
▲	7610	7910	[illegible](FWD)	323.0	CLIMB	0.00[illegible]
□	7610	7910	190.6(FWD)	323.0	AUTOROTATION	0.004967

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 GUN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.93 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 6.96 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

FIGURE NO. 56

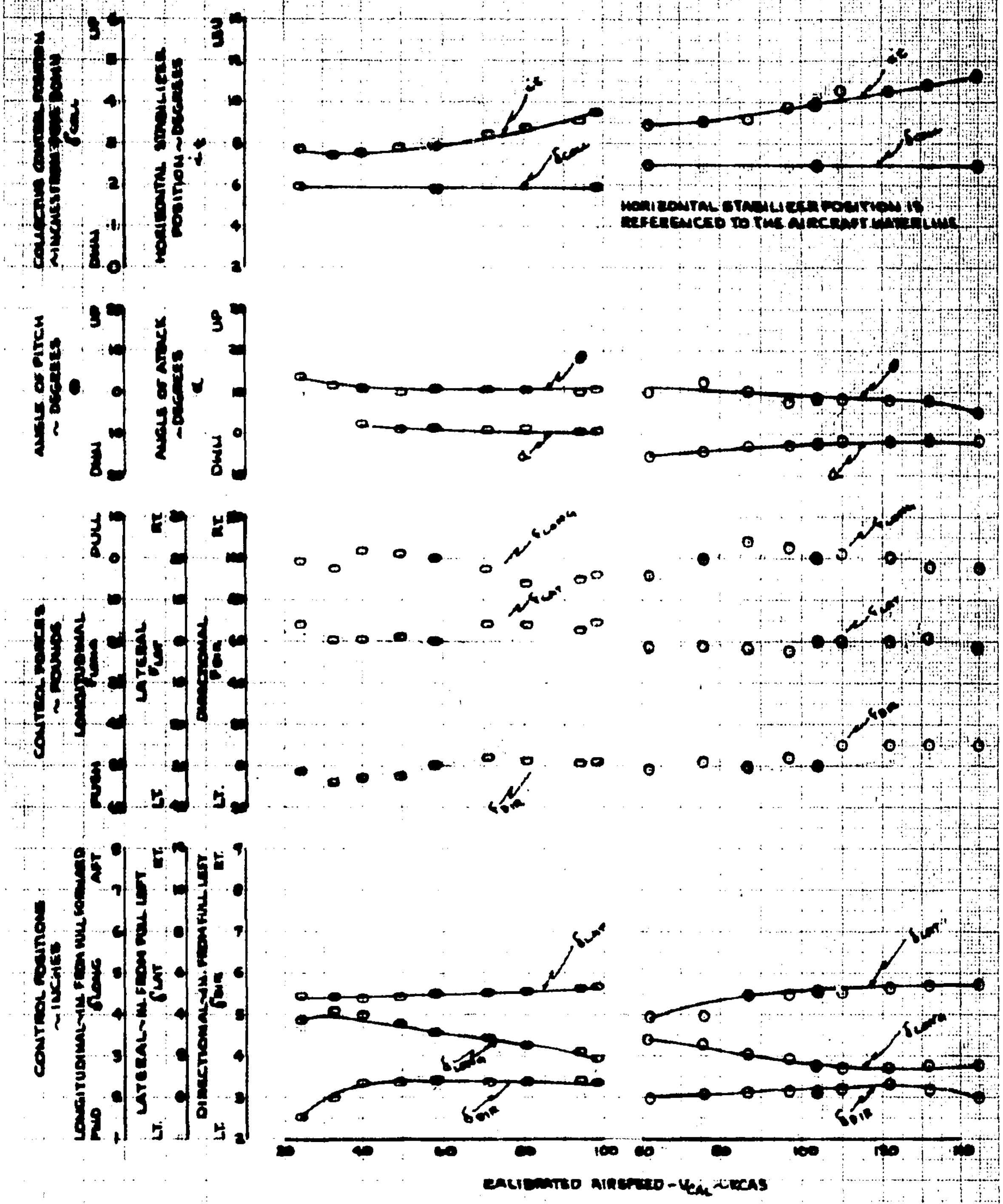
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

[illegible] CONFIGURATION [illegible] FAIRINGS REMOVED

SYM	AVG. ALT. H_p ~ FT	AVG. G.W. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
●	[illegible]	[illegible]	200.7(AFT)	[illegible]	LEVEL FLT.	[illegible]
○	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLT.	[illegible]

NOTES:
1. SOLID SYMBOLS DENOTE TRIM POINTS
2. [illegible] TURRET INSTALLED ([illegible] POSITION)
3. TOTAL CONTROL DISPLACEMENT:
   - LONGITUDINAL = [illegible] INCHES FROM FULL FORWARD
   - LATERAL = [illegible] INCHES FROM FULL LEFT
   - DIRECTIONAL = [illegible] INCHES FROM FULL LEFT
   - COLLECTIVE = [illegible] INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA.



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE.

FIGURE NO. 57

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 15698

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_p ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
▼	5460	8560	201.0(AFT)	323.0	LEVEL FLT.	0.004915
◆	4550	8155	200.6(AFT)	323.0	DIVE	0.005959

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 GUN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT:

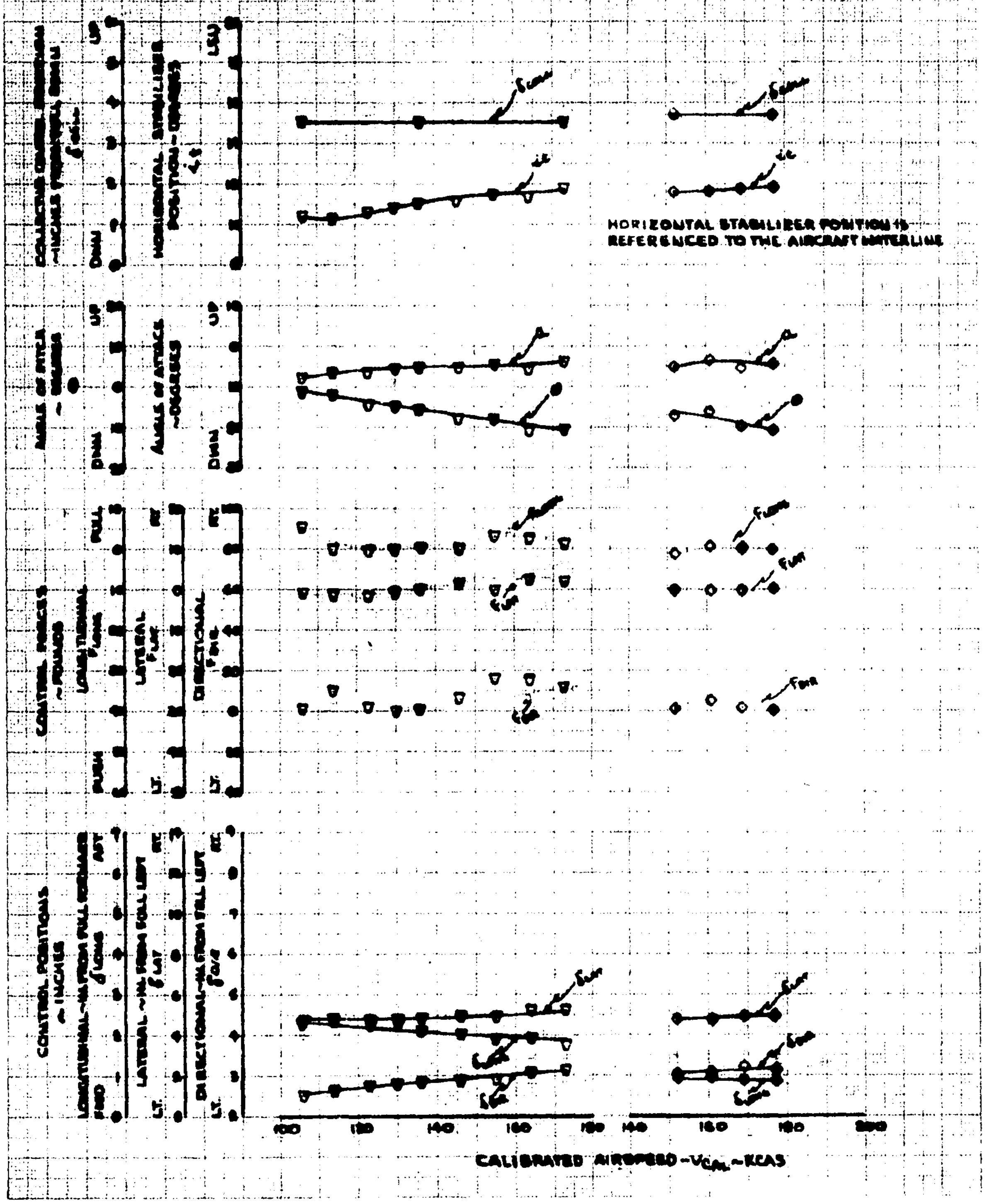
LONGITUDINAL = 10.85 INCHES FROM FULL FORWARD

LATERAL = 9.80 INCHES FROM FULL LEFT

DIRECTIONAL = 5.87 INCHES FROM FULL LEFT

COLLECTIVE = 8.86 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

FIGURE NO. 58

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
▲	6820	8855	201.0(AFT)	320.0	CLIMB	0.005063
■	6820	8825	201.0(AFT)	320.0	AUTOROTATION	0.005043

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.85 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

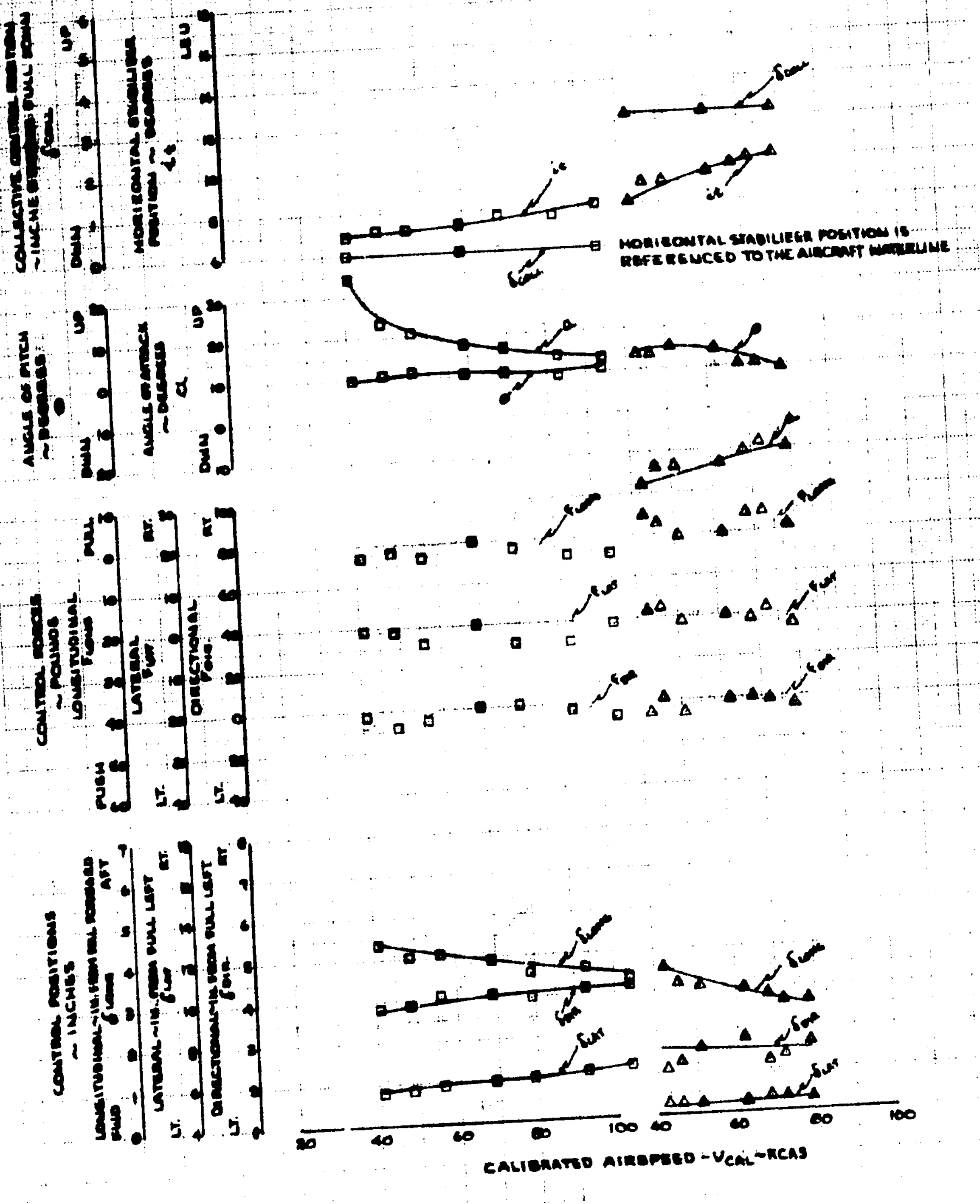


FIGURE No. 59

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_D ~ FT.	AVG. G.W. ~ LBS.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
○	4180	9665	198.0(AFT)	326.0	LEVEL FLT.	0.005570
⊖	[illegible]	9580	200.0(AFT)	324.0	LEVEL FLT.	0.005504

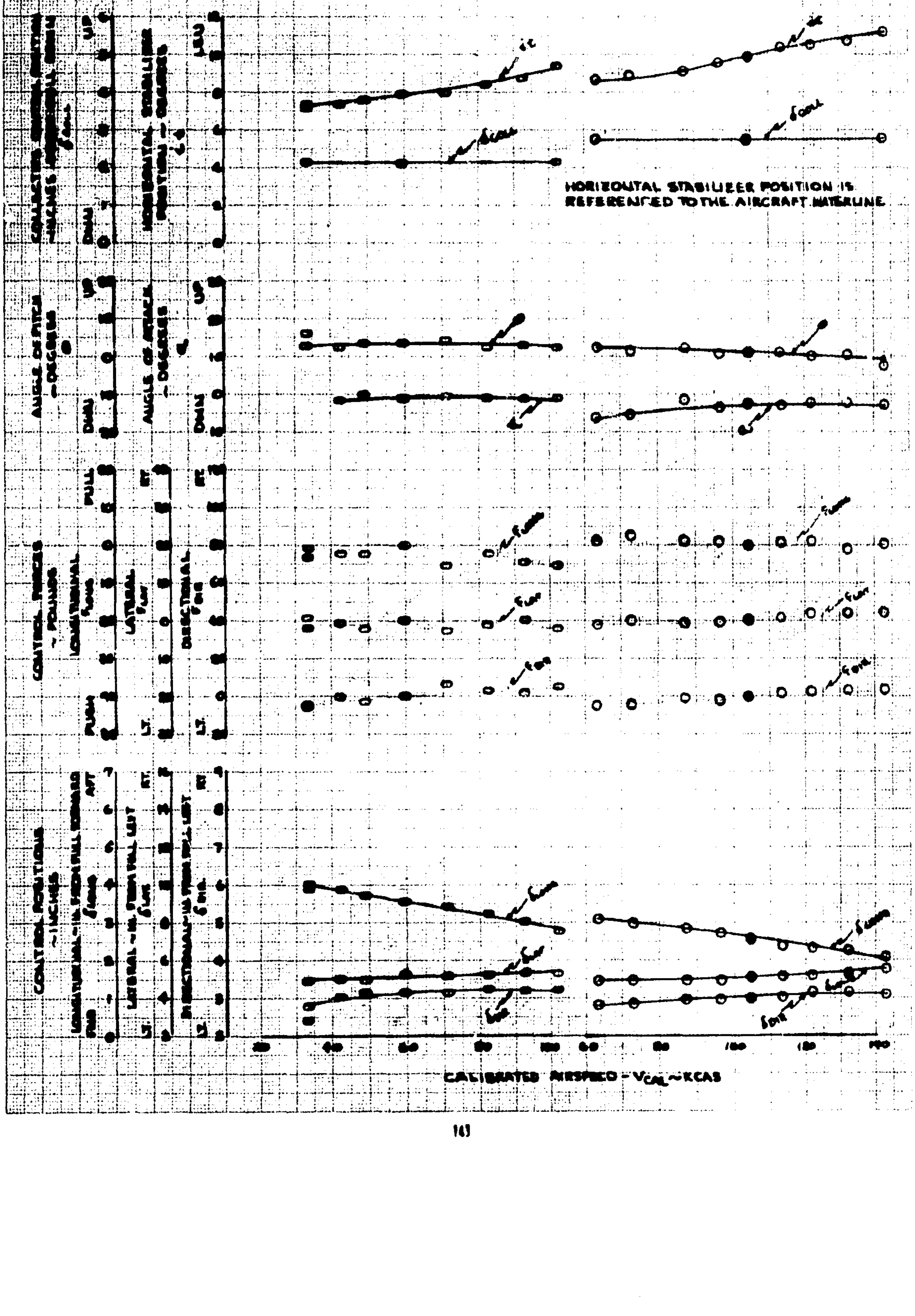
NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.05 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



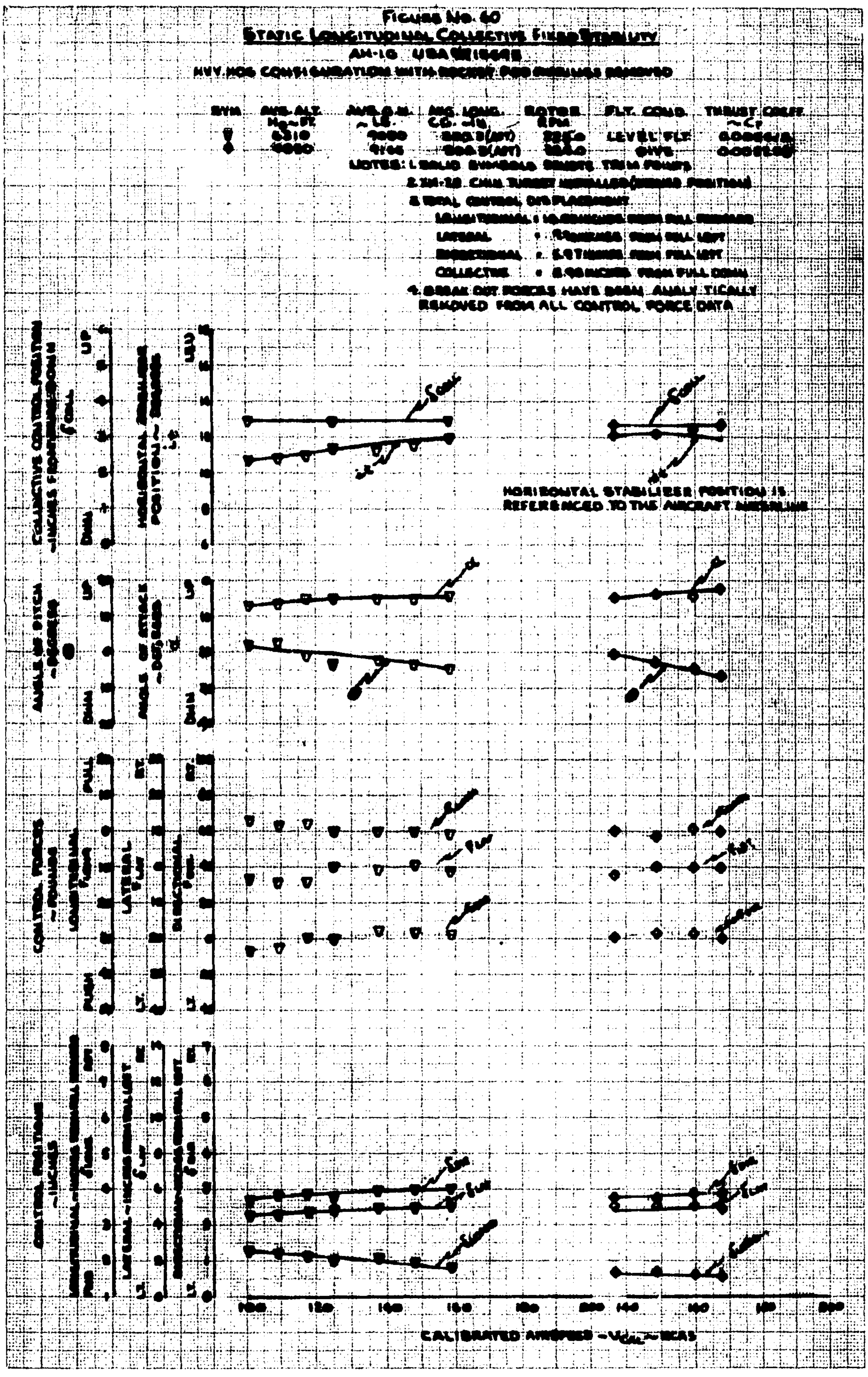


FIGURE NO. 60
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USA [illegible]
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

FIGURE No. 61

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA66-15685

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND	THRUST COEFF ~C_T
▲	7460	8750	200.5(AFT)	323.0	CLIMB	0.005470
□	7940	8720	200.5(AFT)	329.0	AUTOROTATION	0.005341

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

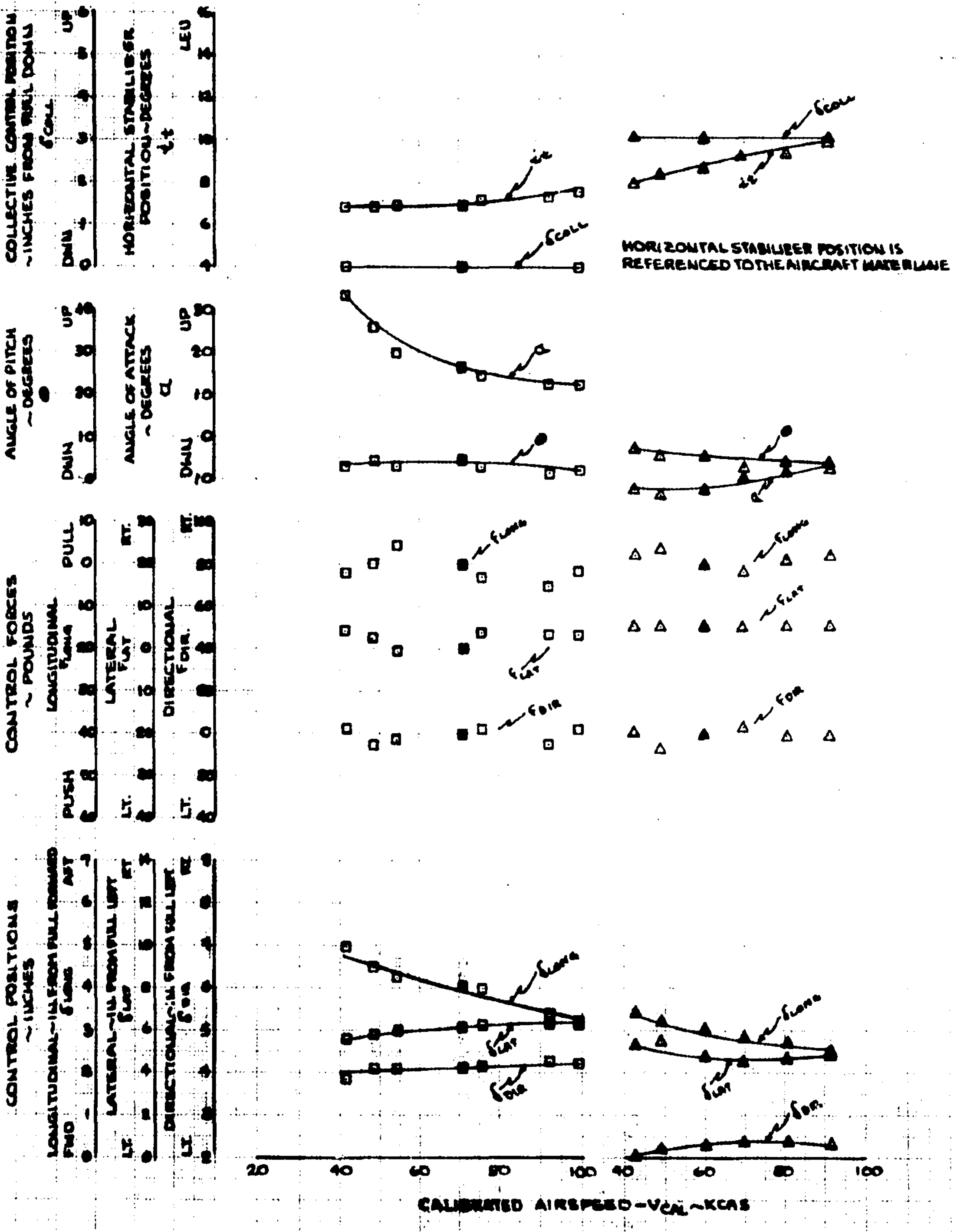


FIGURE NO. 62
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USA S/N 715698
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H_p ~FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
●	14140	8700	200.6 (AFT)	324.0	LEVEL FLT.	0.006676
○	14720	8570	200.7 (AFT)	322.0	LEVEL FLT.	0.006785

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

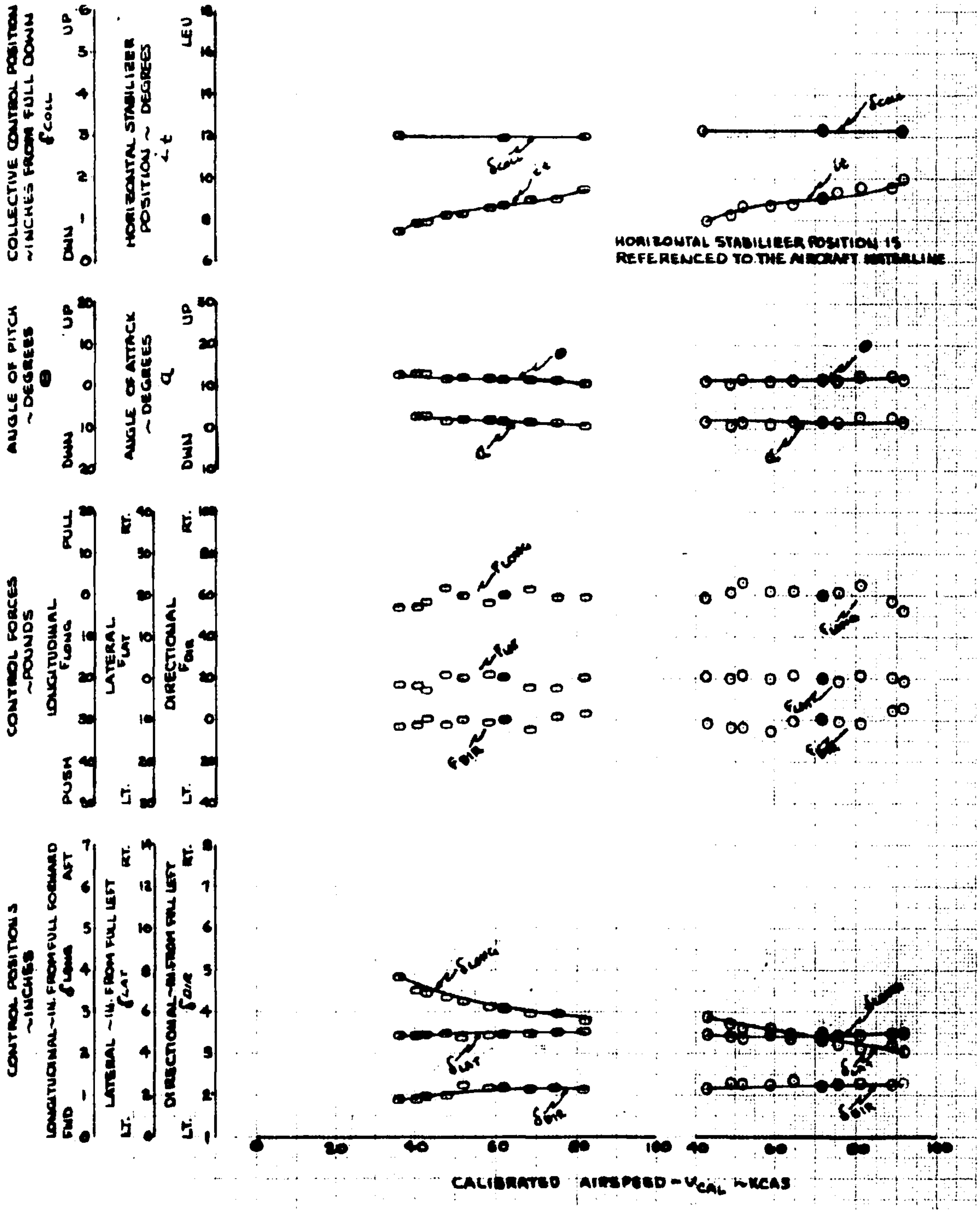


FIGURE NO. 63

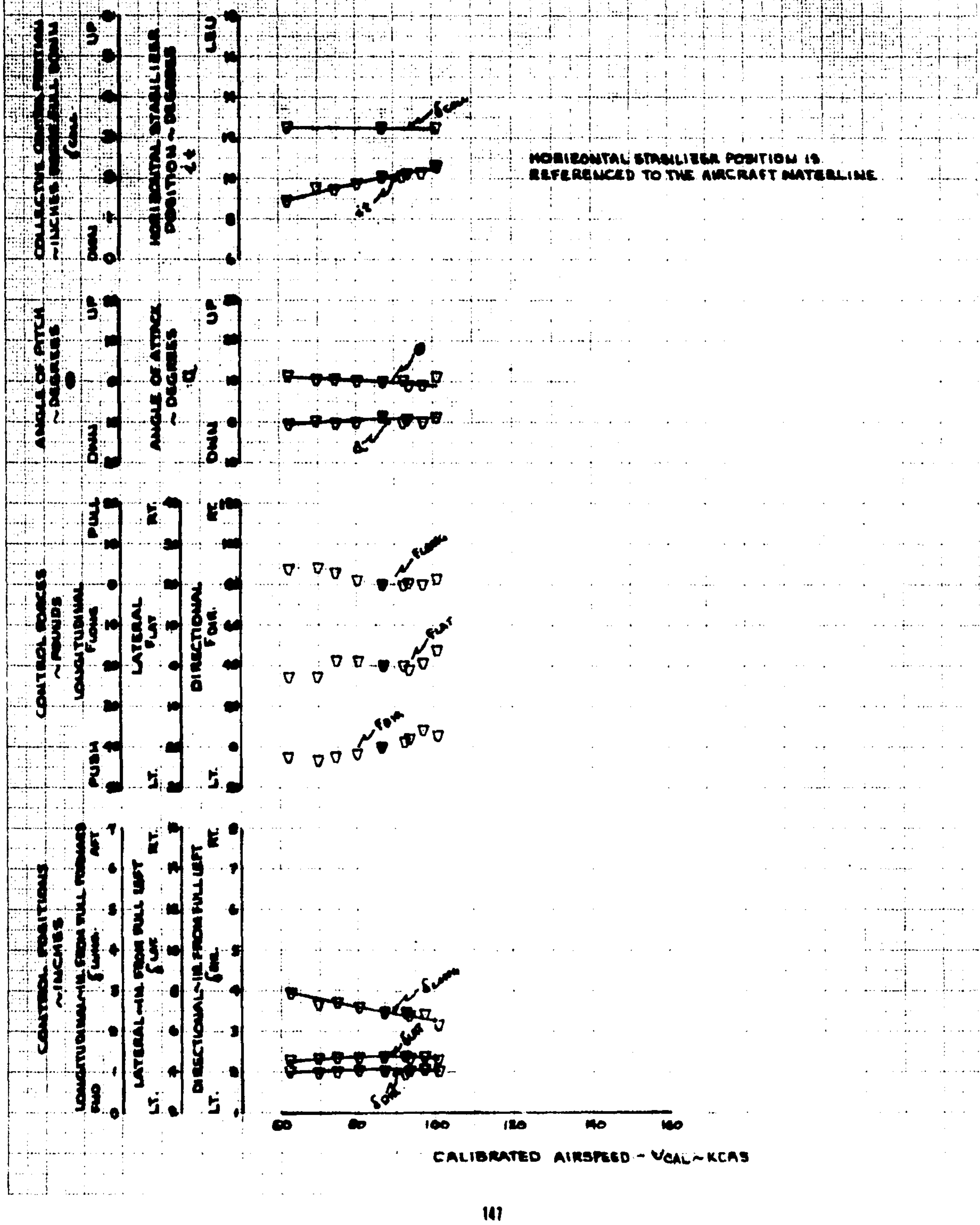
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF.
▼	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLT.	0.006715

NOTES:
1. SOLID SYMBOLS DENOTE TRIM POINTS
2. XM-28 GUN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
   LONGITUDINAL = 10.88 INCHES FROM FULL FORWARD
   LATERAL = 9.96 INCHES FROM FULL LEFT
   DIRECTIONAL = 5.57 INCHES FROM FULL LEFT
   COLLECTIVE = 8.98 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

FIGURE NO. 64

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 615847

CLEAN CONFIGURATION WITH SKID TUBE FAIRINGS REMOVED

SYM.	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	THRUST COEFF. ~C_T	FLT. COND.
▼	5160	8490	199.7(AFT)	322.0	0.004978	LEVEL FLT.
◆	4570	8390	199.7(AFT)	322.0	0.004851	DIVE

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. TAT102 CHIN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 9.07 IN. FROM FULL FORWARD
LATERAL = 10.00 IN. FROM FULL LEFT
DIRECTIONAL = 7.07 IN. FROM FULL LEFT
COLLECTIVE = 9.30 IN FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

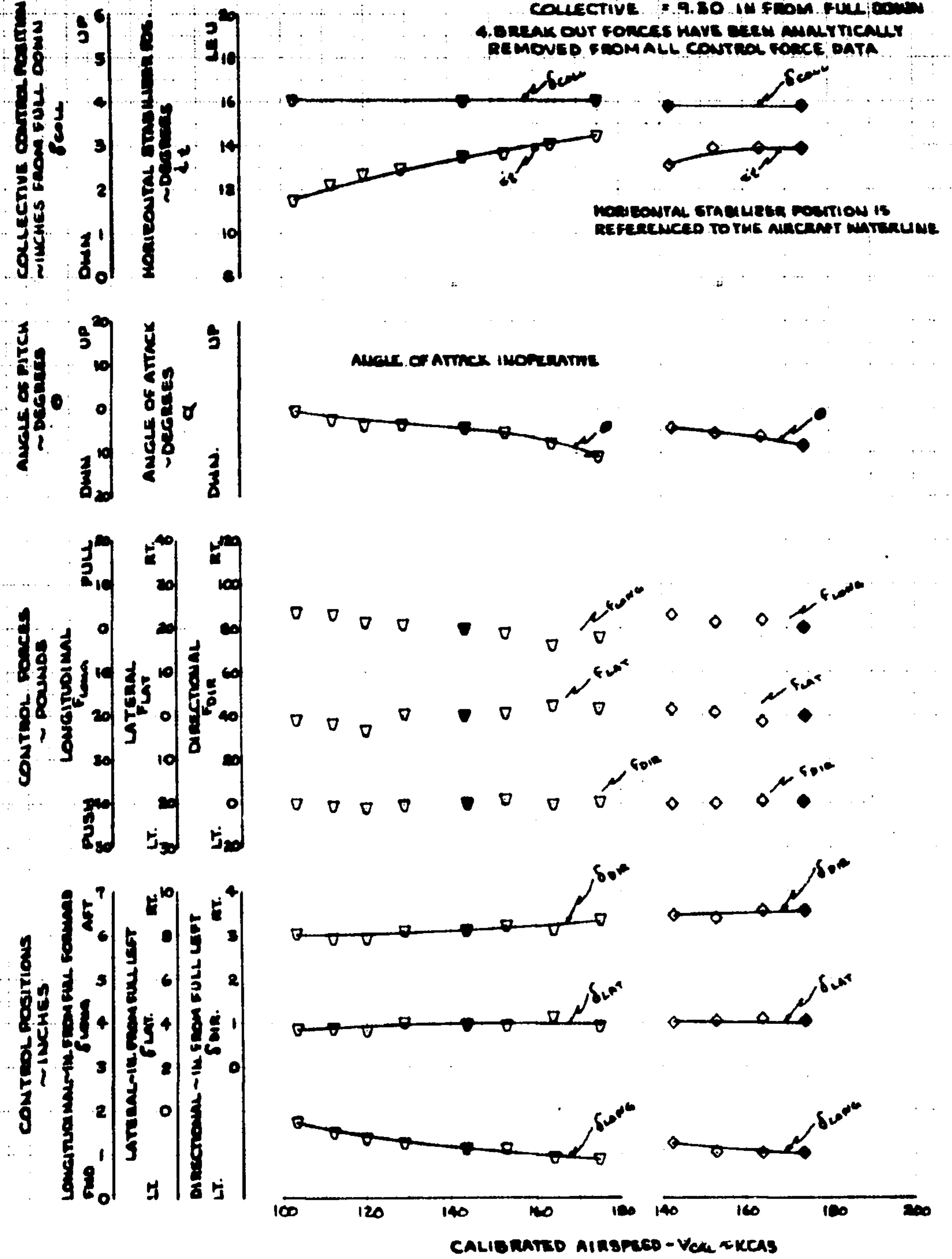


FIGURE No. 65

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AH-1G USA S/N 66-15247

CLEAN CONFIGURATION WITH SKID TUBE FAIRINGS REMOVED

SYM	AVG. ALT. H_p ~FT.	AVG GW. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	THRUST COEFF. ~C_T	FLT. COND.
○	6170	8585	199.8(AFT)	322.0	0.004915	LEVEL FLT.

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. TAT 102 CHIN TURRET INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 9.07 IN. FROM FULL FORWARD
LATERAL = 10.0 IN. FROM FULL LEFT
DIRECTIONAL = 7.07 IN. FROM FULL LEFT
COLLECTIVE = 9.5 IN. FROM FULL DOWN
4. BREAK-OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

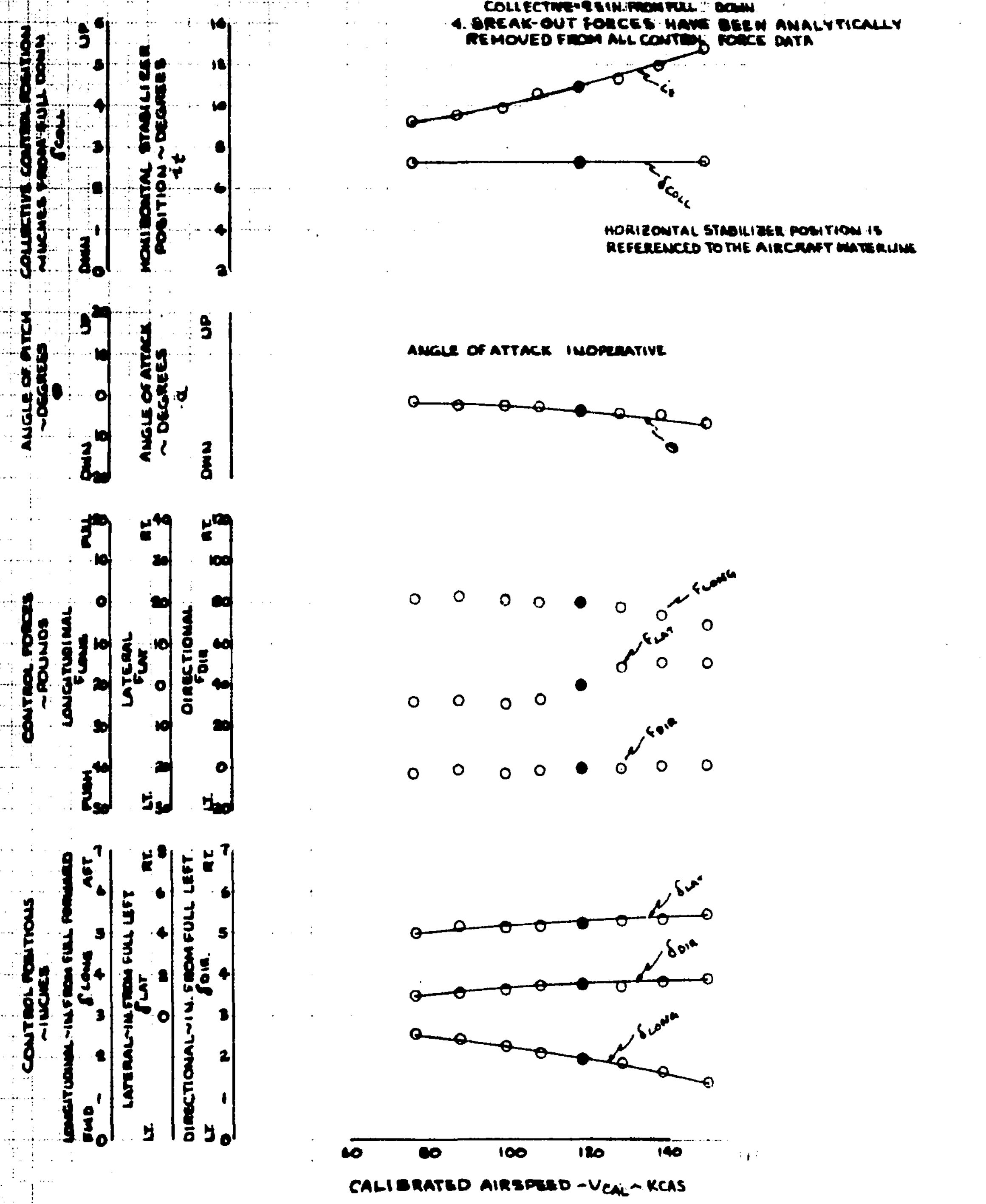


FIGURE NO. 66

SUMMARY OF LATERAL DIRECTIONAL STABILITY

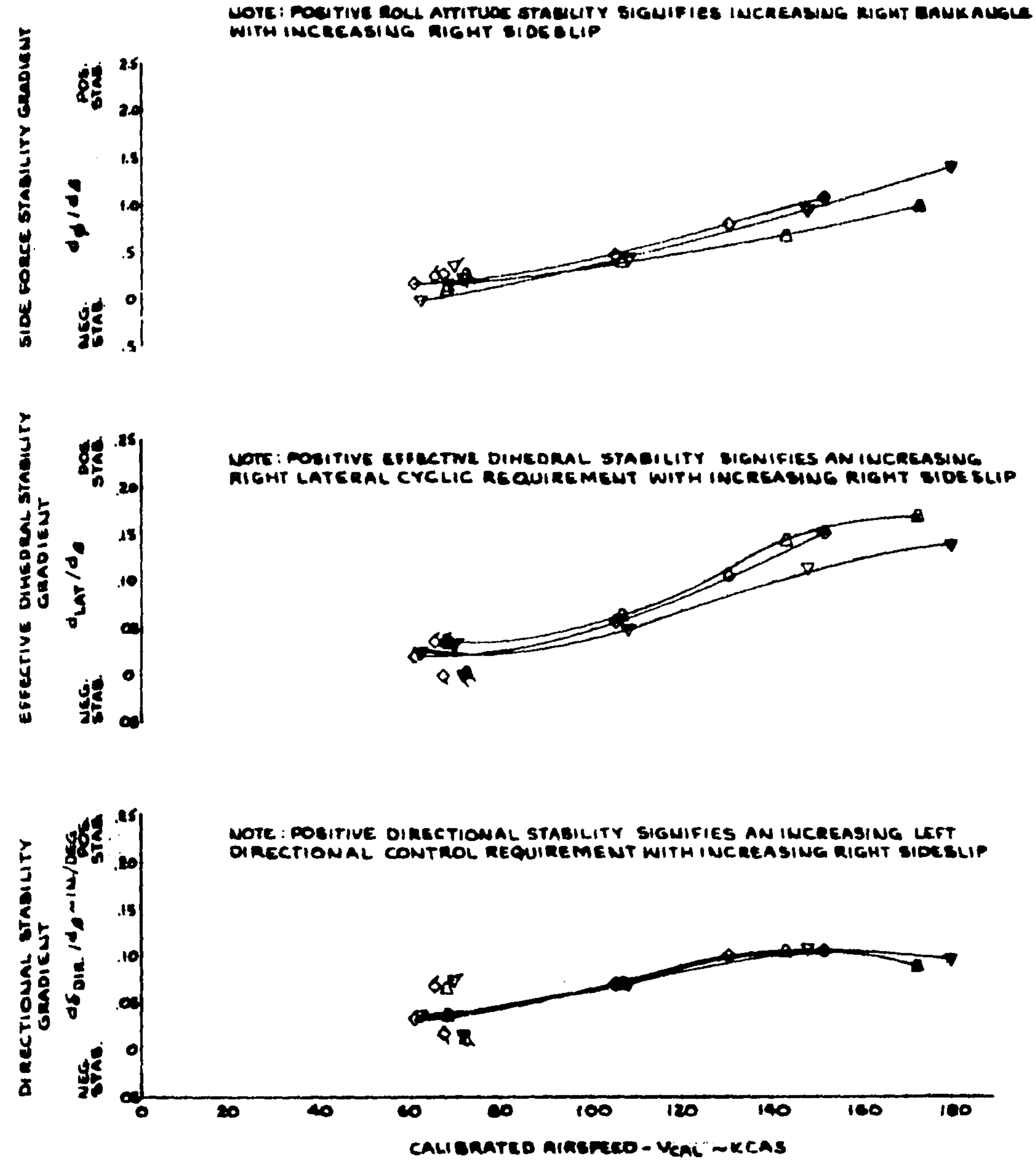
AH-1G USA S/N 71-5698

GROSS WEIGHT COMPARISON

SYM	AVG. ALT. H_p ~ FT.	AVG. GR.WT. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C_T	CONFIGURATION
◇	6080	8310	200.9(AFT)	323.5	0.004970	HVY. HOG
△	5170	9465	200.0(AFT)	322.4	0.005590	HVY. HOG
▽	4750	7765	201.3(AFT)	322.0	0.004581	HVY. HOG

NOTES: 1. POINTS DERIVED FROM FIGURES 82 THROUGH 90, APPENDIX VII.

2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION



NOTE: POSITIVE ROLL ATTITUDE STABILITY SIGNIFIES INCREASING RIGHT BANK ANGLE WITH INCREASING RIGHT SIDESLIP

NOTE: POSITIVE EFFECTIVE DIHEDRAL STABILITY SIGNIFIES AN INCREASING RIGHT LATERAL CYCLIC REQUIREMENT WITH INCREASING RIGHT SIDESLIP

NOTE: POSITIVE DIRECTIONAL STABILITY SIGNIFIES AN INCREASING LEFT DIRECTIONAL CONTROL REQUIREMENT WITH INCREASING RIGHT SIDESLIP

FIGURE No. 67

SUMMARY OF LATERAL DIRECTIONAL STABILITY

AH-1G USAAVNTSA

C.G. & CONFIGURATION COMPARISON

SYM	AVG. ALT. H_P ~ FT.	AVG. GRWT ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C_T	CONFIGURATION
○	5600	8290	199.2 (AFT)	323.0	0.004685	CLEAN
□	6070	8080	191.1 (FWD)	324.5	0.004798	HVY. HOG
◇	6080	8310	200.9 (AFT)	323.5	0.004970	HVY. HOG
△	6010	8680	200.7 (AFT)	326.5	0.005085	OUTB'D ALTERNATE
D	6750	8330	201.0 (AFT)	323.0	0.005088	HVY. SCOUT

NOTES: 1. POINTS DERIVED FROM FIGURES 70 THROUGH 81 AND 85 THROUGH 87, APPENDIX III

2. OPEN SYMBOLS DENOTE LEVEL FLIGHT

3. CROSSED SYMBOLS DENOTE DIVE

4. FLAGGED SYMBOLS DENOTE CLIMB

5. TAILED SYMBOLS DENOTE AUTOROTATION

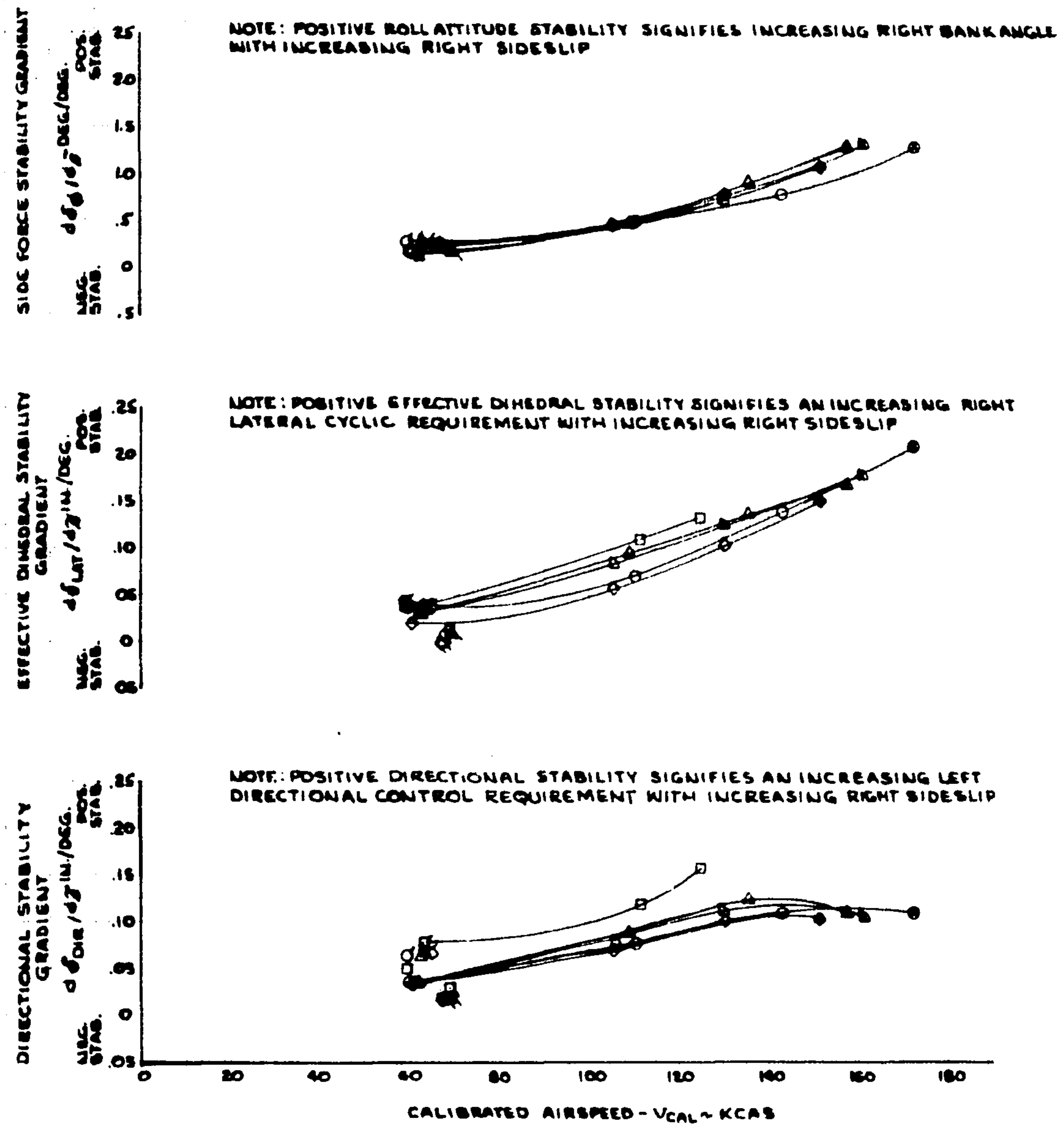
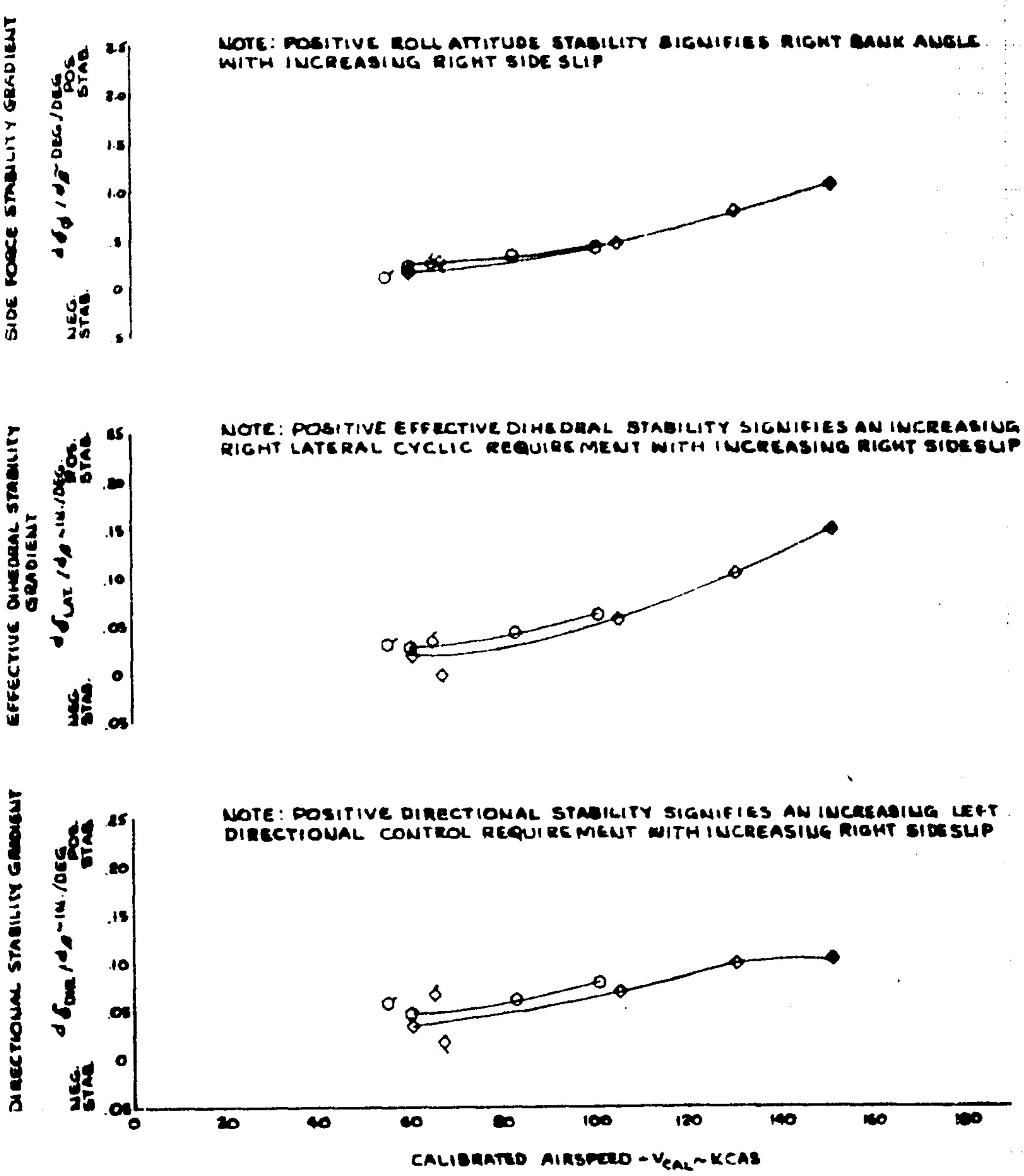


FIGURE NO. 68
SUMMARY OF LATERAL DIRECTIONAL STABILITY
AH-1G USA S/N 15695
ALTITUDE COMPARISON

SYM.	AVG. ALT. H_P ~ FT.	AVG. GRWT. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C_T	CONFIGURATION
◇	6080	8510	200.9(AFT)	323.5	0.00 4970	HVY. HOG
○	14640	8510	200.8(AFT)	324.0	0.00 6687	HVY. HOG

NOTES: 1. POINTS DERIVED FROM FIGURES 85 THROUGH 87 AND 91 THROUGH 93, APPENDIX VII.
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION


NOTE: POSITIVE ROLL ATTITUDE STABILITY SIGNIFIES RIGHT BANK ANGLE WITH INCREASING RIGHT SIDE SLIP

NOTE: POSITIVE EFFECTIVE DIHEDRAL STABILITY SIGNIFIES AN INCREASING RIGHT LATERAL CYCLIC REQUIREMENT WITH INCREASING RIGHT SIDESLIP

NOTE: POSITIVE DIRECTIONAL STABILITY SIGNIFIES AN INCREASING LEFT DIRECTIONAL CONTROL REQUIREMENT WITH INCREASING RIGHT SIDESLIP

FIGURE NO. 69

SUMMARY OF LATERAL DIRECTIONAL STABILITY

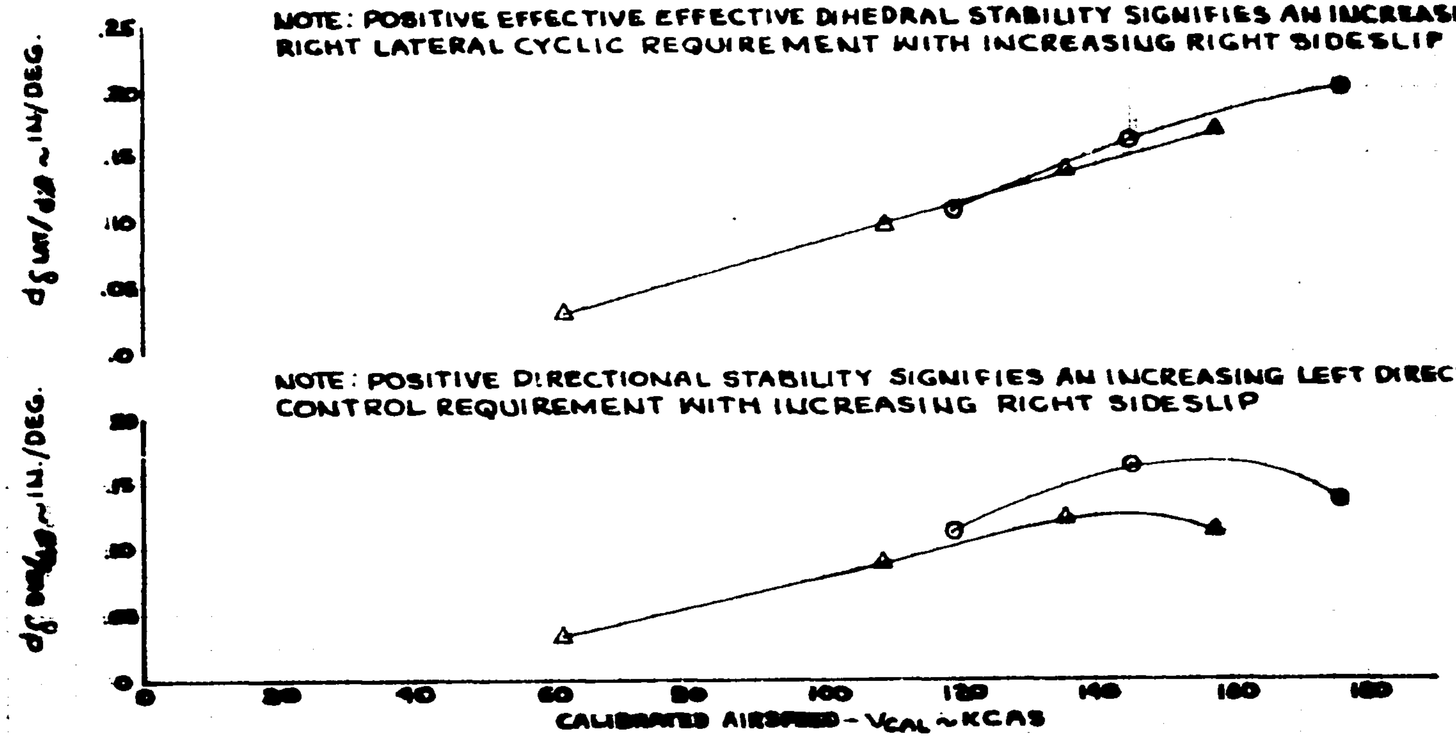
AH-1G

SYM	AVG. ALT. H_p ~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	THRUST COEFF ~C_T	CONFIGURATION	AIRCRAFT S/N
○	3700	8770	200.3 (AFT)	323.0	0.004889	CLEAN (LANDING GEAR CROSS TUBE FAIRINGS REMOVED)	615247
△	5400	8290	199.2 (AFT)	323.0	0.004865	CLEAN	718695

NOTES: 1. POINTS DERIVED FROM FIGURES 70, 71, 94 & 95, APP VII

2. OPEN SYMBOLS DENOTE LEVEL FLIGHT

3. CROSSED SYMBOLS DENOTE DIVE



NOTE: POSITIVE EFFECTIVE EFFECTIVE DIHEDRAL STABILITY SIGNIFIES AN INCREASING RIGHT LATERAL CYCLIC REQUIREMENT WITH INCREASING RIGHT SIDESLIP

NOTE: POSITIVE DIRECTIONAL STABILITY SIGNIFIES AN INCREASING LEFT DIRECTIONAL CONTROL REQUIREMENT WITH INCREASING RIGHT SIDESLIP

FIGURE NO. 70
STATIC LATERAL DIRECTIONAL STABILITY
AH-1G USA S/N [illegible]
CLEAN CONFIGURATION

SYM	AIRSPEED ~KCAS	AVG. ALT. Hp~FT.	AVG. GW ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEF ~CT
○	60.0	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLT.	[illegible]
○	116.5	[illegible]	[illegible]	194.3(AFT)	3[illegible]	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION: 21.58 [illegible] PERCENT FROM FULL DOWN
4. XM-28 (M) TURRET ([illegible])
5. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.08 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

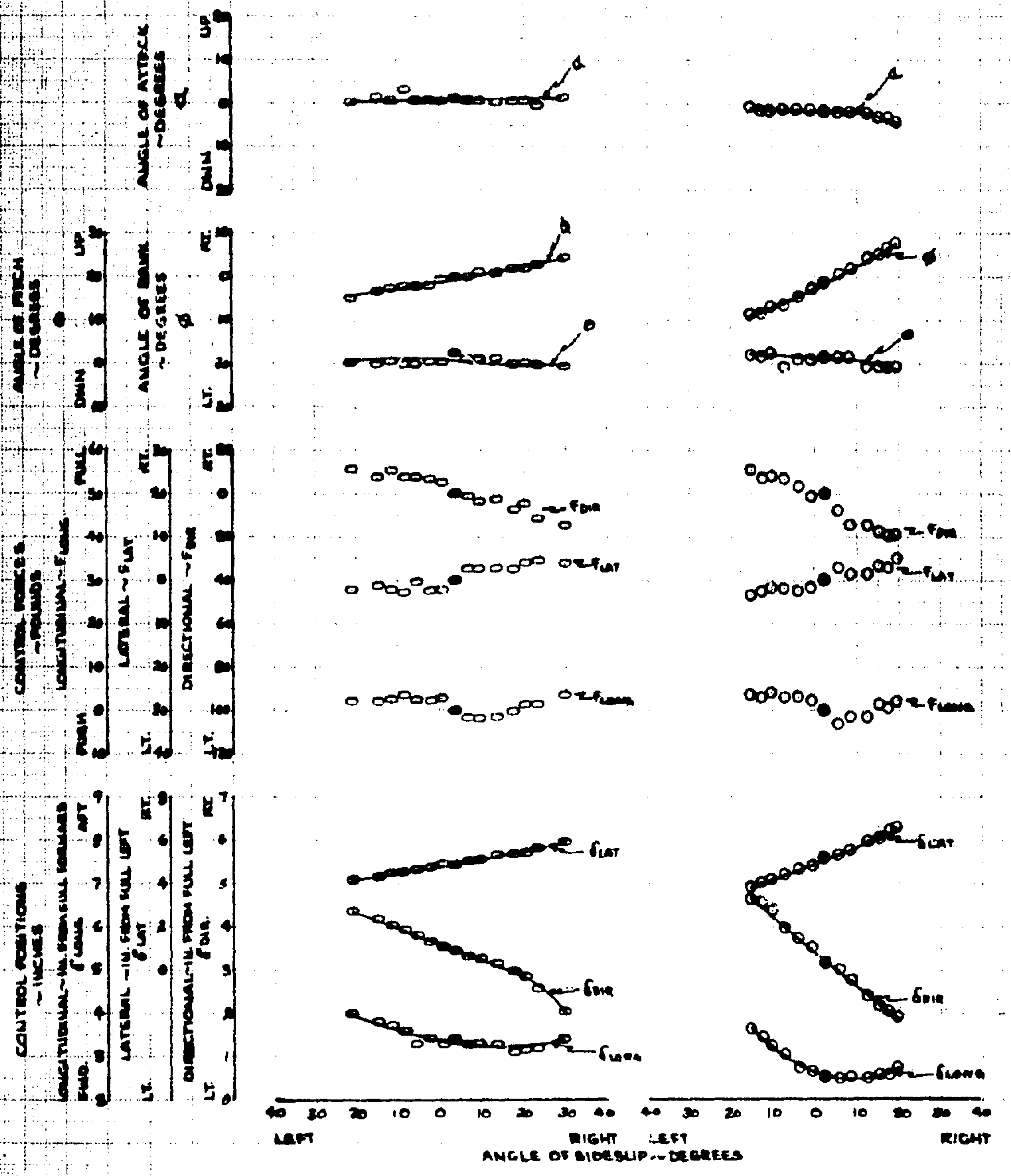


FIGURE NO. 71

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

[illegible]

SYM	AIRSPEED ~KCAS	AVG. ALT H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEF. ~C_T
▽	143.0	5590	8375	199.5(AFT)	[illegible]	LEVEL FLT.	[illegible]
◇	112.5	4660	8225	199.4(AFT)	[illegible]	DIVE	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED.

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = [illegible] ▽ [illegible] ◇ PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

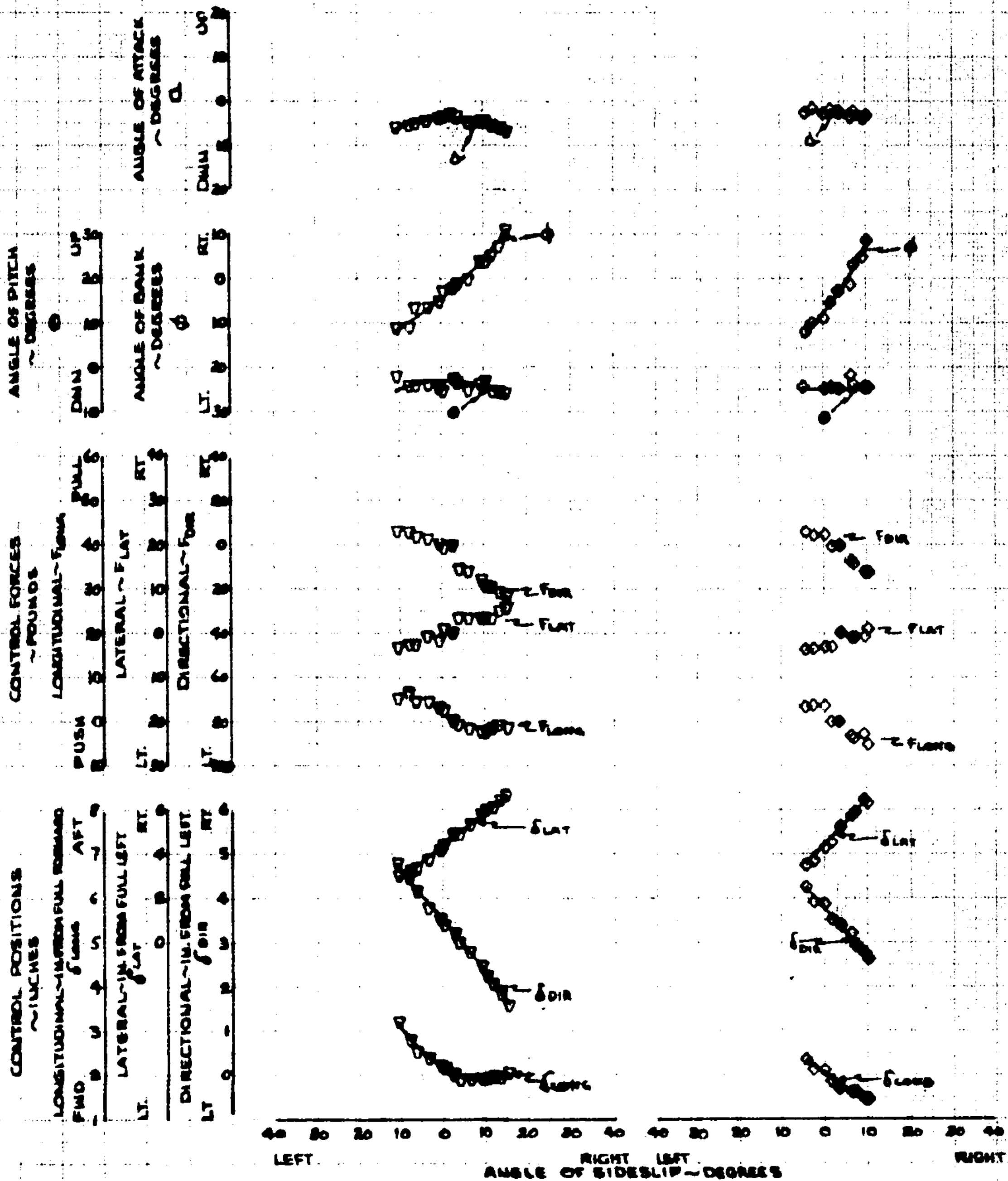


FIGURE NO. 72
STATIC LATERAL DIRECTIONAL STABILITY
AH-1G USA S/N 71-15695
CLEAN CONFIGURATION

SYM	AIRSPEED ~KCAS	AVG ALT. H_p ~FT.	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEF. ~C_T
△	[illegible]	5630	7995	199.1(AFT)	323.0	CLIMB	0.004725
□	[illegible]	7560	7970	199.1(AFT)	319.0	AUTO	0.005075

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = $\overset{36.60}{0.30}$ PERCENT FROM FULL DOWN

4. XM-28 GUN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.83 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

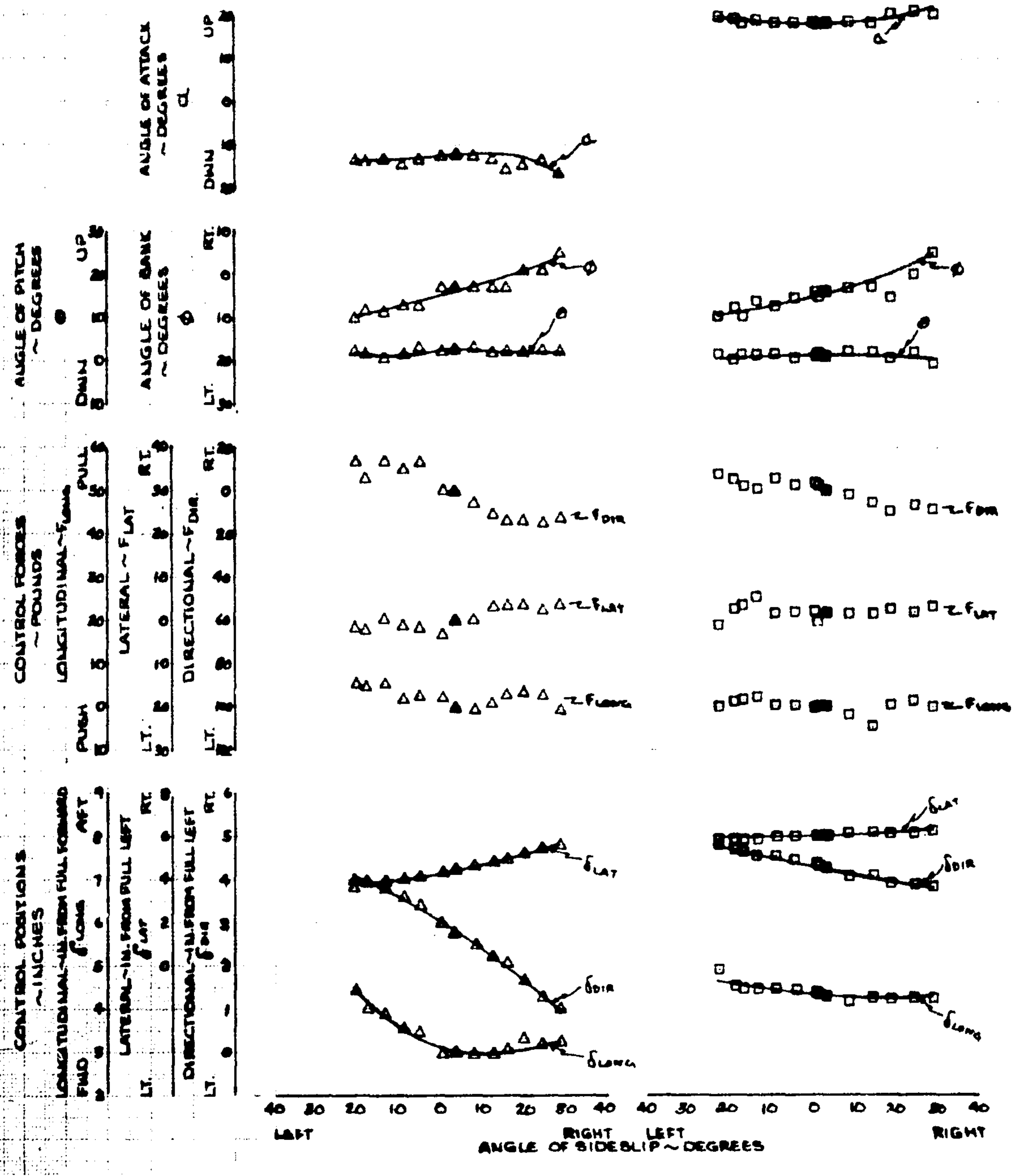


FIGURE No. 75

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA 66-15698

OUT BD ALTERNATE CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~CT
○	82.0	4850	8775	200.4(AFT)	325.0	LEVEL FLT.	0.004994
○	109.0	5780	8765	200.4(AFT)	324.0	LEVEL FLT.	0.005186

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 21.0 ○ / 32.5 ○ PERCENT FROM FULL DOWN

4. XM-28 CMU TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

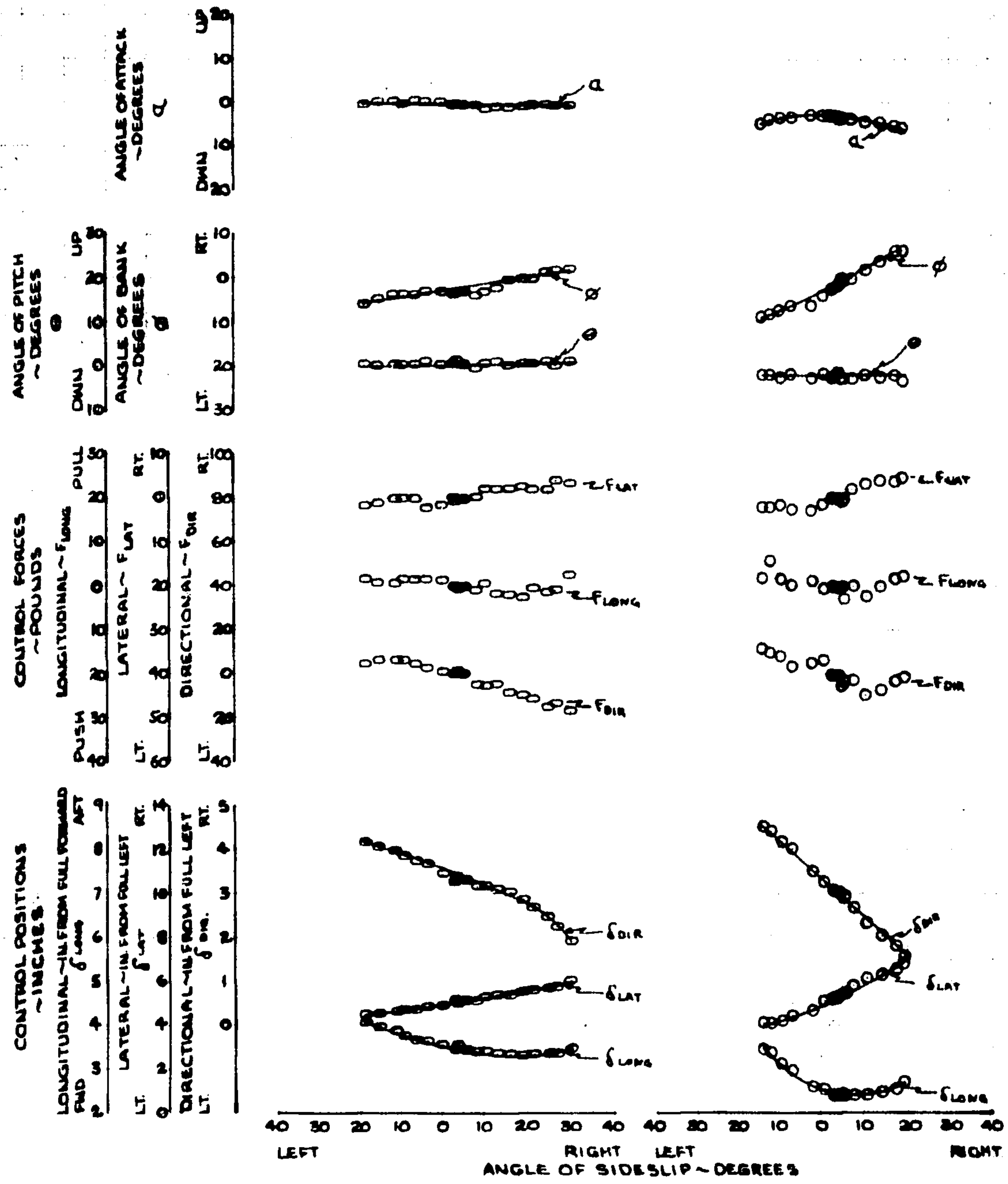


FIGURE NO. 74
STATIC LATERAL DIRECTIONAL STABILITY
AH-1G USA [illegible]
OUTB'D ALTERNATE CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_P~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▽	1355	5540	8655	200.7(AFT)	324.0	LEVEL FLT	0.006052
◇	152.5	5690	8470	200.9(AFT)	324.0	DIVE	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = $\frac{39.0 ▽}{39.6 ◇}$ PERCENT FROM FULL DOWN
4. XM-28 CHIN TURRET (STOWED)
5. TOTAL CONTROL POSITIONS
LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIONAL = 8.98 INCHES FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

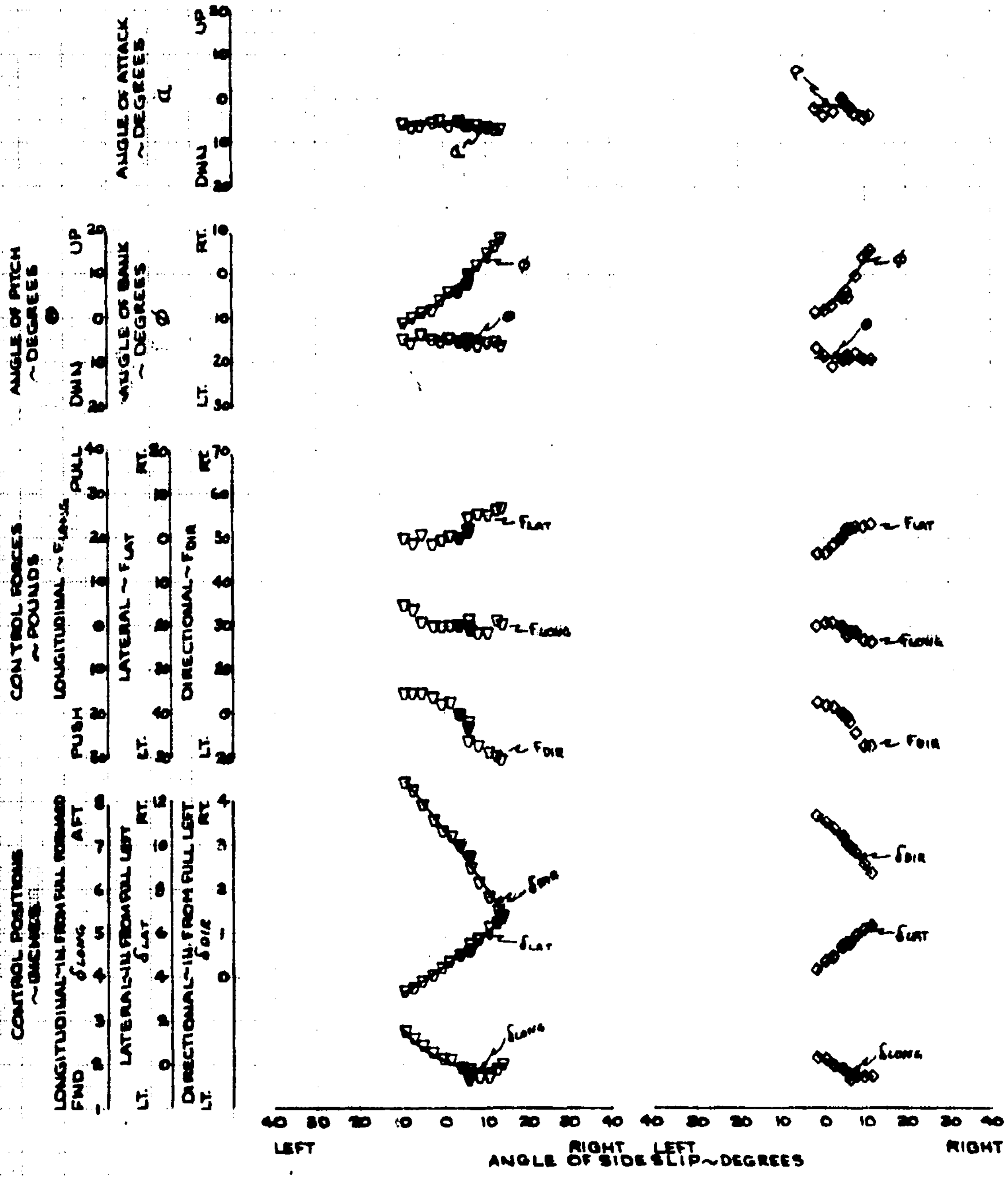


FIGURE No. 75

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N 71-15695

OUTBD ALTERNATE CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND	THRUST COEFF. ~C_T
△	62.5	[illegible]	[illegible]	200.[illegible](AFT)	[illegible]	CLIMB	[illegible]
□	69.8	[illegible]	[illegible]	200.[illegible](AFT)	[illegible]	AUTO	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = $^{35.6\triangle}_{6.1\square}$ PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT:

LONGITUDINAL - 10.03 IN. FROM FULL FORWARD
LATERAL - 9.90 IN. FROM FULL LEFT
DIRECTIONAL - 5.97 IN. FROM FULL LEFT
COLLECTIVE - 8.98 IN. FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

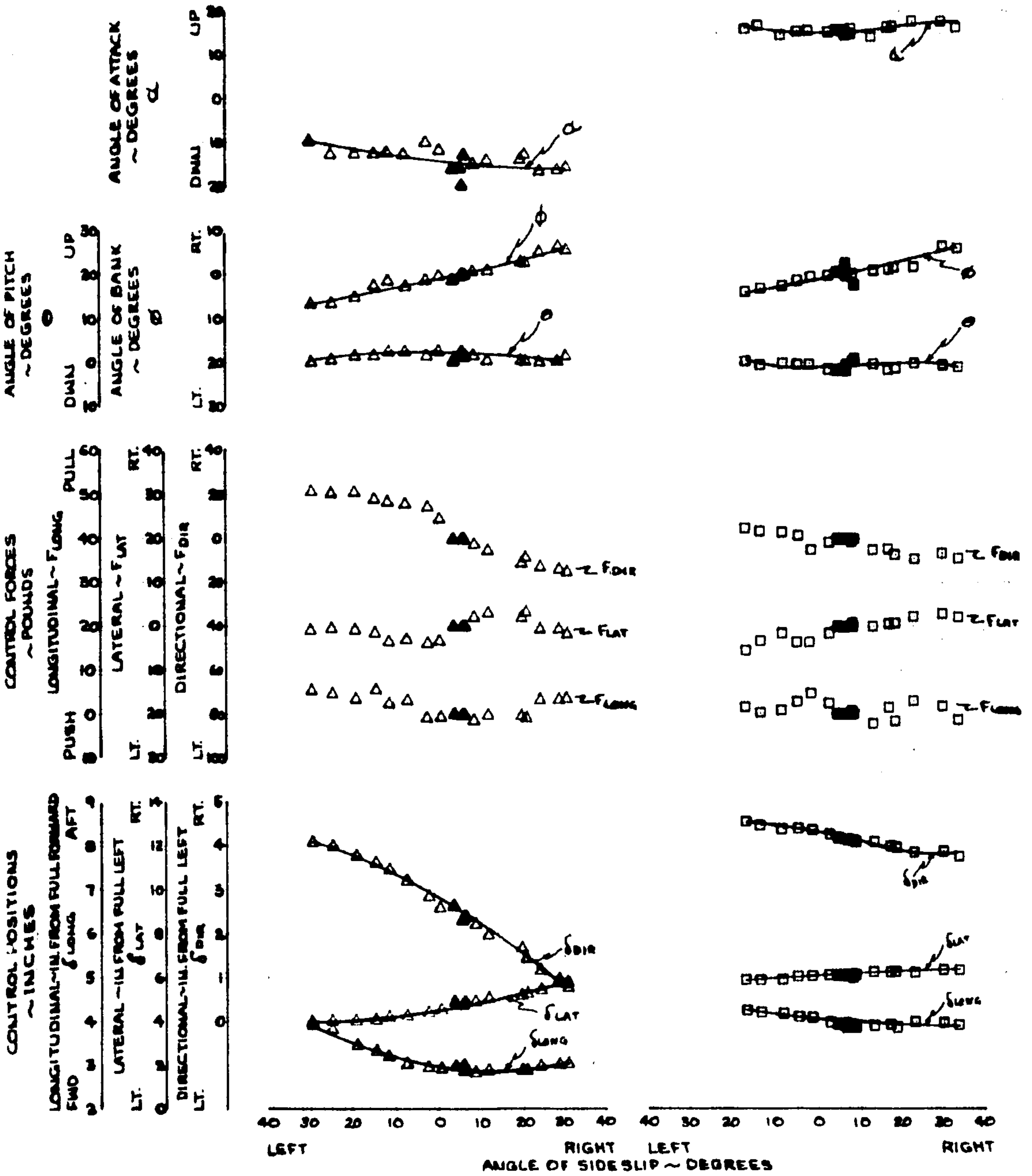


FIGURE NO. 76

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N [illegible]

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
○	62.0	5670	8665	[illegible](AFT)	324.0	LEVEL FLT.	[illegible]
○	105.5	5890	8510	[illegible](AFT)	323.0	LEVEL FLT.	[illegible]

NOTES:
1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN
4. XM-28 GUN TURRET (STOWED)
5. TOTAL CONTROL DISPLACEMENT
   - LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
   - LATERAL = 9.90 INCHES FROM FULL LEFT
   - DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
   - COLLECTIVE = 8.98 INCHES FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

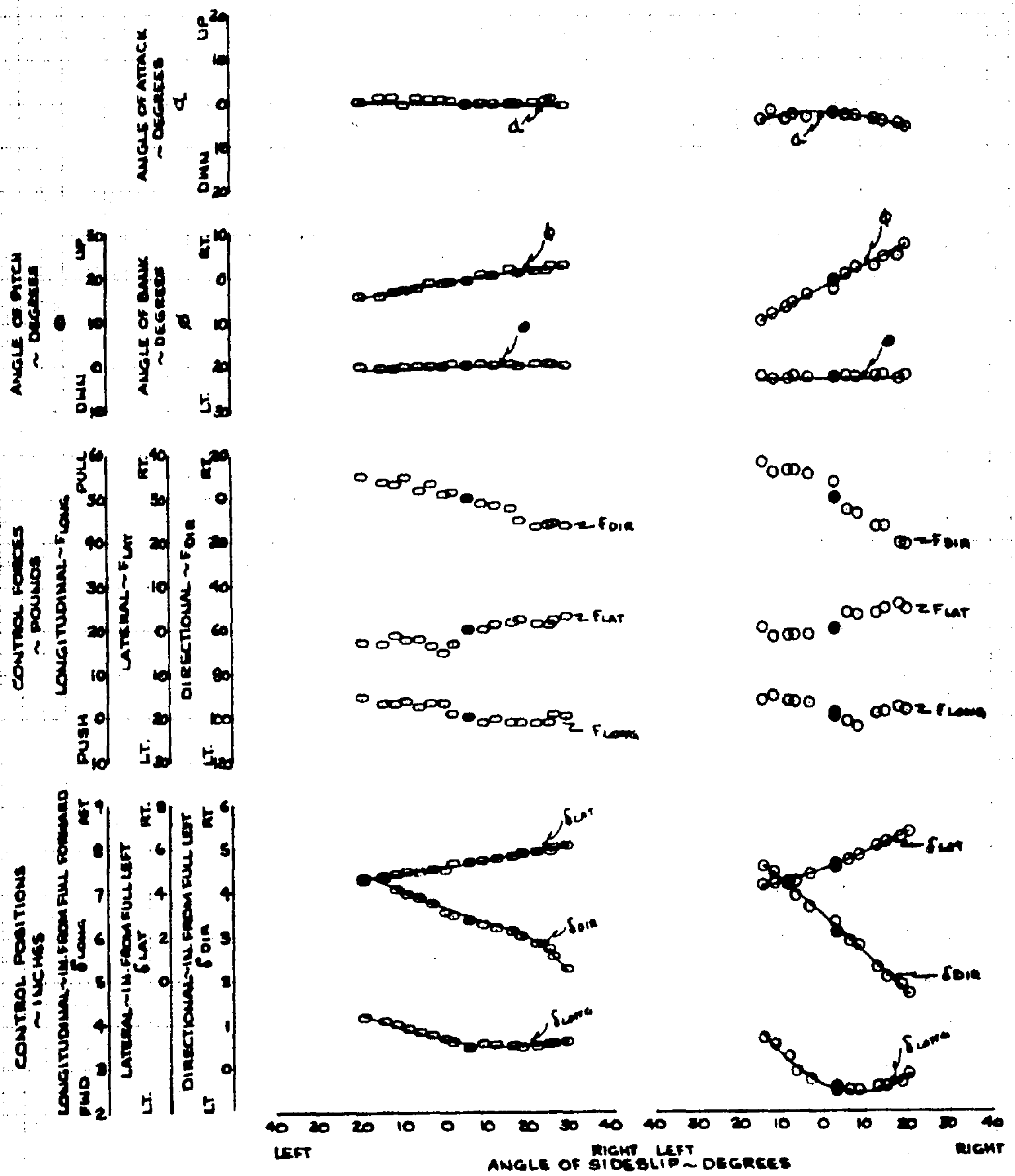


FIGURE No. 77

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N [illegible]

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AIRSPEED ~KCAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▽	130.0	6860	8610	200.9(AFT)	323.0	LEVEL FLT	0.005161
◇	161.0	7600	8875	201.0(AFT)	323.0	DIVE	0.005179

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = $\frac{38.4▽}{32.0◇}$ PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

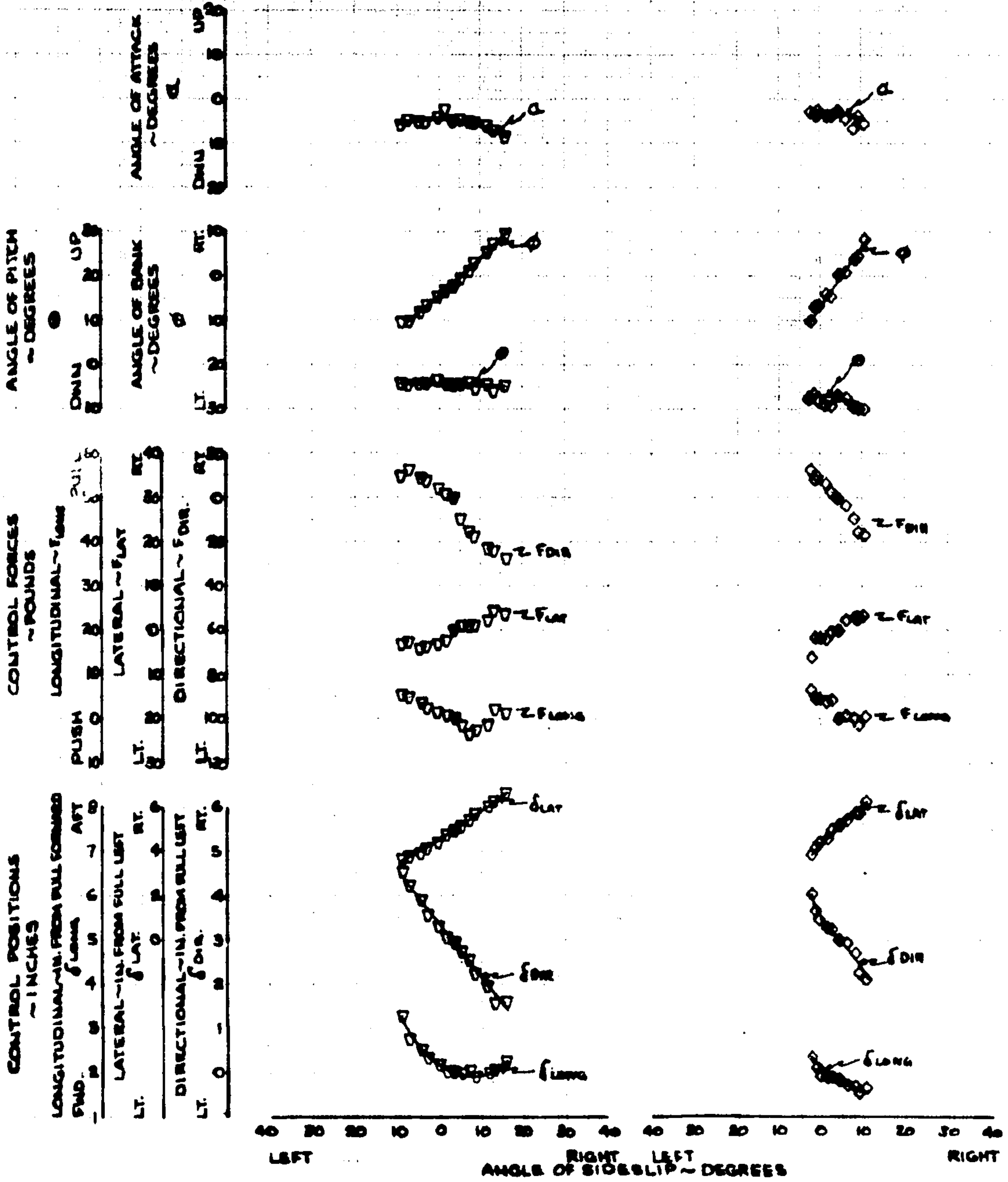


FIGURE NO. 78

STATIC LATERAL-DIRECTIONAL STABILITY

AH-1G USA S/N [illegible]

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF.
△	[illegible]	6160	[illegible]	[illegible](AFT)	323.0	CLIMB	[illegible]
□	67.0	[illegible]	[illegible]	[illegible](AFT)	323.0	AUTO	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN

4. XM-28 GUN TURRET ([illegible])

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.00 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.78 INCHES FROM FULL DOWN

6. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

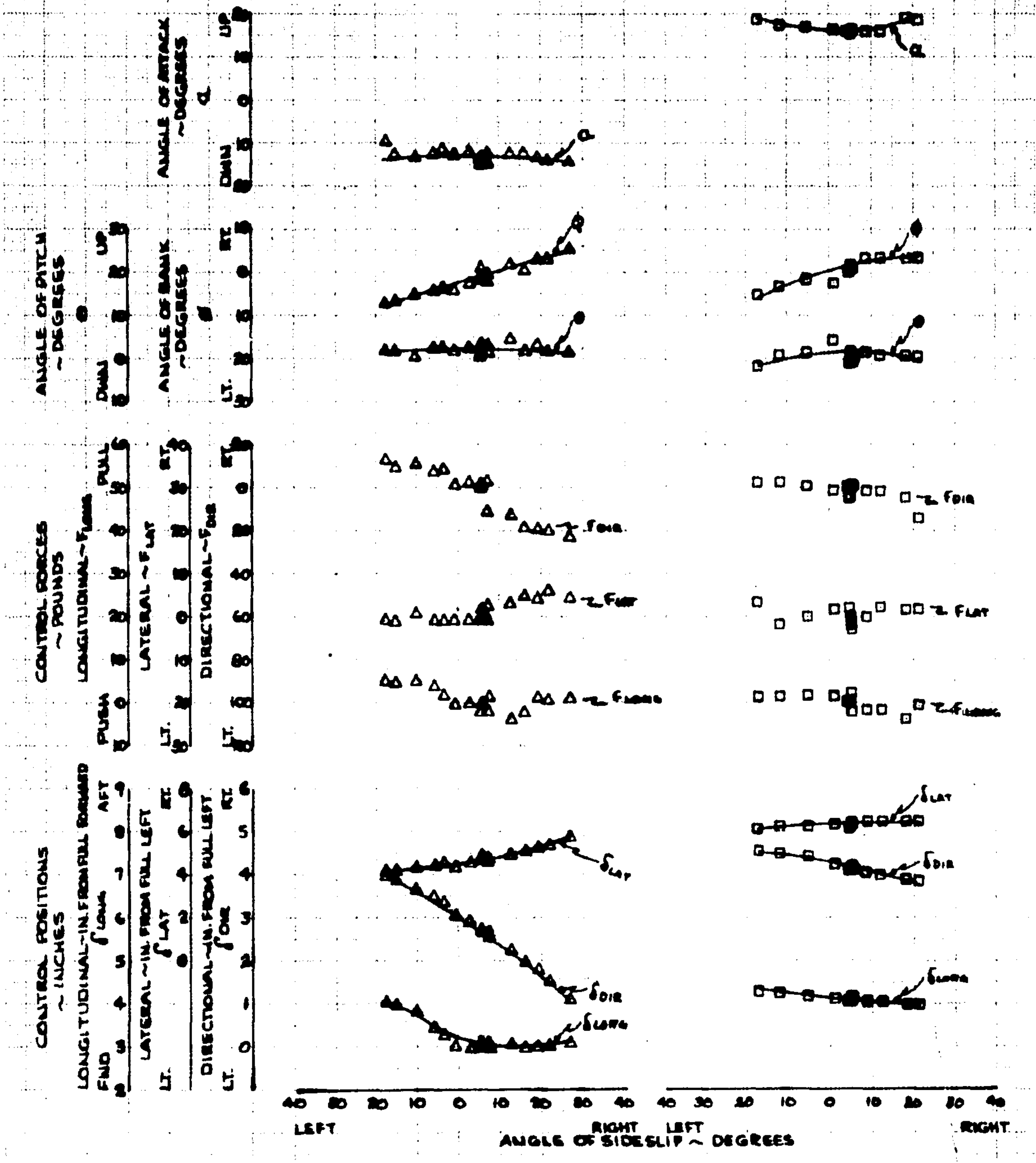


FIGURE No. 79

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA 67-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
●	99.5	4530	8575	191.8(FWD)	324.0	LEVEL FLT.	0.004086
○	141.5	5530	8590	191.5(FWD)	324.0	LEVEL FLT.	0.004089

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = $\frac{28.18}{30.70}$ PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

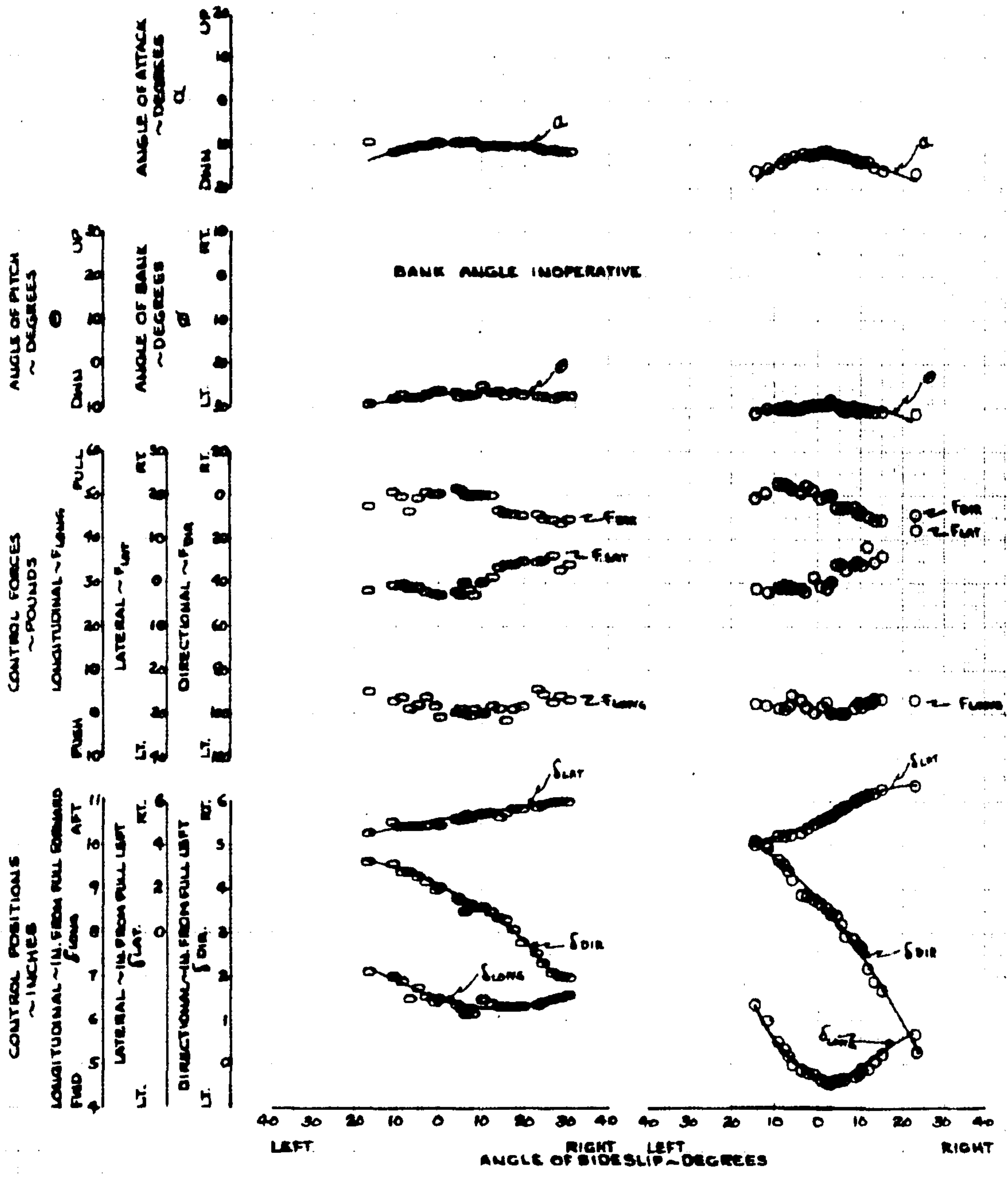


FIGURE NO. 80

STATIC LATERAL-DIRECTIONAL STABILITY

AH-1G USA S/N [illegible]

PVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. Hp~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~CT
▼	175.0	6310	[illegible]	[illegible] (FWD)	[illegible]	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE, GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION: [illegible] PERCENT FROM FULL DOWN

4. XM-28 GUN TURRET ([illegible])

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = [illegible] INCHES FROM FULL FORWARD
LATERAL = [illegible] INCHES FROM FULL LEFT
DIRECTIONAL = [illegible] INCHES FROM FULL LEFT
COLLECTIVE = [illegible] INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

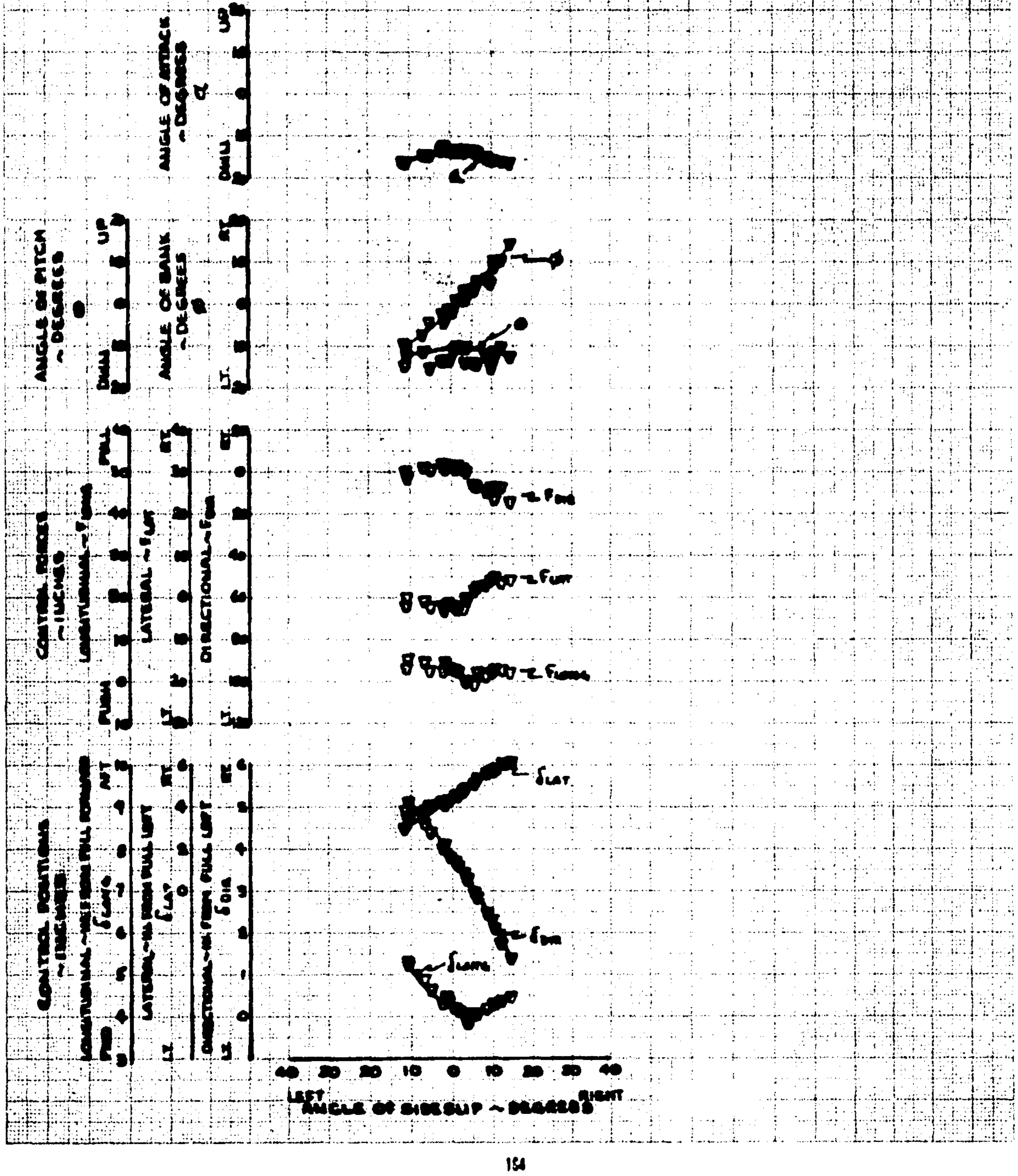


FIGURE NO. 81

STATIC LATERAL-DIRECTIONAL STABILITY

AH-1G USA S/N 15075

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_P~FT	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	ROTOR SPEED RPM	FLT. COND.	THRUST COEFF. ~C_T
▲	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	CLIMB	[illegible]
●	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	AUTOROTATION	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN
4. XM-28 ARM TURRET (FORWARD)
5. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = [illegible] INCHES FROM FULL FORWARD
LATERAL = [illegible] INCHES FROM FULL LEFT
DIRECTIONAL = [illegible] INCHES FROM FULL LEFT
COLLECTIVE = [illegible] INCHES FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

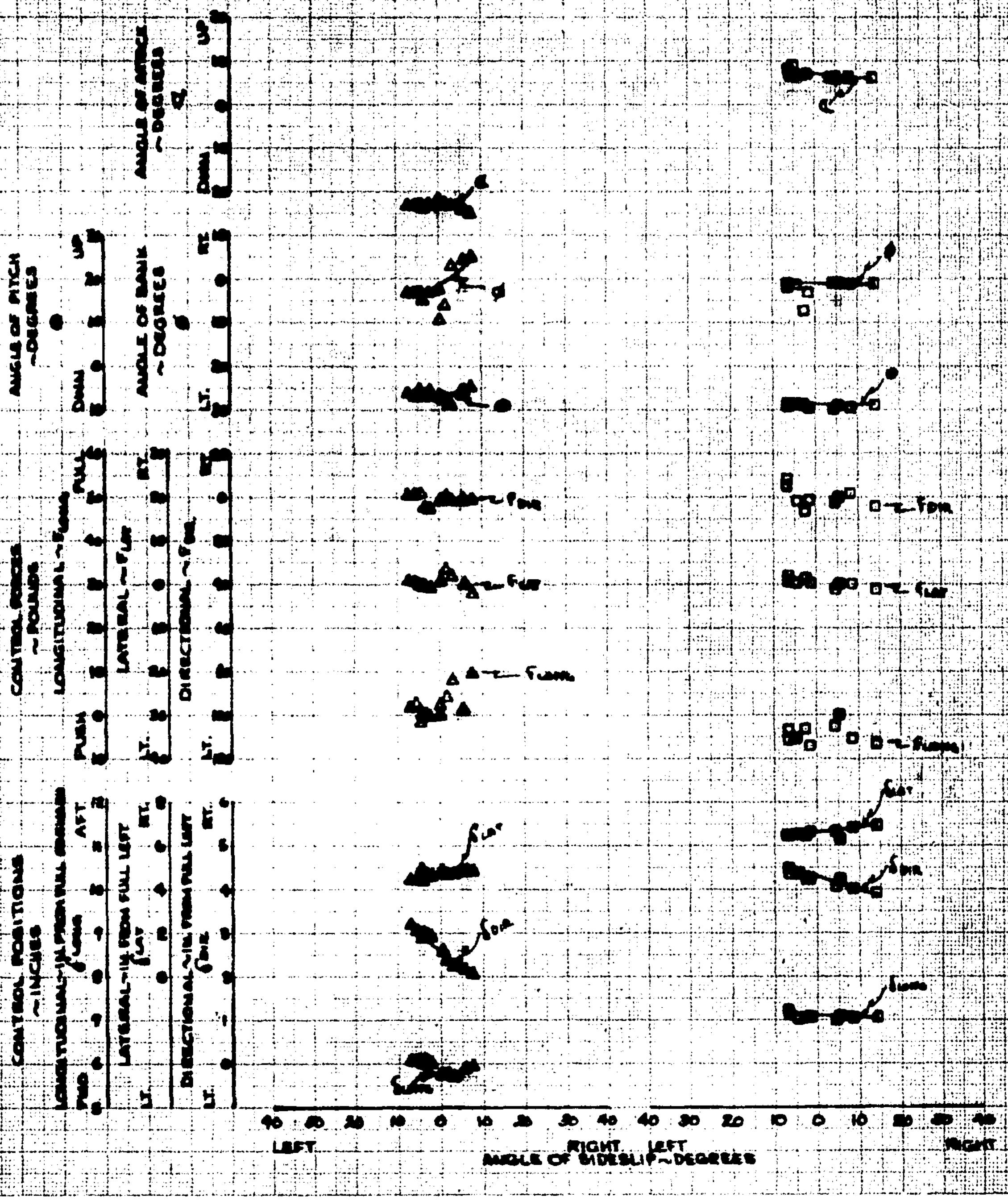


FIGURE NO. [illegible]

[illegible]

[illegible]

HVY. HOG CONFIGURATION WITH [illegible] FAIRINGS REMOVED

[illegible]

SYM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FLT. COND.	THRUST COEFF. ~CT
○	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLT.	[illegible]
●	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLT.	[illegible]

NOTES: 1. [illegible] BANK
ATTITUDE, GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION: [illegible] PERCENT FROM FULL DOWN
4. [illegible] GUN TURRET ([illegible])
5. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL: [illegible] INCHES FROM FULL FORWARD
LATERAL = [illegible] INCHES FROM FULL LEFT
DIRECTIONAL = [illegible] INCHES FROM FULL LEFT
COLLECTIVE = [illegible] INCHES FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED
FROM ALL CONTROL FORCE DATA

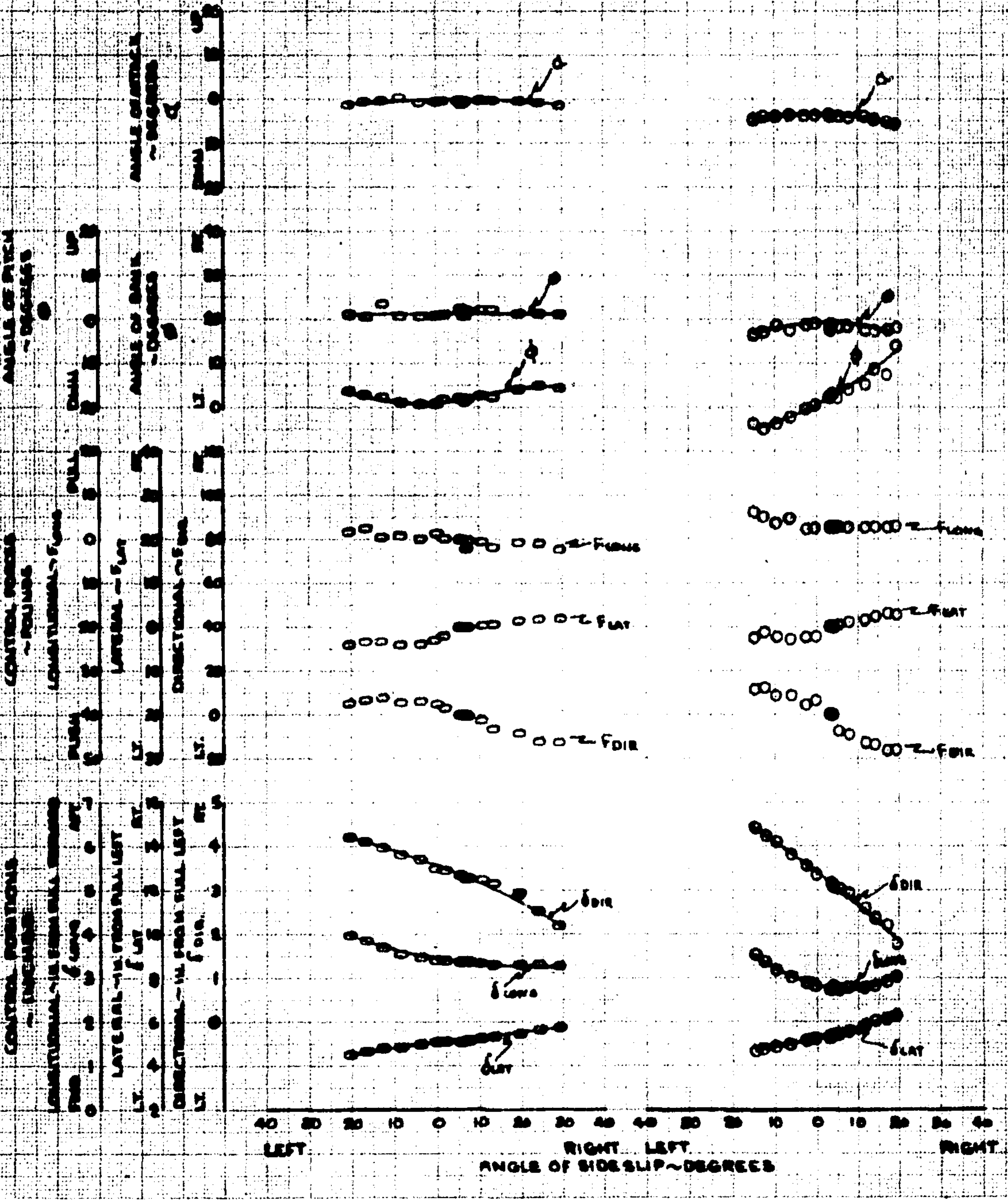


FIGURE NO. 83
STATIC LATERAL DIRECTIONAL STABILITY
AH-1G USA S/N 71-5695
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▽	148.0	5960	7790	201.3 (AFT)	323.0	LEVEL FLT.	0.004374
◇	180.0	5730	7680	201.3 (AFT)	323.0	DIVE	0.004553

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFTS BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = 38.0▽ 38.0◇ PERCENT FROM FULL DOWN
4. XM-28 CHIN TURRET (STOWED)
5. TOTAL CONTROL POSITIONS
LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

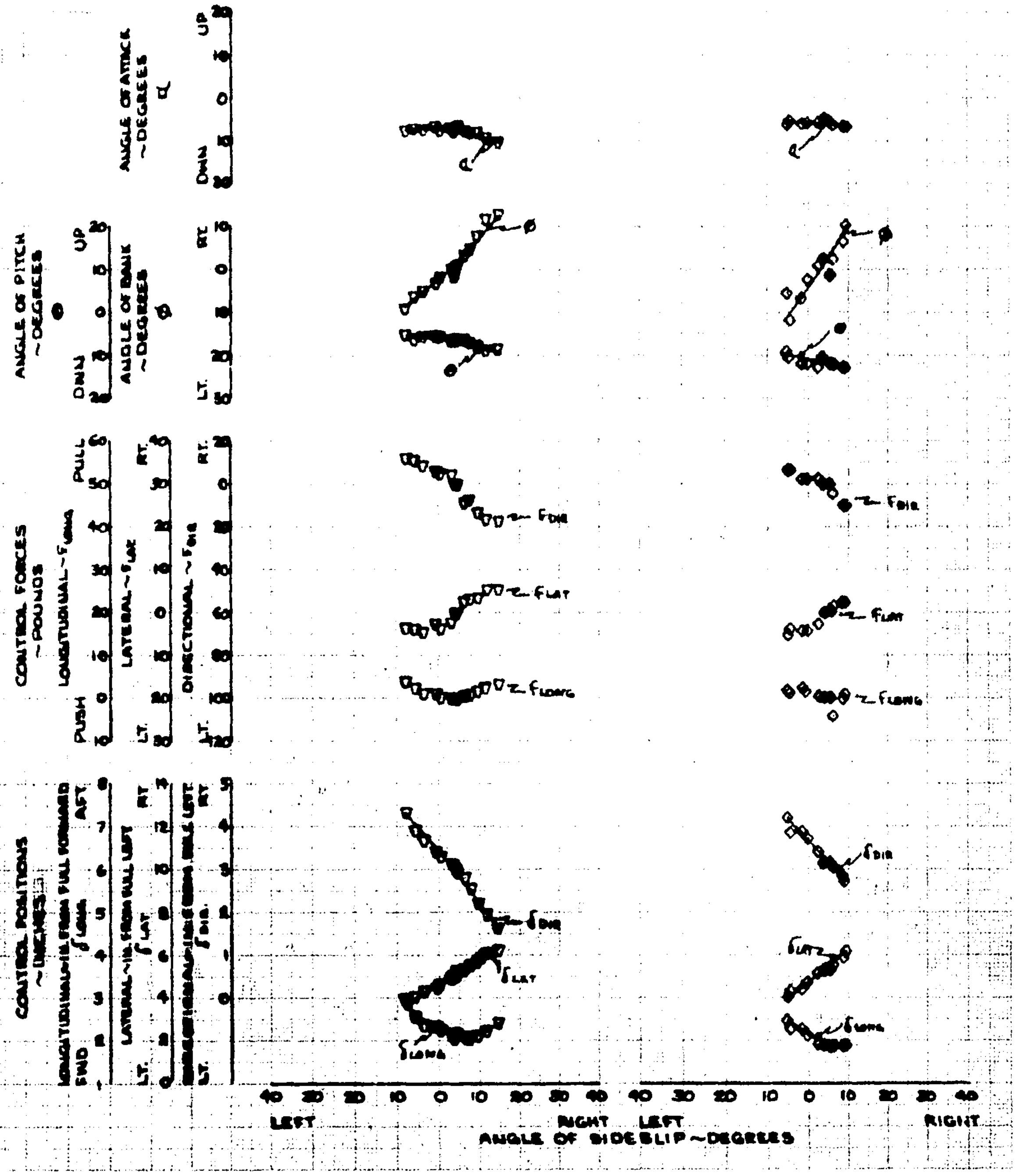


FIGURE NO. 84

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N 15-[illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
△	[illegible]	[illegible]	[illegible]	[illegible](AFT)	323.0	CLIMB	[illegible]
□	[illegible]	[illegible]	[illegible]	[illegible](AFT)	320.0	AUTOROTATION	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = $\overset{\triangle}{34.0}$ $\underset{\square}{0.5}$ PERCENT FROM FULL DOWN
4. XM-28 CHIN TURRET (STOWED)
5. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL = 10.03 IN. FROM FULL FORWARD
LATERAL = 9.90 IN. FROM FULL LEFT
DIRECTIONAL = 5.97 IN. FROM FULL LEFT
COLLECTIVE = 8.98 IN. FROM FULL DOWN
6. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

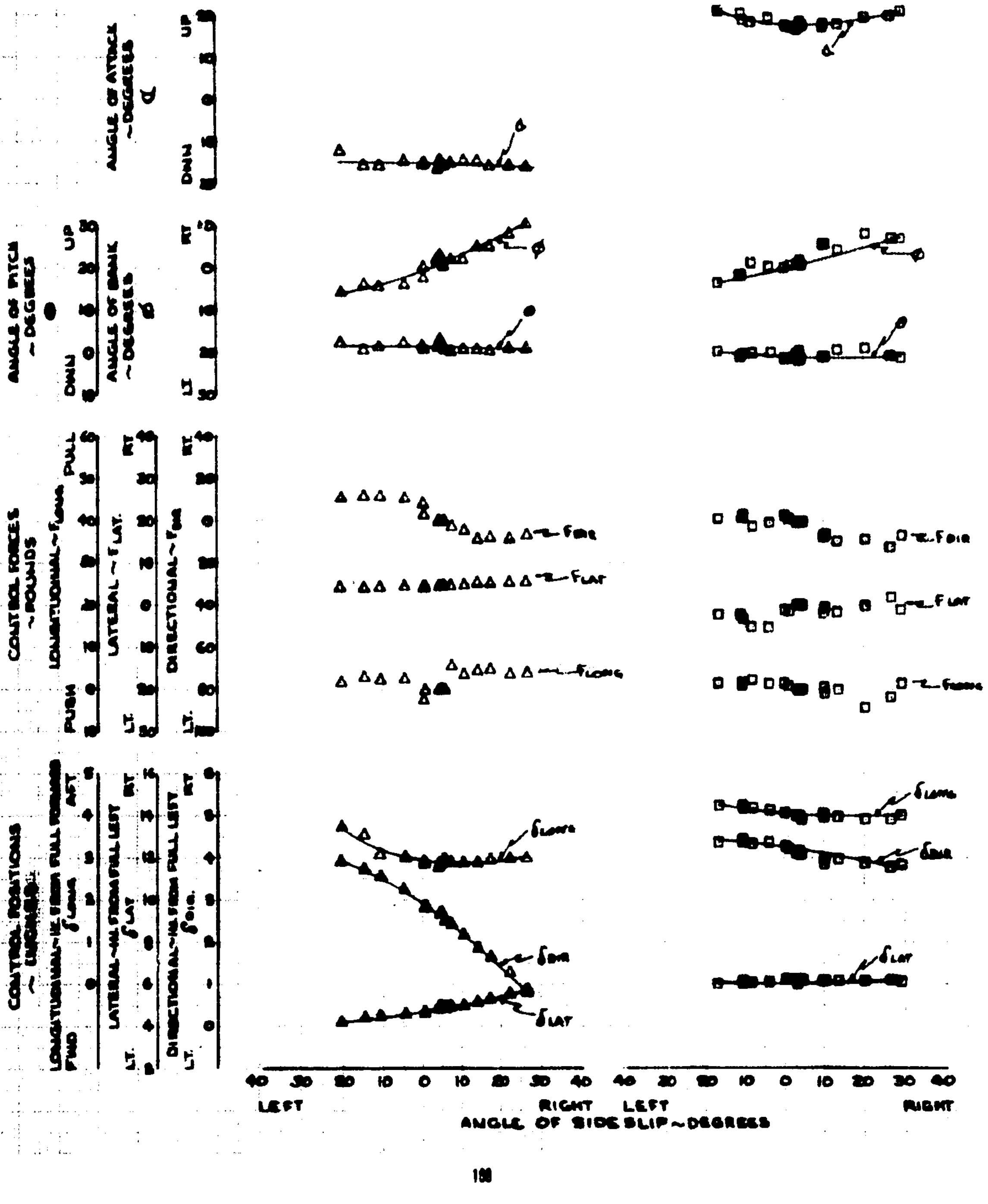


FIGURE No. B5

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▢	60.5	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLT.	[illegible]
○	105.5	[illegible]	[illegible]	[illegible](AFT)	323.0	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = $\frac{21.010}{28.80}$ PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 IN. FROM FULL FORWARD
LATERAL = 9.90 IN. FROM FULL LEFT
DIRECTIONAL = 5.97 IN. FROM FULL LEFT
COLLECTIVE = 8.98 IN. FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

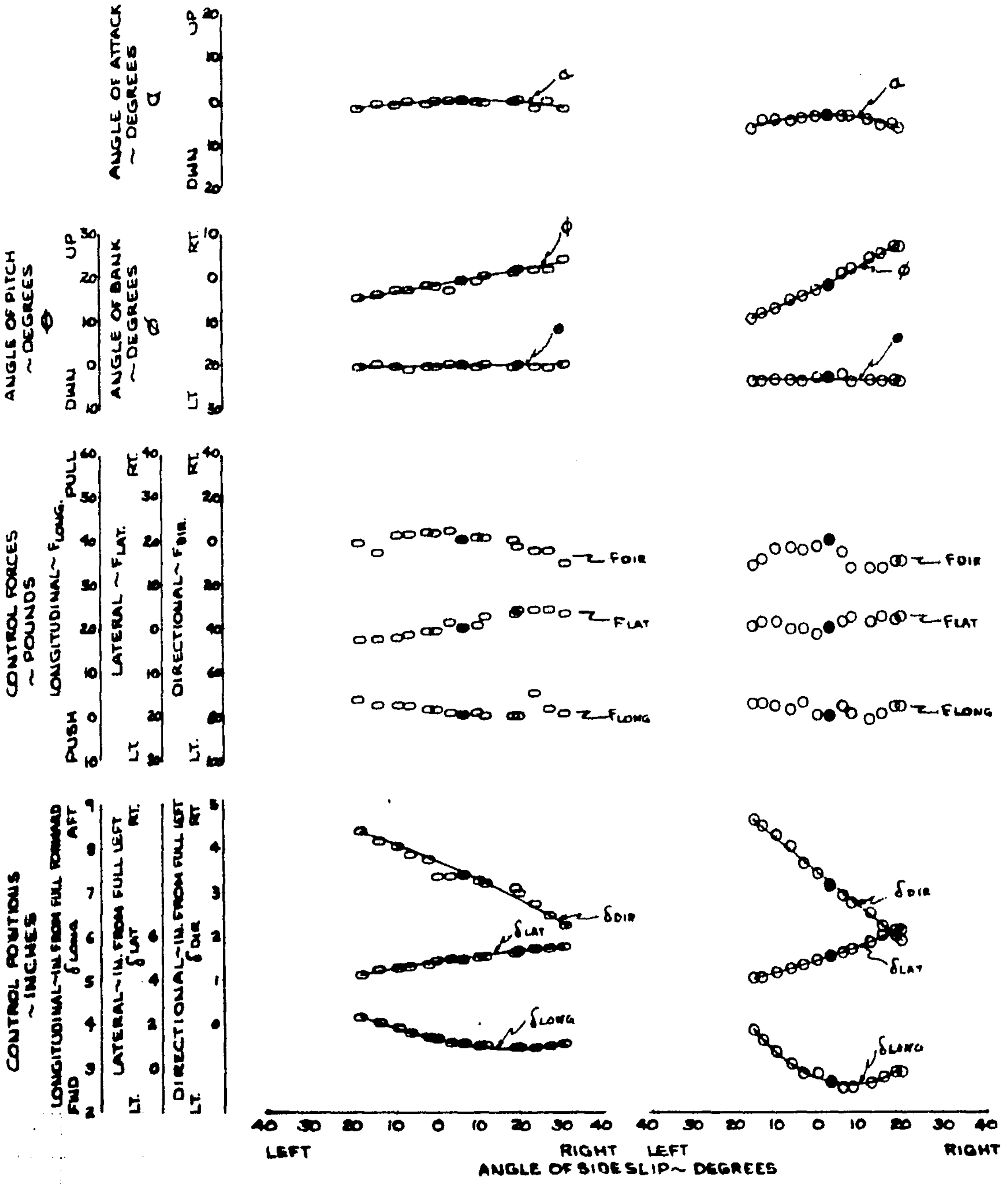


FIGURE NO. 86

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA 6715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_D ~ FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▽	130.5	5440	8390	200.8(AFT)	326.0	LEVEL FLT.	0.[illegible]
◇	151.5	6340	8160	200.9(AFT)	324.0	DIVE	0.[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 39.4▽ / 39.6◇ PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

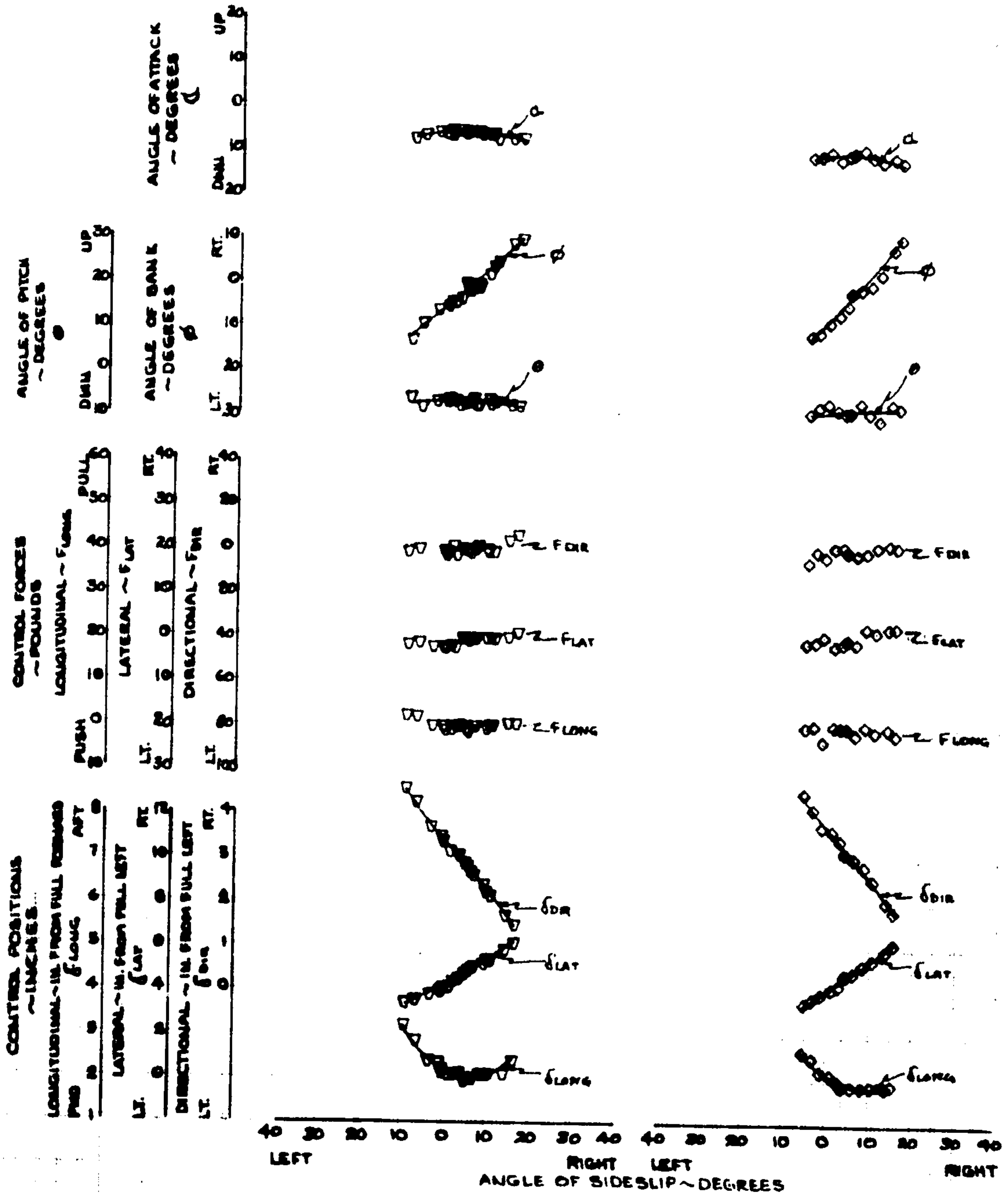


FIGURE No. 87

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N 71-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AIRSPEED ~KCAS	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▲	65.0	[illegible]	[illegible]	200.9(AFT)	318.0	CLIMB	0.005181
■	67.0	[illegible]	7980	200.9(AFT)	328.0	AUTOROTATION	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.08 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

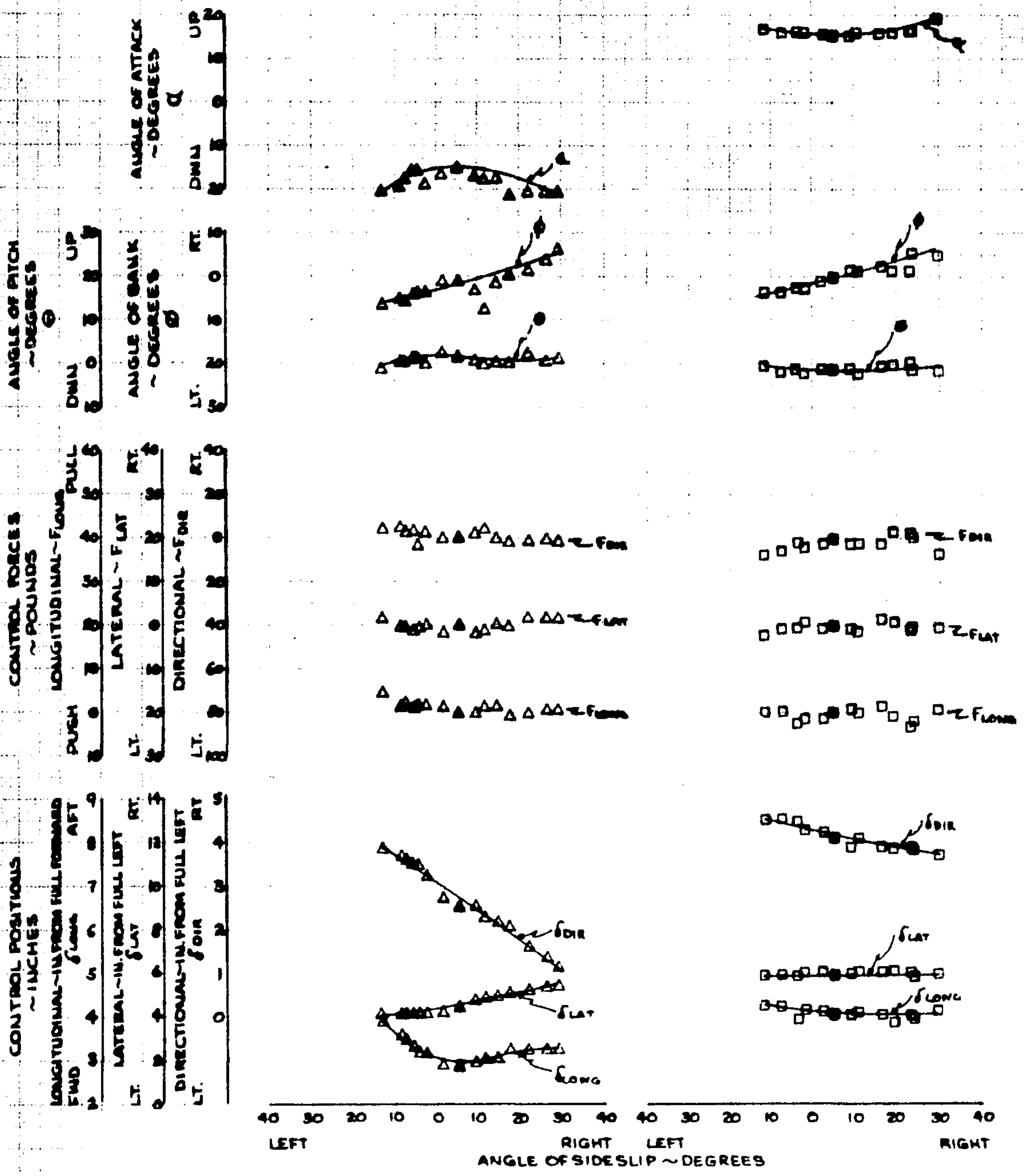


FIGURE NO. 88

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N 15698

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT	AVG. G.W. ~LB	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
●	68.4	4280	9740	199.8(AFT)	323.5	LEVEL FLT.	[illegible]
○	106.0	4660	9620	199.7(AFT)	323.3	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST.

3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN

4. XM-28 GUN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.85 INCHES FROM FULL FORWARD
LATERAL = 9.80 INCHES FROM FULL LEFT
DIRECTIONAL = 5.93 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

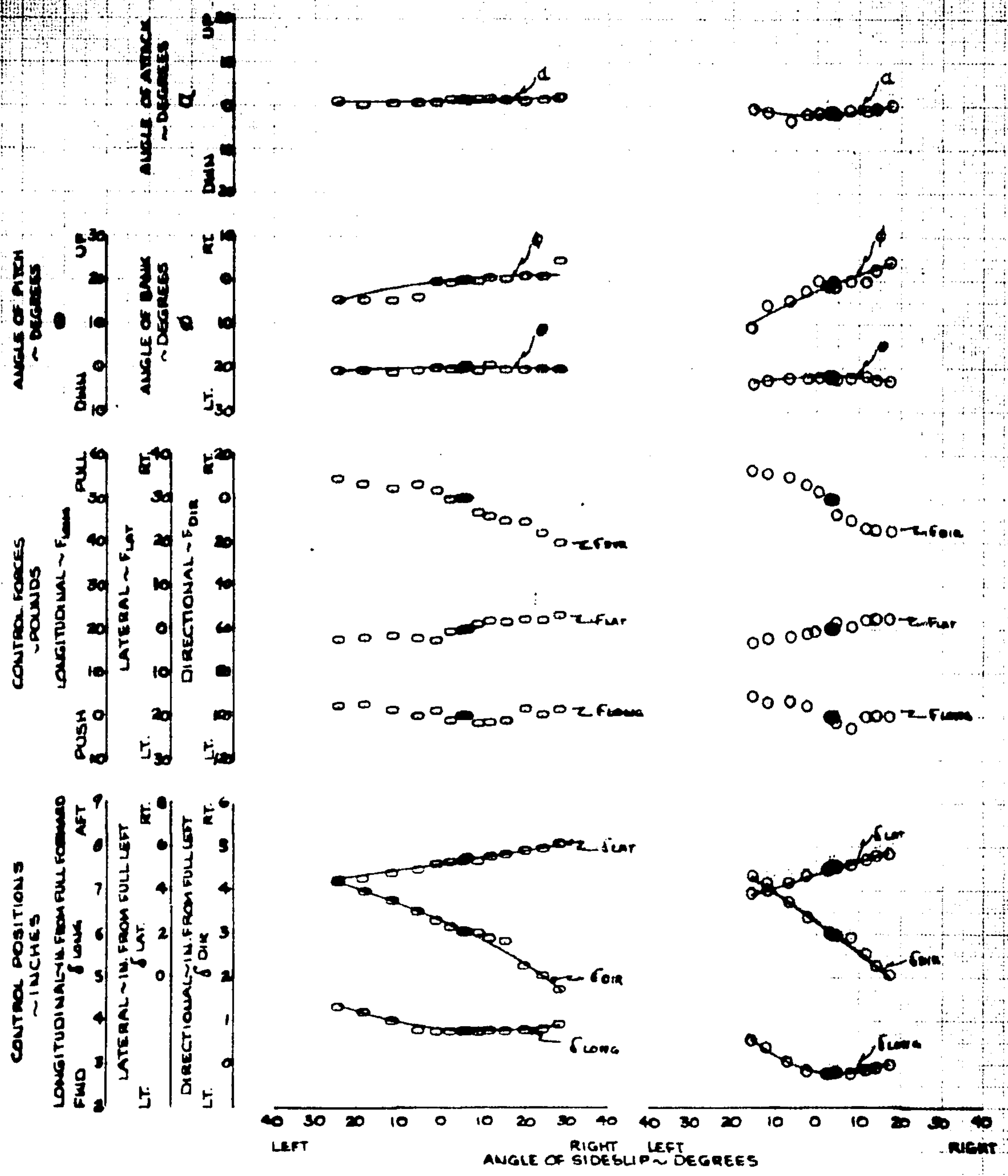


FIGURE NO. [illegible]

STATIC LATERAL-DIRECTIONAL STABILITY

AH-1G USA S/N [illegible]

HVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

[illegible]

SYM.	AIRSPEED ~KCAS	AVG. ALT. ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▼	143.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLT.	[illegible]
◆	[illegible]	5670	[illegible]	[illegible]	324.0	DIVE	[illegible]

NOTES: 1. SHADED SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST.

3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN

4. XM-28 GUN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT:

LONGITUDINAL = 10.[illegible] INCHES FROM FULL FORWARD
LATERAL = [illegible] INCHES FROM FULL LEFT
DIRECTIONAL = [illegible] INCHES FROM FULL LEFT
COLLECTIVE = [illegible] INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

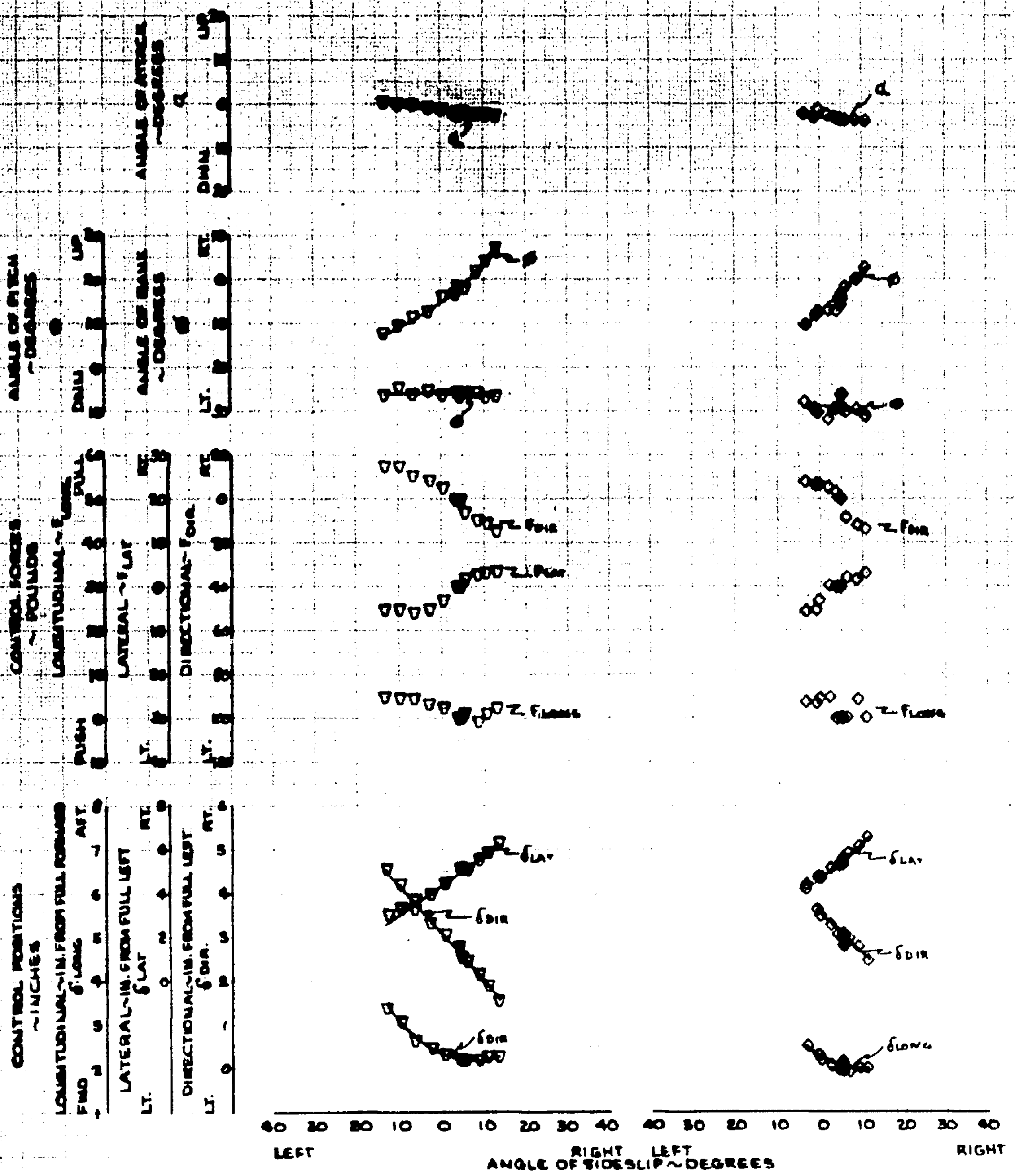


FIGURE No. 90

STATIC LATERAL DIRECTIONAL STABILITY

[illegible] CONFIGURATION WITH [illegible] FAIRINGS REMOVED

[illegible]

ALL CONTROL FORCE DATA

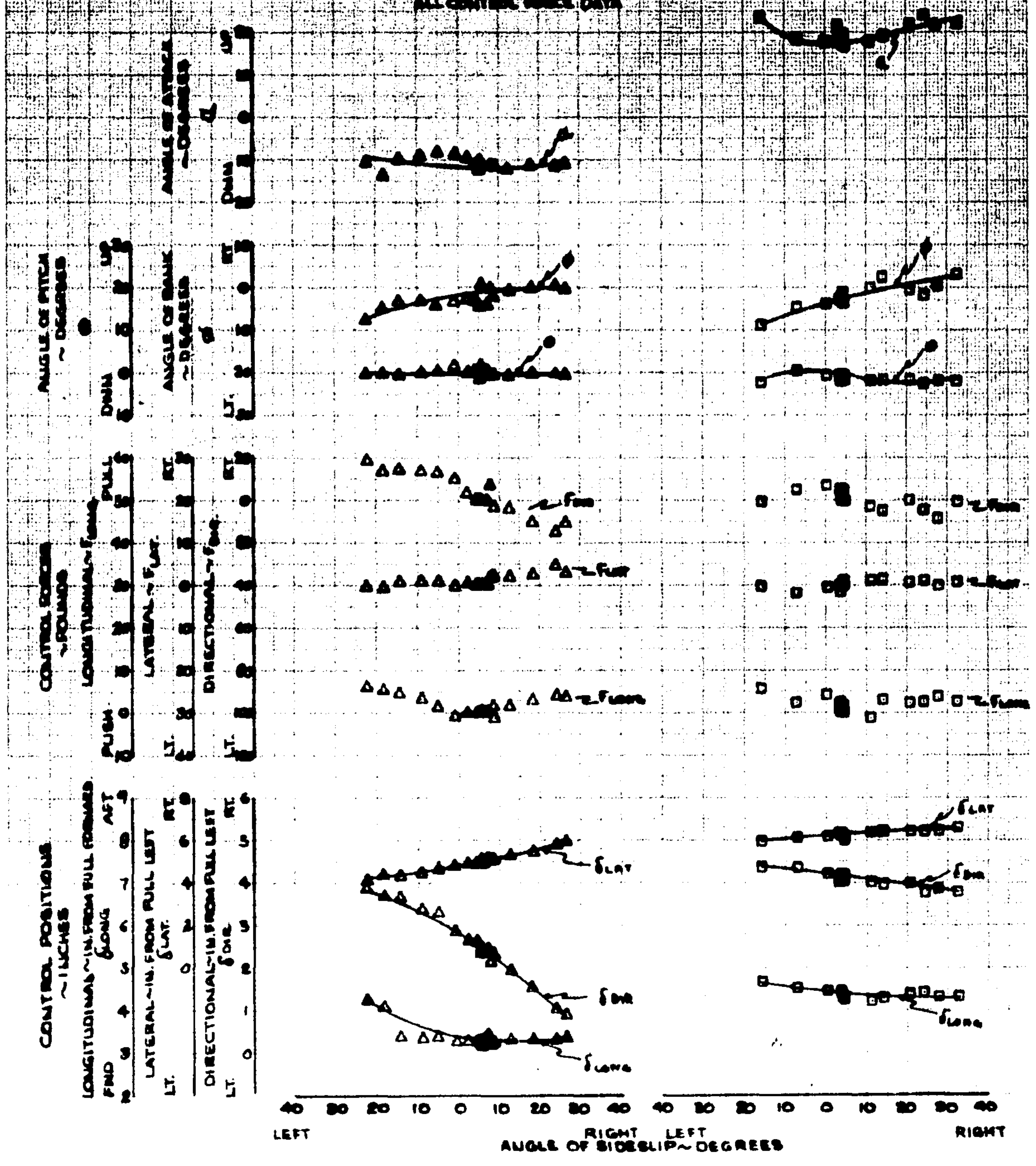


FIGURE NO. 91

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
○	60.0	15560	[illegible]	200.7 (AFT)	324.0	LEVEL FLT	0.006569
O	83.0	14280	[illegible]	200.8 (AFT)	324.0	LEVEL FLT.	0.006687

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN

4. XM-28 GUN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

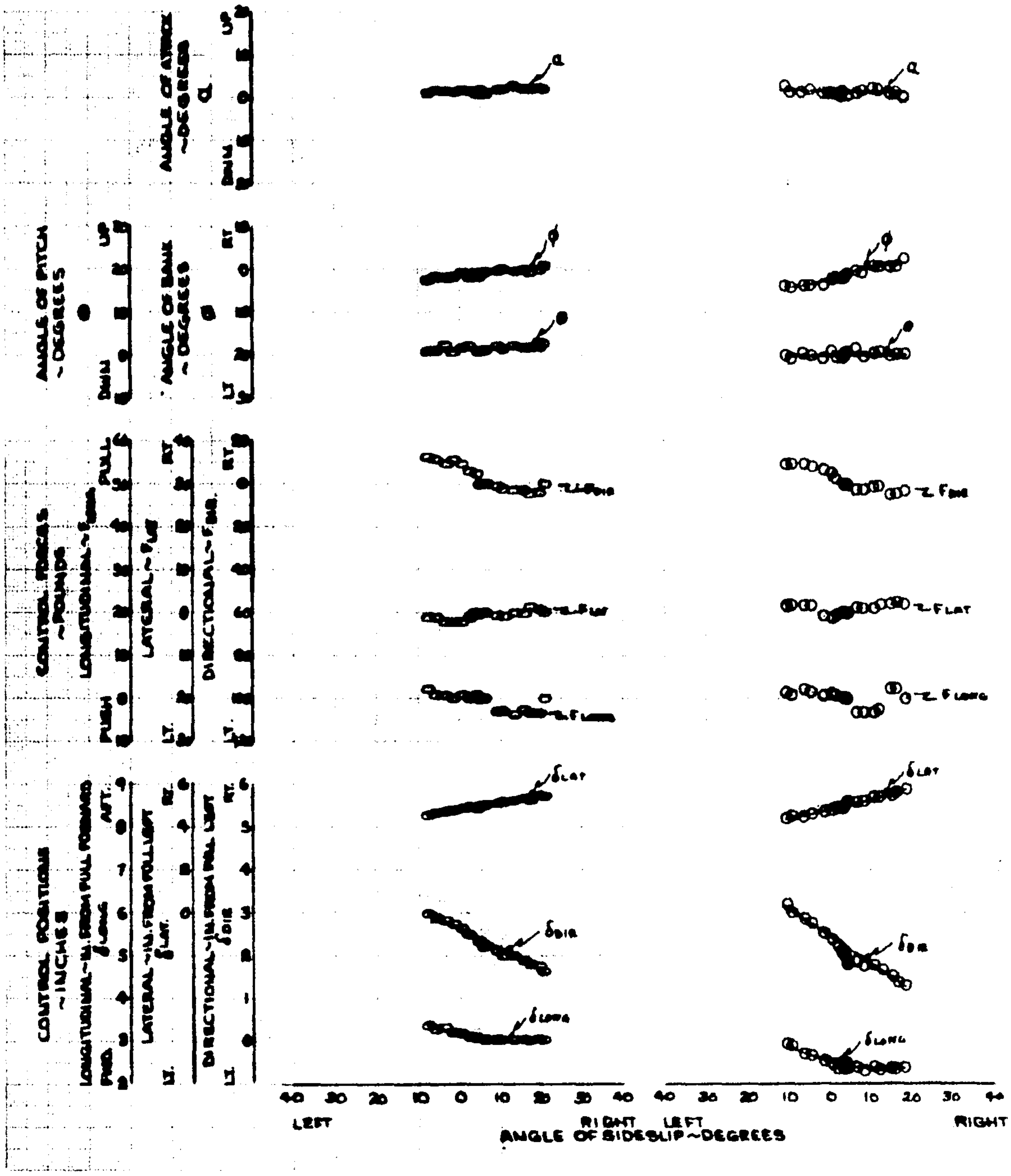


FIGURE NO. 92

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▽	101.0	14070	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = [illegible] PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

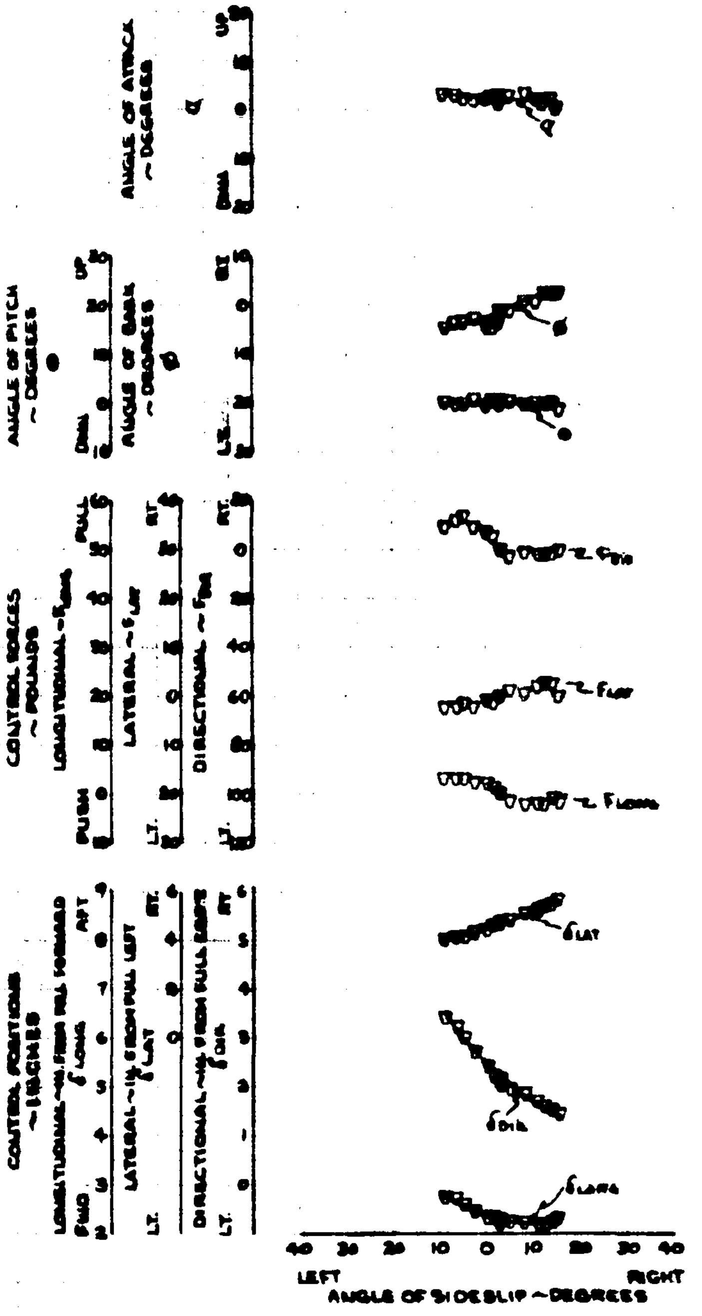


FIGURE NO. 93

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA 66-15247

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▲	55.0	13650	8305	200.7(AFT)	324.0	CLIMB	0.006698

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 38.0 PERCENT FROM FULL DOWN

4. XM-28 CANN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

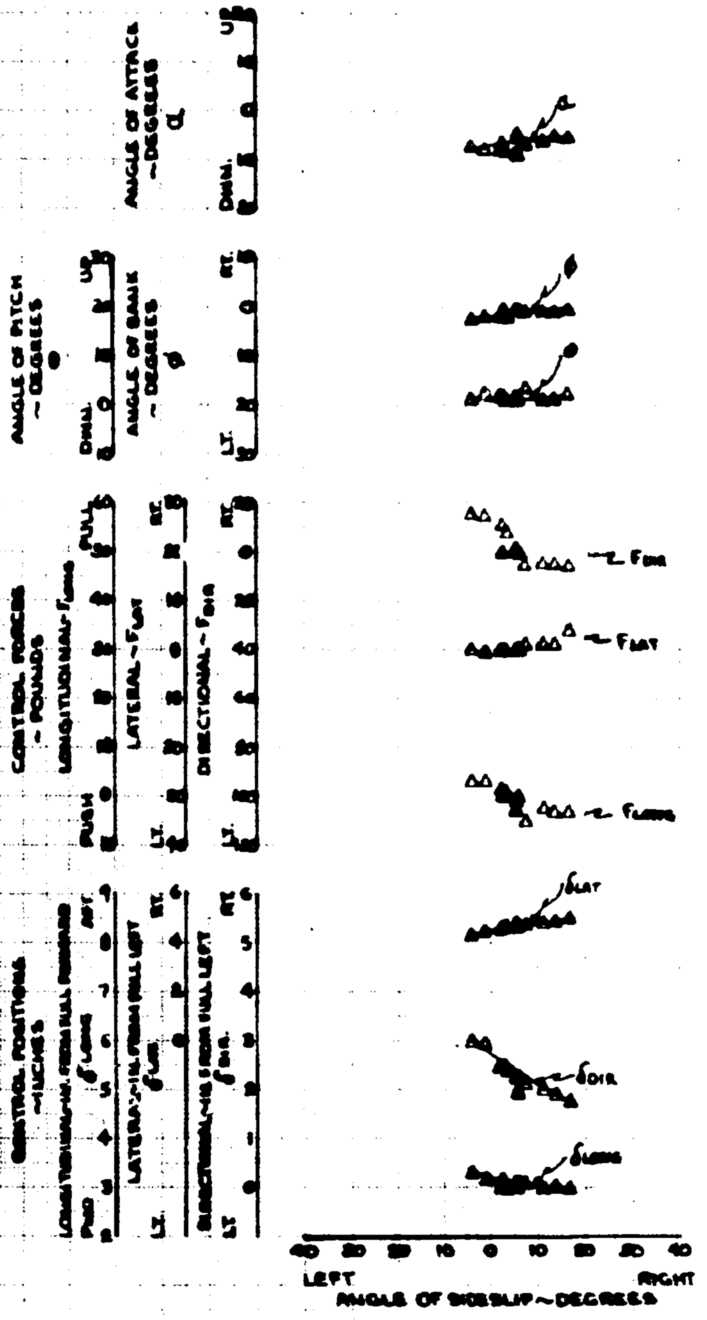


FIGURE No. 94

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. Hp~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEF. ~CT
○	119.0	2860	8720	[illegible] (AFT)	[illegible]	LEVEL FLT.	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = 30.5 PERCENT FROM FULL DOWN
4. XM-28 CHIN TURRET (STOWED)
5. TOTAL CONTROL DISPLACEMENT:
LONGITUDINAL = 9.07 IN. FROM FULL FORWARD
LATERAL = 10.0 IN. FROM FULL LEFT
DIRECTIONAL = 7.07 IN. FROM FULL LEFT
COLLECTIVE = 9.80 IN. FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

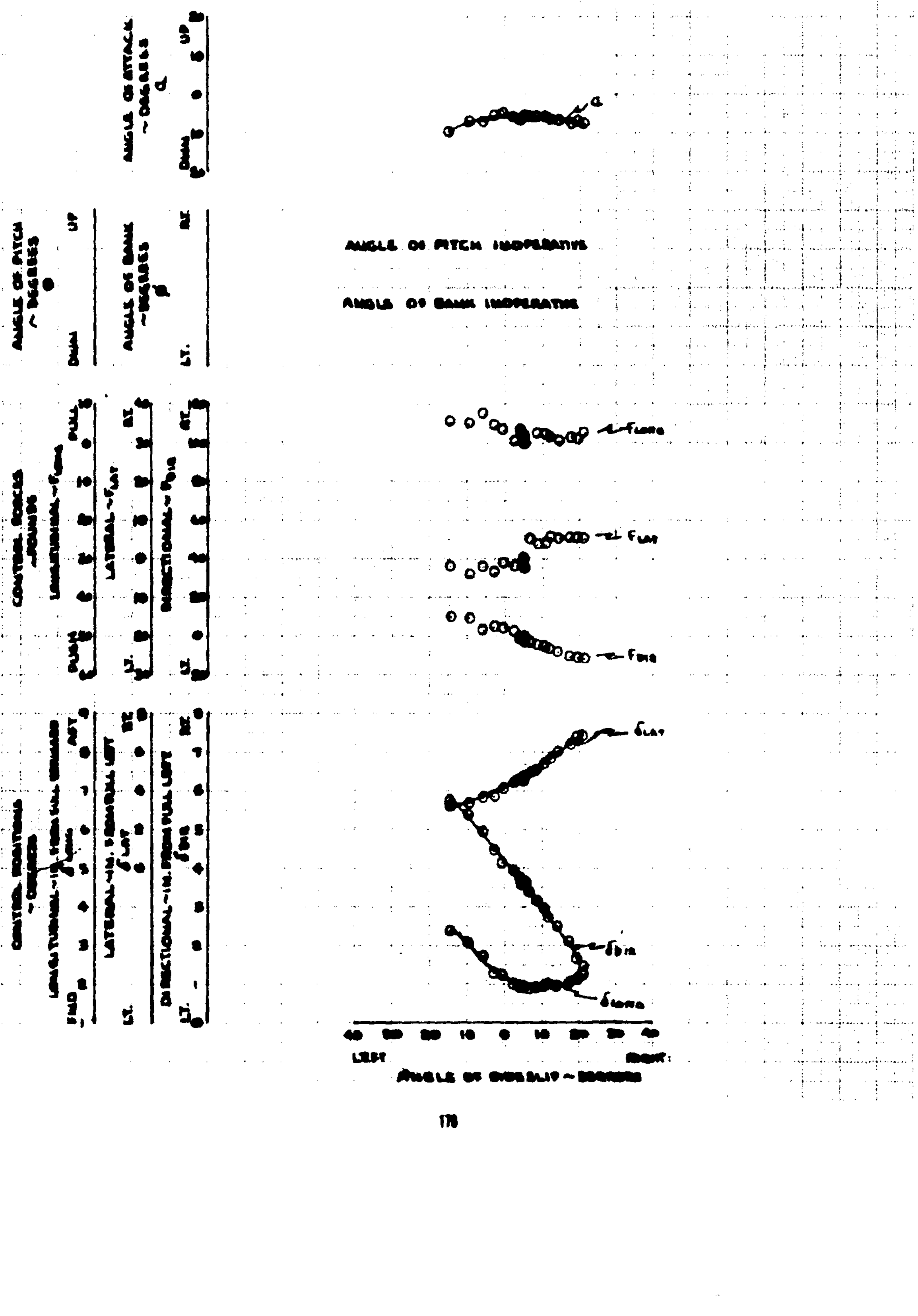


FIGURE NO. 95

STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA [illegible]

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM	AIRSPEED ~KCAS	AVG. ALT. Hp ~FT	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▽	145.0	[illegible]	8785	[illegible] (AFT)	323.0	LEVEL FLT	0.006966
◇	176.0	[illegible]	8656	[illegible] (AFT)	323.0	DIVE	[illegible]

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 44.0 ▽, 44.0 ◇ PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT:

LONGITUDINAL = 9.07 IN. FROM FULL FORWARD

LATERAL = 10.00 IN. FROM FULL LEFT

DIRECTIONAL = 7.07 IN. FROM FULL LEFT

COLLECTIVE = 9.30 IN. FROM FULL DOWN

6. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

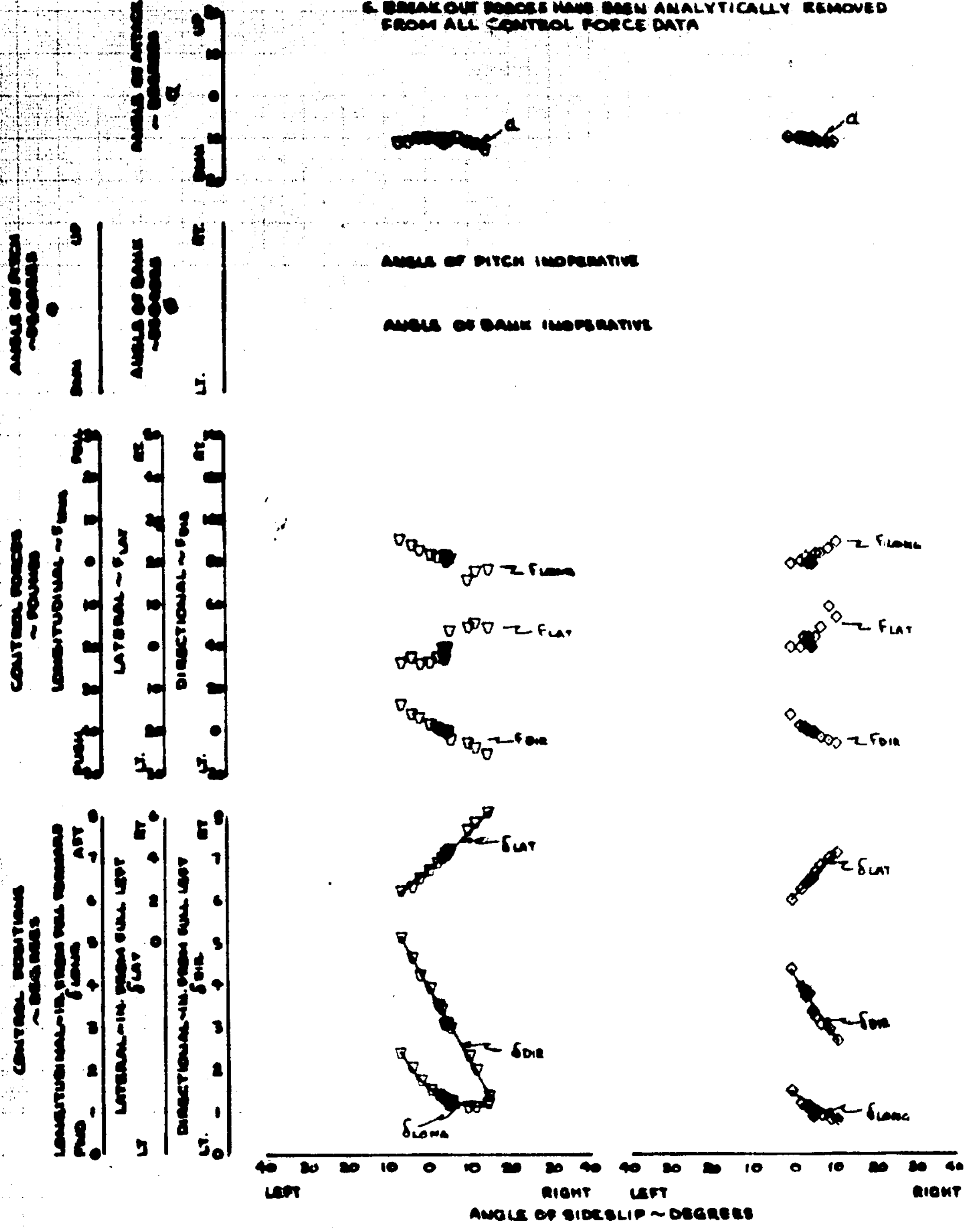


FIGURE No. 96

IGE HOVERING IN WIND

FOR A TEN PERCENT DIRECTIONAL CONTROL MARGIN

AH-1G USA S/N 615247

T53-L-13 S/N LE14001

SKID HEIGHT = 7 FEET

NOTES: 1. POINTS DERIVED FROM NO. 97 THROUGH 100 APP. VII

2. WIND VELOCITY PRESENTED FOR CRITICAL WIND AZIMUTH

3. SEVEN FOOT SKID HEIGHT REPRESENTS MOST CRITICAL CONDITION.

4. FULL LEFT DIRECTIONAL CONTROL = 19° TAIL ROTOR BLADE ANGLE

5. 10 PERCENT DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED HOVER

6. YAW SCAS OFF

7. STANDARD DAY

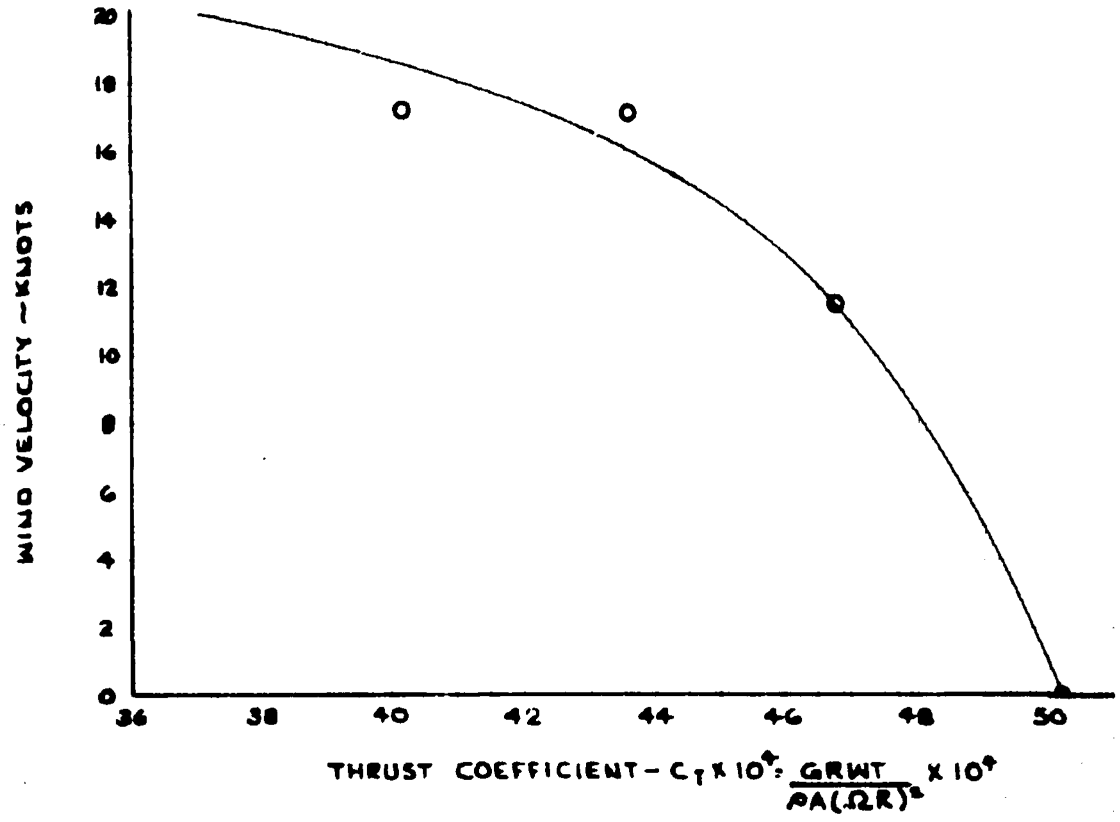


FIGURE NO. 97

DIRECTIONAL CONTROL SUMMARY

AH-1G USA S/N 615247

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

ALTITUDE H_D ~ FT	GROSS WEIGHT ~ LB	LONG. C.G. ~ IN.	ROTOR SPEED ~ RPM	THRUST COEFF. ~ C_T
140	8060	200.4 (AFT)	324	0.004018

NOTES:

1. 10% DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
2. YAW SCAS OFF
3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 IN FROM FULL LEFT
4. SHADED AREAS REPRESENT LESS THAN 10% DIRECTIONAL CONTROL MARGIN
5. POINTS DERIVED FROM FIGURES 101 THROUGH 107, APP VII

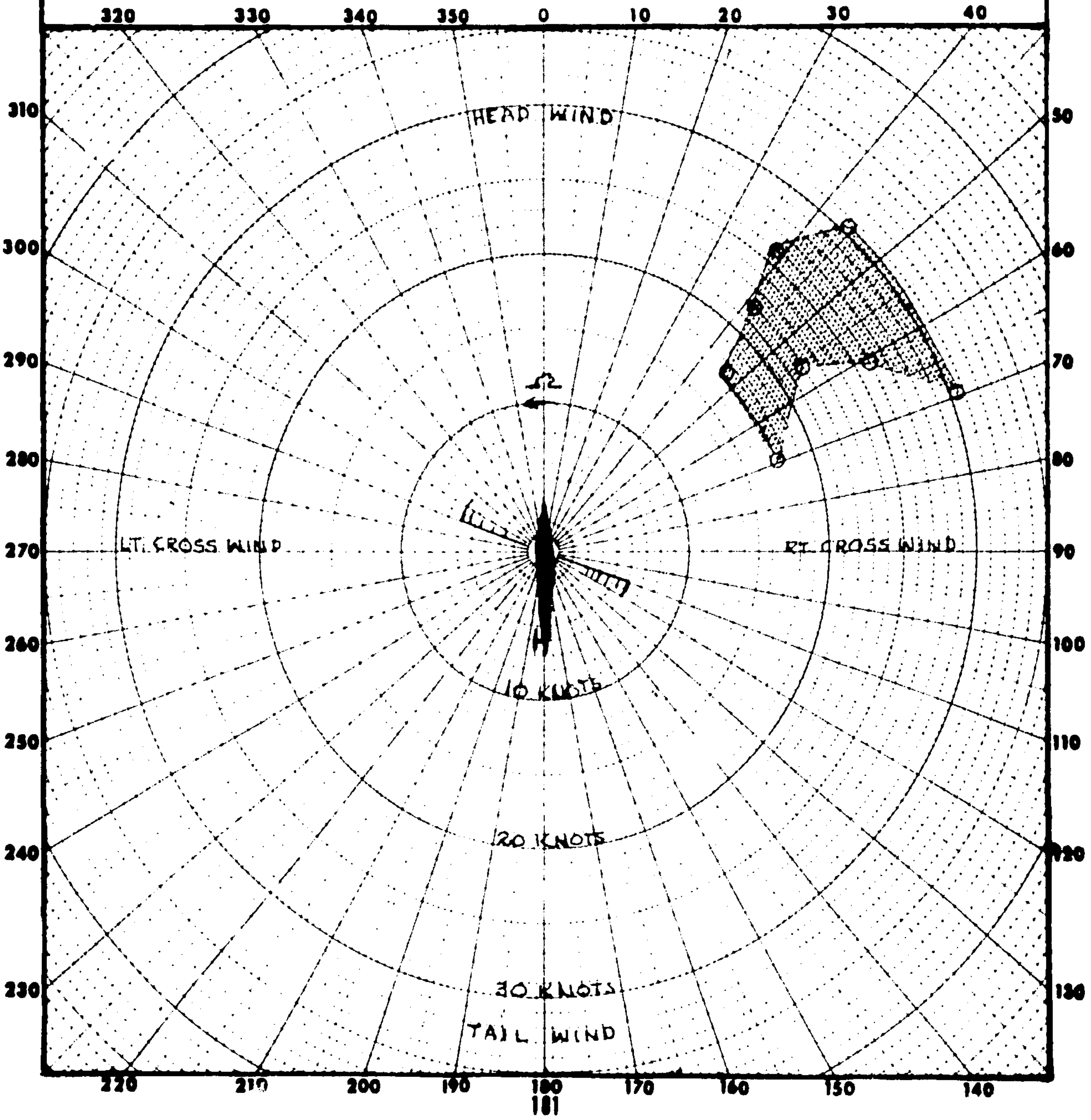


FIGURE NO. 98

DIRECTIONAL CONTROL SUMMARY

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

ALTITUDE H_D~FT.	GROSS WEIGHT ~LB.	LONG. C.G. ~IN.	ROTOR SPEED ~RPM	THRUST COEFF. ~C_T
-40	8245	199.6(AFT)	314	0.004353

NOTES:

1. 10% DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
2. YAW SCAS OFF
3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 IN. FROM FULL LEFT
4. SHADED AREA REPRESENTS LESS THAN 10% DIRECTIONAL CONTROL MARGIN
5. POINTS DERIVED FROM FIGURES 108 THROUGH 114, APP. VII

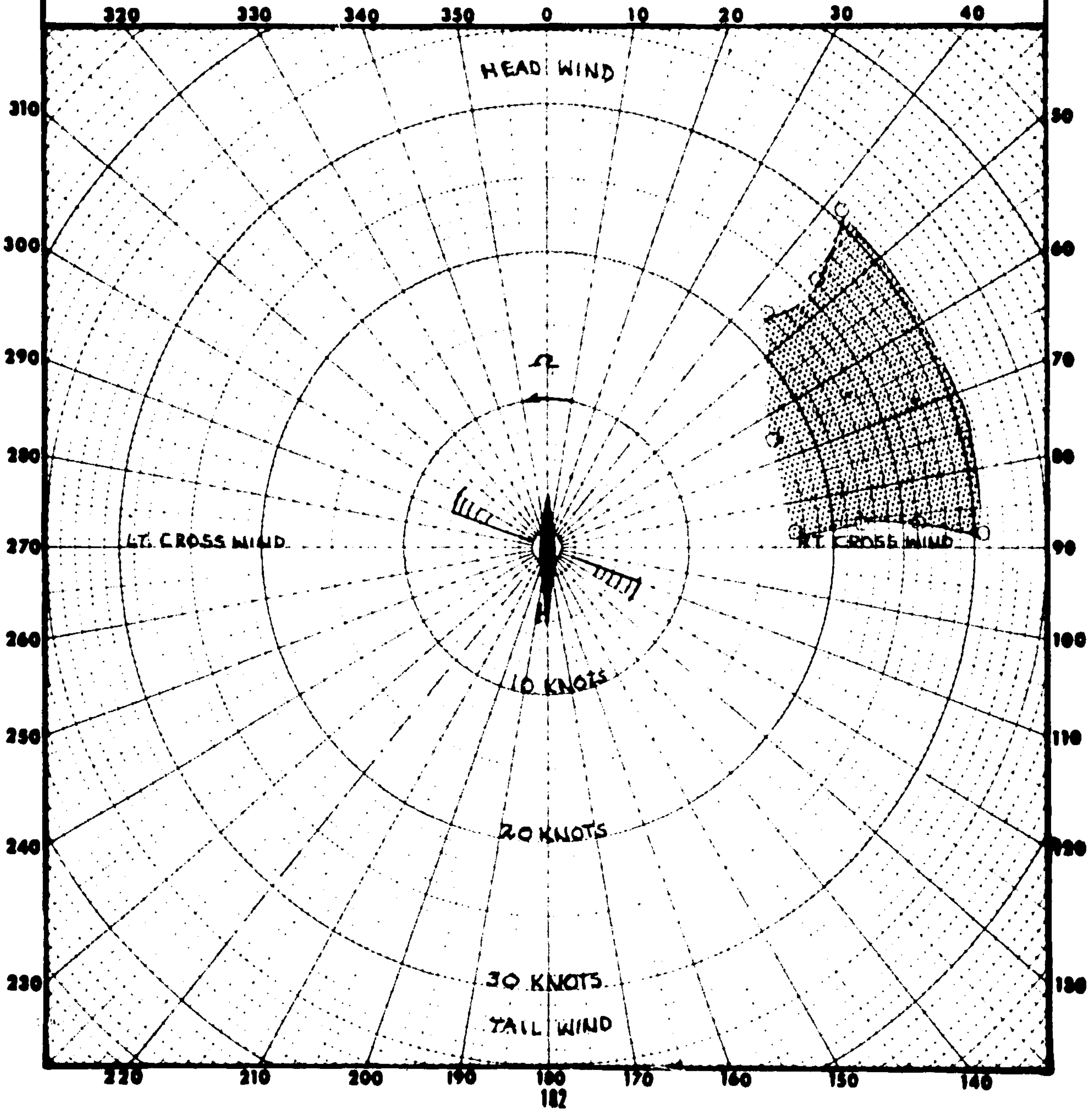


FIGURE No. 99

DIRECTIONAL CONTROL SUMMARY

AH-1G USA S/N 615247

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

ALTITUDE HD~FT	GROSS WEIGHT ~LB.	LONG. C.G. ~IN.	ROTOR SPEED ~RPM	THRUST COEFF ~ C_T
5270	8050	200.7(AFT)	324	0.004678

NOTES:

1. 10% DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
2. YAW SCAS OFF
3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 IN. FROM FULL LEFT
4. SHADED AREA REPRESENTS LESS THAN 10% DIRECTIONAL CONTROL MARGIN
5. POINTS DERIVED FROM FIGURES 115 THROUGH 121 APP VII

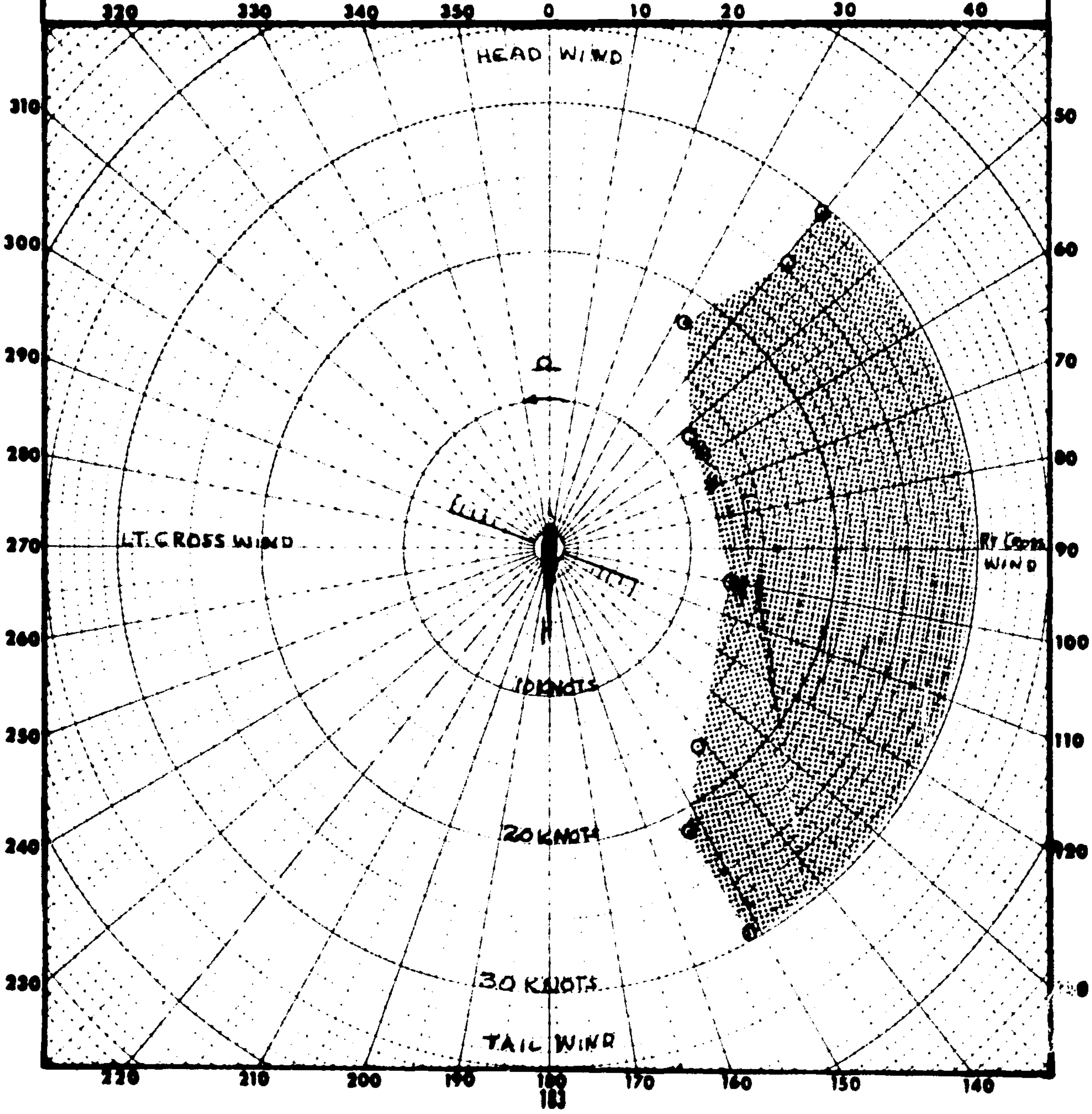


FIGURE NO 100

DIRECTIONAL CONTROL SUMMARY

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

ALTITUDE H_D~FT.	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED ~RPM	THRUST COEFF. ~C_T
11120	7210	195.4 (MID)	324	0.005023

NOTES:

1. 10% DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
2. YAW SCAS OFF
3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 IN. FROM FULL LEFT
4. SHADED AREA REPRESENTS LESS THAN 10% DIRECTIONAL CONTROL MARGIN
5. POINTS DERIVED FROM FIGURES 122 THROUGH 124 APP VII

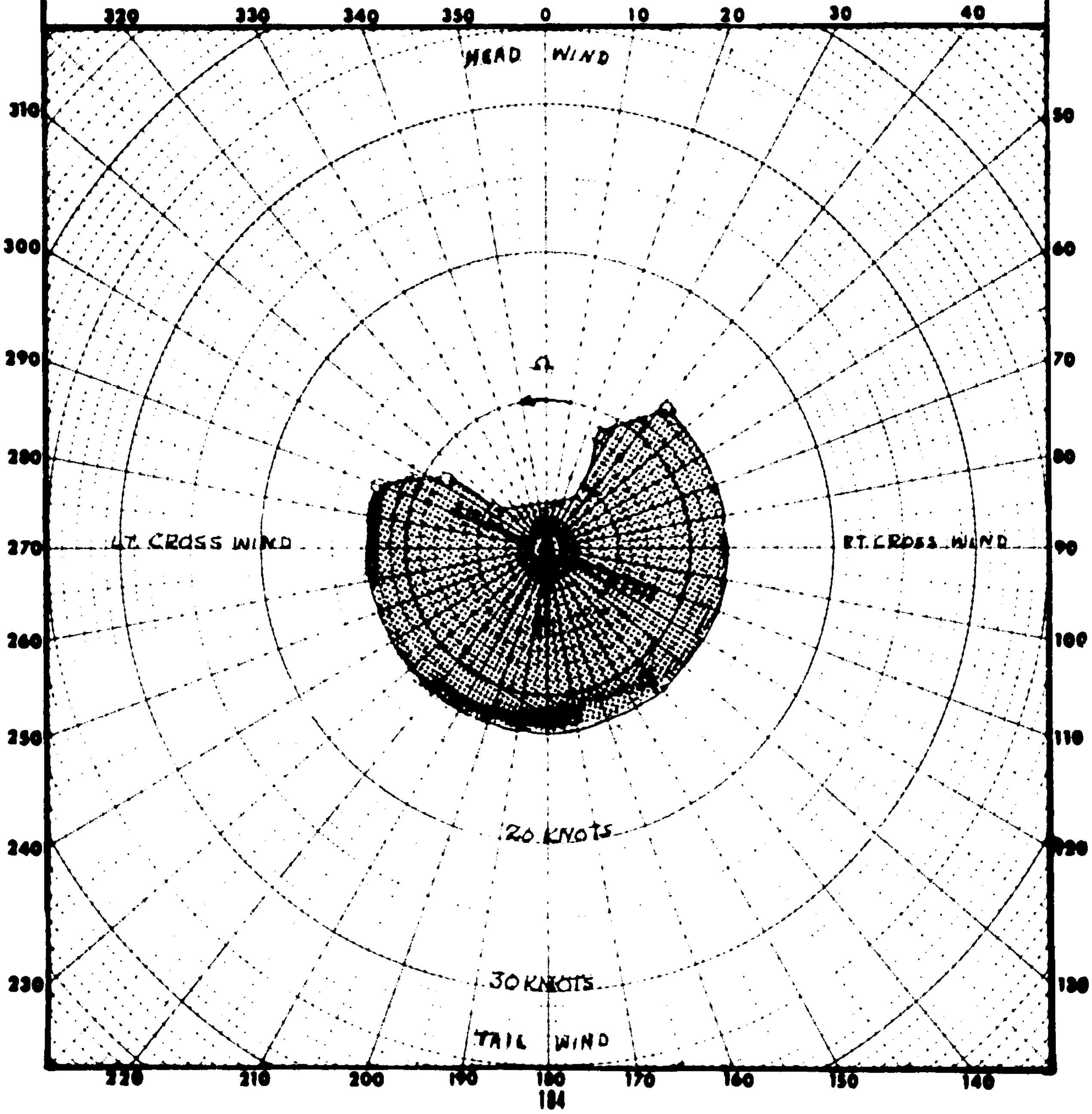


FIGURE NO. 101

<u>STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH</u>

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE H_D ~FT.	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT.	THRUST COEFF. ~C_T
4.5	120	8110	200.1(AFT)	324.0	7 TO 15	0.004840

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH A CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

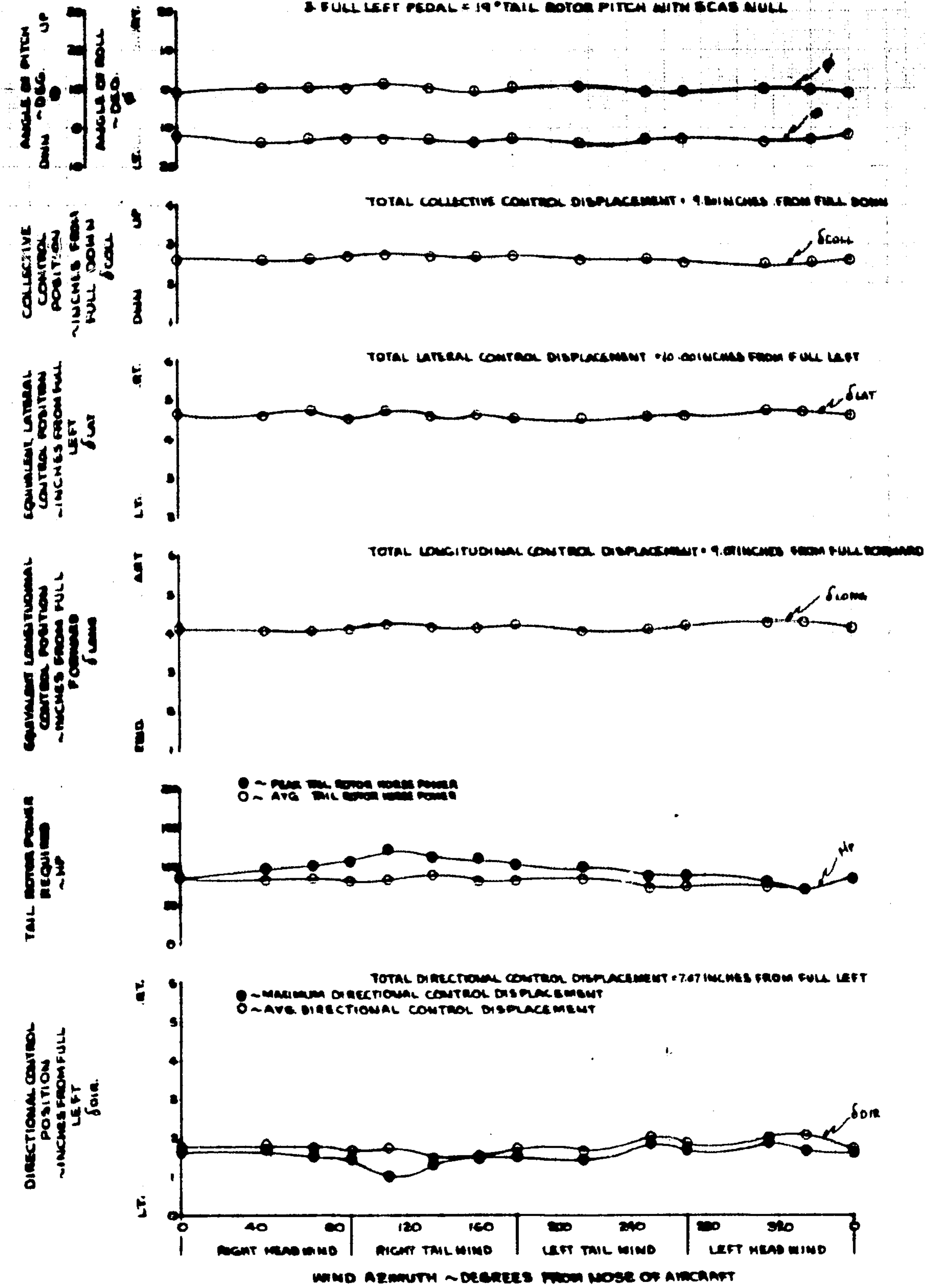


FIGURE No. 102

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 66-15247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~ KTAS	DENSITY ALTITUDE H_D ~ FT.	GROSS WEIGHT ~ LB.	LONG. C.G. IN.	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~ FT	THRUST COEFF. ~ C_T
9.0	120	8000	200.7(AFT)	324.0	7 TO 15	0.003986

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

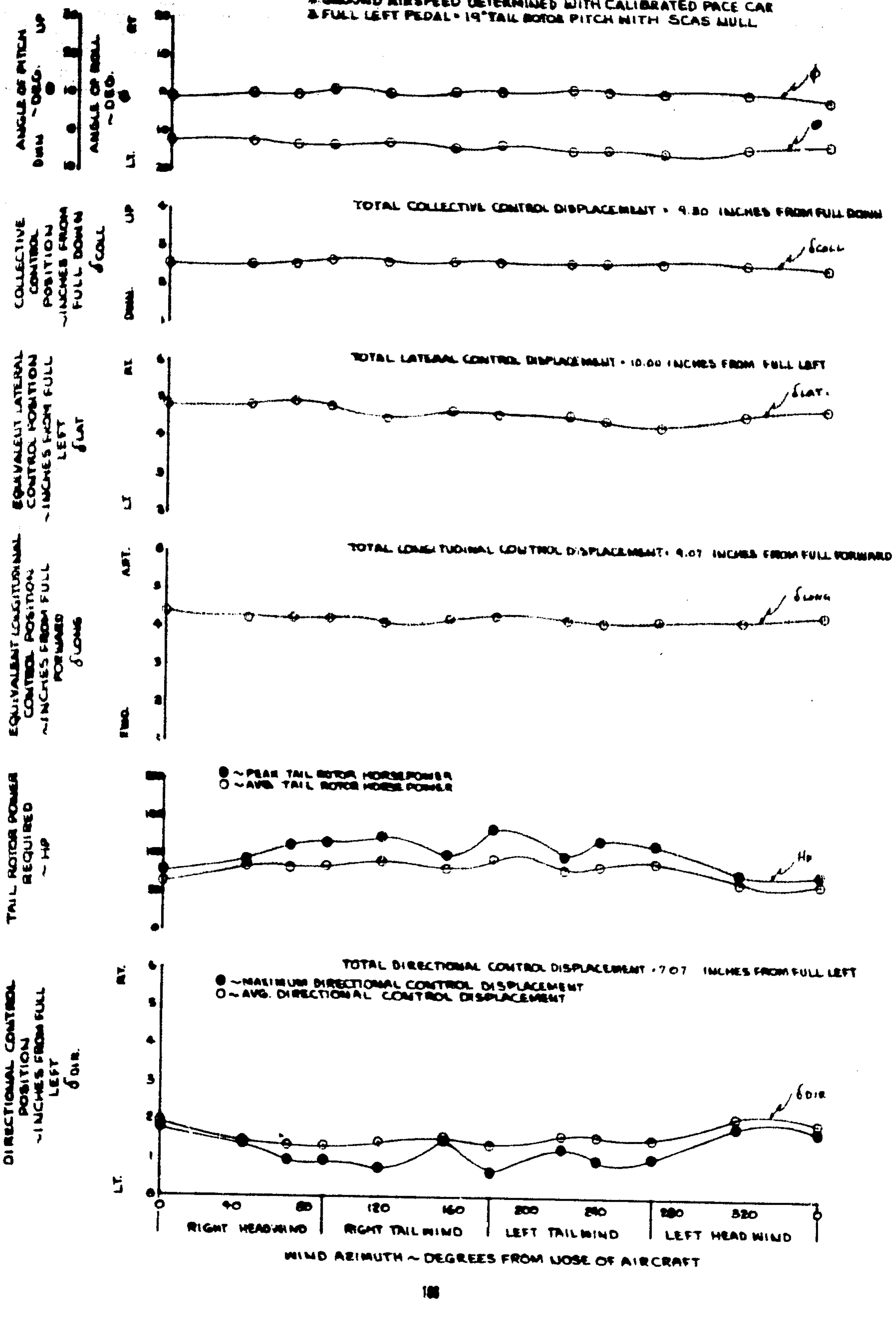


FIGURE No 103

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 66-15247

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE H_D ~FT	GROSS WEIGHT ~LB	LONG. C.G ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	THRUST COEF. ~C_T
13.0	120	8080	200.5(AFT)	324.0	7 TO 15	0.004026

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

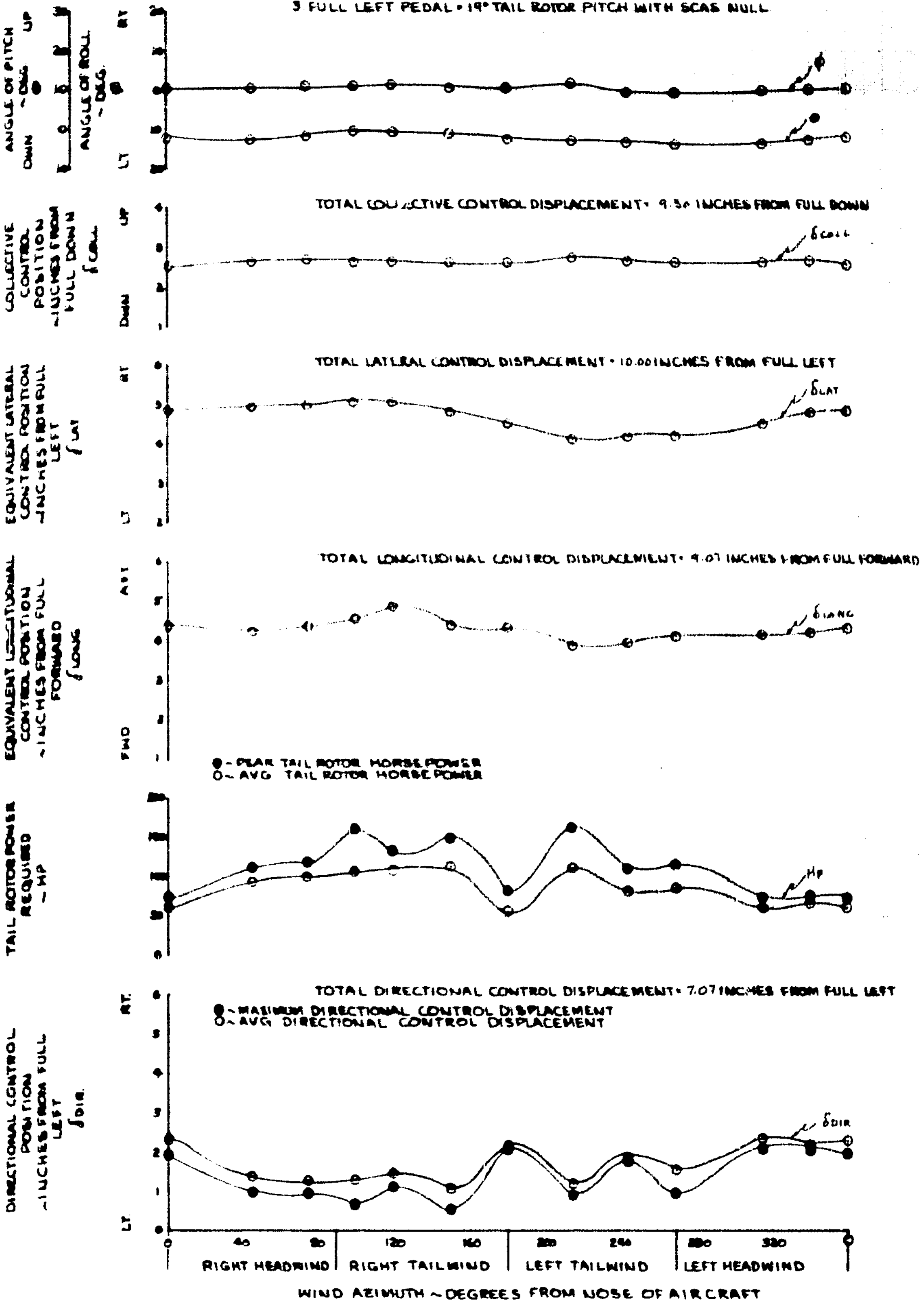


FIGURE NO. 104

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615847

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE H_D ~ FT.	GROSS WEIGHT ~LB	LONG. C.G. ~IN	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~FT	THRUST COEFF ~C_T
17.5	120	[illegible]	200.4(AFT)	324.0	[illegible]	0.004016

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED AND WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

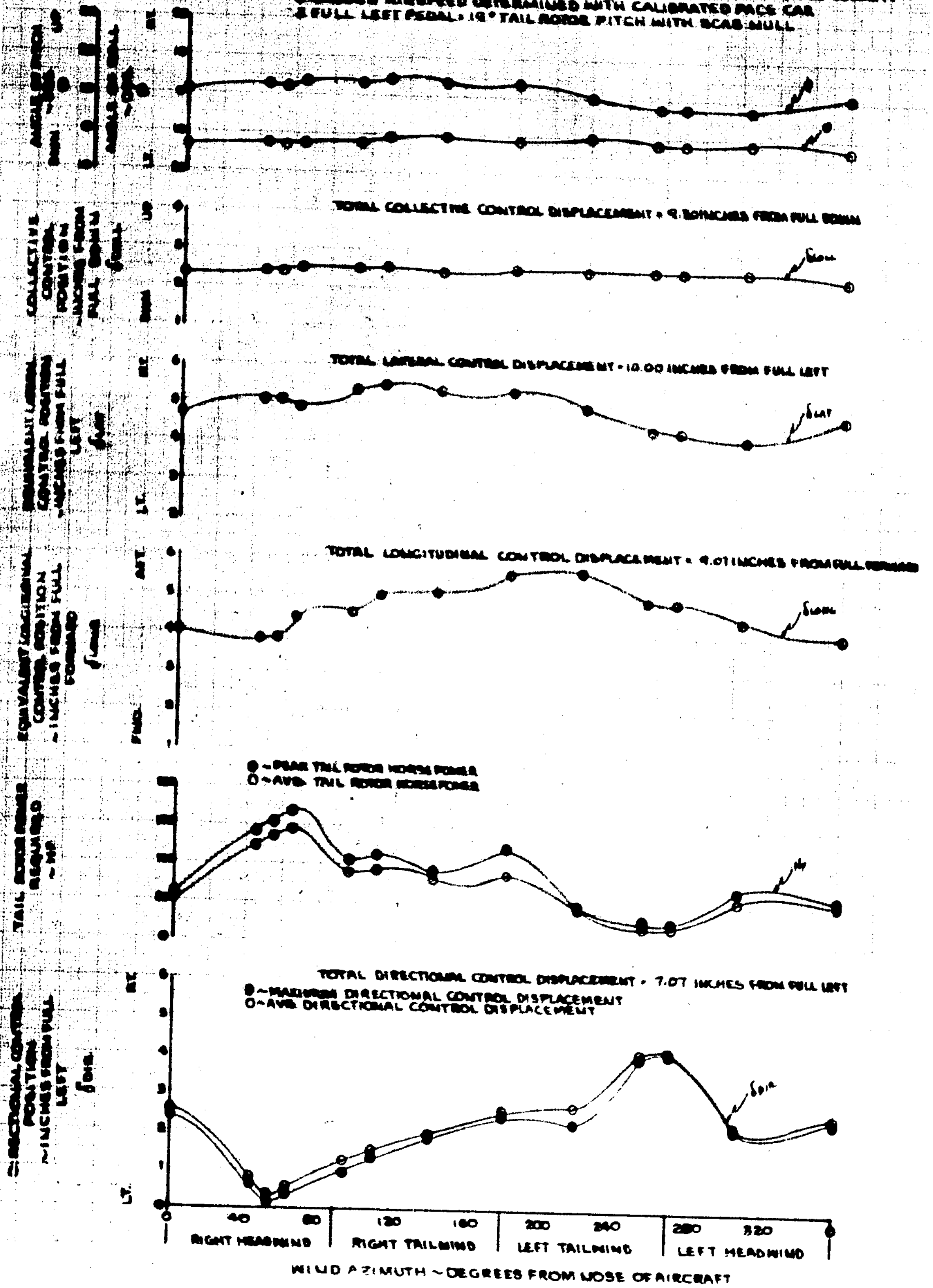


FIGURE NO. 105

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 66-15247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE H_D ~FT.	GROSS WEIGHT ~LB.	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	THRUST COEFF. ~C_T
22.0	120	8060	200.3(AFT)	324.0	7 TO 15	0.004016

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

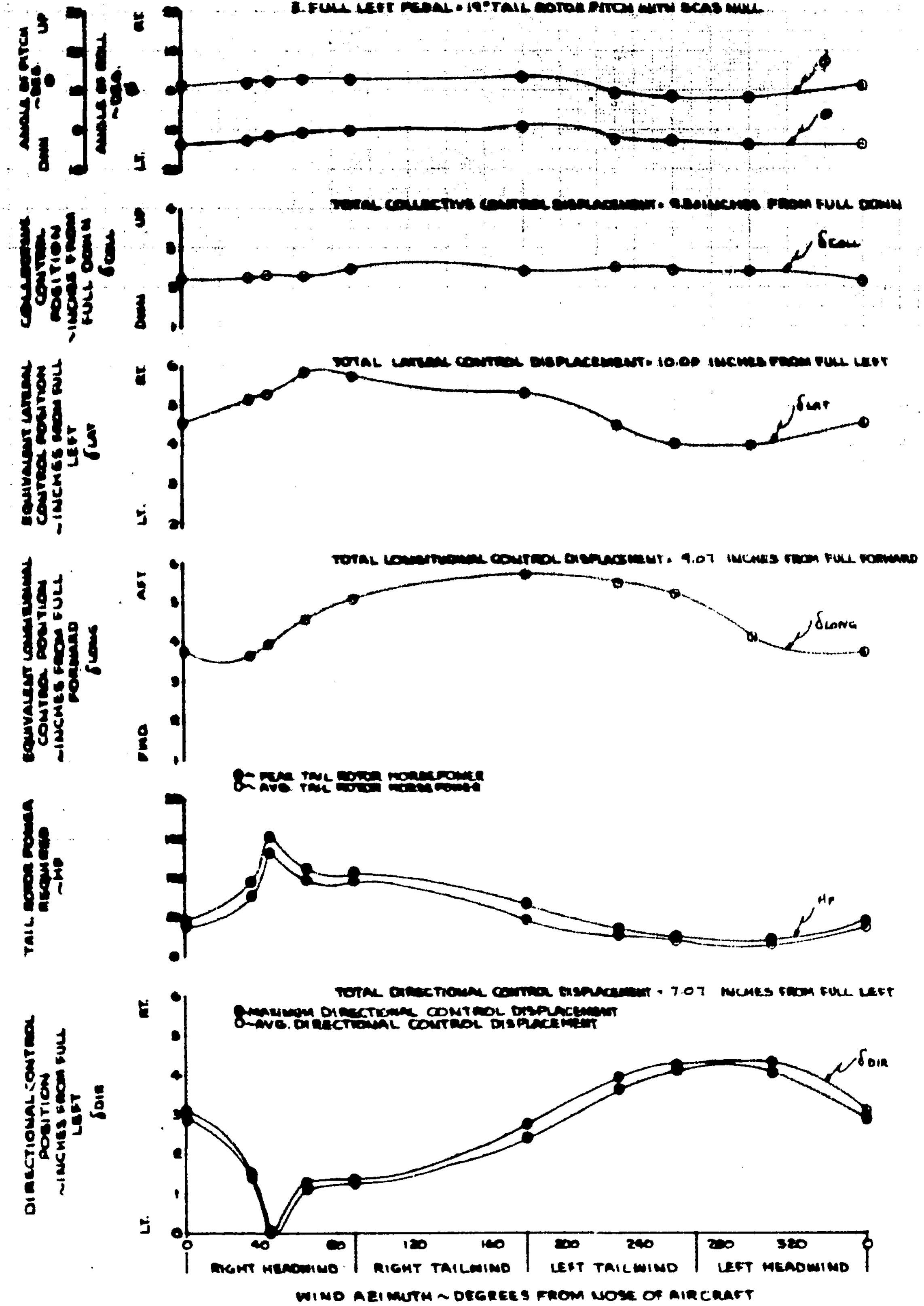


FIGURE No. 106

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE H_D ~ FT	GROSS WEIGHT ~LB.	LONG. C.G. ~IN.	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~FT	THRUST COEFF ~C_T
26.0	100	8020	200.3(AFT)	324.0	7 TO 15	0.004004

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 14° TAIL ROTOR PITCH WITH SCAS NULL

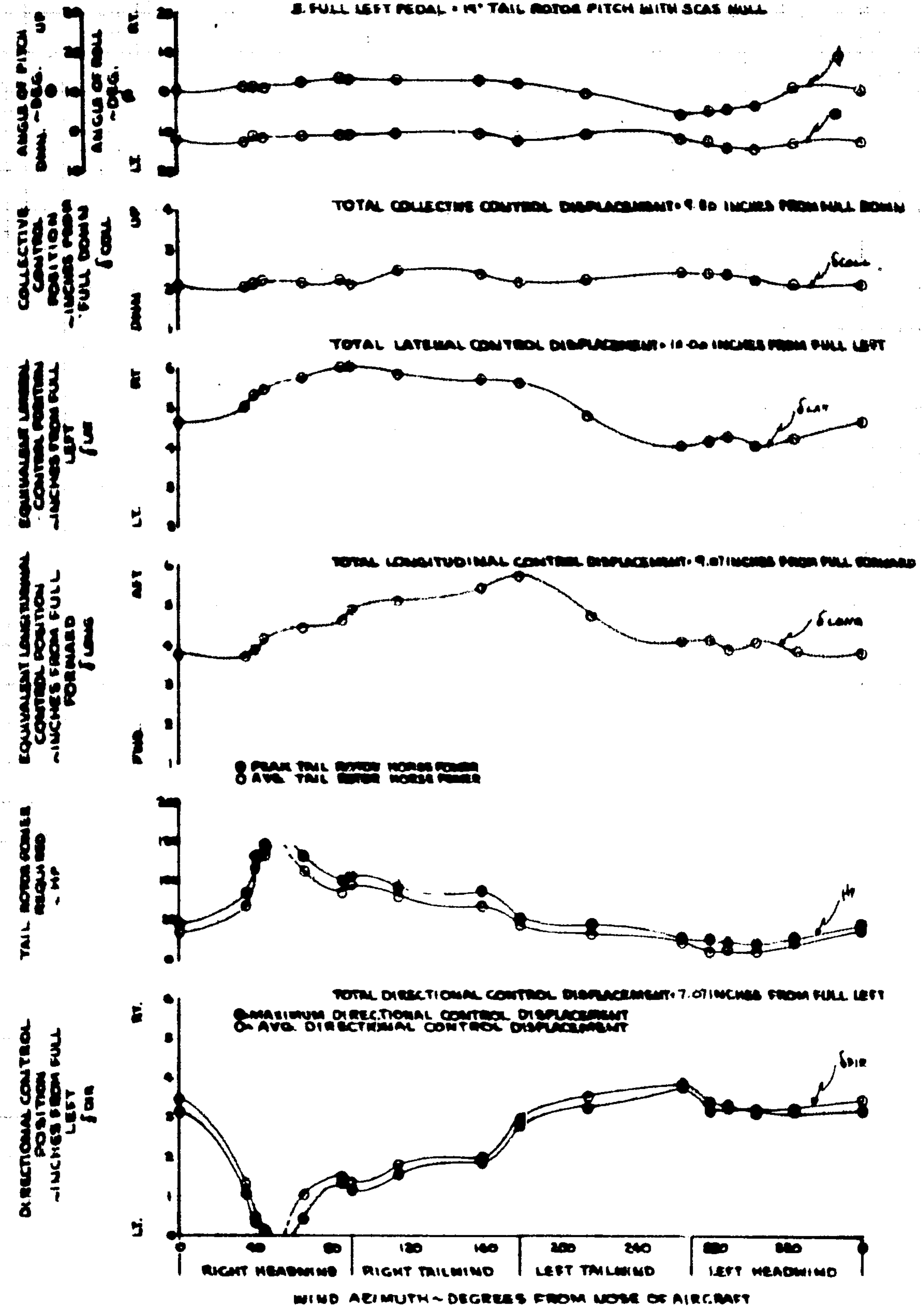


FIGURE No. 107

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE H_D ~ FT	GROSS WEIGHT ~ LB	LONG. C.G. ~ IN.	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~ FT	THRUST COEFF. ~ C_T
30.5	230	8080	200.1 (AFT)	324.0	7 TO 15	0.004039

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 11° TAIL ROTOR PITCH WITH SCAS NULL

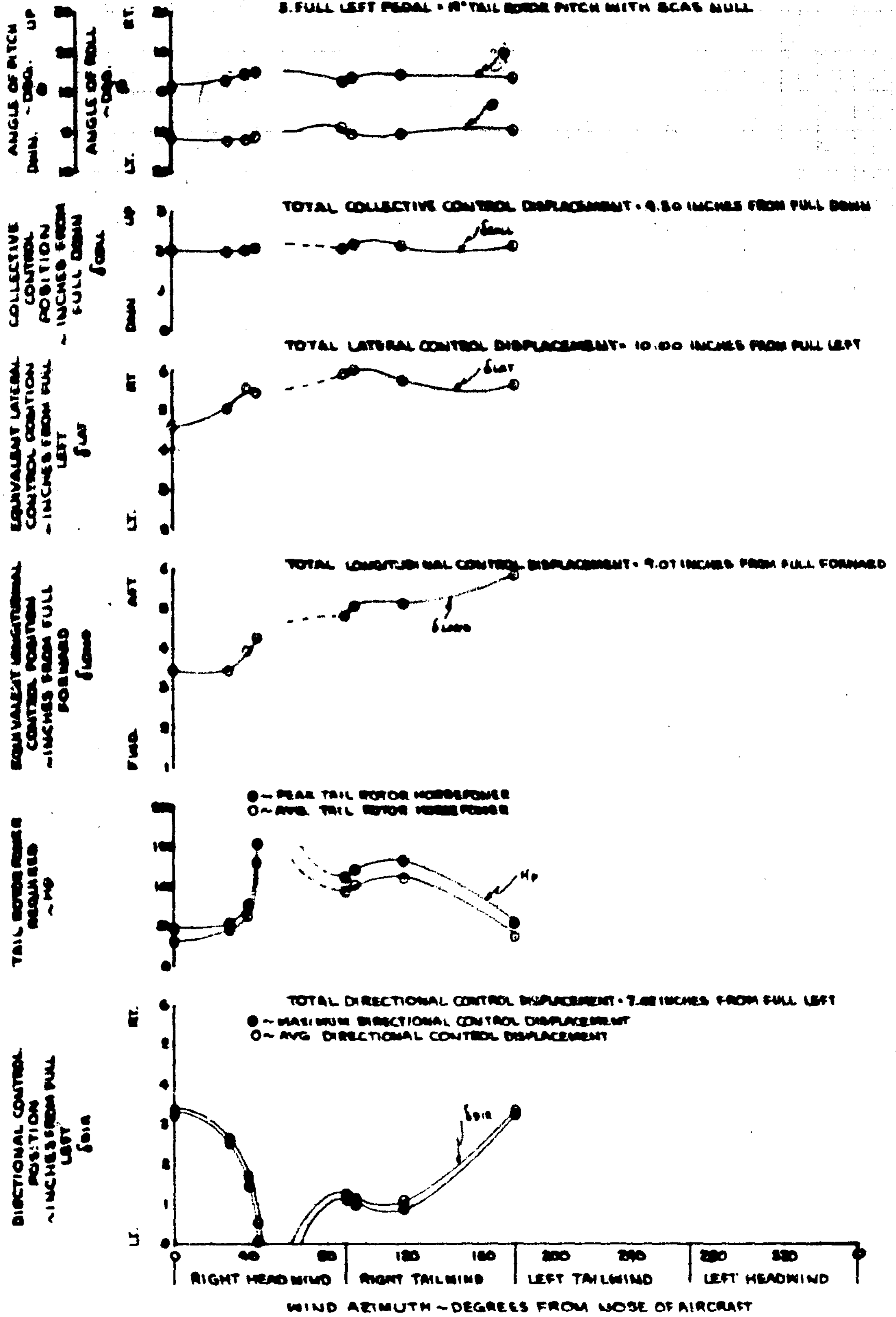


FIGURE No. 108

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE H_D ~FT	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT.	THRUST COEFF. ~C_T
4.5	570	8080	200.9(MID)	314.0	1 TO 15	0.004342

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 10° TAIL ROTOR PITCH WITH SCAS NULL

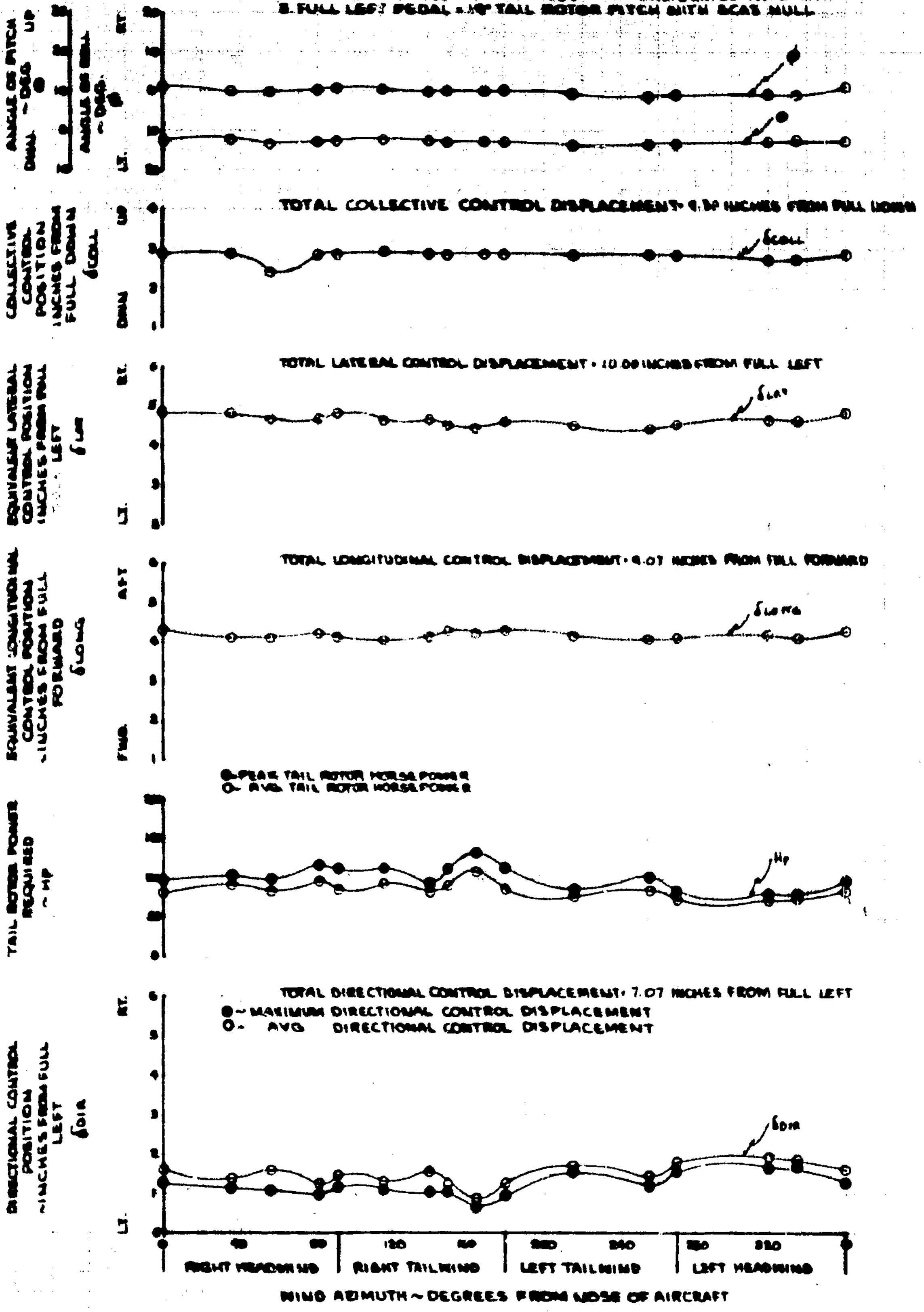


FIGURE NO. 109

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB.	LONG. C.G ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	THRUST COEFF ~C_T
4.0	570	8060	200.8(AFT)	324.0	7 TO 15	0.004332

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

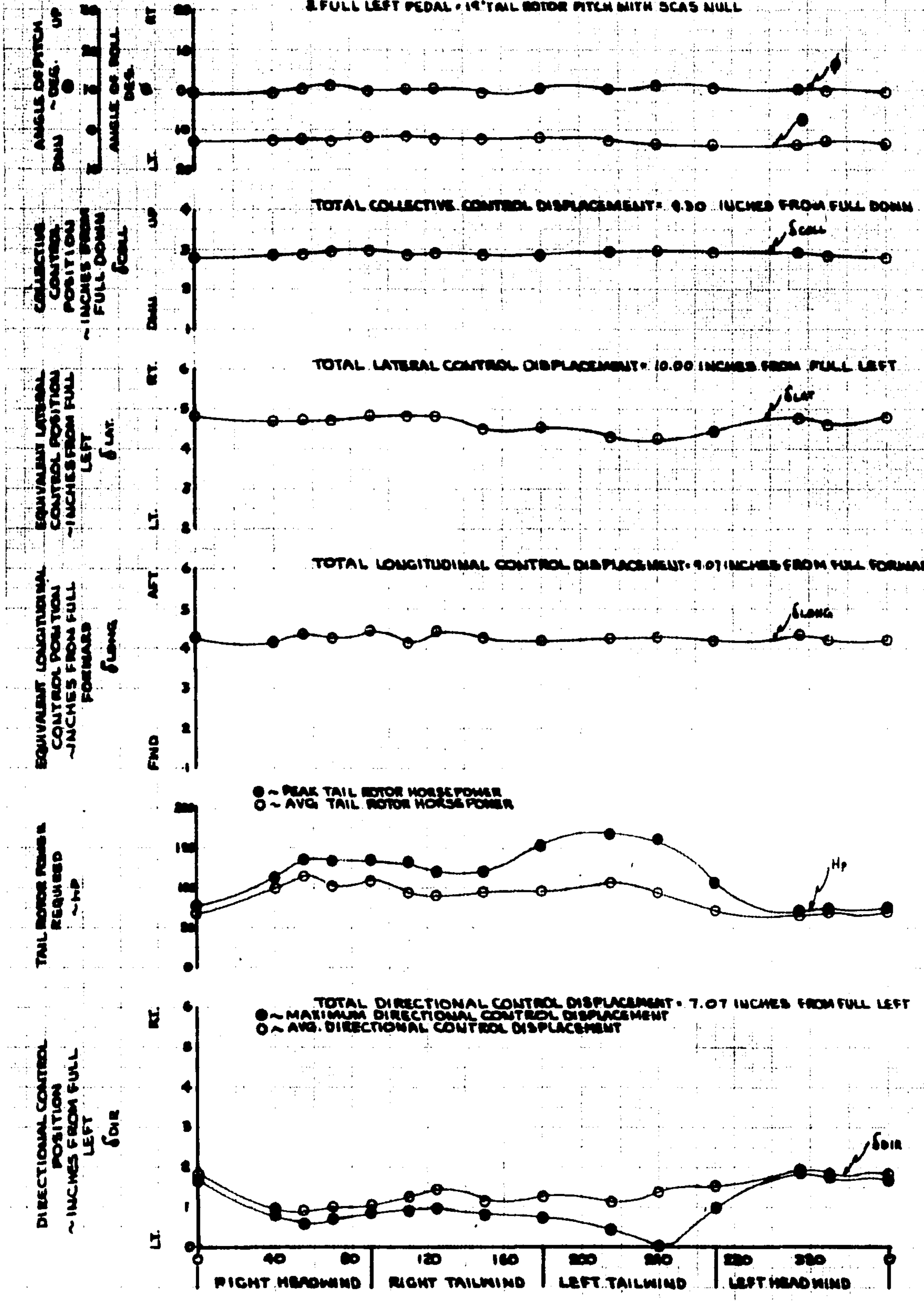


FIGURE No. 110

STATIC TRIM STABILITY IN GROUND EFFECT WITH VARIOUS WIND AZIMUTH

AH-1G USA S/N 15247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT.	GROSS WEIGHT ~LB	LONG. C.G. ~IN	ROTOR SPEED N_R~RPM	SKID HEIGHT ~FT	THRUST COEFF. ~C_T
13.0	570	8040	200.8(AFT)	314.0	7 TO 15	0.004881

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

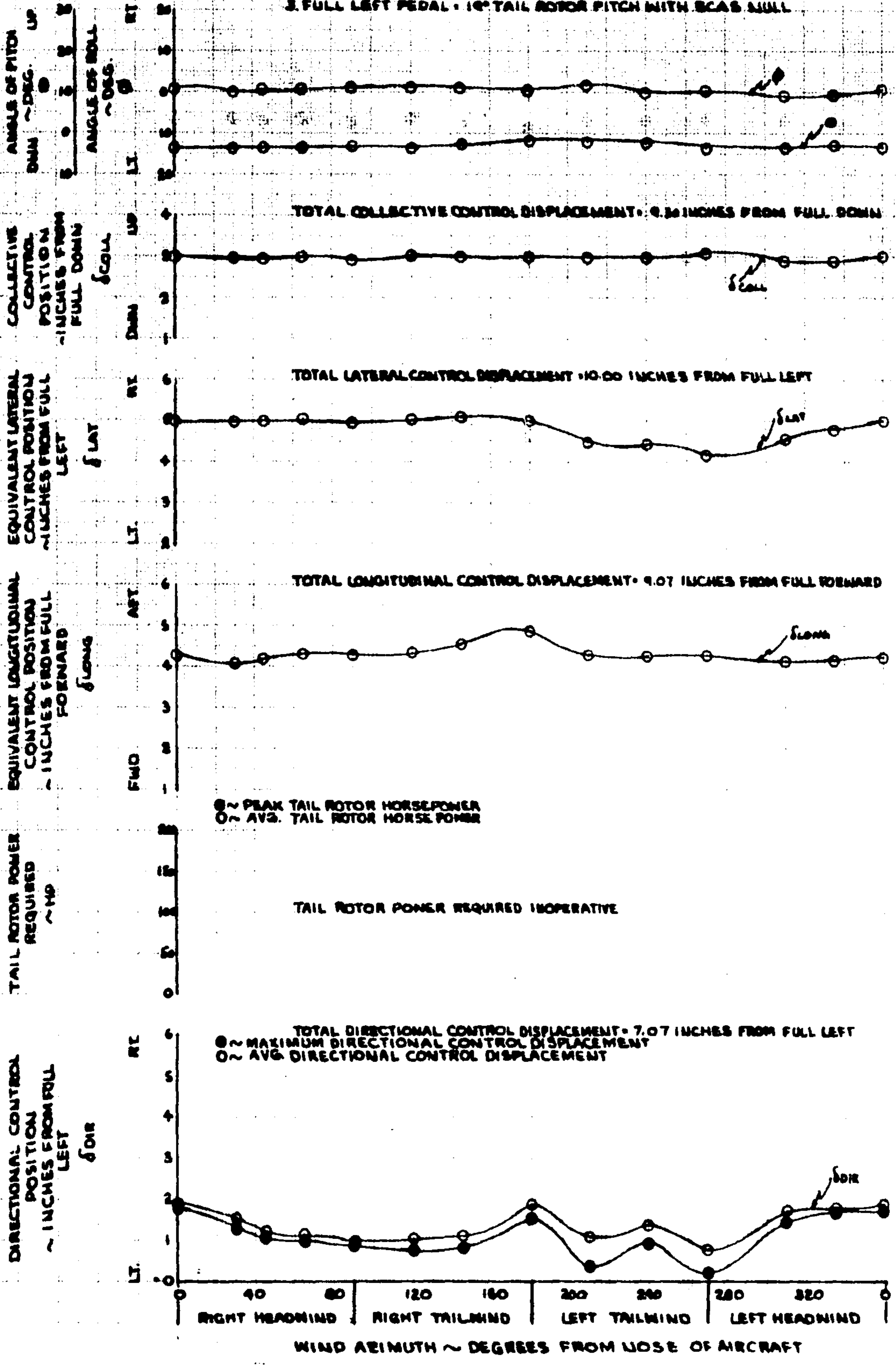


FIGURE No. III

STATIC TRIM STABILITY IN GROUND EFFECT WITH VARIOUS WIND AZIMUTH

AH-1G USA 66-15267

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~ FT	GROSS WEIGHT ~ LB	LONG. C.G. ~ IN.	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~ FT	THRUST COEFF ~C_T
17.5	-400	8360	199.0(AFT)	314.0	7 TO 15	0.004368

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

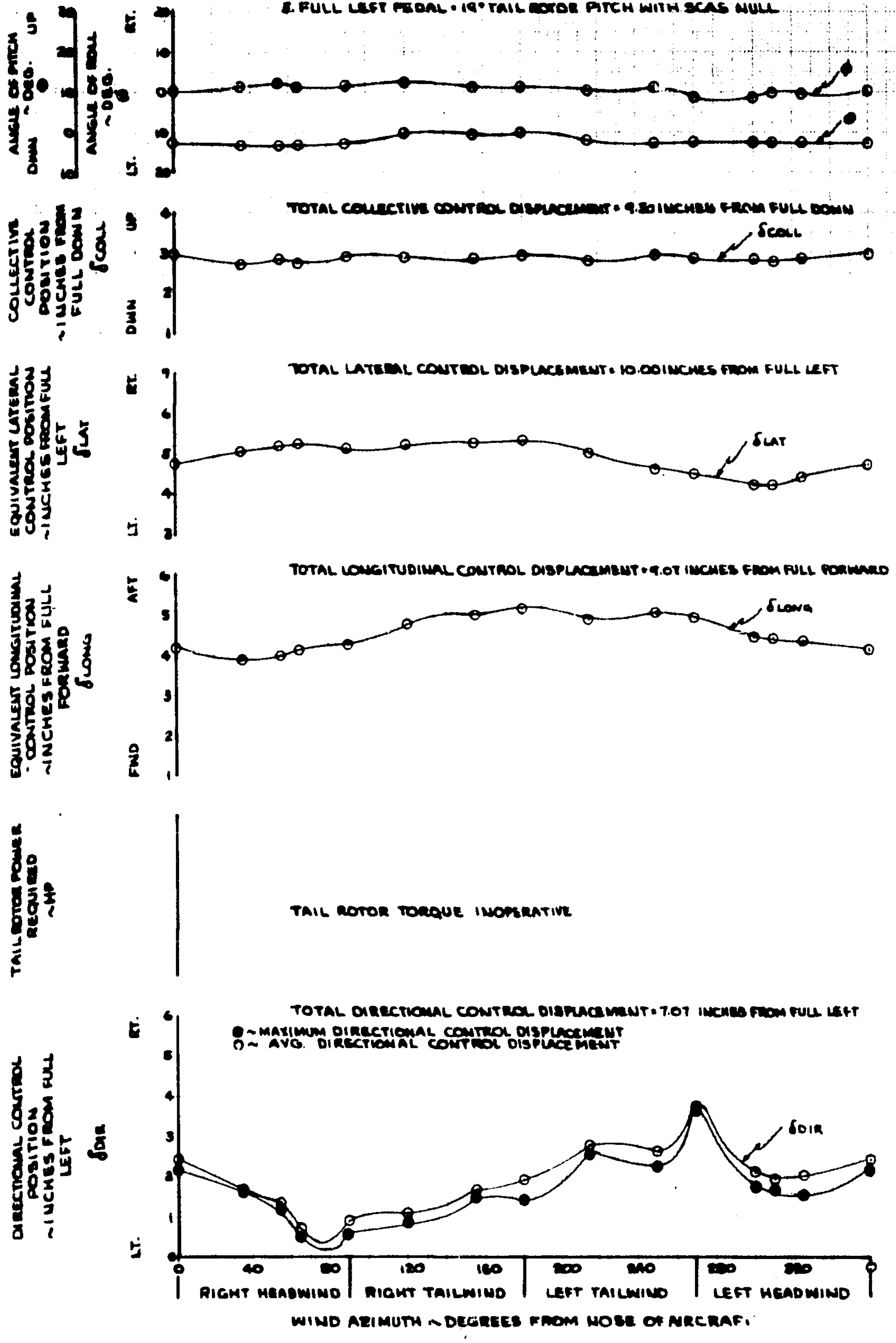


FIGURE NO. 112
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
AH-1G USA S/N 615207
HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	THRUST COEFF. ~C_T
22.0	-400	[illegible]	192.8(AFT)	314.0	7 TO 15	0.004410

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL + 19° TAIL ROTOR PITCH WITH SCAS NULL

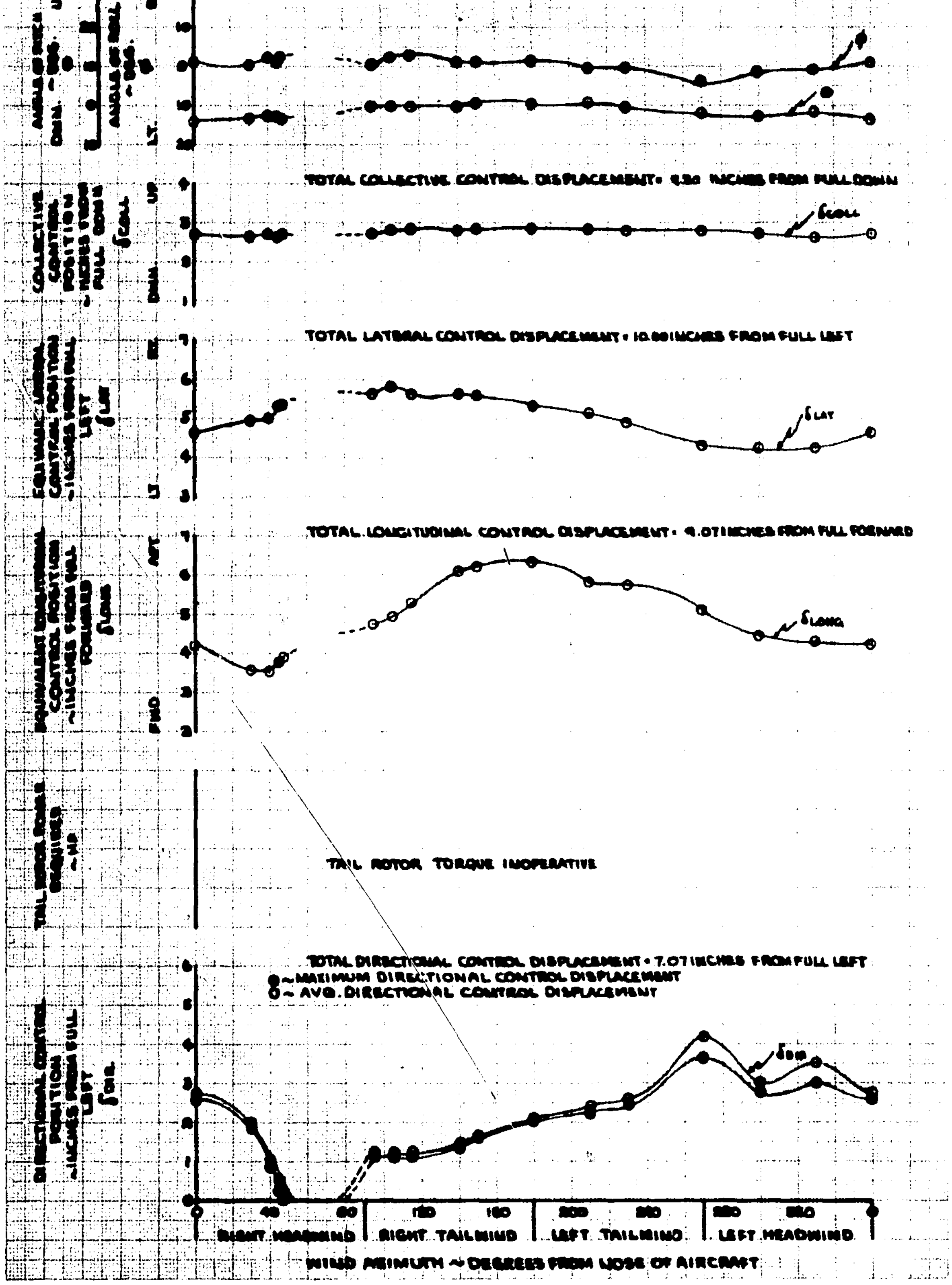


FIGURE No. 115

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT.	GROSS WEIGHT ~LB	LONGITUDINAL C.G. ~IN	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~ FT.	THRUST COEFF. ~C_T
26.0	-400	8340	198.7(AFT)	314.0	7 TO 15	0.004338

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

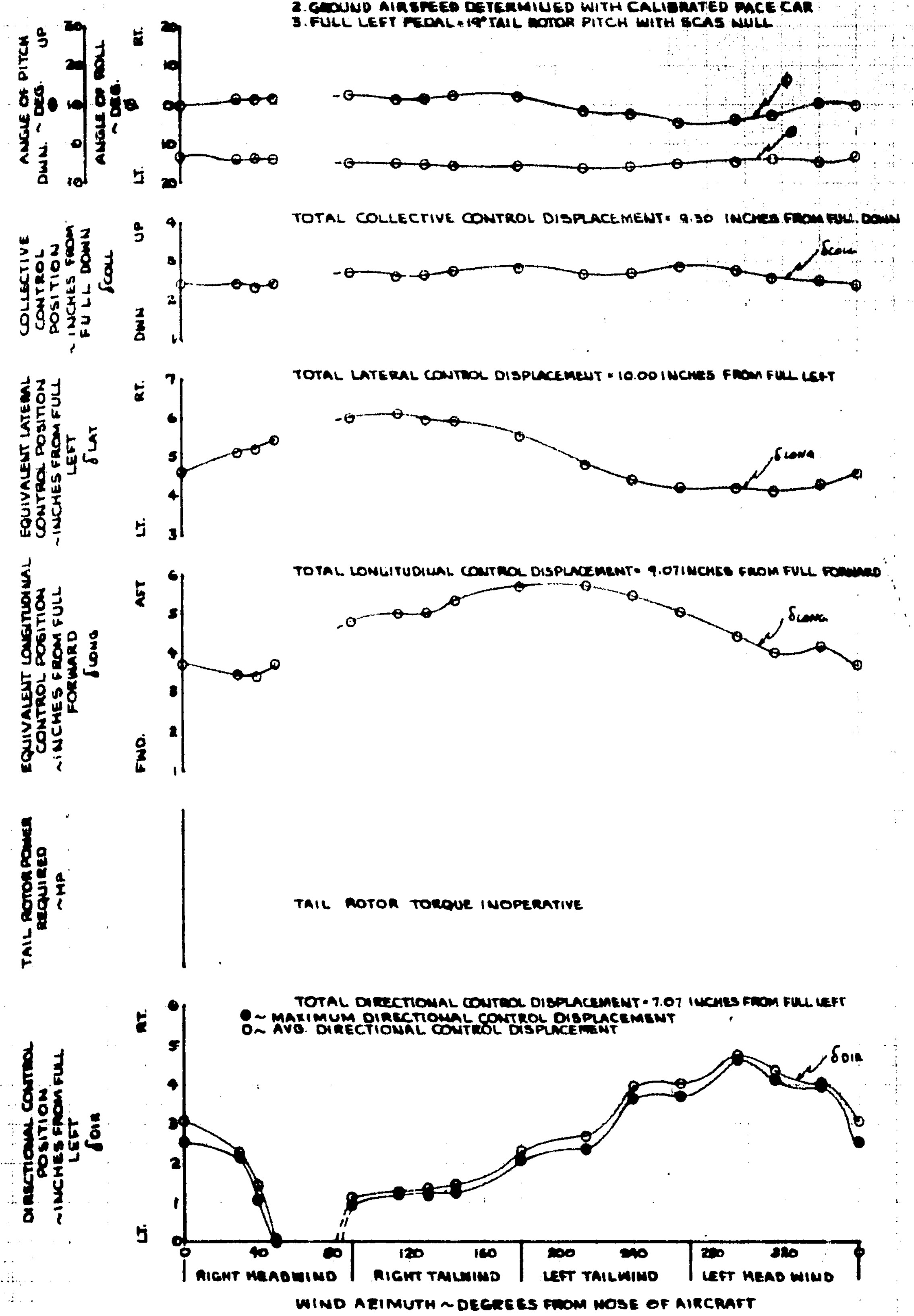


FIGURE NO 114

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB.	LONG. C.G ~IN	ROTOR SPEED N_R~RPM	SKID HEIGHT ~FT	THRUST COEFF. ~C_T
30.5	-400	8290	198.7(AFT)	314.0	7 TO 15	0.004831

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

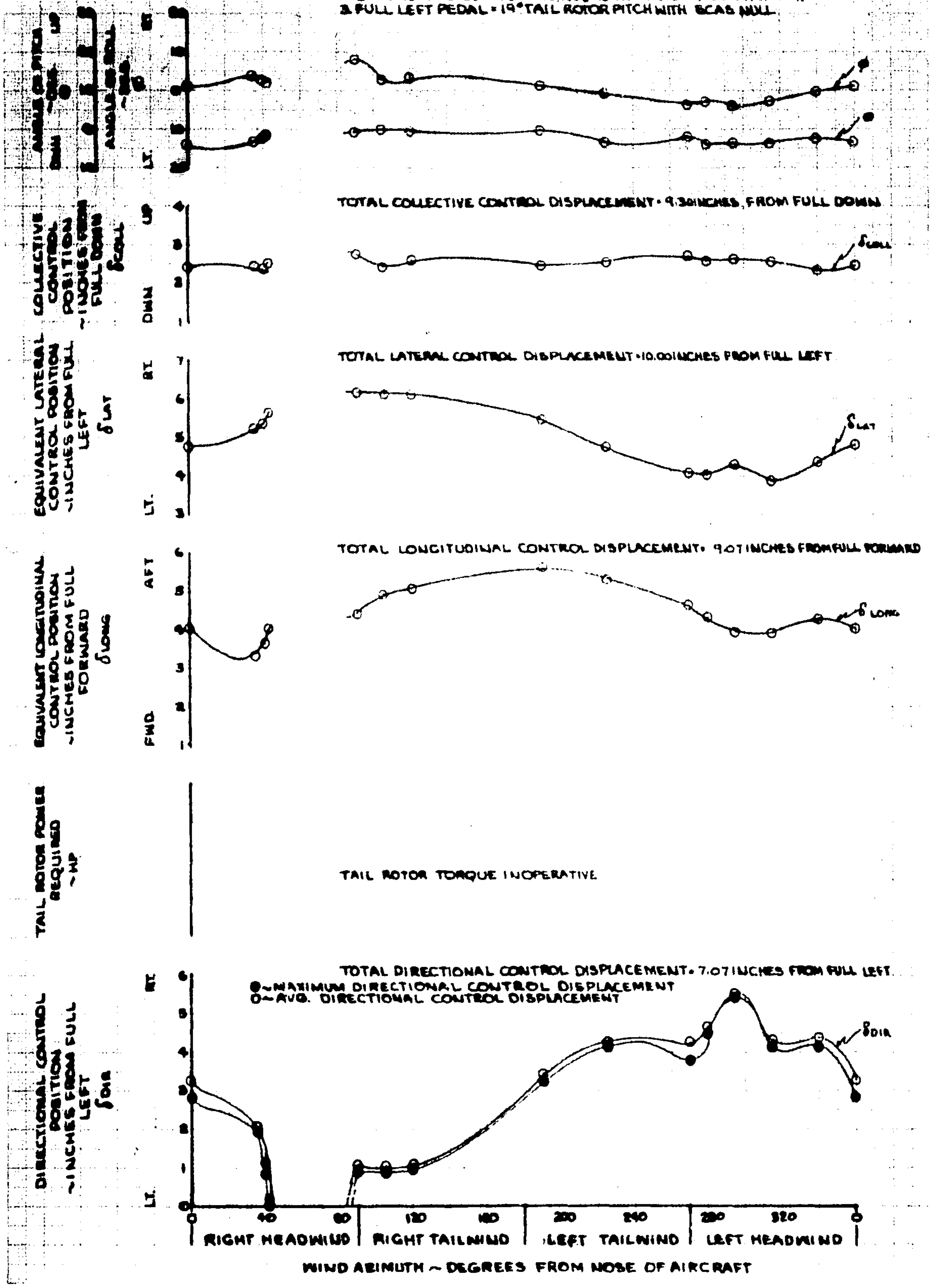


FIGURE No. 115

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTHS

AH-1G USA 66-15247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS INSTALLED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	THRUST COEF. ~C_T
4.5	5130	8090	200.4(AFT)	324.0	7 TO 15	[illegible]

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED AND WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

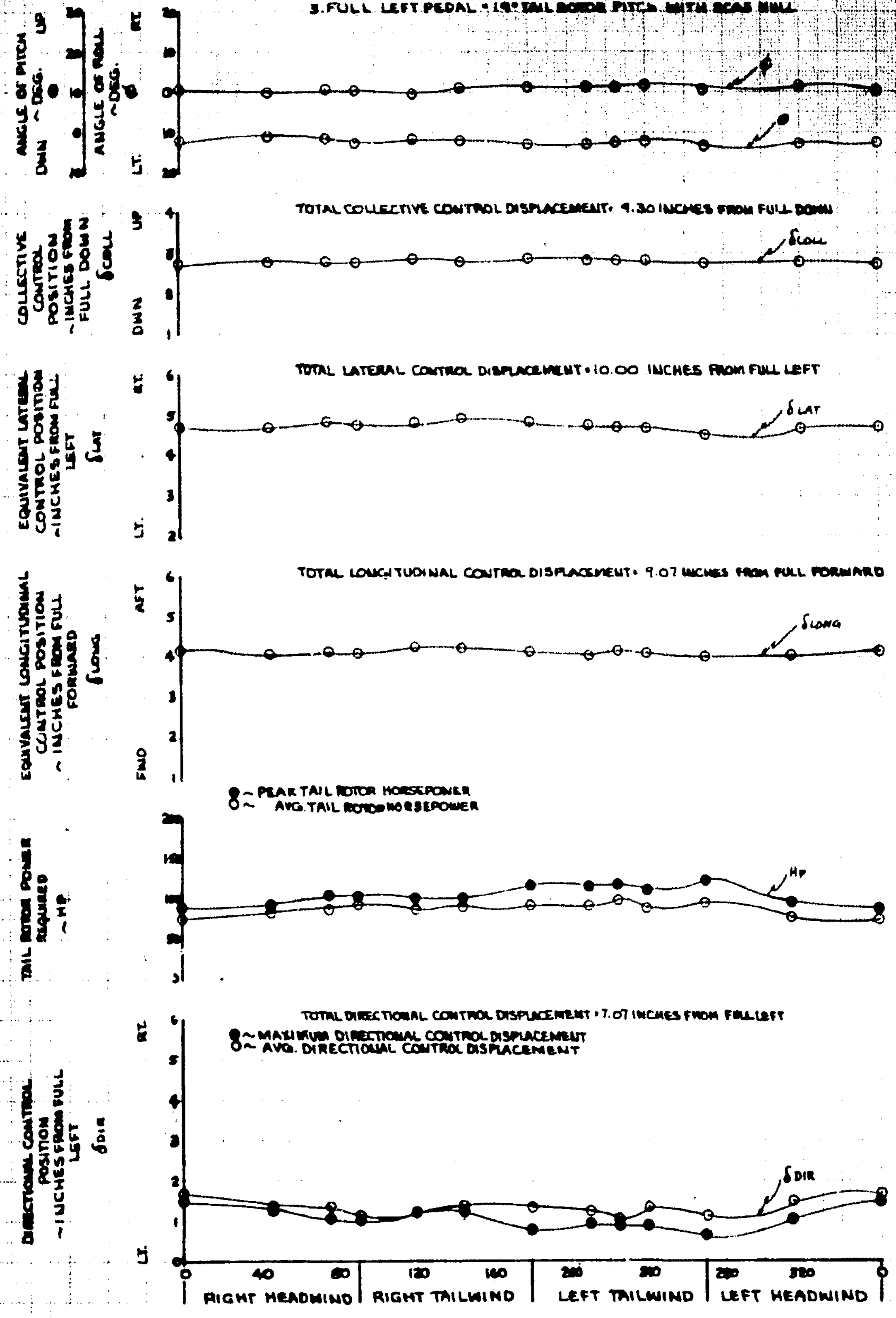


FIGURE NO. 116

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 6615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R~RPM	SKID HEIGHT ~FT	THRUST COEFF. ~C_T
8.5	5260	8070	200.6(MID)	324.0	7 TO 16	0.004687

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

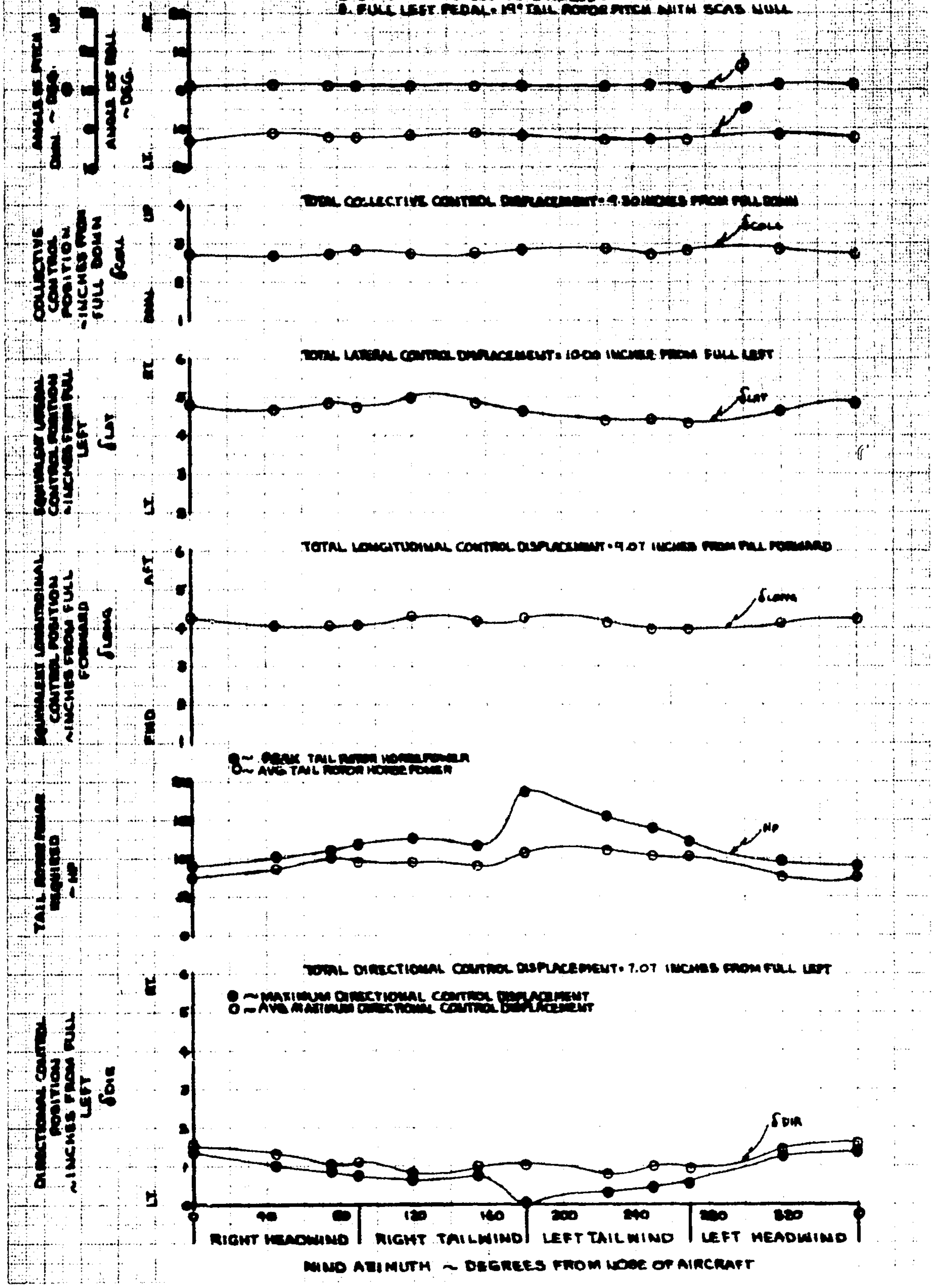


FIGURE NO. 117

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT.	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	[illegible] ~C_T
12.5	5240	8090	200.6(AFT)	324.0	7 TO 15	0.004697

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

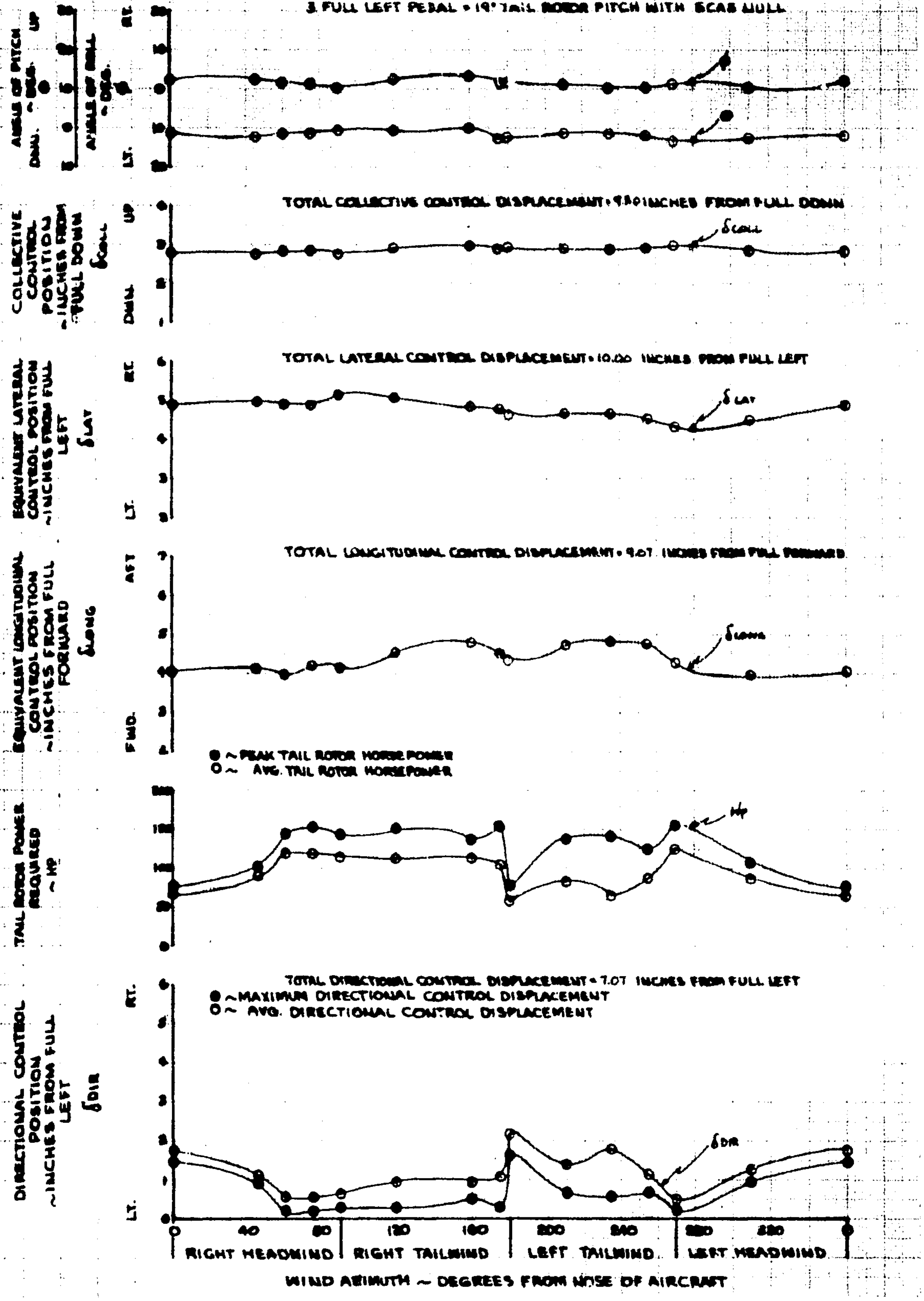


FIGURE No 118

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT.	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	THRUST COEFF ~C_T
17.0	5210	8080	200.6(AFT)	324.0	7 TO 15	0.004663

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED + WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL.

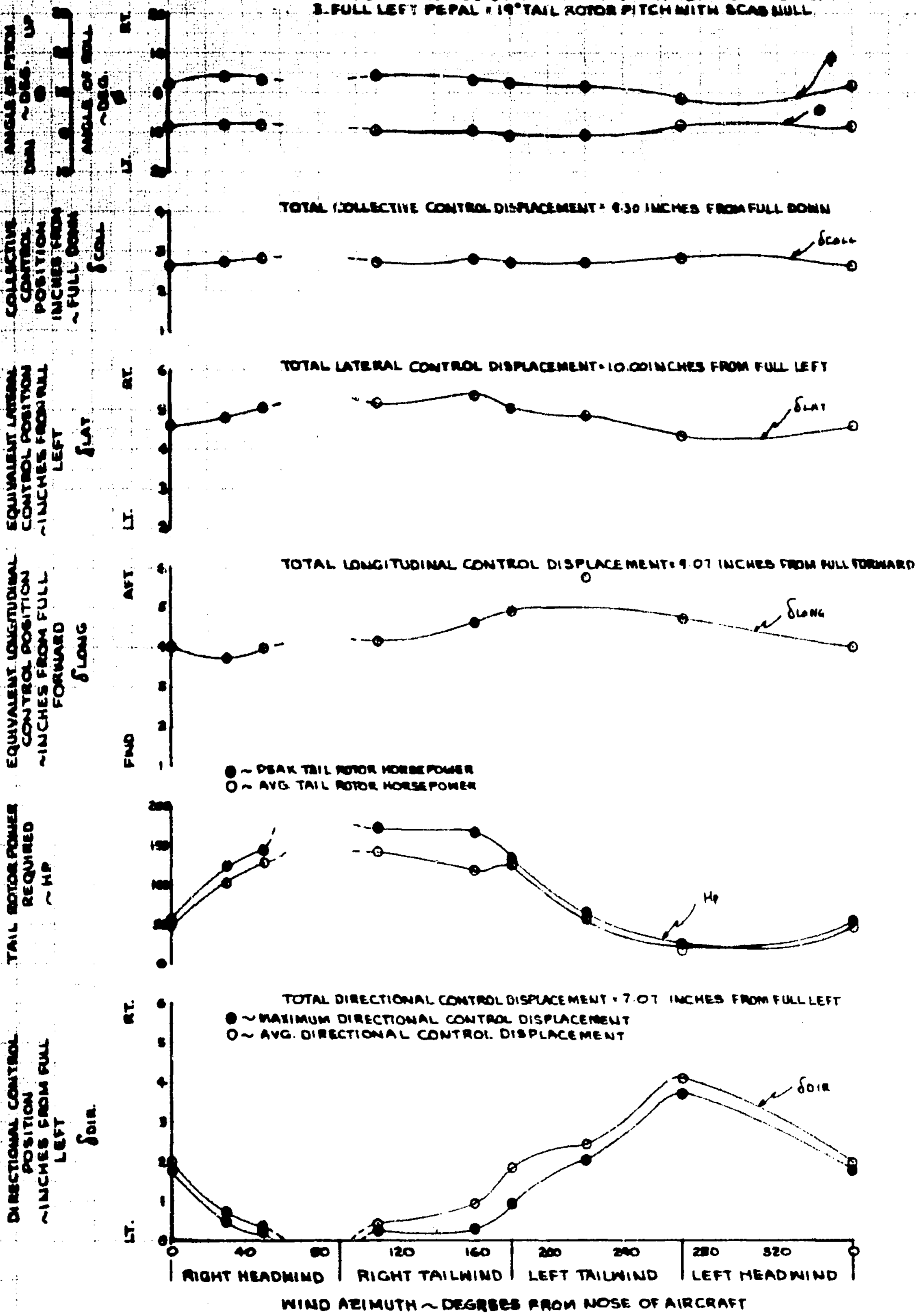


FIGURE No. 119

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB	LONG. C.G ~IN.	ROTOR SPEED N_R~RPM	SKID HEIGHT ~FT	THRUST COEFF. ~C_T
21.5	5350	8050	200.5(MID)	324.0	7 TO 15	0.004690

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL.

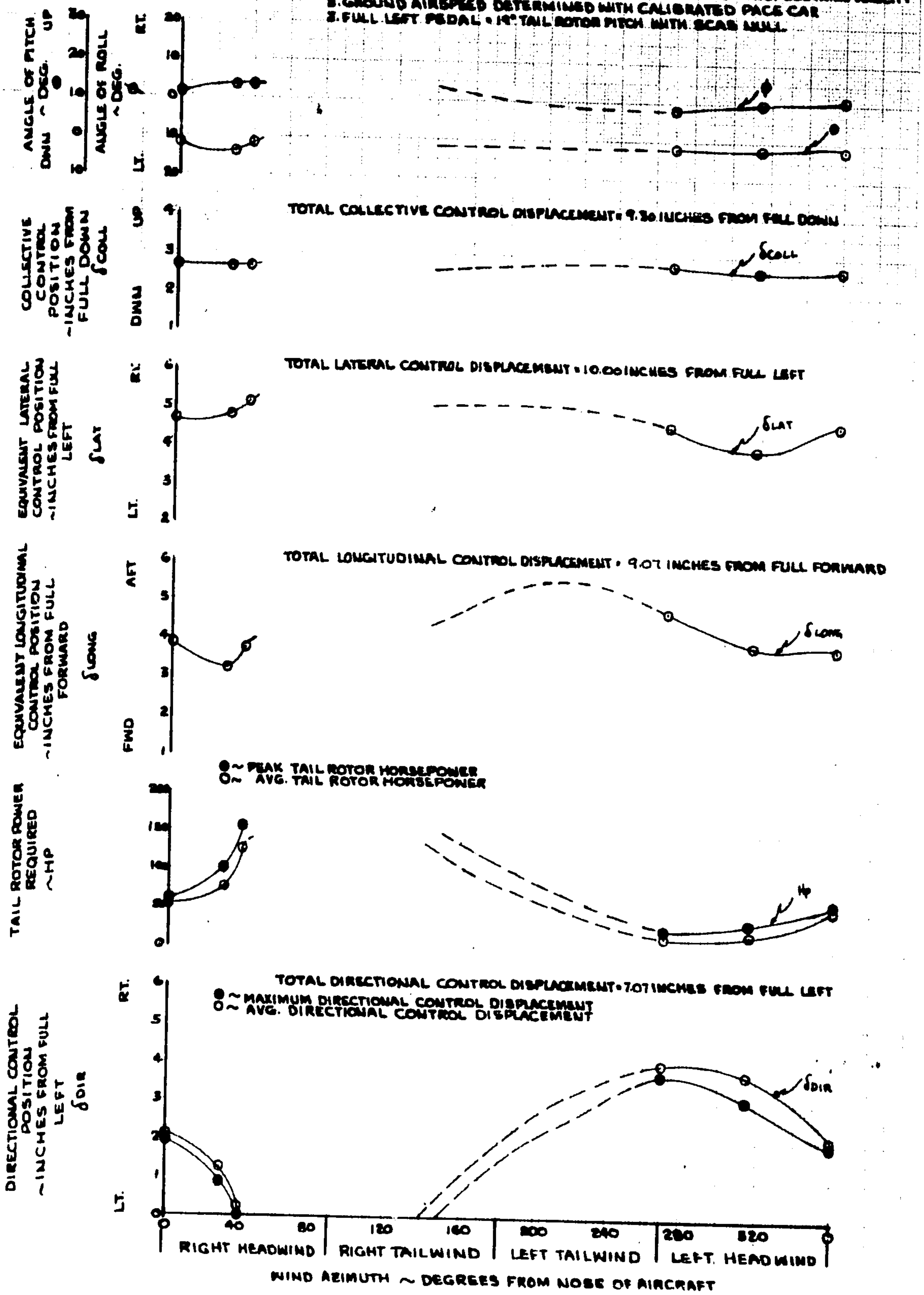


FIGURE NO. 120

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT	THRUST COEFF. ~C_T
25.5	5350	8040	200.5(AFT)	324.0	7 TO 15	0.004684

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED AND WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

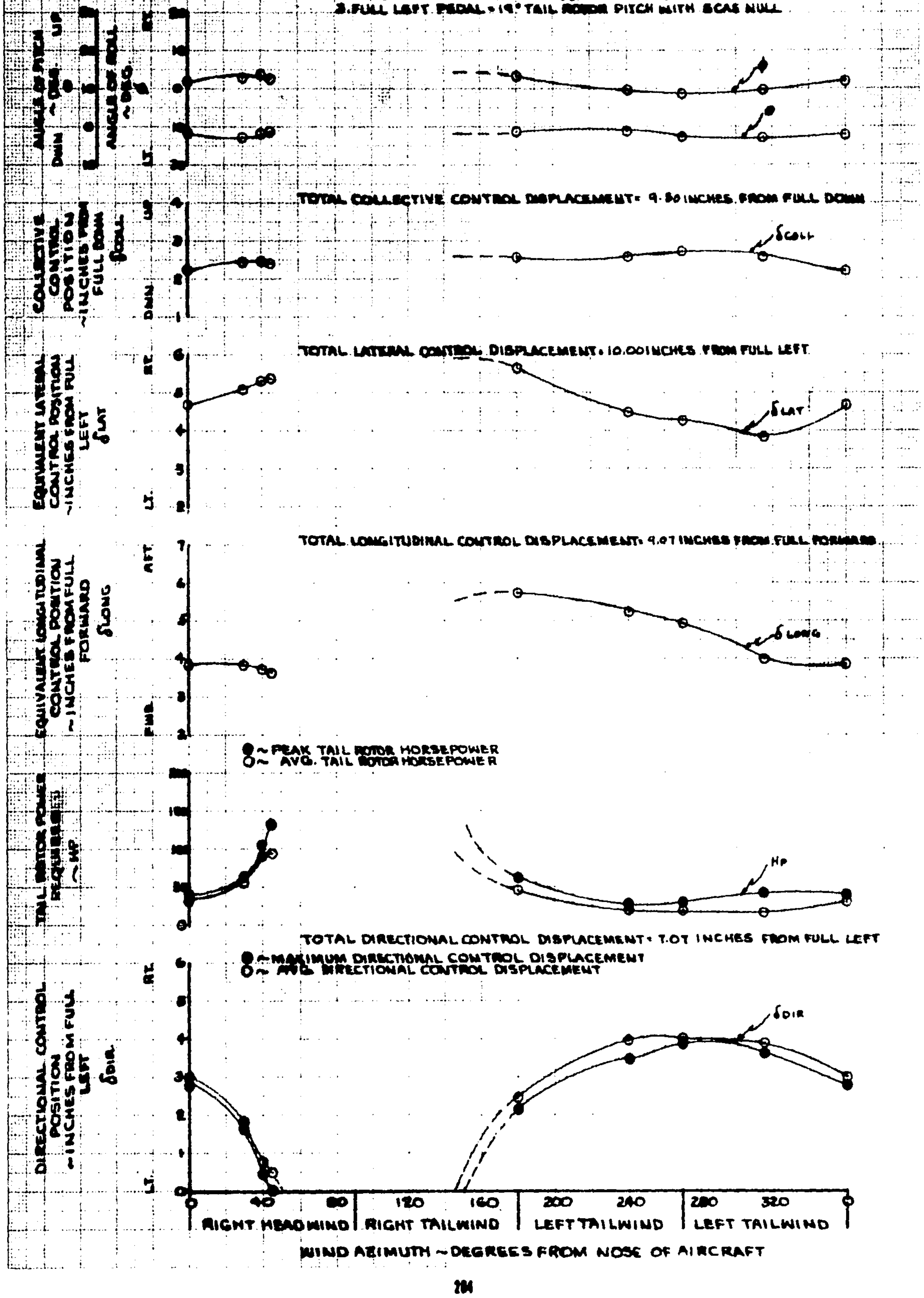


FIGURE NO. 121

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB.	LONG. C.G. ~IN.	ROTOR SPEED N_R~RPM	SKID HEIGHT ~FT.	THRUST COEFF. ~C_T
29.5	5350	7980	200.5(AFT)	324.0	7 TO 15	[illegible]

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF THE GROUND AIRSPEED AND WIND VELOCITY.
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR.
3. FULL LEFT PEDAL = 18° TAIL ROTOR PITCH WITH SCAS NULL.

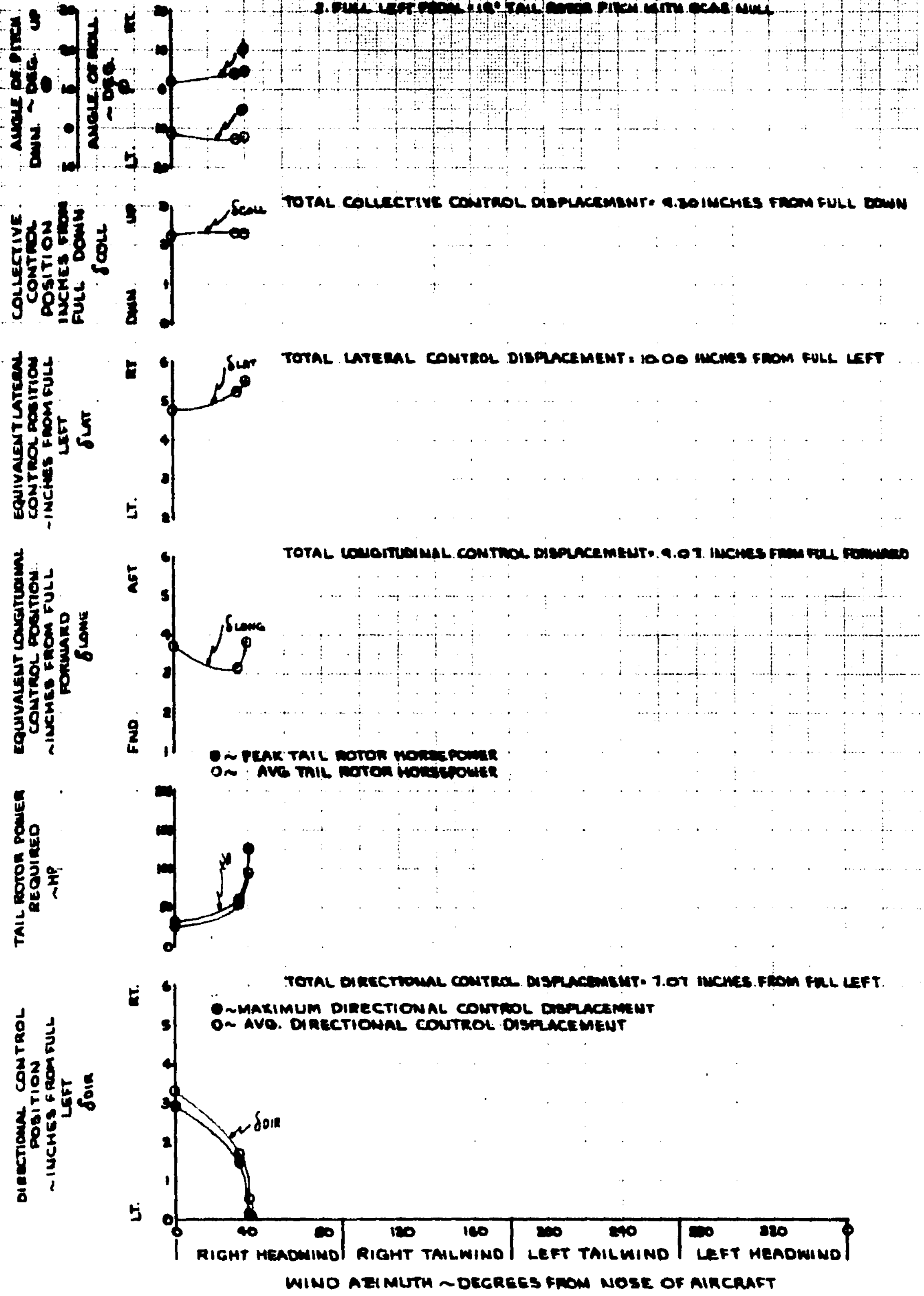


FIGURE NO. 122

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA 66-15247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~RPM	SKID HEIGHT ~FT.	THRUST COEFF. ~C_T
4.5	10950	7550	195.6(MID)	324.0	7 TO 15	0.005094

NOTES:
1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

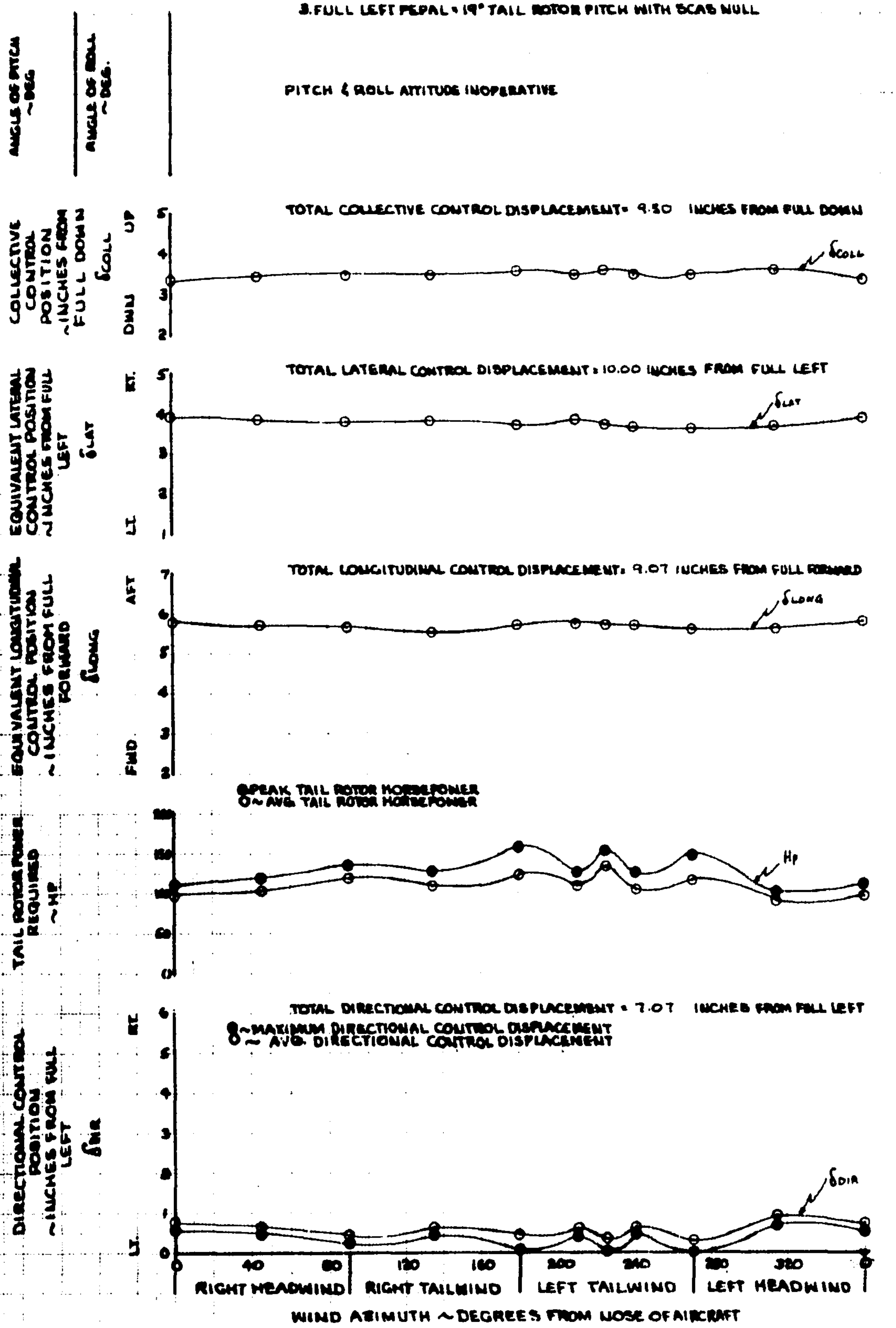


FIGURE NO. 123

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~ KTAS	DENSITY ALTITUDE ~ FT.	GROSS WEIGHT ~ LB	LONG. C.G. ~ IN	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~ FT	THRUST COEFF. ~ C_T
8.5	11090	7210	195.4(MID)	324.0	7 TO 15	0.005018

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

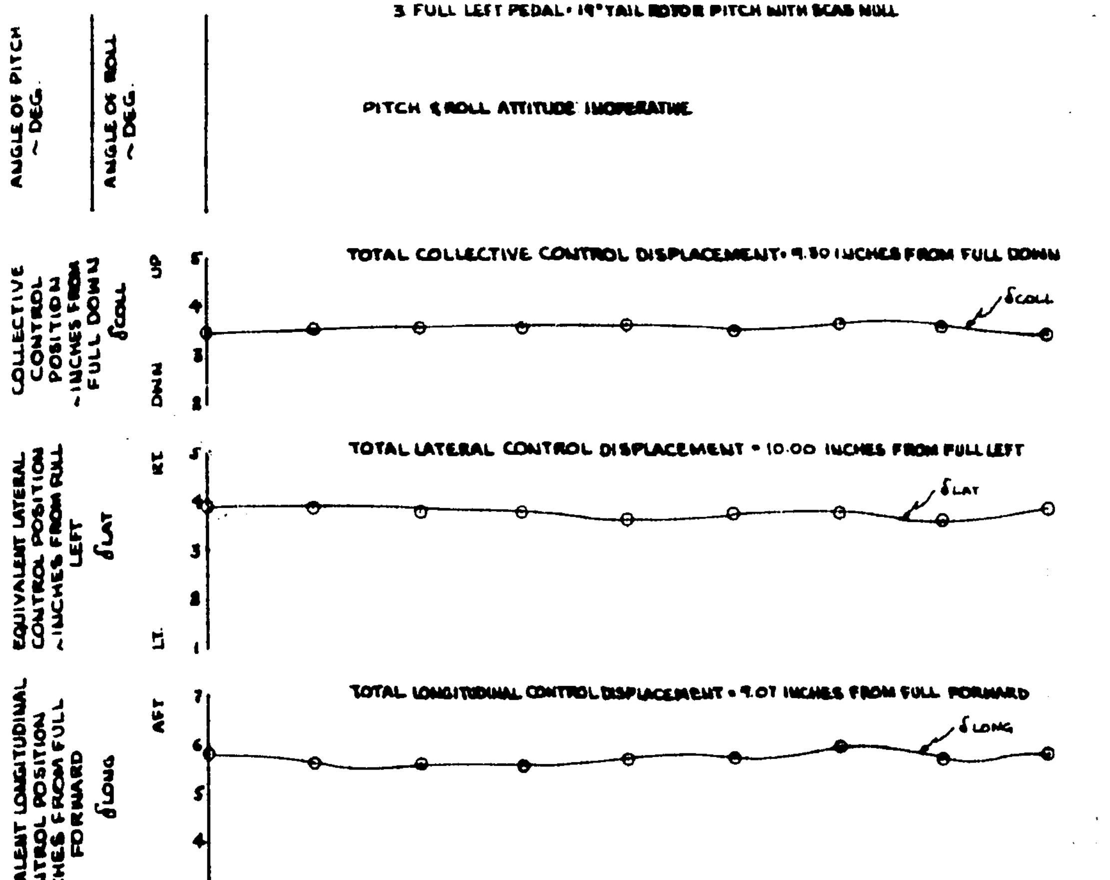


FIGURE NO. 124

STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH

AH-1G USA S/N 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTAS	DENSITY ALTITUDE ~FT.	GROSS WEIGHT ~LB	LONG. C.G. ~IN.	ROTOR SPEED N_R ~ RPM	SKID HEIGHT ~FT.	THRUST COEFF. ~C_T
12.5	11320	7070	195.3(MID)	324.0	7 TO 15	0006955

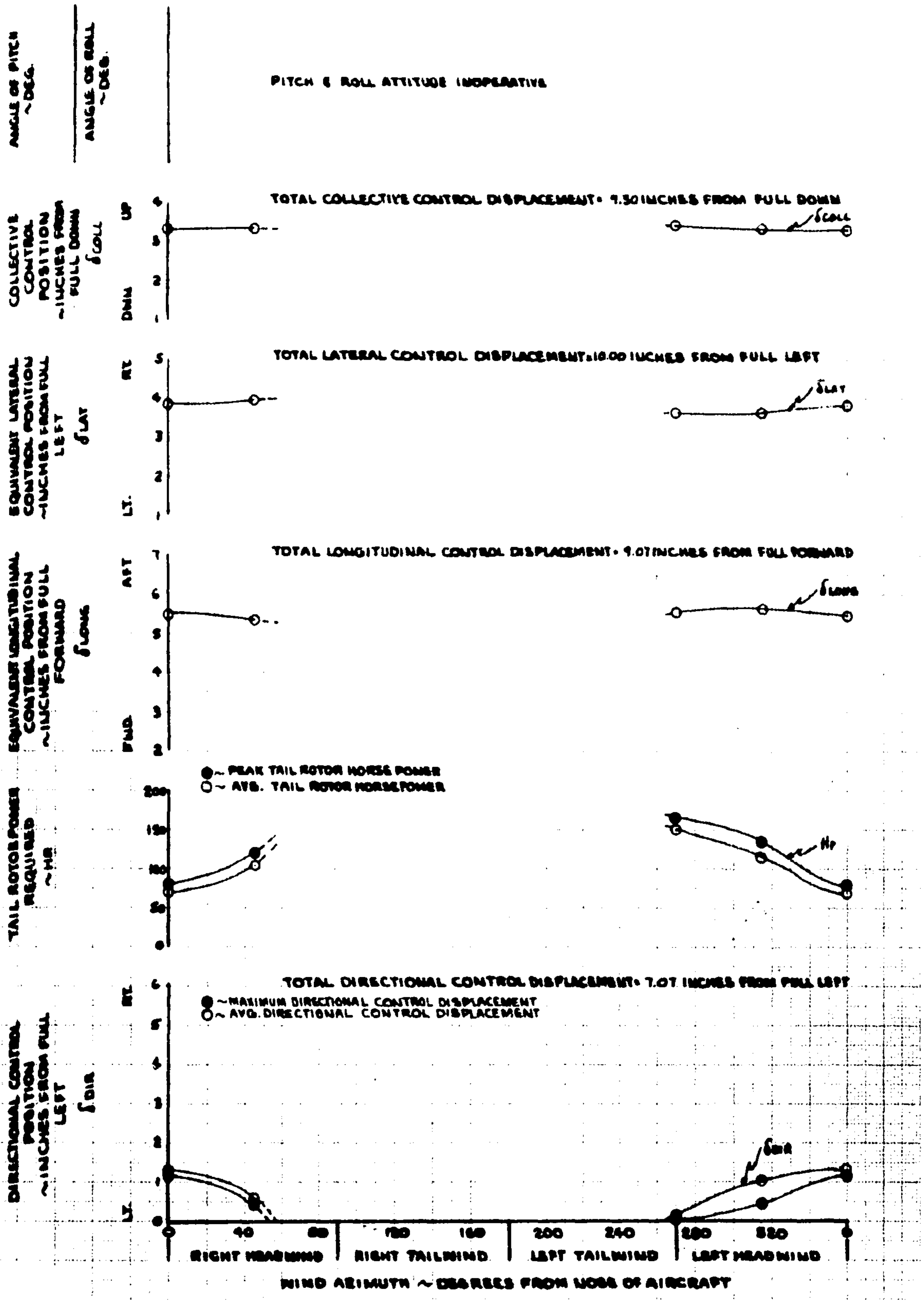


FIGURE NO 125

SIDEWARD & REARWARD FLIGHT

AH-1G USA [illegible]615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

LANDING GEAR CROSS TUBE FAIRINGS REMOVED

DENSITY ALTITUDE H_D ~ FEET	GROSS WEIGHT ~ LBS	LONG. C.G. ~ IN.	ROTOR SPEED NR ~ RPM	SKID HEIGHT ~ FT.	THRUST COEFF. ~ C_T
8030	8000	201.1 (AFT)	324.0	7 TO 15	[illegible]

NOTES: 1 TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY

2 GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR

3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH SCAS NULL

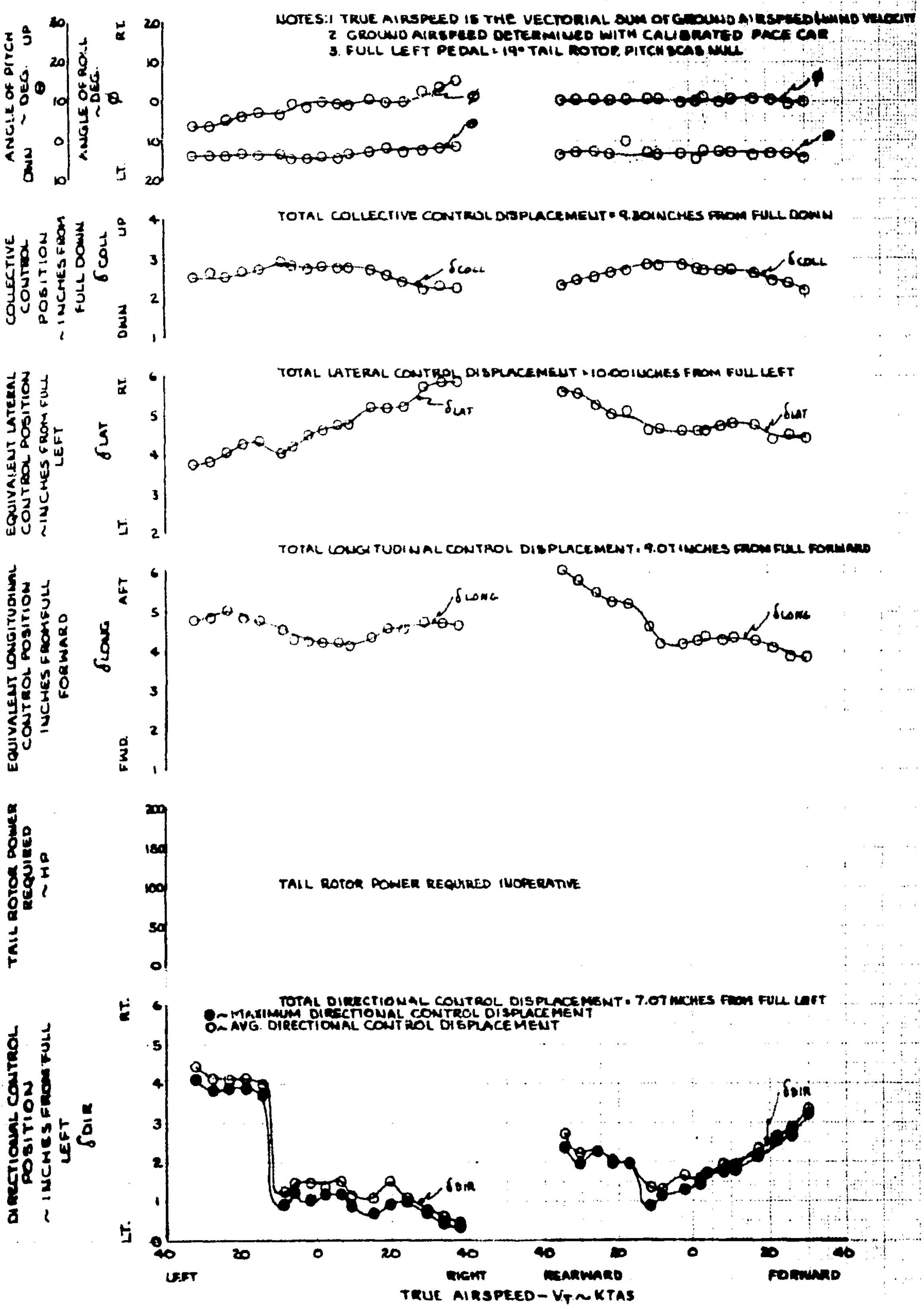


FIGURE NO. 126

LONGITUDINAL DYNAMIC STABILITY SUMMARY

AH-1G USA S/N 715695

CONFIG	AVG G W ~LB	AVG ALT H_D ~FT	AVG LONG C G ~IN	SCAS	$V_{MIN\ POWER}$ (LEVEL FLT)			.8 V_H (LEVEL FLT)			V_H (LEVEL FLT)		
					ω_d ζ	DESCRIP	AIRSPEED ~ CAS	ω_d ζ	DESCRIP	AIRSPEED ~ CAS	ω_d ζ	DESCRIP	AIRSPEED ~ CAS
CLEAN	7660	5000	190.5 (FWD)	ON	NA NA	DEAD BEAT	63	NA NA	DEAD BEAT	106	NA NA	DEAD BEAT	137
				OFF	NA NA	DEAD BEAT		NA NA	DEAD BEAT		NA NA	DEAD BEAT	
CLEAN	7540	4000	201 (AFT)	ON	.26 1.7	HEAVILY DAMPED	65	NA NA	DEAD BEAT	108	NA NA	DEAD BEAT	142
				OFF	.05 .9	HEAVILY DAMPED		.09 .3	LIGHTLY DAMPED		.16 1.4	HEAVILY DAMPED	
HEAVY HOG ☆	7740	4300	201 (AFT)	ON	NA NA	DEAD BEAT	62	NA NA	DEAD BEAT	105	.28 1.45	HEAVILY DAMPED	150
				OFF	.08 -.1	UNDAMPED		.02 -.3	UNDAMPED		.08 .9	HEAVILY DAMPED	
HEAVY HOG ☆ ☆	9340	4400	200 (AFT)	ON	NA NA	DEAD BEAT	63	NA NA	DEAD BEAT	104	NA NA	DEAD BEAT	132
				OFF	NF	NF		NF	NF		.06 .4	LIGHTLY DAMPED	
HEAVY HOG ☆	7730	15000	201 (AFT)	ON	.06 1.2	HEAVILY DAMPED	56	NA NA	DEAD BEAT	86	NA NA	DEAD BEAT	105
				OFF	NF	NF		NF	NF		NA NA	UNDAMPED	
☆ ☆ HEAVY SCOUT	9310	4500	200 (AFT)	ON	NF	NF	NF	NA NA	DEAD BEAT	104	NA NA	DEAD BEAT	140

CONFIG	AVG G.W. ~LB	AVG ALT H_D ~FT	AVG LONG C.G. ~IN.	SCAS	V_{LIMIT} (DIVE)			V_{MAX} (R/C)			V_{MIN} (R/D)		
					ω_d ζ	DESCRIP	AIRSPEED ~ CAS	ω_d ζ	DESCRIP	AIRSPEED ~ CAS	ω_d ζ	DESCRIP	AIRSPEED ~ CAS
CLEAN	7660	5000	190 (FWD)	ON	NA NA	DEAD BEAT	180	NA NA	DEAD BEAT	60	NA NA	DEAD BEAT	72
				OFF	NA NA	DEAD BEAT		NA NA	DEAD BEAT		NA NA	DEAD BEAT	
CLEAN	7540	4000	201 (AFT)	ON	.49 1.8	HEAVILY DAMPED	180	NA NA	DEAD BEAT	65	NA NA	DEAD BEAT	70
				OFF	.10 .6	HEAVILY DAMPED		.09 .3	LIGHTLY DAMPED		.10 .6	HEAVILY DAMPED	
HEAVY HOG ☆	7740	4300	201 (AFT)	ON	NA NA	DEAD BEAT	170	NA NA	DEAD BEAT	68	NA NA	DEAD BEAT	69
				OFF	.13 .1	LIGHTLY DAMPED		.09 .3	LIGHTLY DAMPED		NA NA	DEAD BEAT	
HEAVY HOG ☆ ☆	9340	4400	200 (AFT)	ON	NF	NF	NF	NA NA	DEAD BEAT	62	NF	NF	NF
				OFF	NF	NF		.15 .5	LIGHTLY DAMPED		NF	NF	
☆ ☆ HEAVY SCOUT	9310	4500	200 (AFT)	ON	NA NA	DEAD BEAT	170	NA NA	DEAD BEAT	60	NF	NF	NF

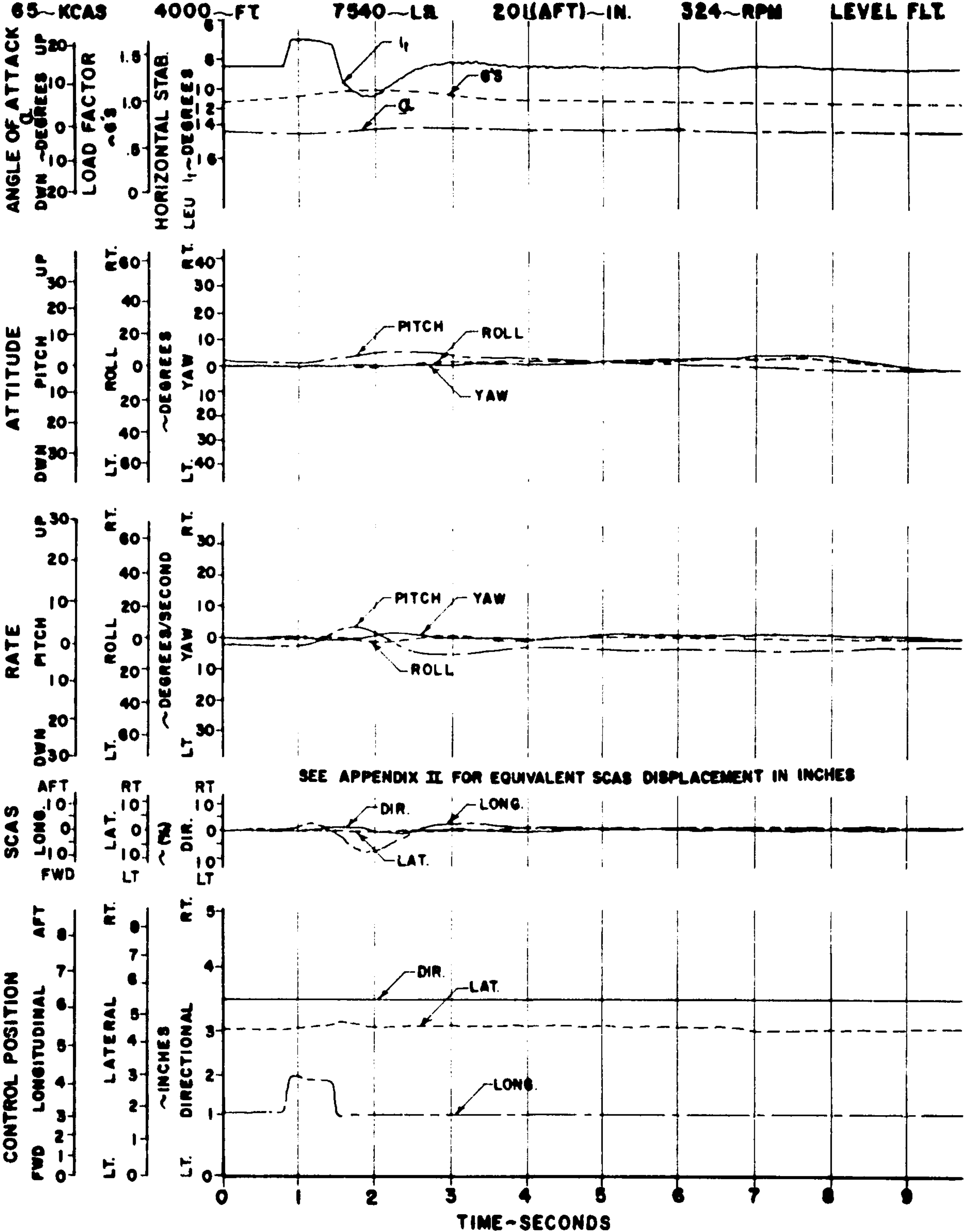
NOTE: ALL APPLICABLE NOTES ARE PRESENTED ON FIGURE 150.

FIGURE NO. 127

AFT LONGITUDINAL PULSE SCAS ON

AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
65~KCAS	4000~FT	7540~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.



SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

FIGURE NO. 128
AFT LONGITUDINAL PULSE SCAS ON

AH-1G USA S/N 6715695

CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
180~KCAS	4000~FT	7540~LB	201(AFT)~IN.	324~RPM	DIVE

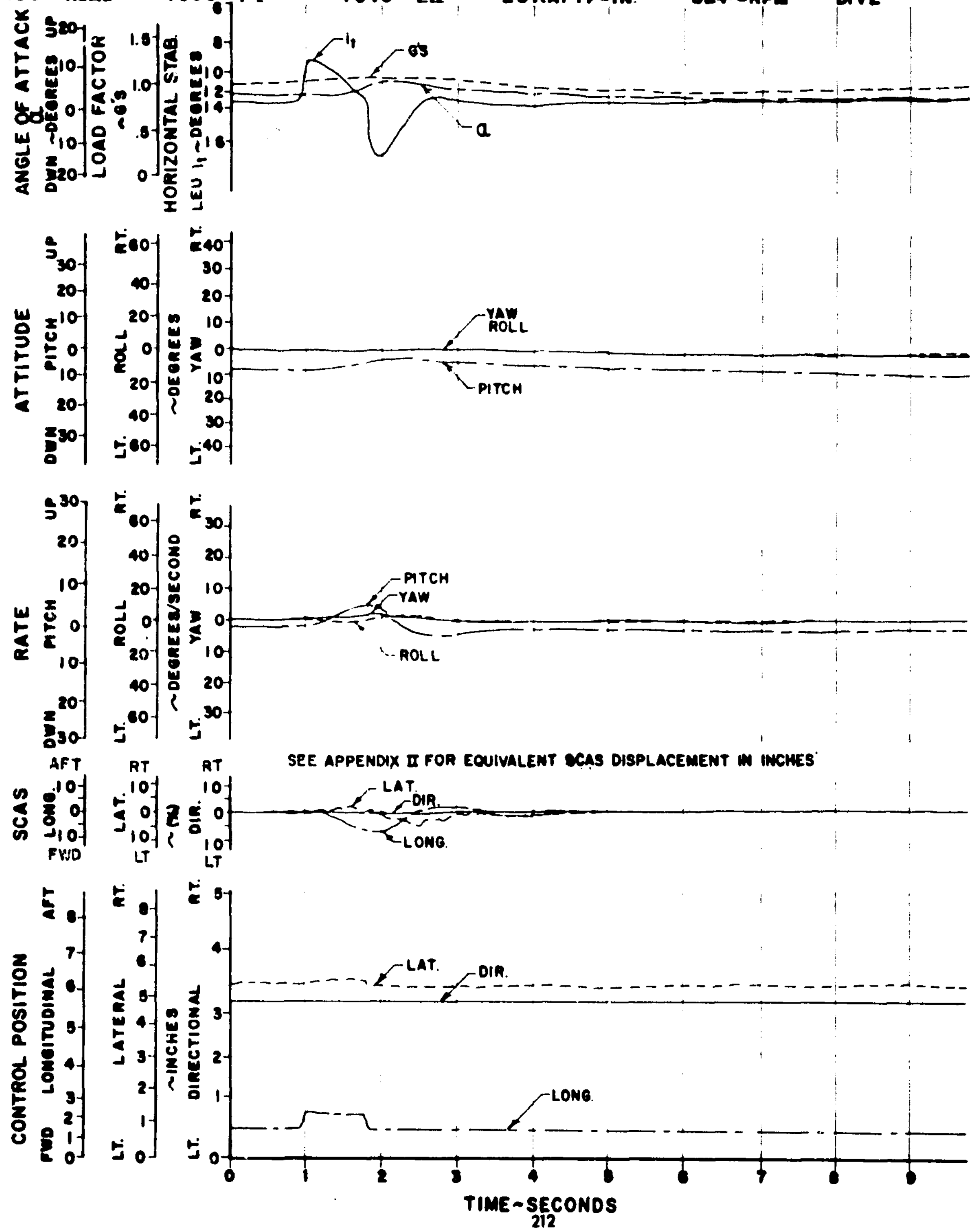


FIGURE NO. 129
AFT LONGITUDINAL PULSE SCAS ON

AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
65~KCAS	4000~FT	7540~LB	201(AFT)~IN.	324~RPM	CLIMB

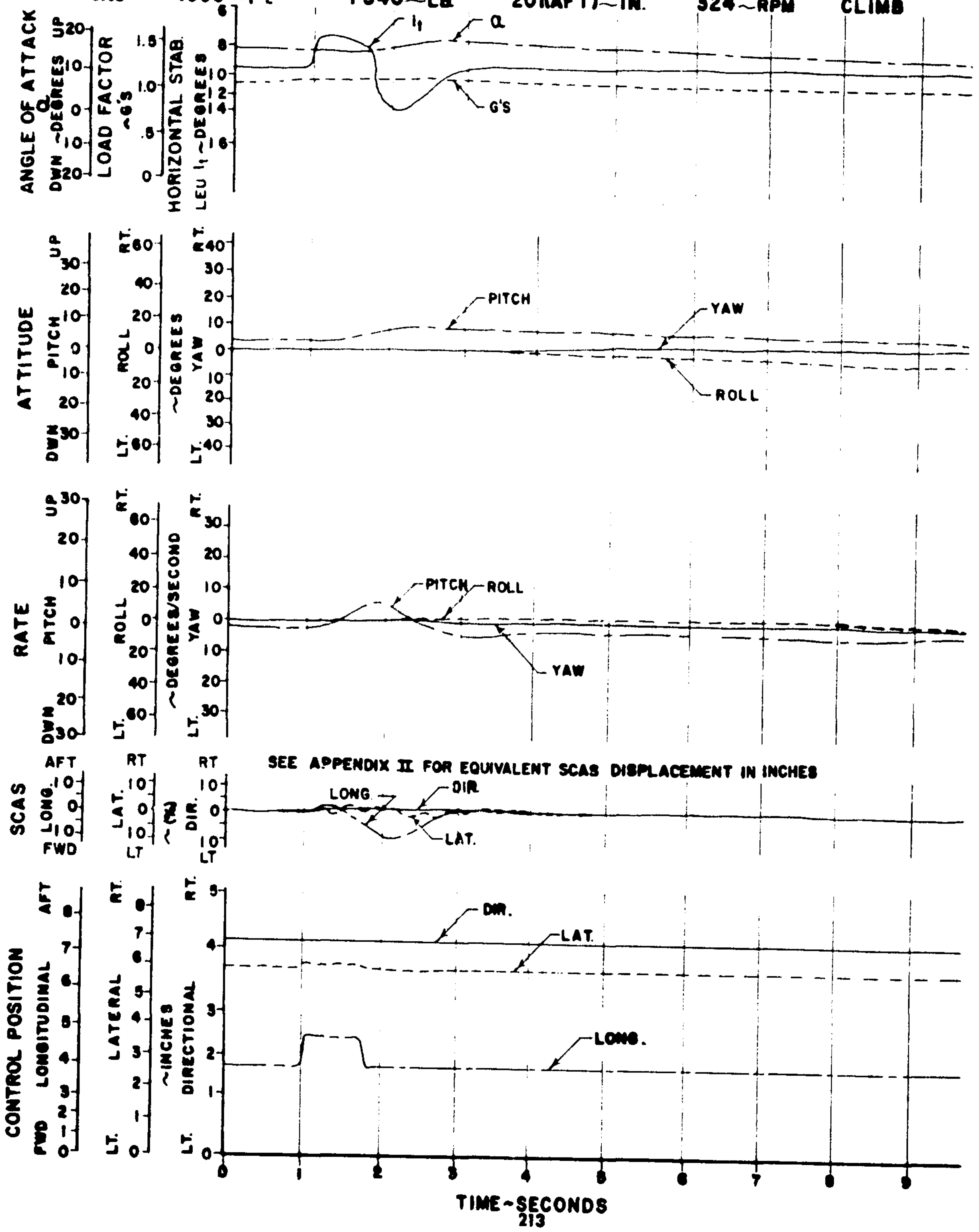


FIGURE NO. 130
AFT LONGITUDINAL PULSE SCAS ON

AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
70~KCAS	4000~FT	7540~LB.	201(AFT)~IN.	324~RPM	AUTOROTATION

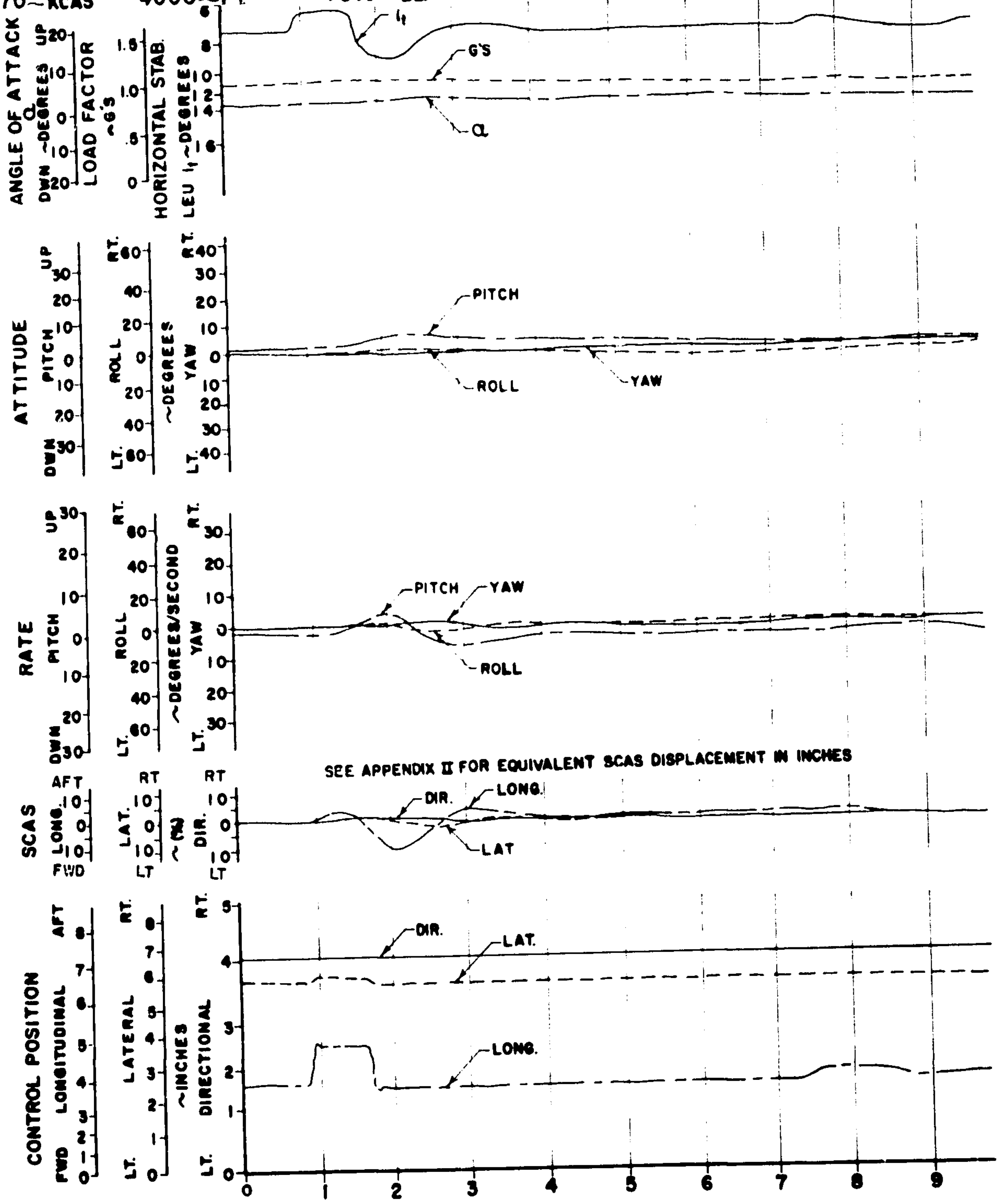


FIGURE NO.131

AFT LONGITUDINAL PULSE SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hd)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
105~KCAS	4300~FT.	7740~LB.	201(AFT)~IN.	324~RPM	LEVEL FLT.

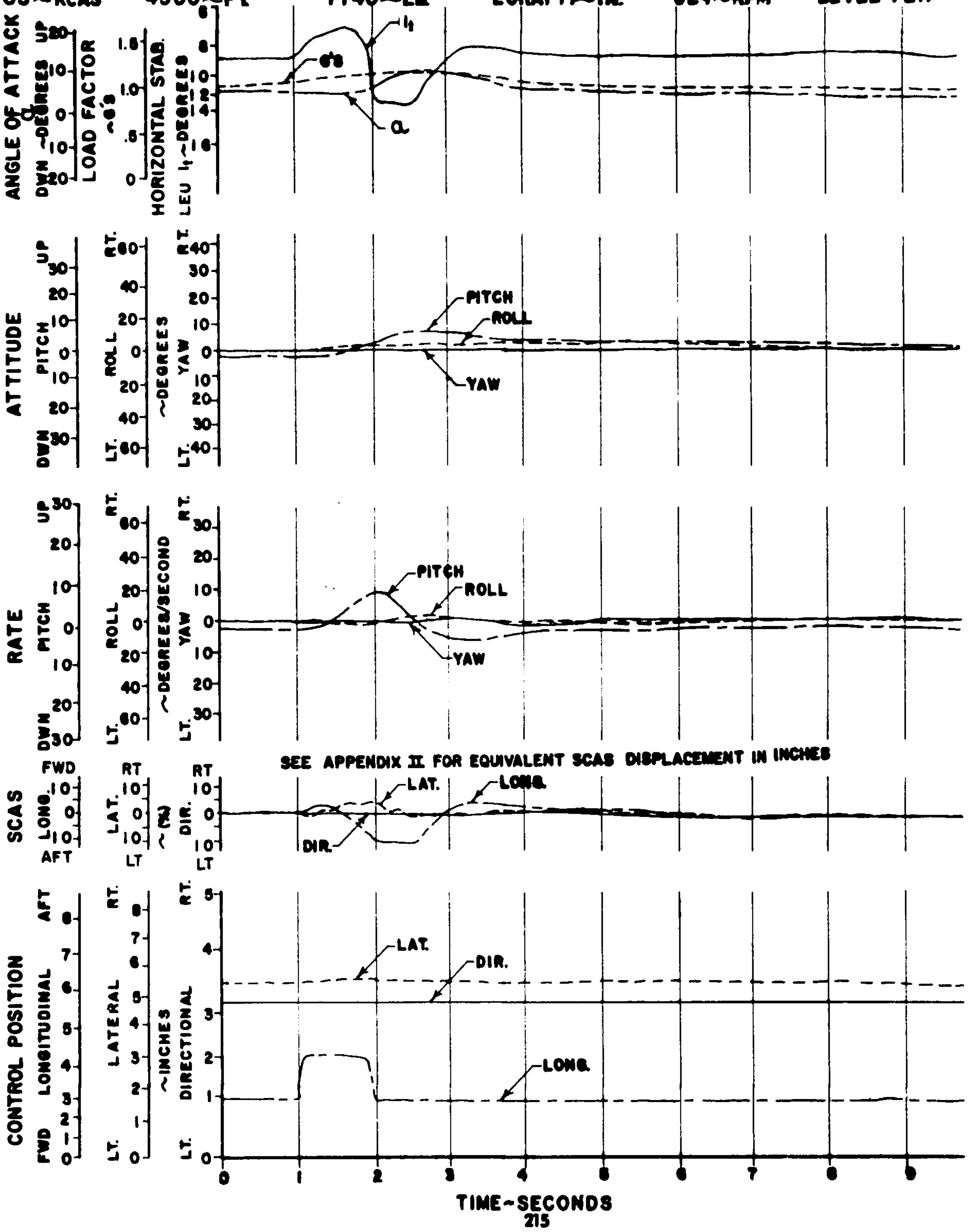


FIGURE NO. 132
AFT LONGITUDINAL PULSE SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
105~KCAS	15000~FT	7730~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

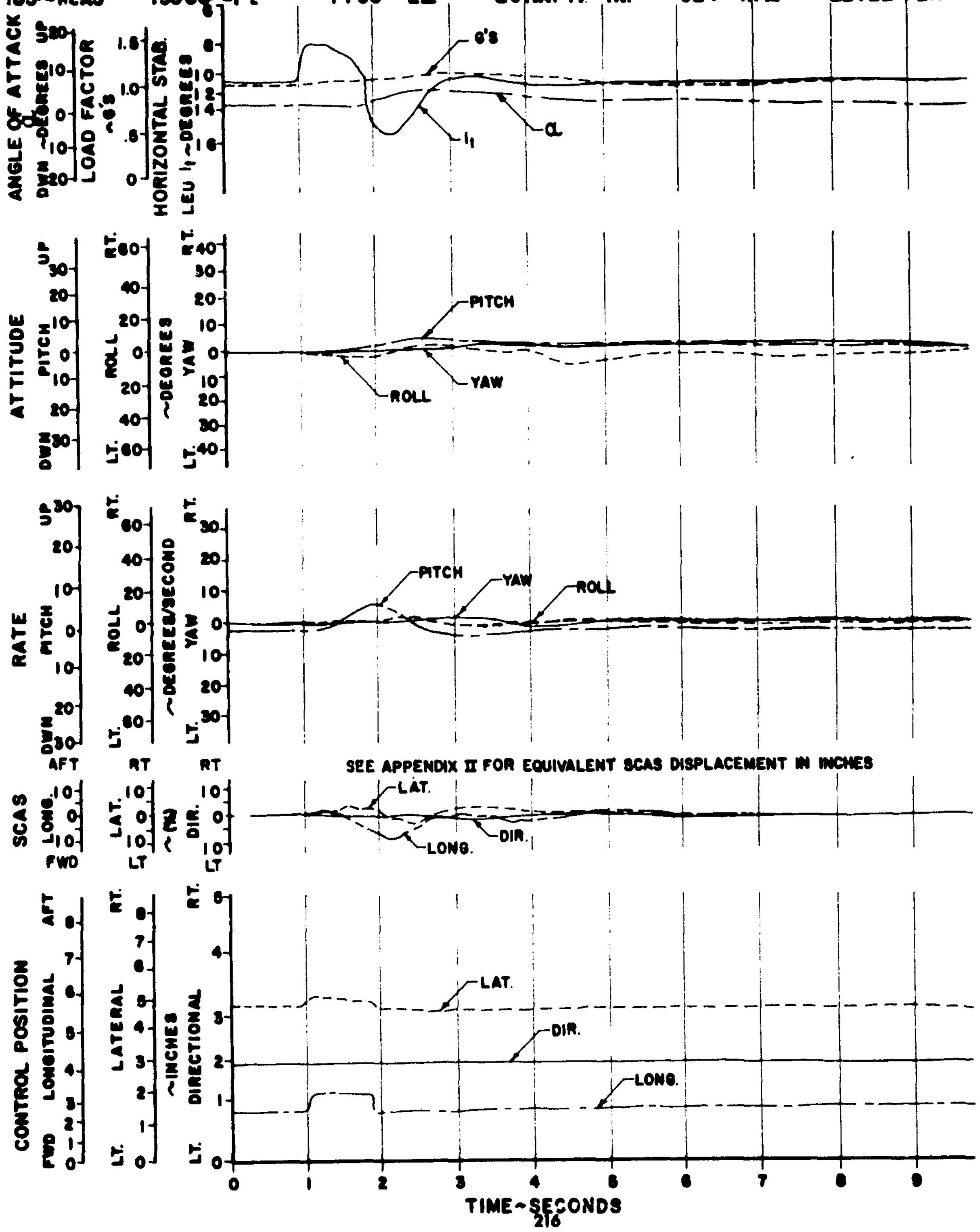
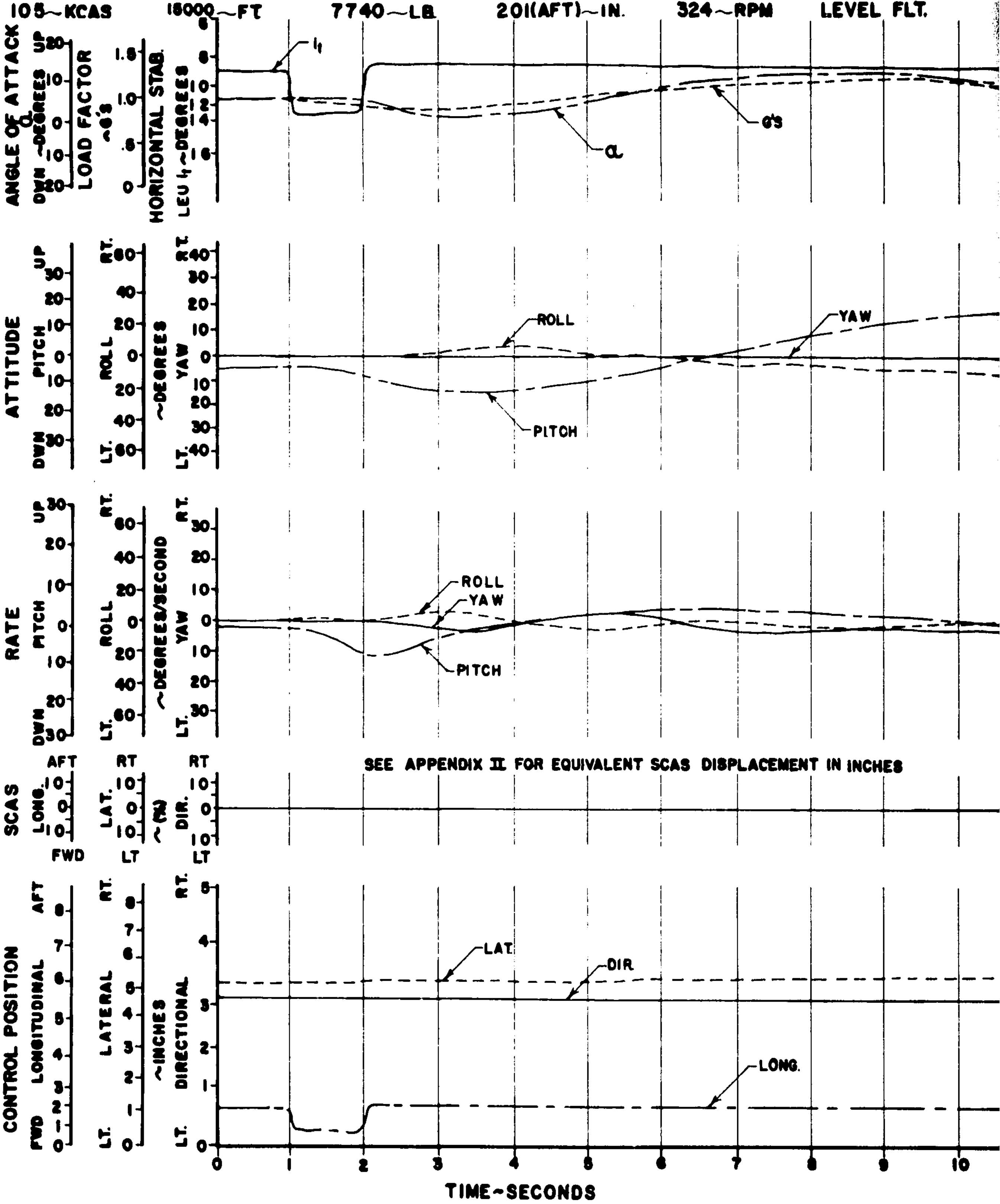


FIGURE NO. 133
FWD LONGITUDINAL PULSE SCAS OFF

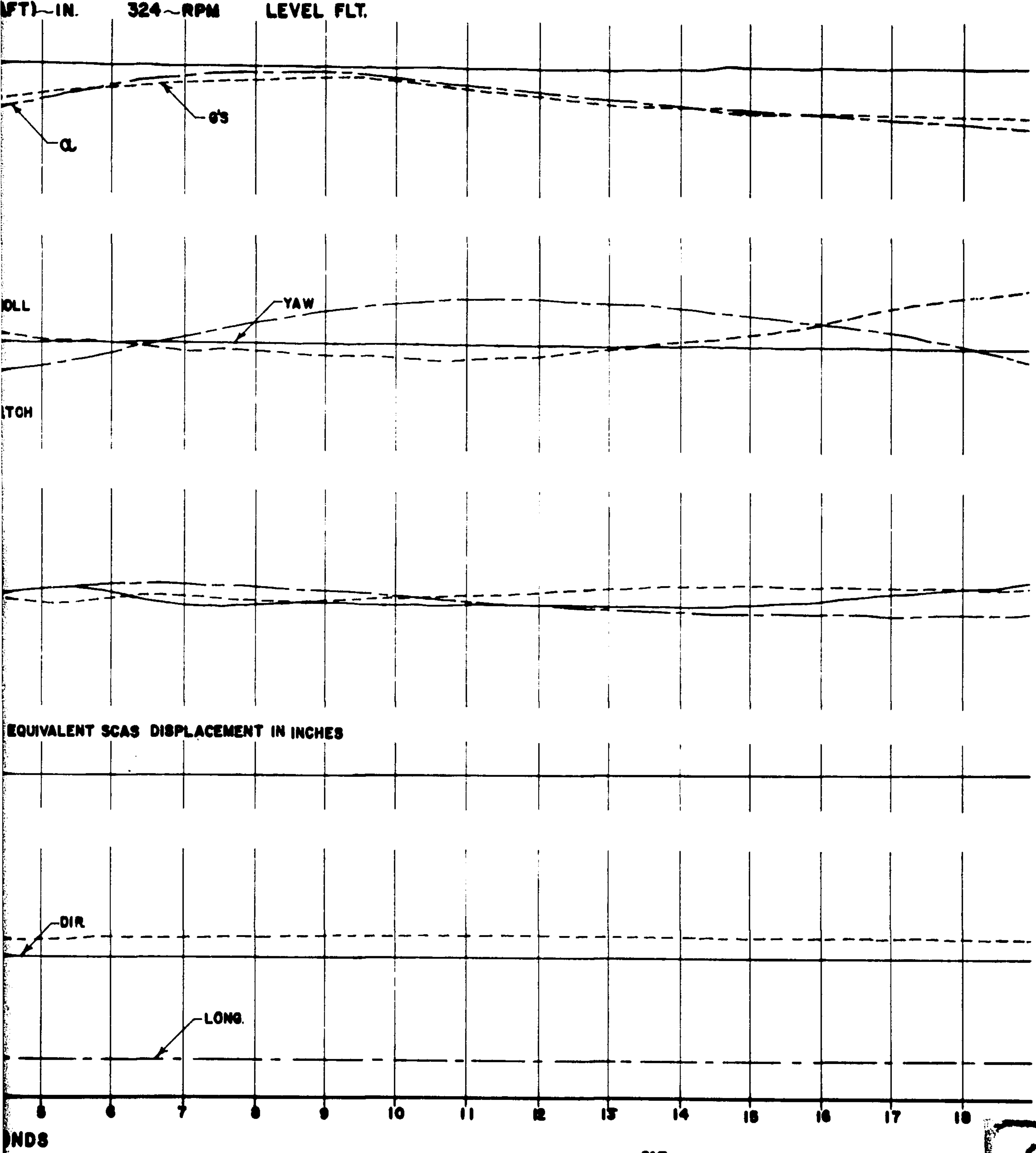
AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
105~KCAS	15000~FT	7740~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.



.133
LSE SCAS OFF
695
KET POD FAIRINGS REMOVED
IG. C.G. ROTOR SPEED FLT. CONDITION
FT)~IN. 324~RPM LEVEL FLT.



2

FIGURE NO. 154

LATERAL DYNAMIC STABILITY SUMMARY

AH-1G USA S/N 715695

LEFT AND RIGHT CONTROL PULSES

CONFIG	AVG GW - LB	AVG ALT H_D - FT	AVG LONG C G - IN	SCAS	$V_{MIN\ POWER}$ (LEVEL FLT)			$.8V_H$ (LEVEL FLT)			V_H (LEVEL FLT)		
					ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS
CLEAN	7300	4100	201 (AFT)	ON	.15 1.3	HEAVILY DAMPED	65	.57 1.8	HEAVILY DAMPED	106	NA NA	DEAD BEAT	14.
				OFF	.14 .8	HEAVILY DAMPED		.19 .6	HEAVILY DAMPED		.25 .1	LIGHTLY DAMPED	
HEAVY HOG ☆	7620	3700	201 (AFT)	ON	NA NA	DEAD BEAT	60	.05 1.1	HEAVILY DAMPED	106	NA NA	DEAD BEAT	150
				OFF	.29 .6	HEAVILY DAMPED		.27 .1	LIGHTLY DAMPED		.21 .1	LIGHTLY DAMPED	
HEAVY HOG ☆	8360	4500	195 (MID)	ON	.03 .9	HEAVILY DAMPED	60	.06 1.3	HEAVILY DAMPED	104	NA NA	DEAD BEAT	138
				OFF	.17 .1	LIGHTLY DAMPED		.24 .1	LIGHTLY DAMPED		.27 .1	LIGHTLY DAMPED	
HEAVY HOG ☆ ☆	8680	3600	195 (MID)	ON	.17 1.3	HEAVILY DAMPED	62	.36 1.6	HEAVILY DAMPED	103	NA NA	DEAD BEAT	138
				OFF	.23 .3	LIGHTLY DAMPED		.24 .1	LIGHTLY DAMPED		.27 .1	LIGHTLY DAMPED	
HEAVY HOG ☆ ☆	9270	4300	200 (AFT)	ON	NF	NF	NF	.20 1.2	HEAVILY DAMPED	104	NA NA	DEAD BEAT	132
				OFF	NF	NF		NF	NF		.25 .1	LIGHTLY DAMPED	
HEAVY HOG ☆	7690	15060	201 (AFT)	ON	.07 .9	HEAVILY DAMPED	55	NA NA	DEAD BEAT	88	NA NA	DEAD BEAT	102
				OFF	NF	NF		NF	NF		.22 .1	LIGHTLY DAMPED	
☆ ☆ HEAVY SCOUT	9000	5000	200 (AFT)	ON	NF	NF	NF	NA NA	DEAD BEAT	103	.30 1.5	HEAVILY DAMPED	140

CONFIG	AVG GW LB	AVG ALT H_D - FT	AVG LONG C.G - IN.	SCAS	V_{LIMIT} (DIVE)			V_{MAX} (R/C)			V_{MIN} (R/D)		
					ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS
CLEAN	7300	4100	201 (AFT)	ON	.44 1.5	HEAVILY DAMPED	180	.20 1.3	HEAVILY DAMPED	65	NF	NF	NF
				OFF	.29 .1	LIGHTLY DAMPED		.26 .1	LIGHTLY DAMPED		NF	NF	
HEAVY HOG ☆	7620	3700	201 (AFT)	ON	NA NA	DEAD BEAT	170	NF	NF	NF	NF	NF	NF
				OFF	.27 0	NEUTRAL DAMPED		NF	NF		NF	NF	
HEAVY HOG ☆	8360	4500	195 (MID)	ON	NA NA	DEAD BEAT	170	.27 1.4	HEAVILY DAMPED	60	NA NA	DEAD BEAT	68
				OFF	.16 .2	LIGHTLY DAMPED		.25 .1	LIGHTLY DAMPED		.12 .8	HEAVILY DAMPED	
HEAVY HOG ☆ ☆	8680	3600	195 (MID)	ON	.14 1.2	HEAVILY DAMPED	180	.27 1.4	HEAVILY DAMPED	64	.07 1.1	HEAVILY DAMPED	74
				OFF	.22 .1	LIGHTLY DAMPED		.24 0	NEUTRAL DAMPED		NF	NF	
HEAVY HOG ☆ ☆	9270	4300	200 (AFT)	ON	.16 1.2	HEAVILY DAMPED	170	NF	NF	NF	NF	NF	NF

NOTE: ALL APPLICABLE NOTES ARE PRESENTED ON FIGURE 150.

FIGURE NO. 135
RIGHT LATERAL PULSE SCAS ON

AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
65~KCAS	4100~FT	7300~LB	201(AFT)~IN.	324~RPM	CLIMB

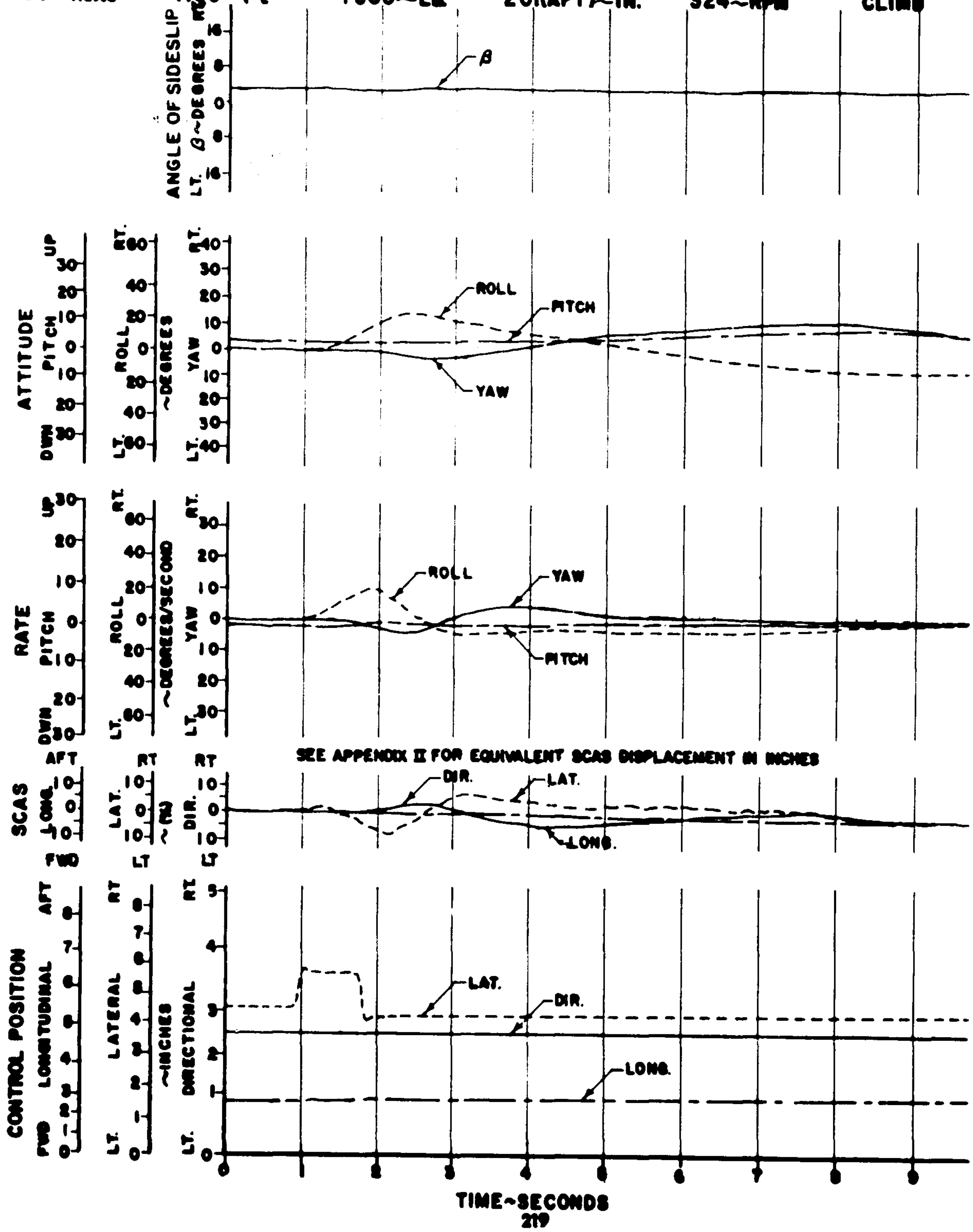
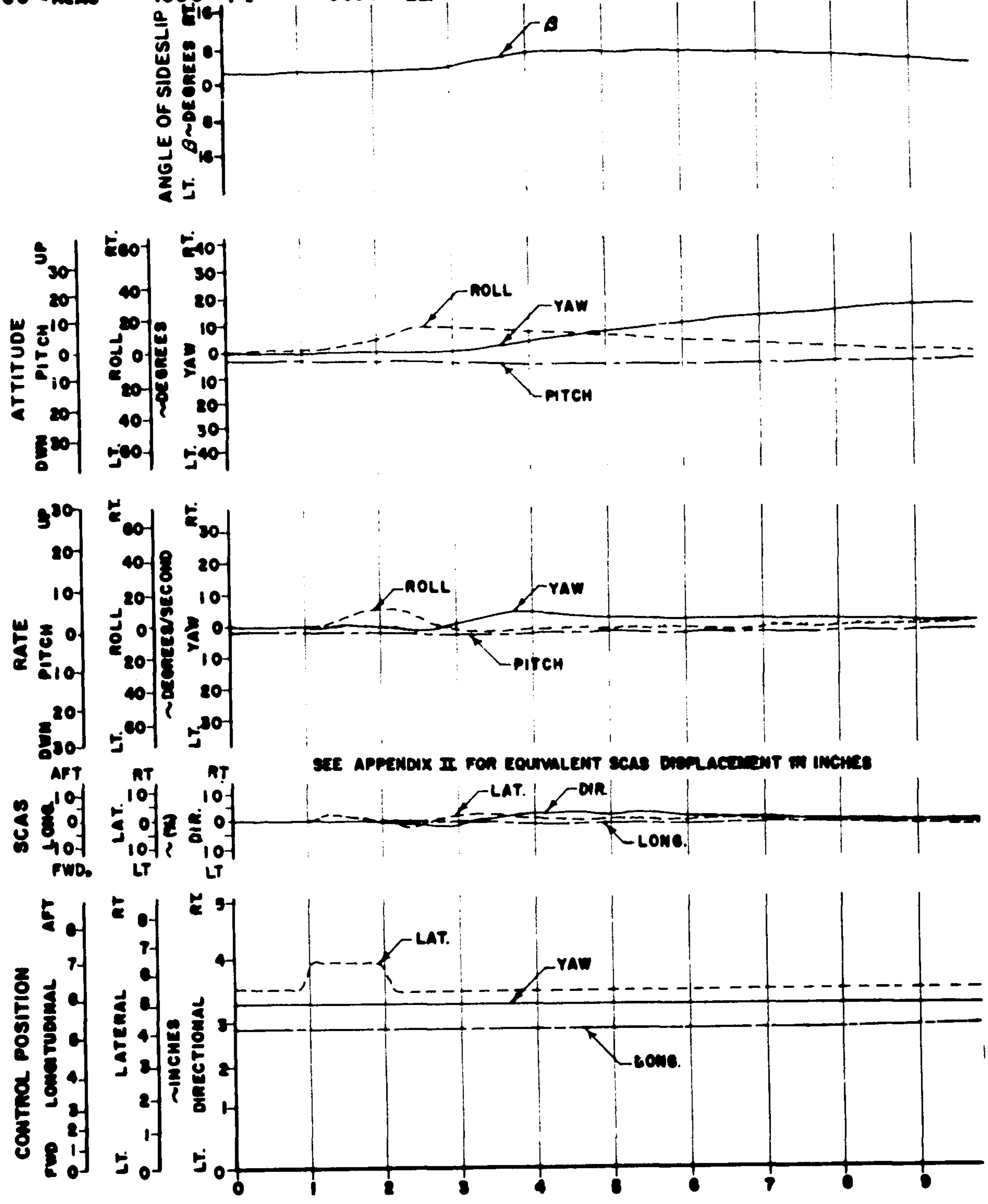


FIGURE NO. 136
RIGHT LATERAL PULSE SCAS ON

AH-1G USA S/N 6715695
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE (Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
60~KCAS	4500~FT.	8360~LB.	195(MID.)~IN.	324~RPM	LEVEL FLT.



SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

FIGURE NO. 137

RIGHT LATERAL PULSE SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
105~KCAS	3700~FT	7620~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

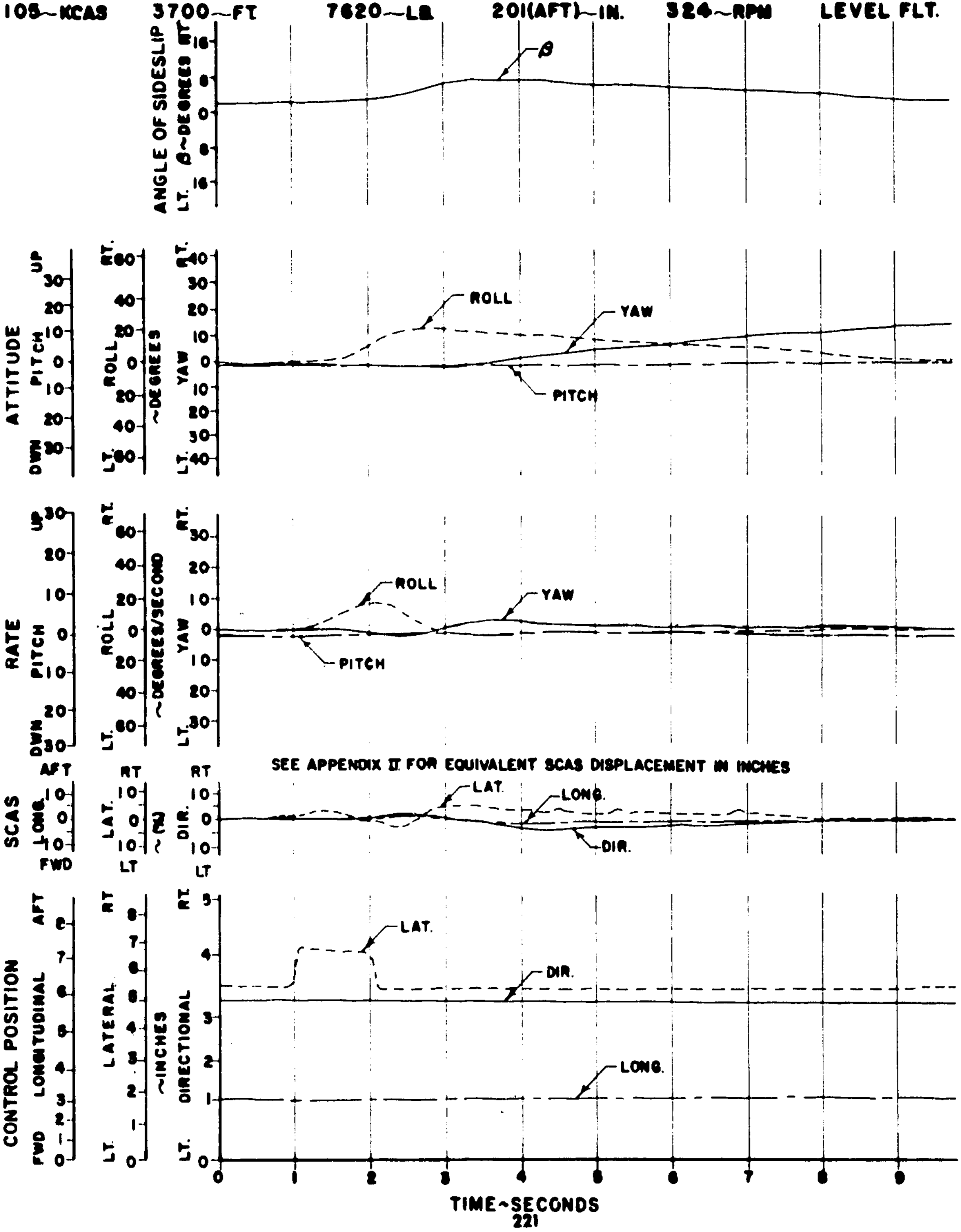


FIGURE NO. 138
RIGHT LATERAL PULSE SCAS ON

AH-1G USA S/N 6715695

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
140~KCAS	5000~FT	9000~LB.	200(AFT)~IN.	324~RPM	LEVEL FLT

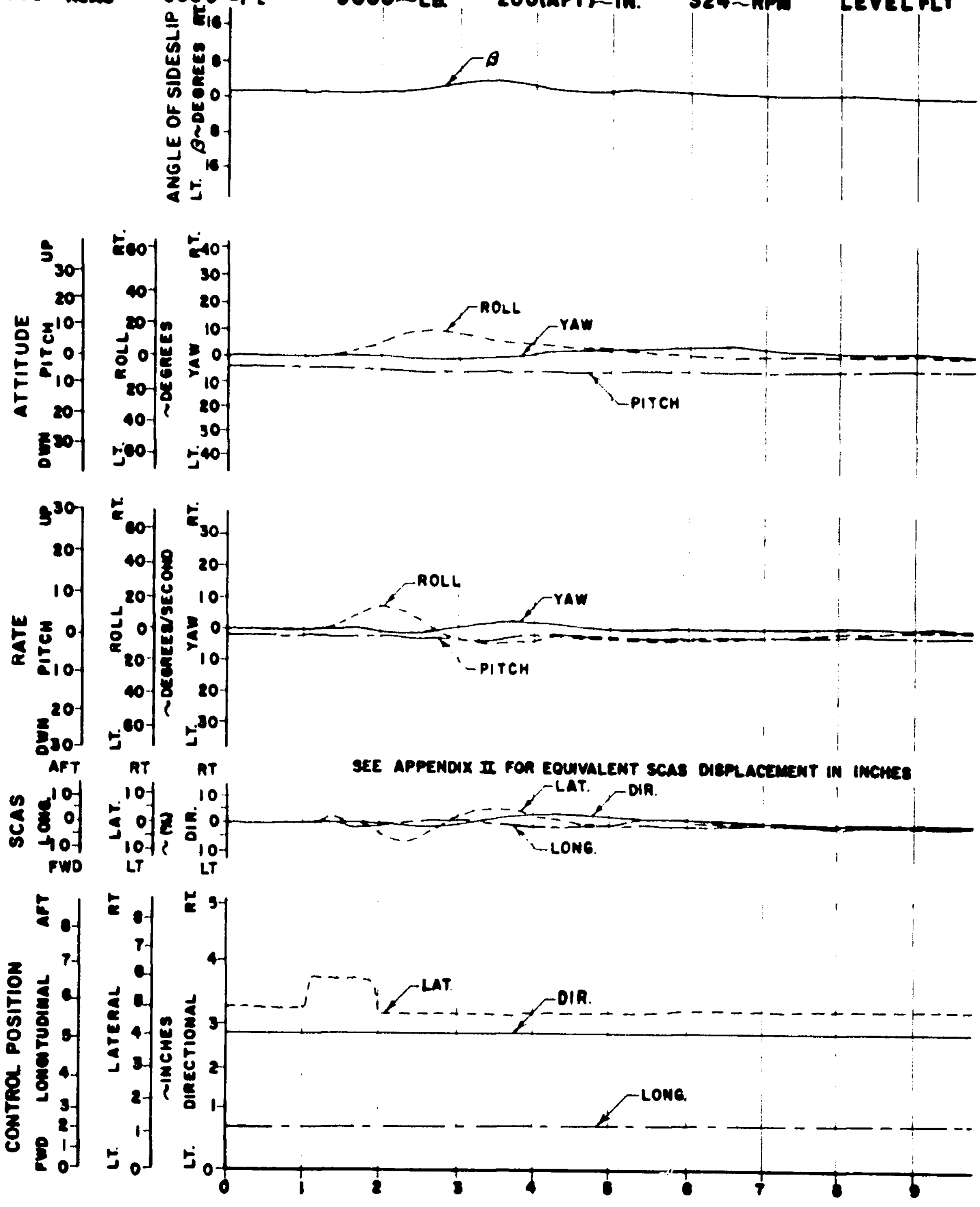


FIGURE NO. 139
RIGHT LATERAL PULSE SCAS ON

AH-1G USA S/N 6715695
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE (Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
170~KCAS	4300~FT	9270~LB	200(AFT)~IN.	324~RPM	DIVE

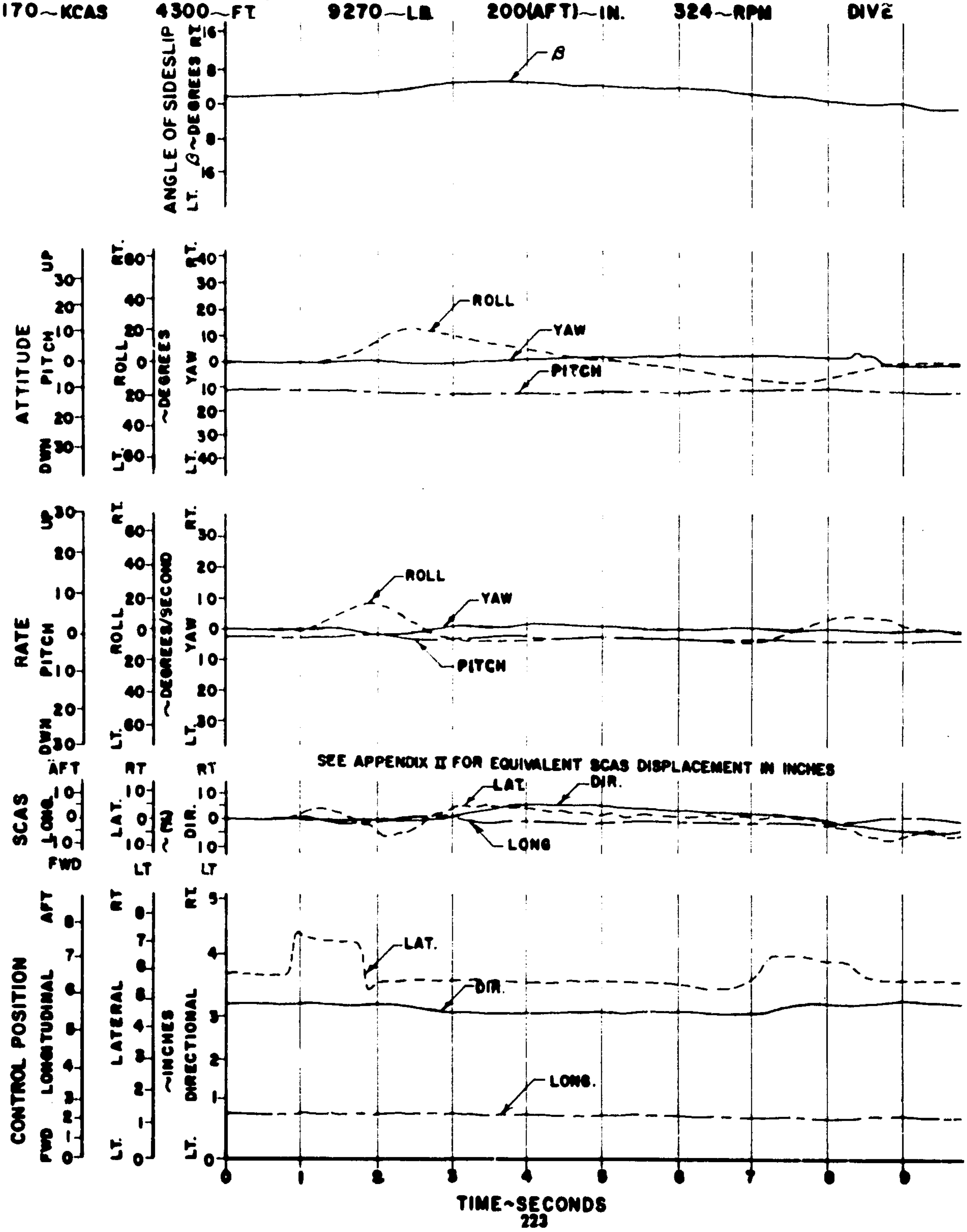
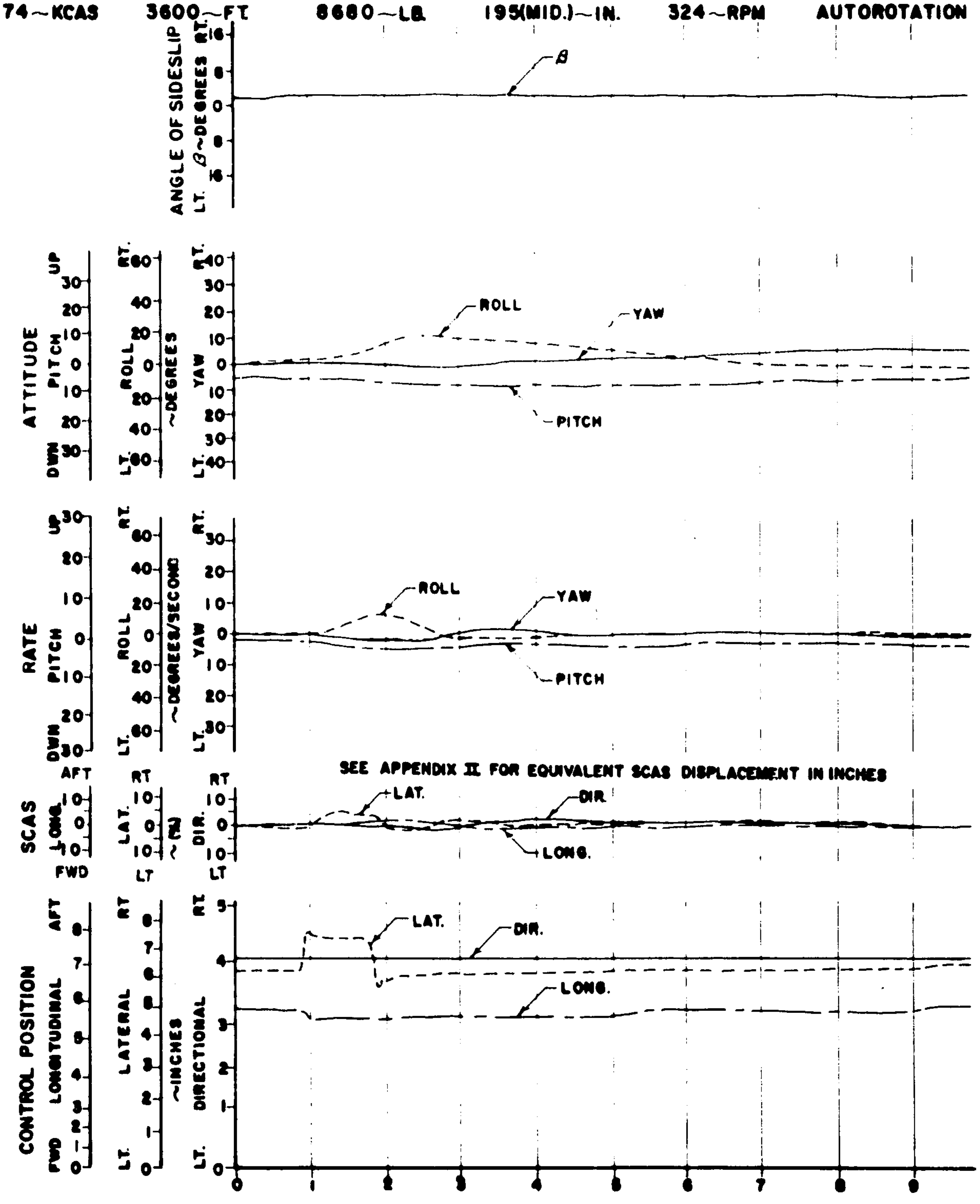


FIGURE NO. 140
RIGHT LATERAL PULSE SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
74~KCAS	3600~FT.	8680~LB.	195(MID.)~IN.	324~RPM	AUTOROTATION

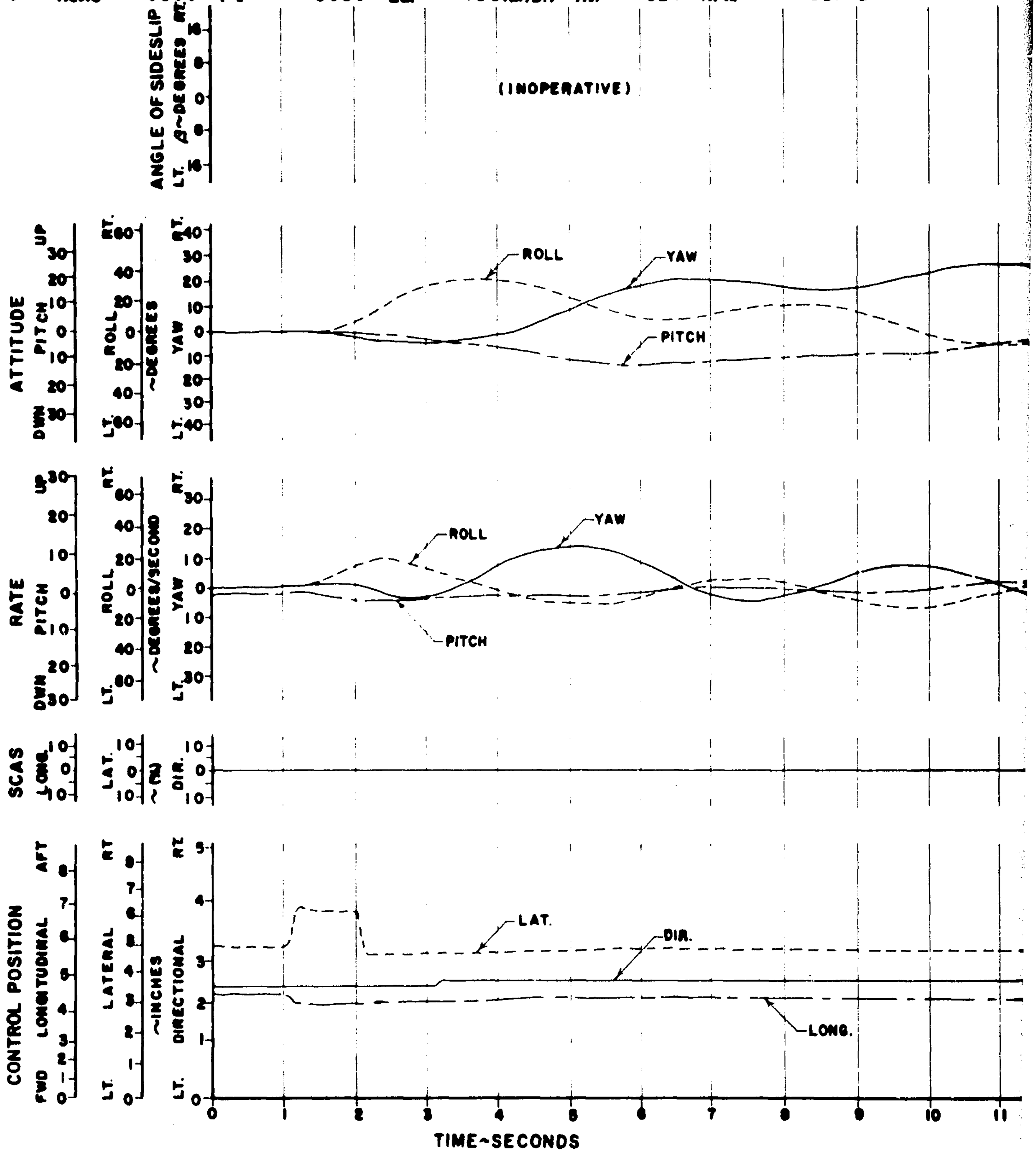


SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

FIGURE NO. 141
RIGHT LATERAL PULSE SCAS OFF

AH-1G USA S/N 6715695
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE (Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
64 ~ KCAS	3600 ~ FT	8680 ~ LB.	195 (MID.) ~ IN.	324 ~ RPM	CLIMB



/

). 141
SE SCAS OFF
3695
ET POD FAIRINGS REMOVED
3 C.G. ROTOR SPEED FLT. CONDITION
ID.)~IN. 324~RPM CLIMB

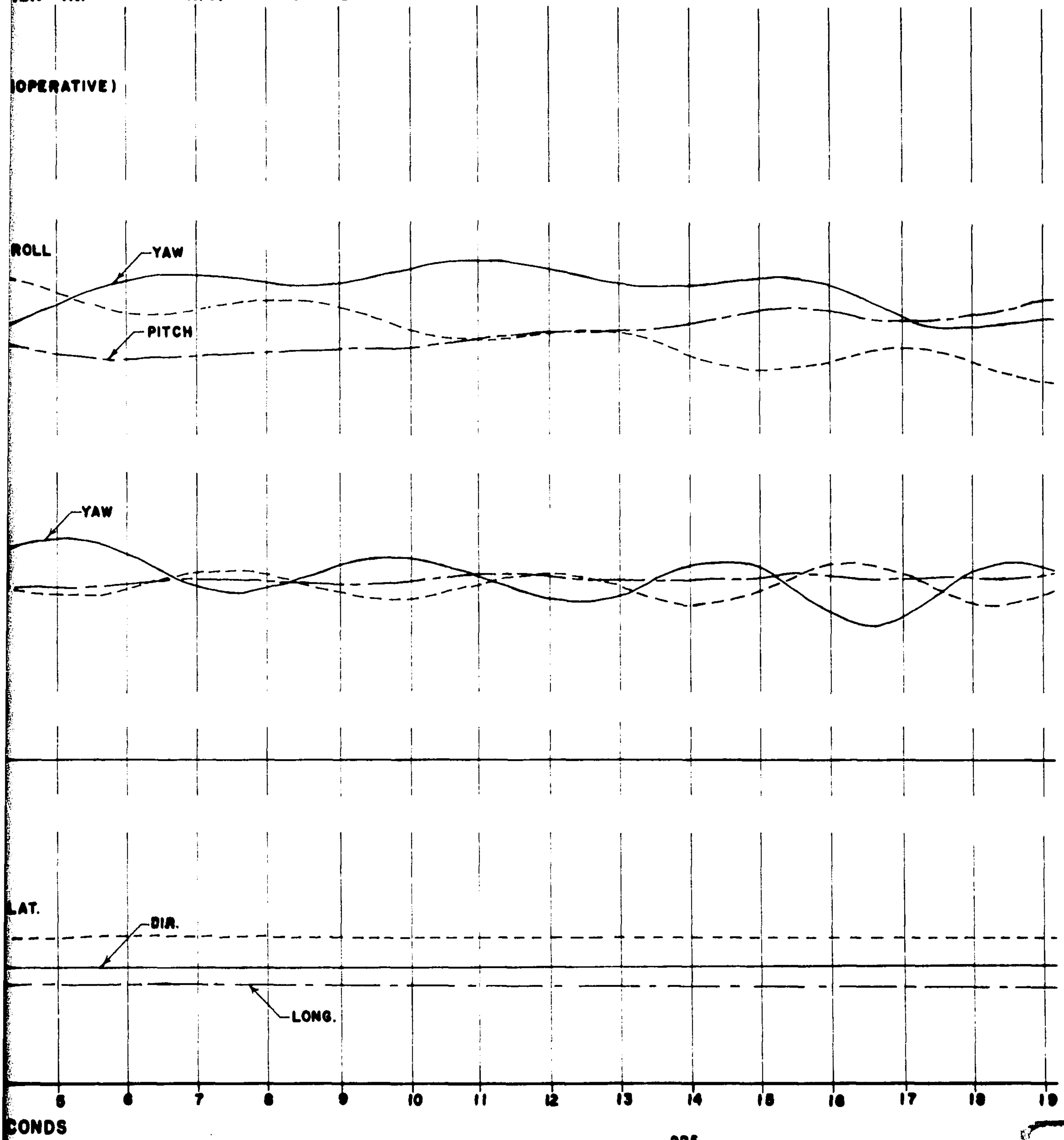


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FIGURE NO. 142

DIRECTIONAL DYNAMIC STABILITY SUMMARY

AH-1G USA S/N 715695

LEFT & RIGHT CONTROL PULSES

CONFIG	AVG GW ~LB	AVG ALT H_D~FT	AVG LONG CG ~ IN	SCAS	$V_{MIN\ POWER}$ (LEVEL FLT)			.8 V_H (LEVEL FLT)			V_H (LEVEL FLT)		
					ω_d ζ	DESCRIP	AIRSPEED ~CAS	ω_d ζ	DESCRIP	AIRSPEED ~CAS	ω_d ζ	DESCRIP	AIRSPEED ~ CAS
CLEAN	7210	4200	201 (AFT)	ON	.13 1.0	HEAVILY DAMPED	65	NA NA	DEAD BEAT	107	.29 .6	HEAVILY DAMPED	138
				OFF	.22 .5	HEAVILY DAMPED		.27 .2	LIGHTLY DAMPED		.27 0	NEUTRAL DAMPED	
HEAVY HOG ☆	7490	5000	201 (AFT)	ON	.15 .6	HEAVILY DAMPED	60	.10 .9	HEAVILY DAMPED	105	NF	NF	NF
				OFF	.19 .2	LIGHTLY DAMPED		.24 .1	LIGHTLY DAMPED		NF	NF	
HEAVY HOG ☆ ☆	9180	4600	200 (AFT)	ON	NA NA	DEAD BEAT	60	.23 .7	HEAVILY DAMPED	104	.26 .5	HEAVILY DAMPED	136
				OFF	NF	NF		.22 .6	NF		.25 .1	LIGHTLY DAMPED	
HEAVY HOG ☆	7620	15400	201 (AFT)	ON	.11 .9	HEAVILY DAMPED	55	.12 1.1	HEAVILY DAMPED	88	.36 1.3	HEAVILY DAMPED	103
				OFF	NF	NF		NF	NF		.25 .1	LIGHTLY DAMPED	

CONFIG	AVG GW ~LB	AVG ALT H_D~FT	AVG LONG CG~IN	SCAS	V_{LIMIT} (DIVE)			V_{MAX} (R/C)			V_{MIN} (R/D)		
					ω_d ζ	DESCRIP	AIRSPEED ~ CAS	ω_d ζ	DESCRIP	AIRSPEED ~ CAS	ω_d ζ	DESCRIP	AIRSPEED ~ CAS
CLEAN	7210	4200	201 (AFT)	ON	.21 .9	HEAVILY DAMPED	180	.31 .6	HEAVILY DAMPED	64	NA NA	DEAD BEAD	75
				OFF	.27 0	NEUTRAL DAMPED		.21 -.3	UNDAMPED		.09 1.1	HEAVILY DAMPED	
HEAVY HOG ☆	7490	5000	201 (AFT)	ON	NA NA	DEAD BEAT	170	NA NA	DEAD BEAT	60	.18 .6	HEAVILY DAMPED	68
				OFF	.27 0	NEUTRAL DAMPED		.24 .1	LIGHTLY DAMPED		.12 .3	LIGHTLY DAMPED	
HEAVY HOG ☆ ☆	9180	4600	200 (AFT)	ON	.28 .5	HEAVILY DAMPED	170	NF	NF	NF	NF	NF	NF
				OFF	.21 0	NEUTRAL DAMPED		NF	NF		NF	NF	

NOTE: ALL APPLICABLE NOTES ARE PRESENTED ON FIGURE 150.

FIGURE NO. 143

RIGHT DIRECTIONAL PULSE SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
55~KCAS	15400~FT	7620~LB.	201(AFT)~IN.	324~RPM	LEVEL FLT.

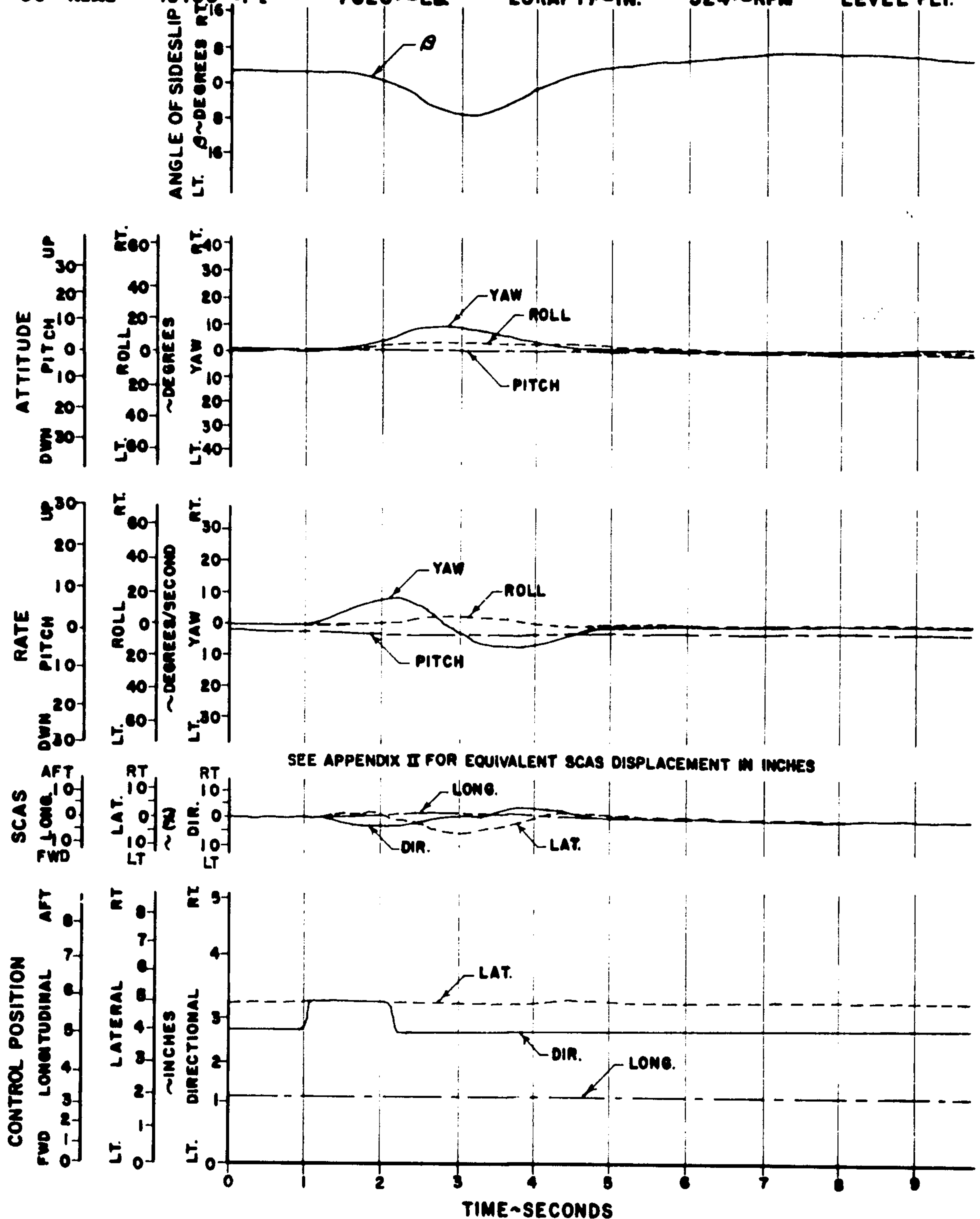


FIGURE NO. 144

RIGHT DIRECTIONAL PULSE SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
104 ~ KCAS	4600 ~ FT.	9180 ~ LB.	201(AFT) ~ IN.	324 ~ RPM	LEVEL FLT.

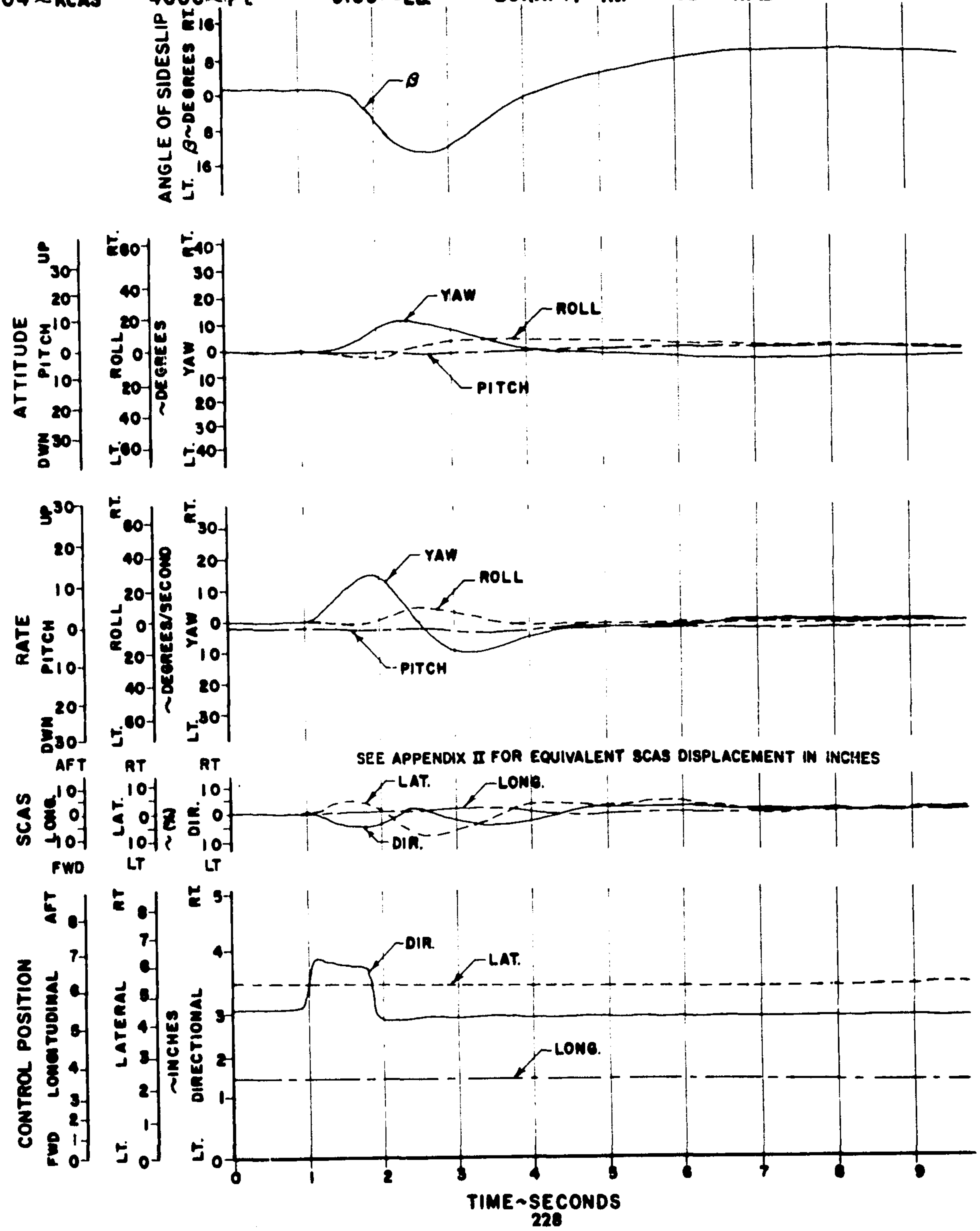


FIGURE NO. 145
LEFT DIRECTIONAL PULSE SCAS ON

AH-1G USA S/n 6715695
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
135~KCAS	4600~FT	9180~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

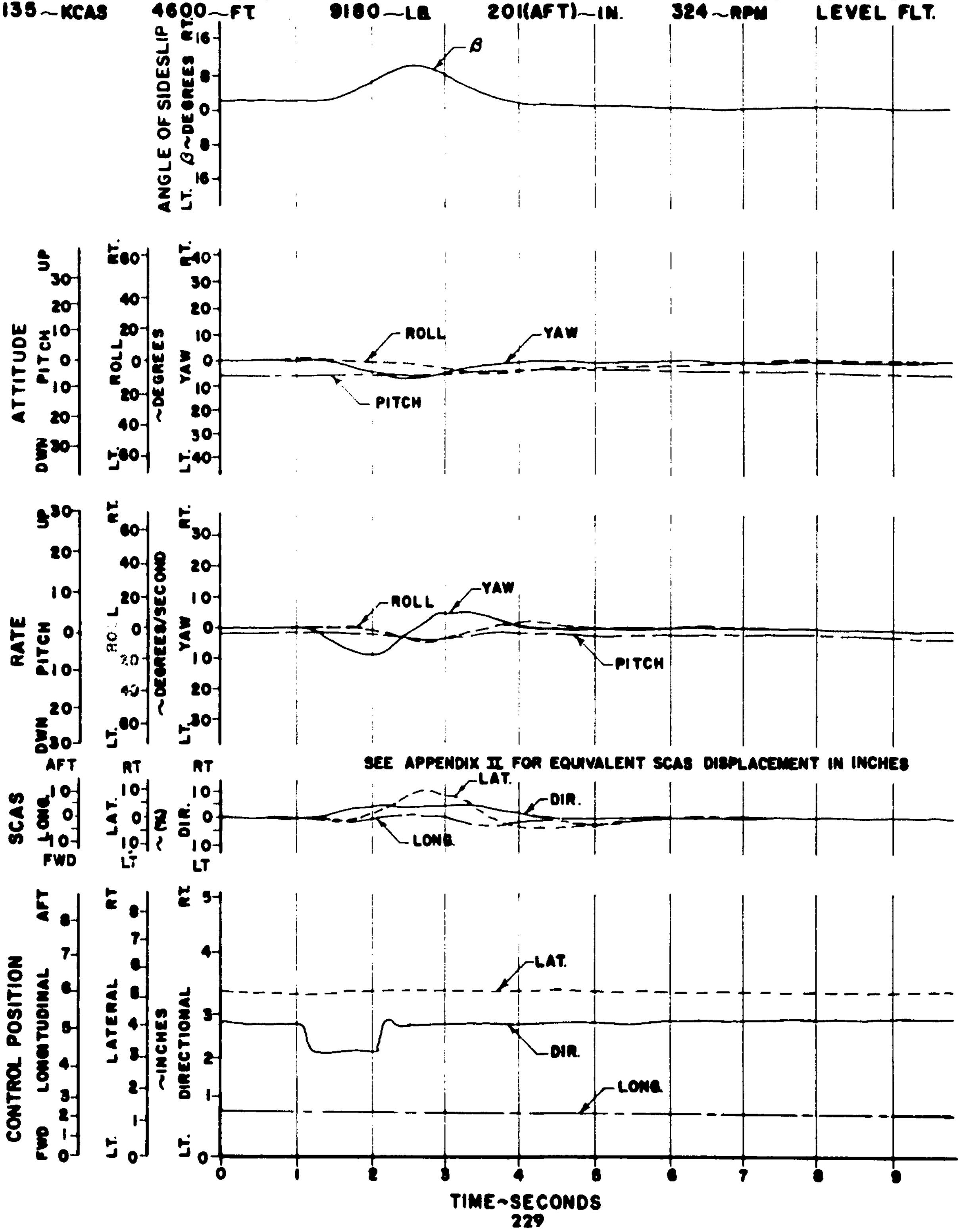


FIGURE NO. 146
LEFT DIRECTIONAL PULSE SCAS ON

AH-1G USA S/N 6715695
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
170~KCAS	4600~FT	9180~LB	200(AFT)~IN.	324~RPM	DIVE

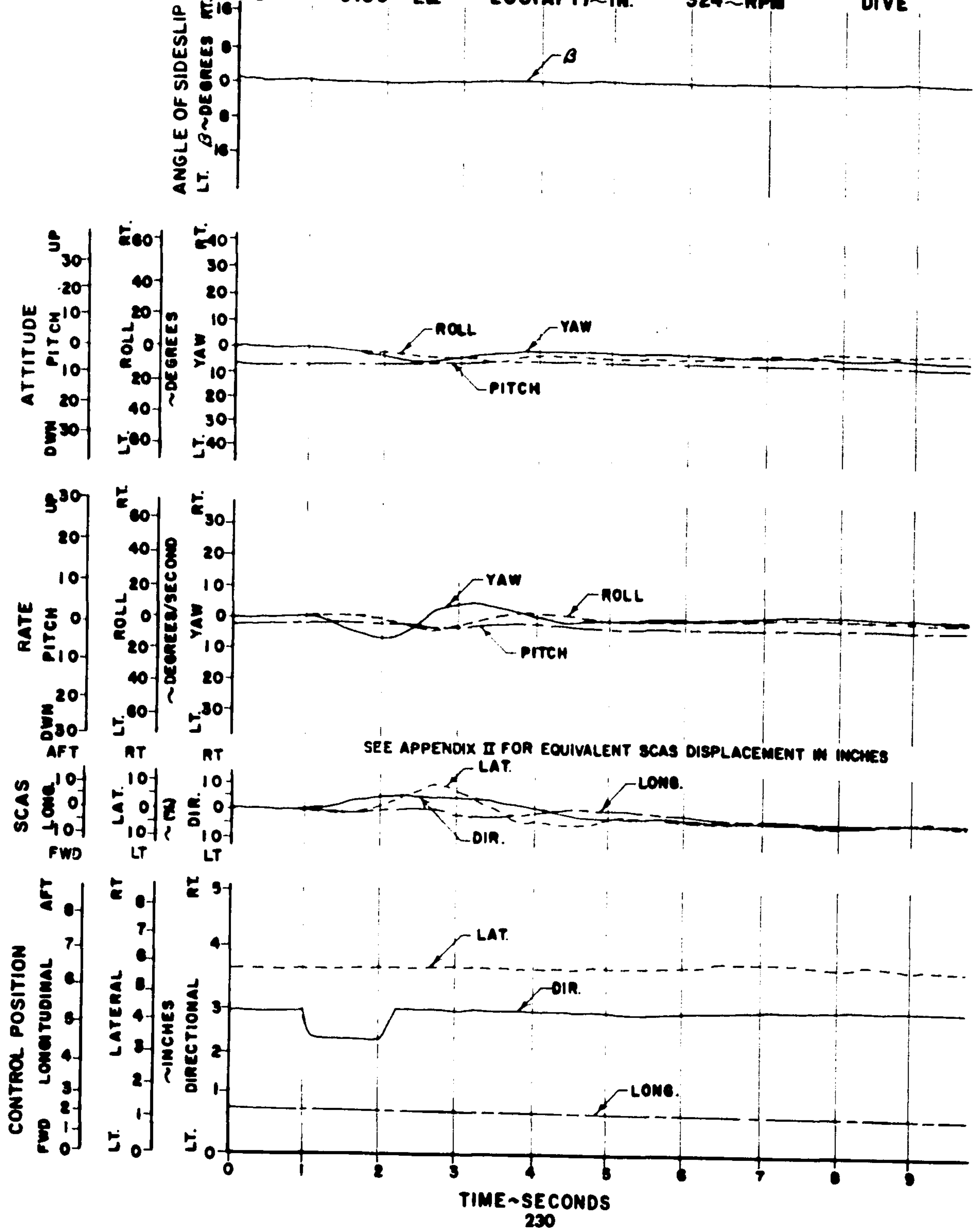


FIGURE NO. 147
LEFT DIRECTIONAL PULSE SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
68~KCAS	5000~FT	7490~LB	201(AFT)~IN.	324~RPM	AUTOROTATION

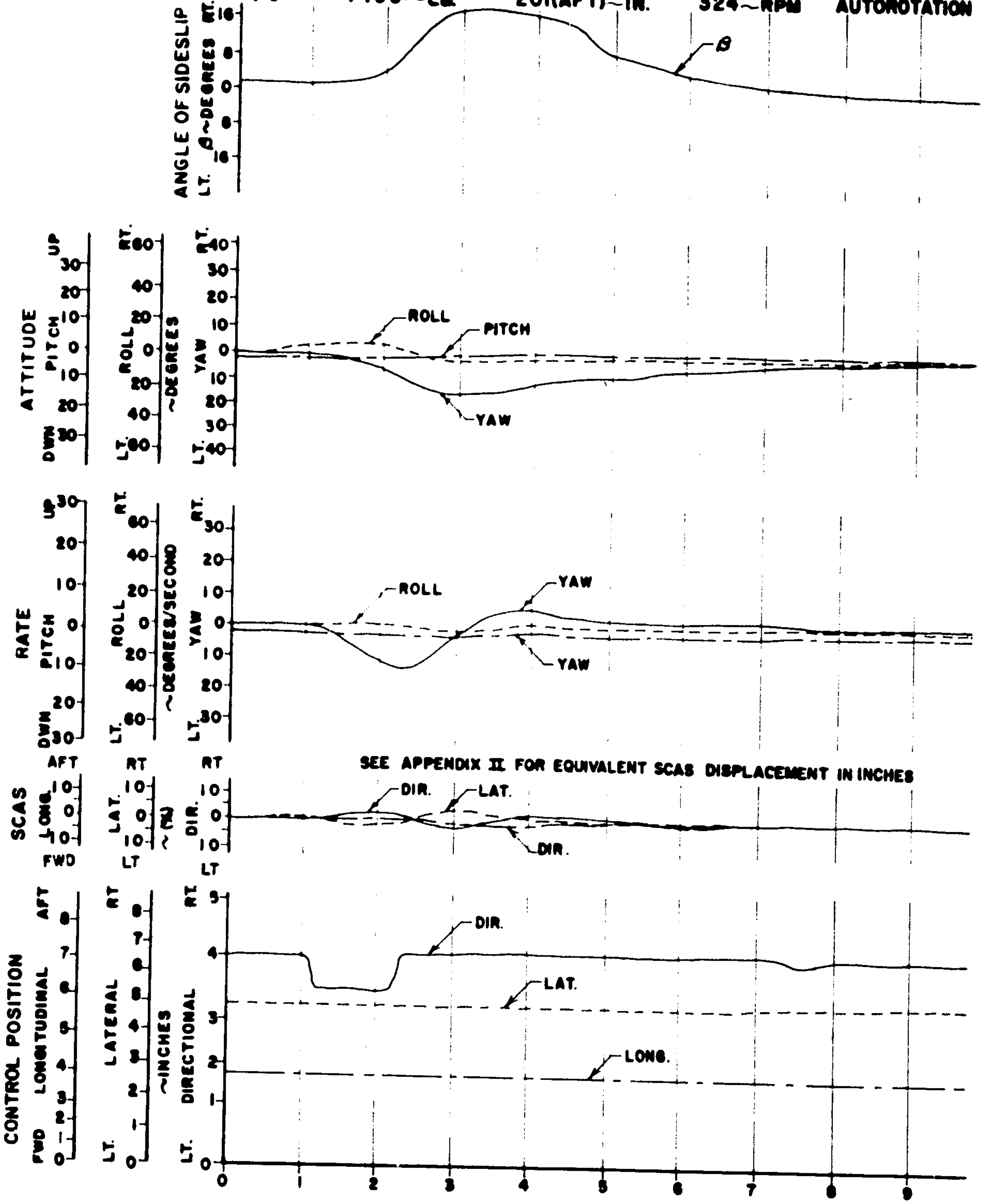
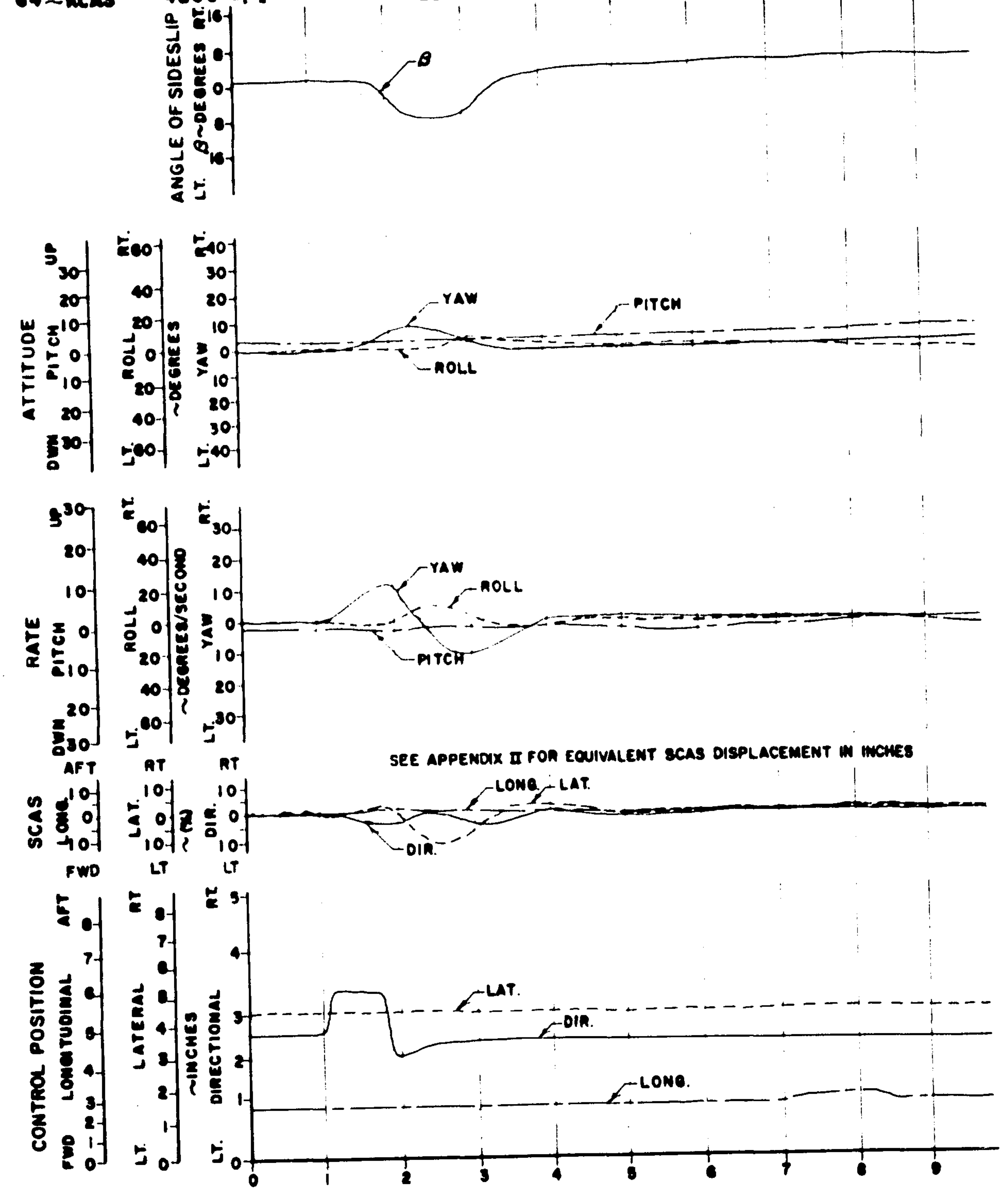


FIGURE NO. 148
RIGHT DIRECTIONAL PULSE SCAS ON

AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
64~KCAS	4200~FT.	7210~LB.	201(AFT)~IN.	324~RPM	CLIMB



SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

FIGURE NO. 149
RIGHT DIRECTIONAL PULSE SCAS OFF
AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE (Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
60~KCAS	4200~FT	7210~LB.	201(AFT)~IN.	324~RPM	CLIMB

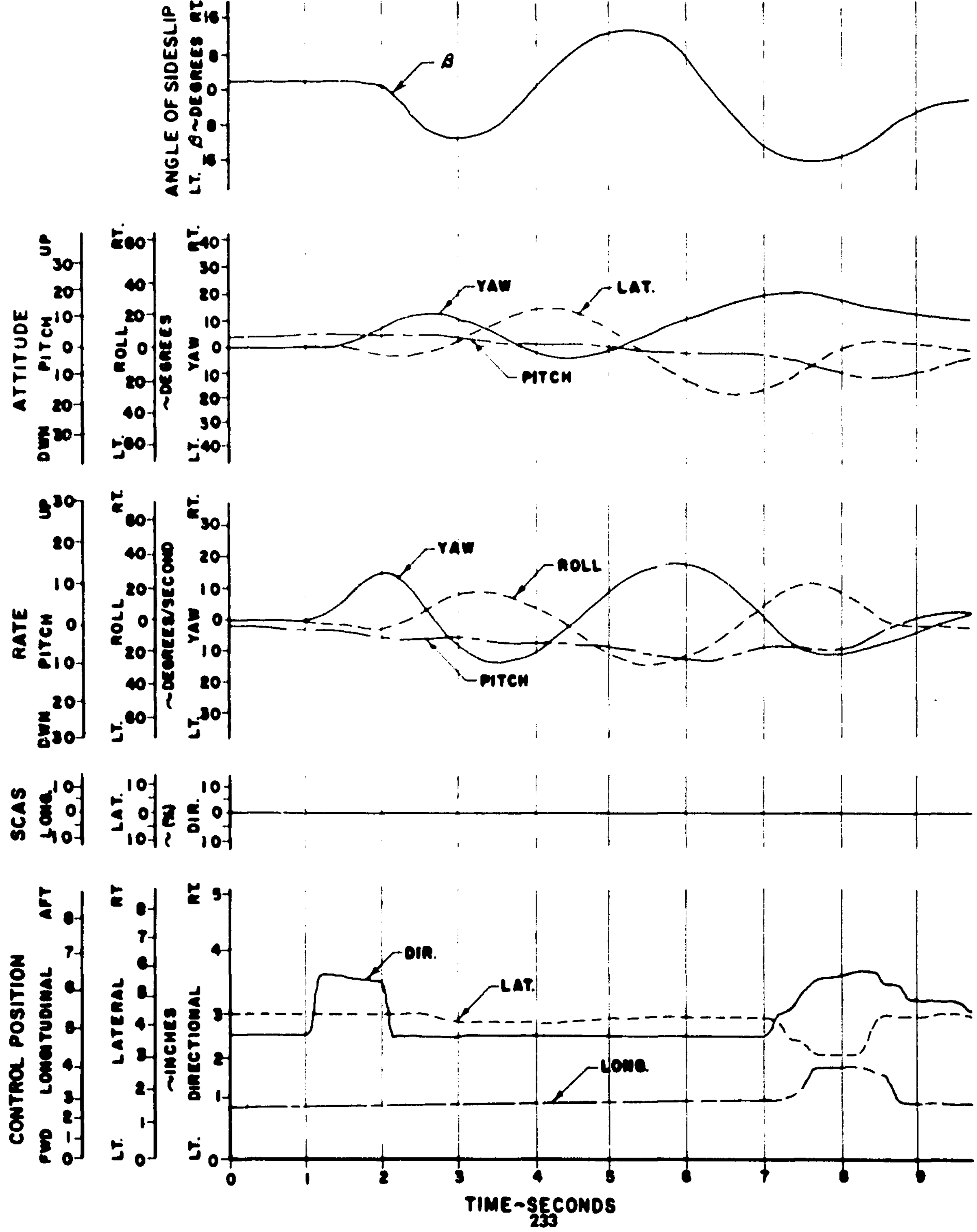


FIGURE NO. 150

LATERAL DIRECTIONAL DYNAMIC STABILITY

SKID TUBE FAIRING COMPARISON

LEFT AND RIGHT CONTROL PULSES

LATERAL

CONFIG	AVG GW - LB	AVG ALT - FT	AVG LONG CG - IN	SCAS	.8V_H (LEVEL FLT)			V_H (LEVEL FLT)			V_{LIMIT} (DIVE)			AH-1G USA S/N
					ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS	
CLEAN SKID FAIRINGS OFF	8630	3700	199.3 (AFT)	ON	.20 1.4	HEAVILY DAMPED	110	.31 1.6	HEAVILY DAMPED	143	NA NA	DEAD BEAT	165	615247
				OFF	NF	NF		.29 -.1	UNDAMPED		.29 -.1	UNDAMPED		
CLEAN	7300	4100	201 (AFT)	ON	.57 1.5	HEAVILY DAMPED	106	NA NA	DEAD BEAT	142	.44 1.5	HEAVILY DAMPED	180	715695
				OFF	.19 6	HEAVILY DAMPED		.25 .1	LIGHTLY DAMPED		.29 .1	LIGHTLY DAMPED		

DIRECTIONAL

CONFIG	AVG GW - LB	AVG ALT - FT	AVG LONG CG - IN	SCAS	.8V_H (LEVEL FLT)			V_H (LEVEL FLT)			V_{LIMIT} (DIVE)			AH-1G USA S/N
					ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS	ω_d ζ	DESCRIP	AIRSPEED - CAS	
CLEAN SKID TUBE FAIRINGS OFF	8650	3700	199.3 (AFT)	ON	NA NA	HEAVILY DAMPED	115	.29 .5	HEAVILY DAMPED	143	.41 .5	HEAVILY DAMPED	165	615247
				OFF	.23 -.1	UNDAMPED		.25 -.2	UNDAMPED		NF	NF		
CLEAN	7210	4200	201 (AFT)	ON	NA NA	DEAD BEAT	107	.29 6	HEAVILY DAMPED	138	.21 .9	HEAVILY DAMPED	180	715695
				OFF	.27 .2	LIGHTLY DAMPED		.27 0	NEUTRAL DAMPED		.27 0	NEUTRAL DAMPED		

NOTES:
1. ◇ DENOTES WITHOUT ROCKETS
2. ◇◇ DENOTES WITH ROCKETS.
3. ω_d IS THE DAMPED NATURAL FREQUENCY IN CYCLES PER SECOND.
4. ζ DAMPING RATIO.
5. DESCRIPTION DENOTES DEGREE OF DAMPING BASED ON THE FOLLOWING DEFINITIONS.
    - a. DEAD BEAT ($\zeta > 1.8$)
    - b. HEAVILY DAMPED (ζ = .5 to 1.8)
    - c. LIGHTLY DAMPED (ζ = .1 to .4)
    - d. NEUTRALLY DAMPED ($\zeta = 0$)
    - e. UNDAMPED ($\zeta<0$)
6. "N A " DENOTES THAT ω_d and ζ ARE NOT AVAILABLE.
7. "NF" DENOTES THAT THE CONDITION WAS NOT FLOWN.
8. ALL ABOVE NOTES ARE APPLICABLE FOR FIGURE 126, 134, AND 142.

FIGURE NO. 151

SUMMARY LATERAL-DIRECTIONAL DYNAMIC STABILITY

AH-1G USA S/N 715695

SCAS ON

NOTES: 1. ALL CONDITIONS TESTED ON S/N 715695 FALL WITHIN SOLID LINE

2. □ DENOTES CONDITIONS TESTED ON S/N 615247 WITH SKID TUBE FAIRINGS REMOVED

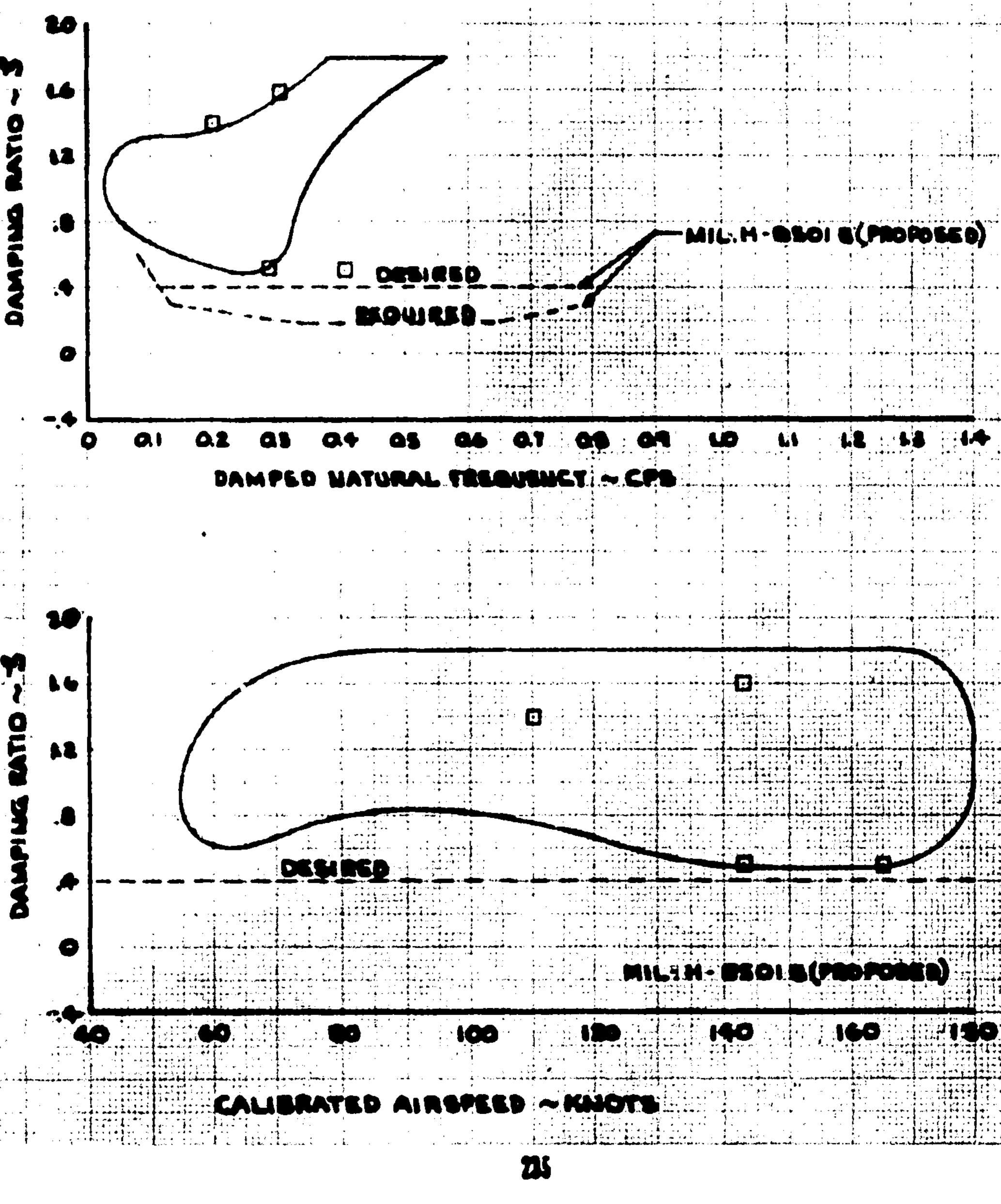


FIGURE NO. 152

SUMMARY LATERAL-DIRECTIONAL DYNAMIC STABILITY

AH-1G USA S/N 715695

SCAS OFF

NOTES: 1. ALL CONDITIONS TESTED ON S/N 715695 FALL WITHIN SOLID LINE

2. □ DENOTES CONDITIONS TESTED ON S/N 615247 WITH SKID TUBE FAIRINGS REMOVED

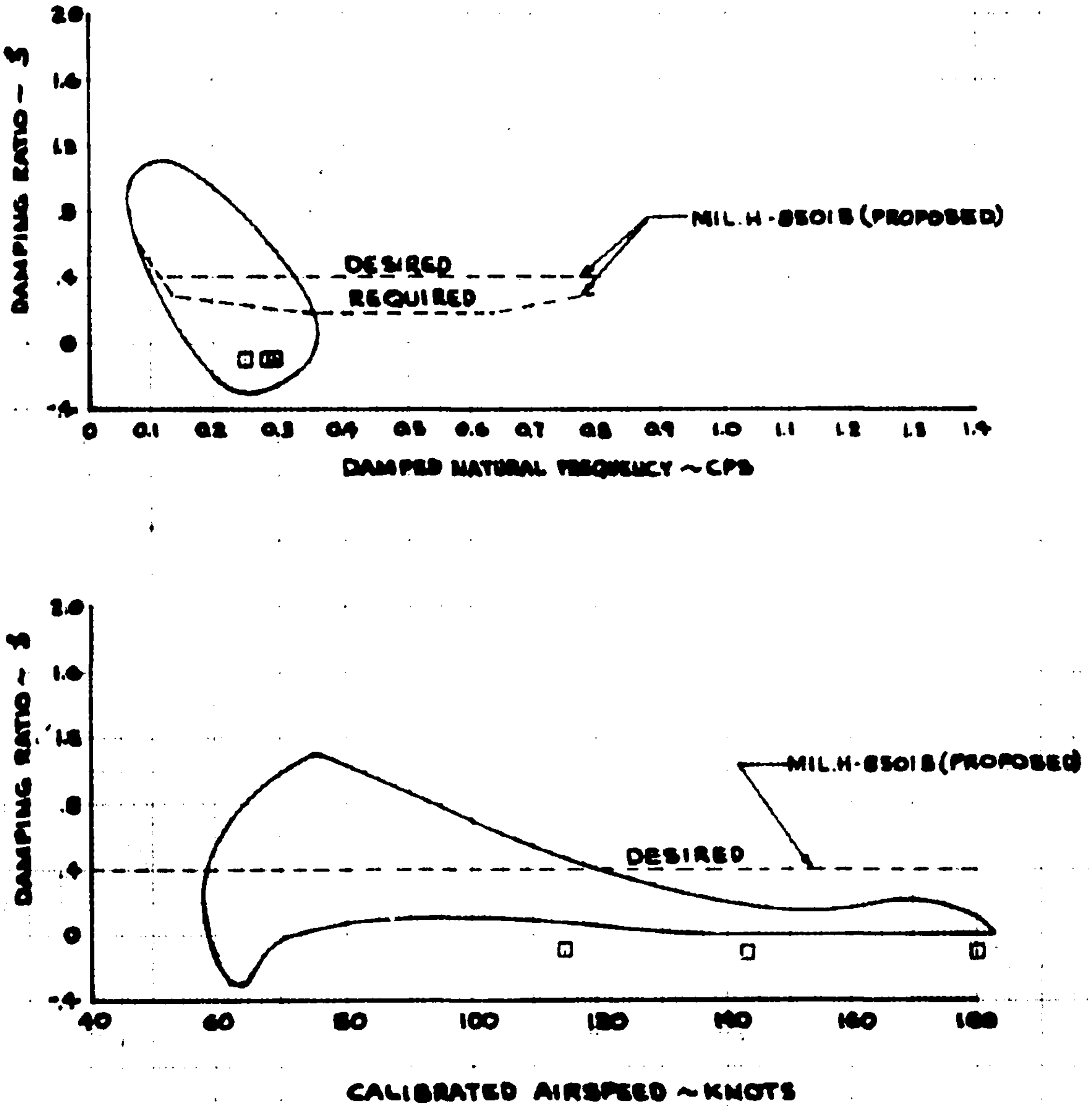
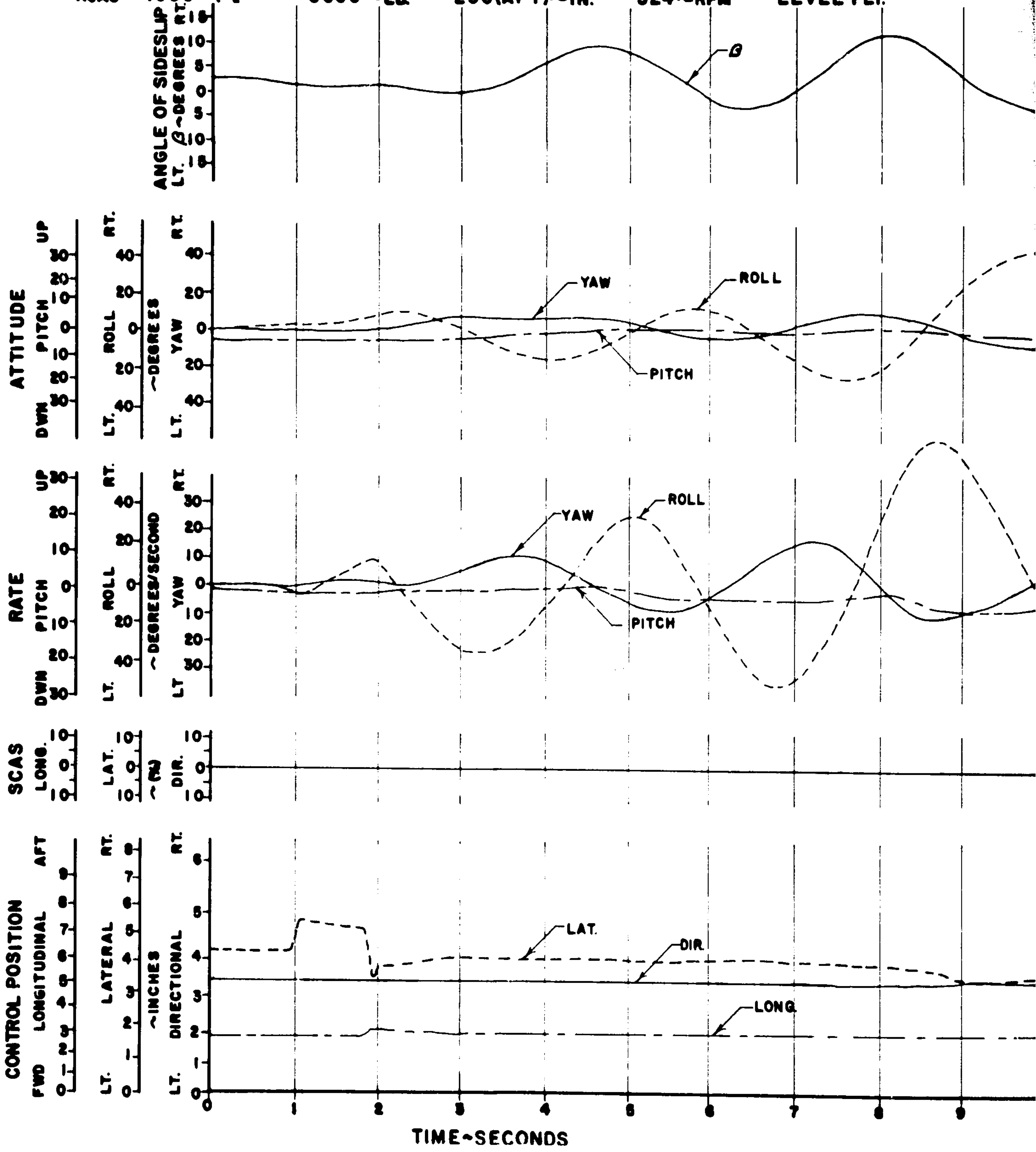


FIGURE NO. 153
RIGHT LATERAL PULSE SCAS OFF

AH-1G USA S/N 66-15247

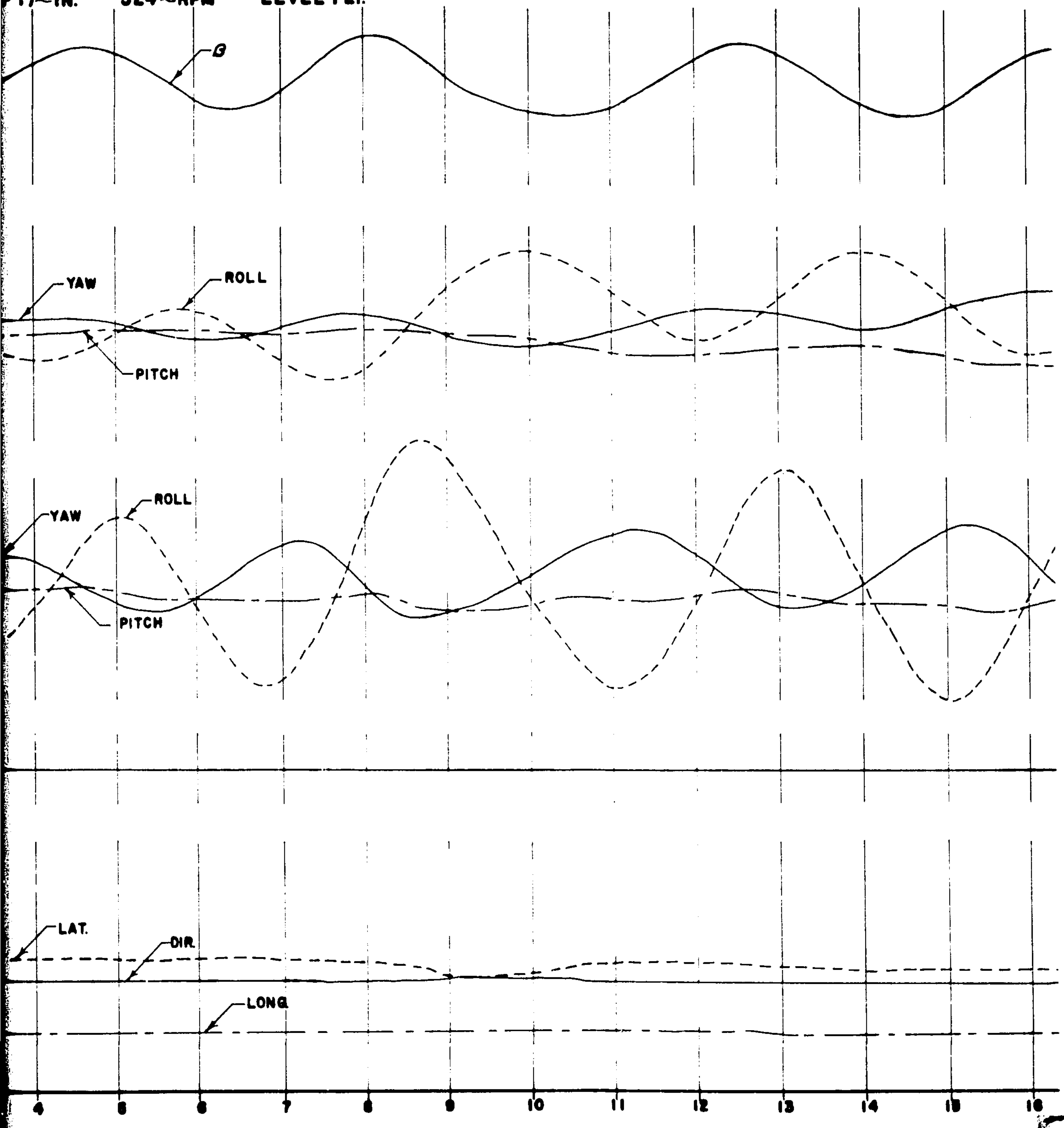
CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

AIRSPEED	ALTITUDE (Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
142~KCAS	4000~FT	8660~LB	200(AFT)~IN.	324~RPM	LEVEL FLT.



1

O. 153
LSE SCAS OFF
15247
AR CROSS TUBE FAIRINGS REMOVED
B. C.G. ROTOR SPEED FLT. CONDITION
FT)—IN. 324~RPM LEVEL FLT.



ONDS

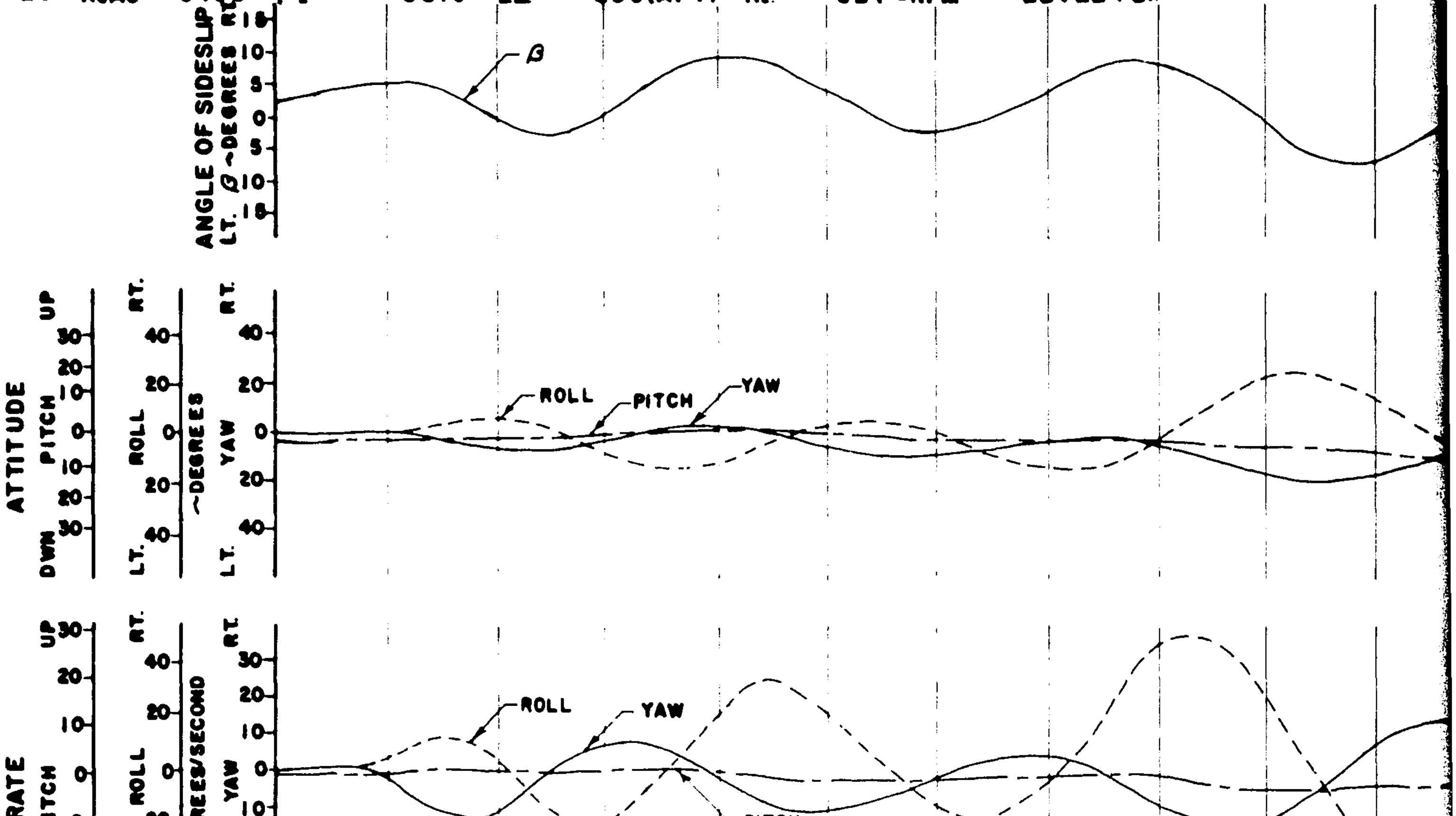
2

FIGURE NO. 154
LEFT DIRECTIONAL PULSE SCAS OFF

AH-1G USA S/N 6615247

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
120~KCAS	3400~FT	8810~LB	200(AFT)~IN.	324~RPM	LEVEL FLT.



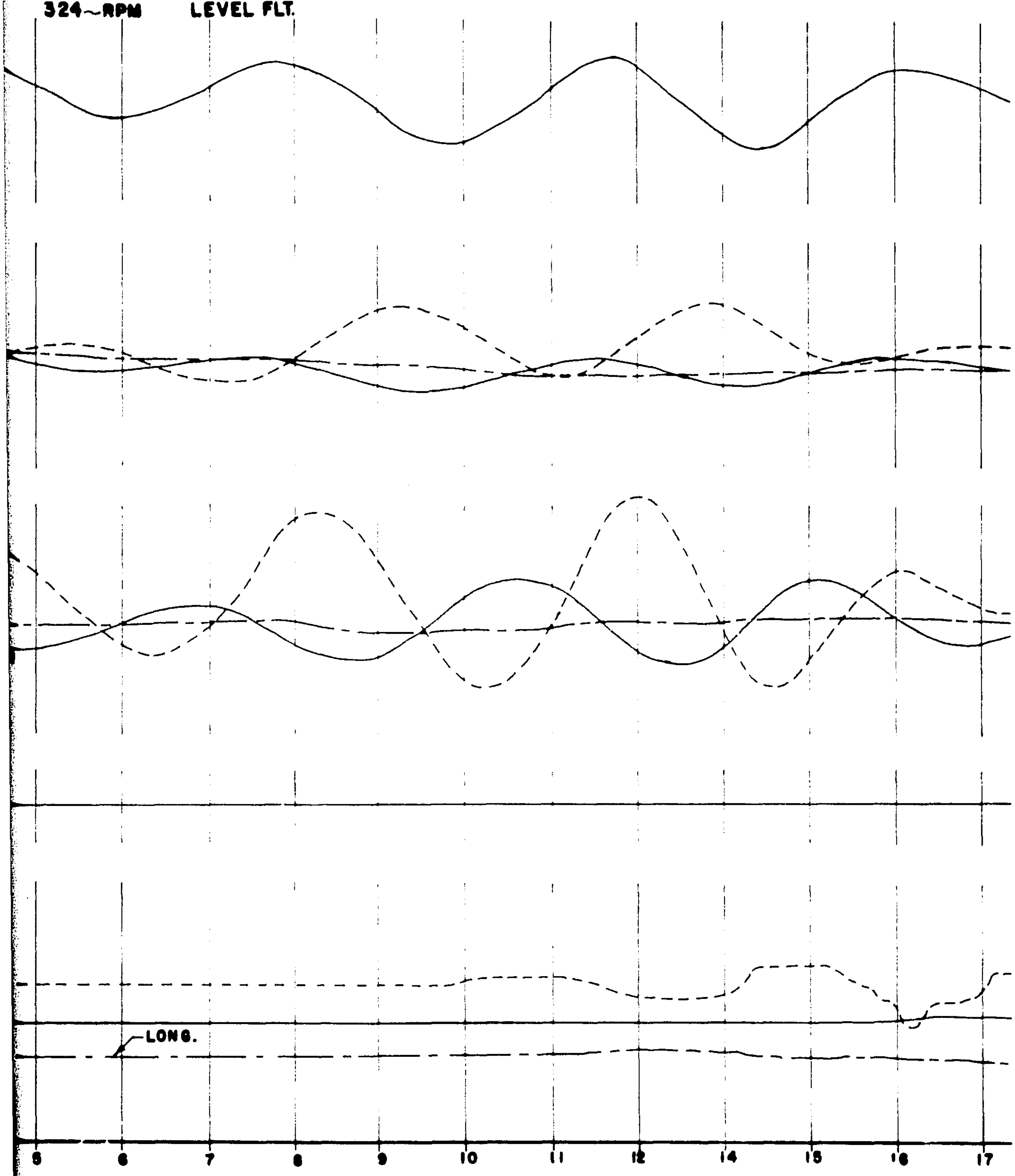
1

SCAS OFF

TUBE FAIRINGS REMOVED

ROTOR SPEED
324~RPM

FLT. CONDITION
LEVEL FLT.



2

FIGURE NO. 155

LONGITUDINAL RESPONSE CHARACTERISTICS

AH-1G USA S/N 71-15696

SYM	AIRSPEED ~ CAS	AVG. ALT. Hp ~ FT	AVG. GWT. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	CONFIG.	THRUST COEFF. ~ CT
□	111	3500	7800	201.0 (AFT)	3240	LEV. FLT.	CLEAN	0.004020
○	146	4600	7760	201.0 (AFT)	3240	LEV. FLT.	CLEAN	0.004449
◇	110	5000	7480	200.8 (AFT)	3240	LEV. FLT.	HOG	0.004310
▷	152	4000	7800	200.4 (AFT)	3240	LEV. FLT.	HOG	0.004361
▽	172	3500	8040	200.9 (AFT)	3240	DIVE	HOG	0.004428
⬡	108	4000	9350	200.1 (AFT)	3240	LEV. FLT.	HOG	0.005288
△	133	5060	9180	200.2 (AFT)	3240	LEV. FLT.	HOG	0.005880
☆	108	4000	7690	191.8 (FWD)	3240	LEV. FLT.	CLEAN	0.004299
◇	139	3500	7470	191.0 (FWD)	324.0	LEV. FLT.	CLEAN	0.004104
△	172	4000	7480	191.0 (FWD)	3240	DIVE	CLEAN	0.004154

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

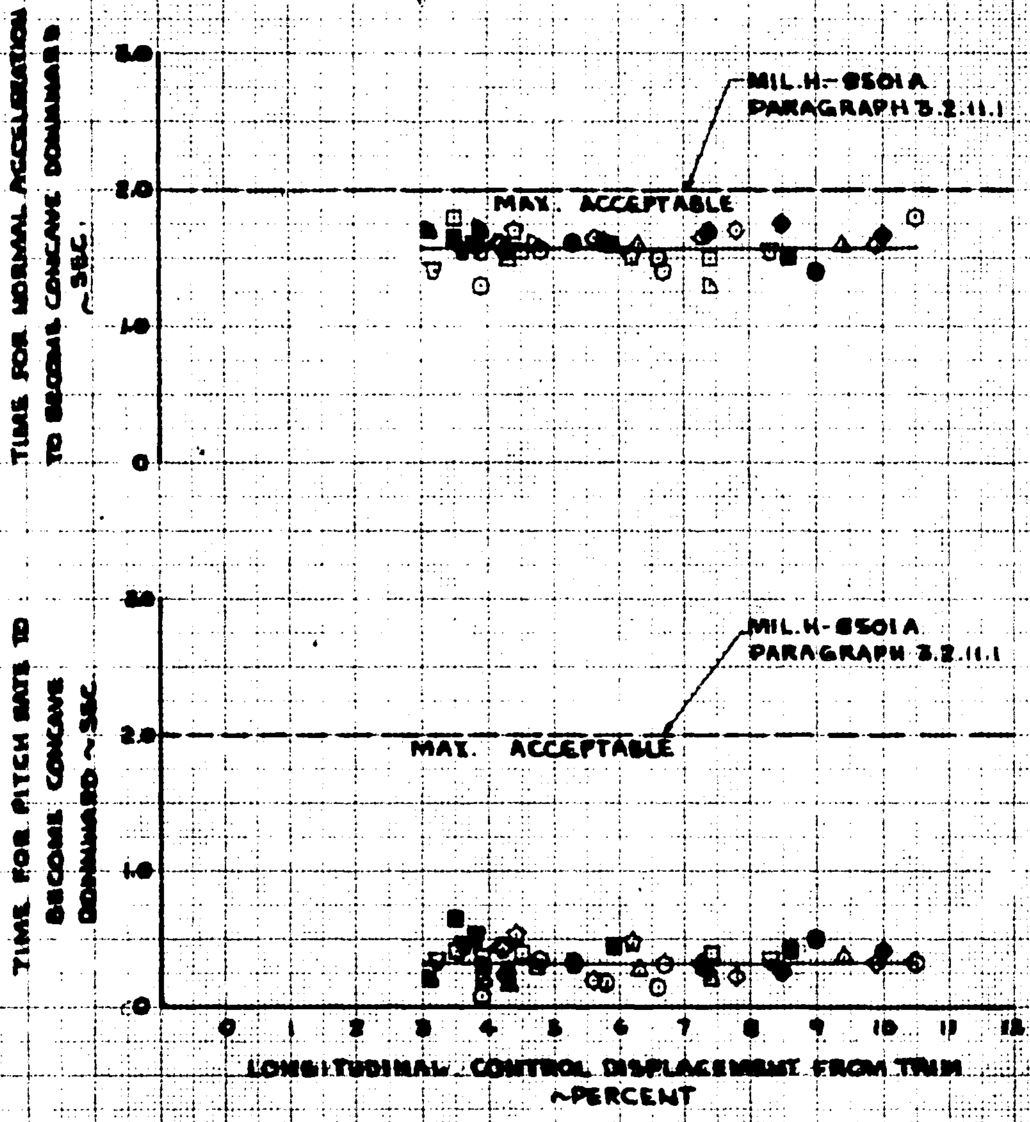


FIGURE NO. 156

LONGITUDINAL CONTROLLABILITY SUMMARY

AH-1G USA S/N 715695

GROSS WEIGHT COMPARISON

SYM	AVG. ALTITUDE H_p ~FT.	AVG. GROSS WEIGHT ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~C_T	PODS LOADING
○	5060	7910	199.6 (AFT)	324	HVY. HOG	0.004666	PODS EMPTY
□	5470	9490	200.0 (AFT)	324	HVY. HOG	0.005550	PODS LOADED (1654 LB. TOTAL)

NOTES:
1. OPEN SYMBOLS DENOTE FORWARD INPUT
2. SOLID SYMBOLS DENOTE AFT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~300→330 RPM
8. POINTS DERIVED FROM FIGURES 180 THROUGH 187, APPENDIX VII

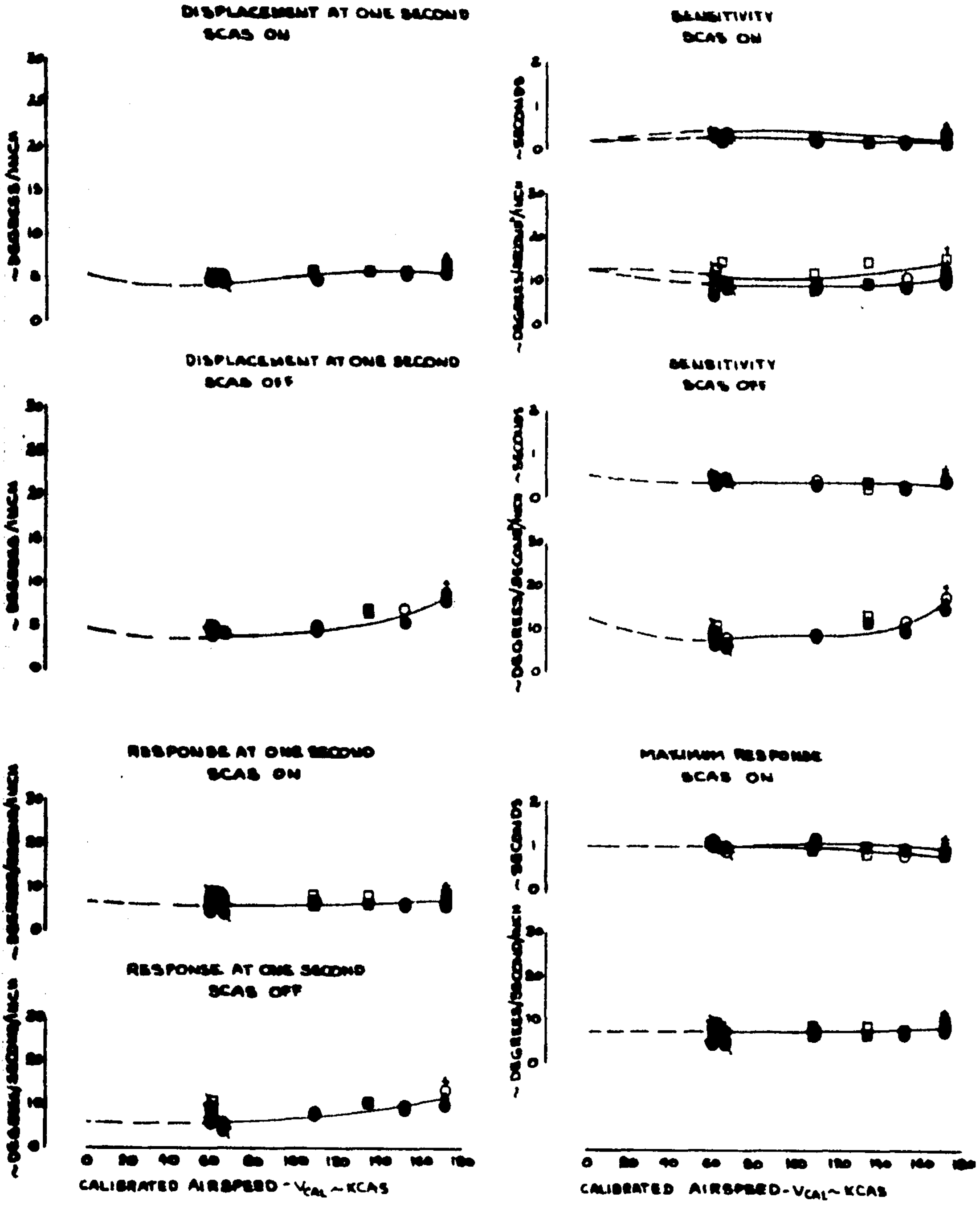


FIGURE No. 157
LONGITUDINAL CONTROLLABILITY SUMMARY
AH-1G USA S/N 715685
CONFIGURATION COMPARISON

SYM	AVG. ALTITUDE H_D ~ FT.	AVG. GROSS WEIGHT ~ LB	AVG. LONG. C.G ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~C_T	PODS LOADING
○	5060	7910	199.6(AFT)	324	HVY. HOG	0.004566	PODS EMPTY
⊖	5440	7780	201.2(AFT)	324	CLEAN	0.004543	NO PODS

NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
2. SOLID SYMBOLS DENOTE AFT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTES AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 330 RPM
8. POINTS DERIVED FROM FIGURES 172 THROUGH 175, AND 180 THROUGH 185, APPENDIX VII

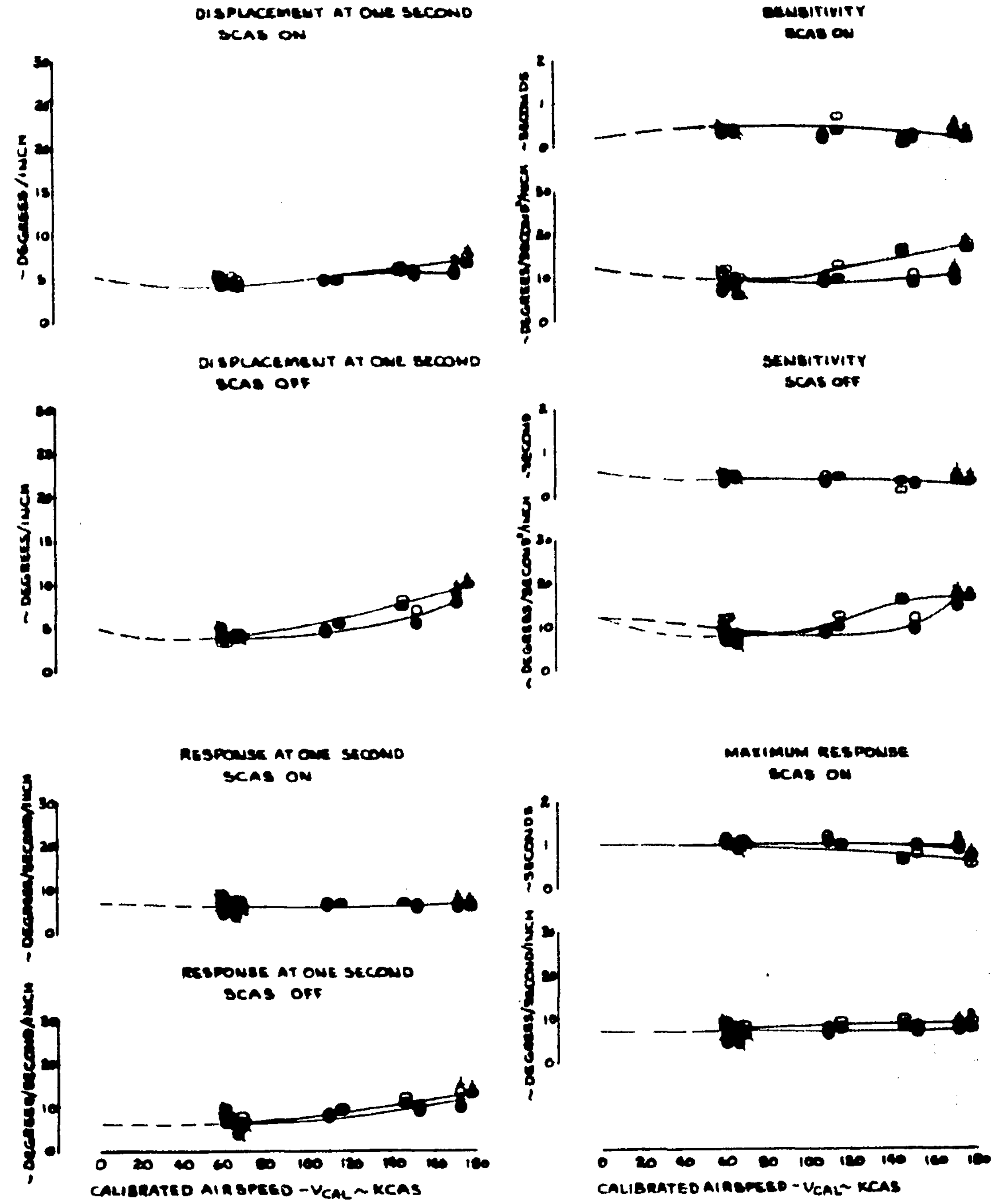


FIGURE NO. 158

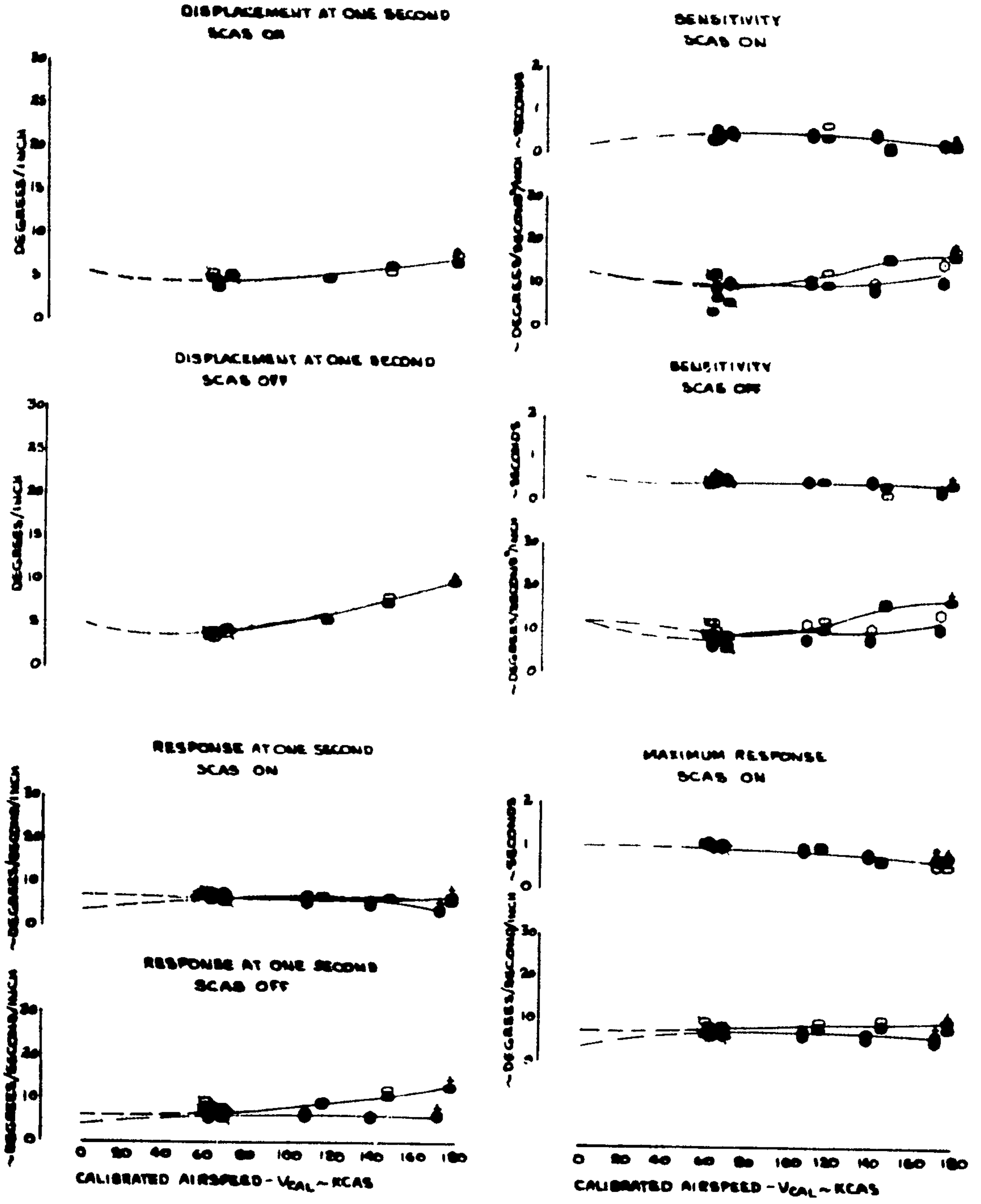
LONGITUDINAL CONTROLLABILITY SUMMARY

AH-1G USA S/N 715695

CENTER OF GRAVITY COMPARISON

SYM	AVG. ALTITUDE H_p ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C_T	PODS LOADING
○	6200	7610	190.5 (FWD)	3240	CLEAN	0.004548	NO PODS
●	5440	7780	201.2 (AFT)	324.0	CLEAN	0.004545	NO PODS

NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
2. SOLID SYMBOLS DENOTE AFT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 330 RPM
8. POINTS DERIVED FROM FIGURES 169 THROUGH 175, APPENDIX VII



DISPLACEMENT AT ONE SECOND
SCAS ON

SENSITIVITY
SCAS ON

DISPLACEMENT AT ONE SECOND
SCAS OFF

SENSITIVITY
SCAS OFF

RESPONSE AT ONE SECOND
SCAS ON

MAXIMUM RESPONSE
SCAS ON

RESPONSE AT ONE SECOND
SCAS OFF

FIGURE No. 159
LONGITUDINAL CONTROLLABILITY SUMMARY
AH-1G USA 66715646
ALTITUDE COMPARISON

SYM	AVG. ALTITUDE H_p ~ FT	AVG. GROSS WEIGHT ~ LBS	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C_T	PODS LOADING
○	5060	7910	199.6 (AFT)	3240	HVY. HOG	0.004556	PODS EMPTY
▲	15530	7840	200.9 (AFT)	3240	HVY. HOG	0.006896	PODS EMPTY

NOTES:
1. OPEN SYMBOLS DENOTE FORWARD INPUT
2. SOLID SYMBOLS DENOTE AFT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 330 RPM
8. POINTS DERIVED FROM FIGURES 180 THROUGH 183, AND 188 THROUGH 191, APPENDIX VII

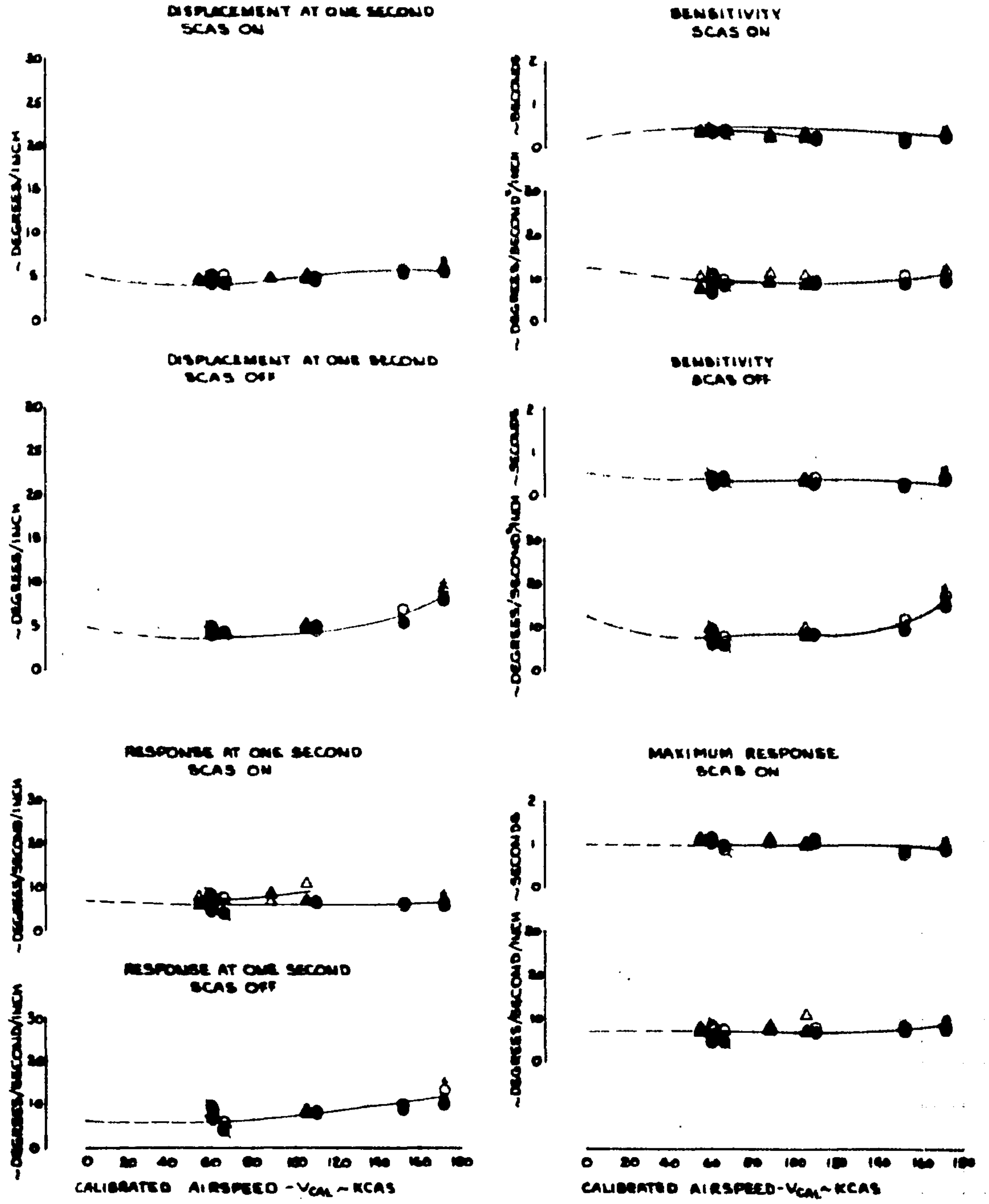


FIGURE No. 160

LATERAL CONTROLLABILITY SUMMARY

AH-1G USA S/N 715695

GROSS WEIGHT COMPARISON

SYM.	AVG. ALTITUDE H_p ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~C_T	POD LOADING
○	5290	7800	200.2(AFT)	324.0	HVY HOG	0.004530	PODS EMPTY
□	5270	9390	200.2(AFT)	324.0	HVY. HOG	0.005953	PODS LOADED

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 + 360 RPM
8. POINTS DERIVED FROM FIGURES 212 THROUGH 218, APPENDIX VII

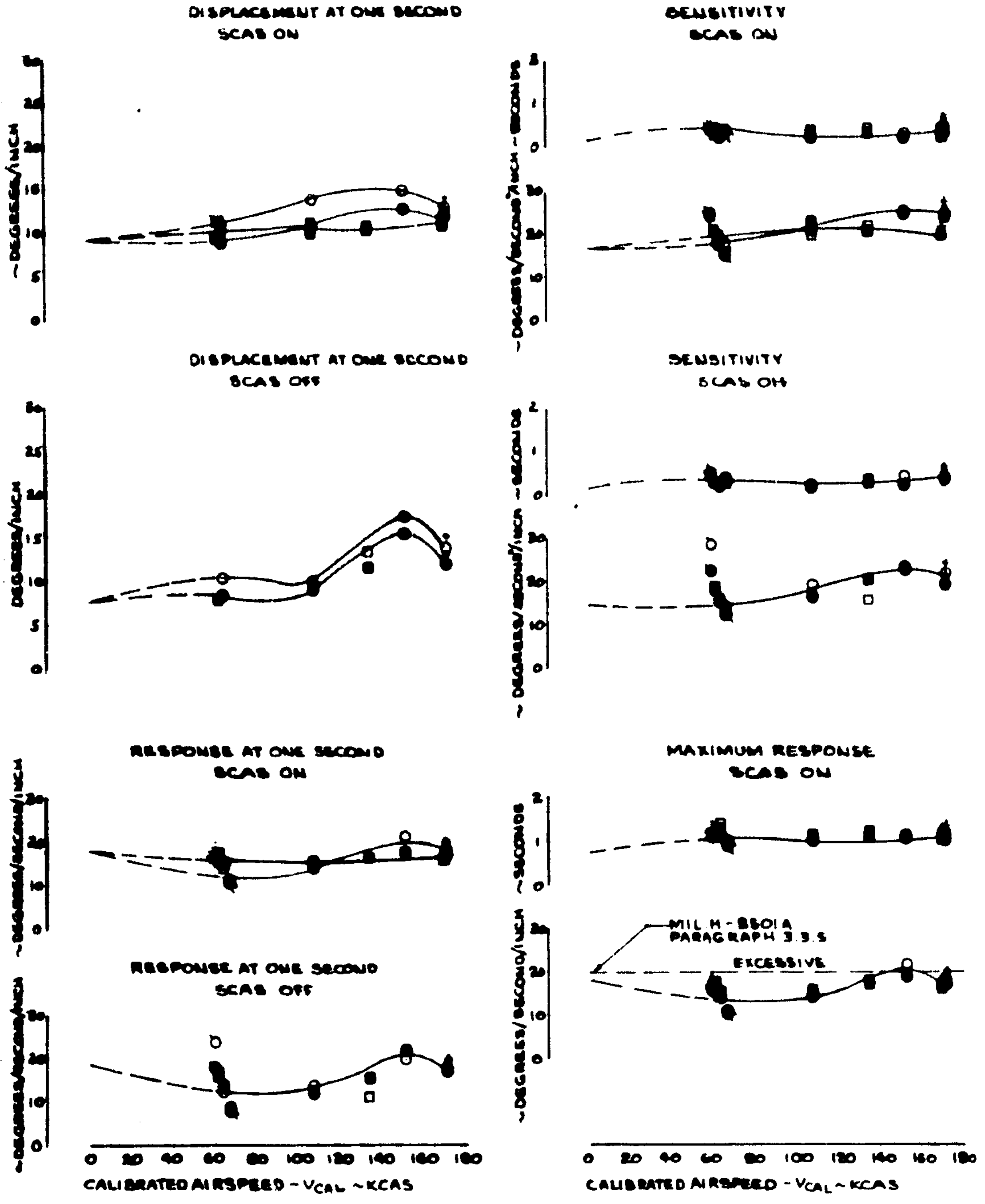


FIGURE No. 161

LATERAL CONTROLLABILITY SUMMARY

AH-1G USA [illegible]

POD LOADING COMPARISON

SYM	AVG. ALTITUDE Hp ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C_T	PODS LOADING
▼	4030	8850	195.8 (MID)	324.0	HVY. HOG	0.004991	PODS LOADED([illegible])
◆	5180	8580	195.1 (MID)	325.0	HVY. HOG	0.004961	PODS EMPTY

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~300→330 RPM
8. POINTS DERIVED FROM FIGURES 204 THROUGH 211, APPENDIX III

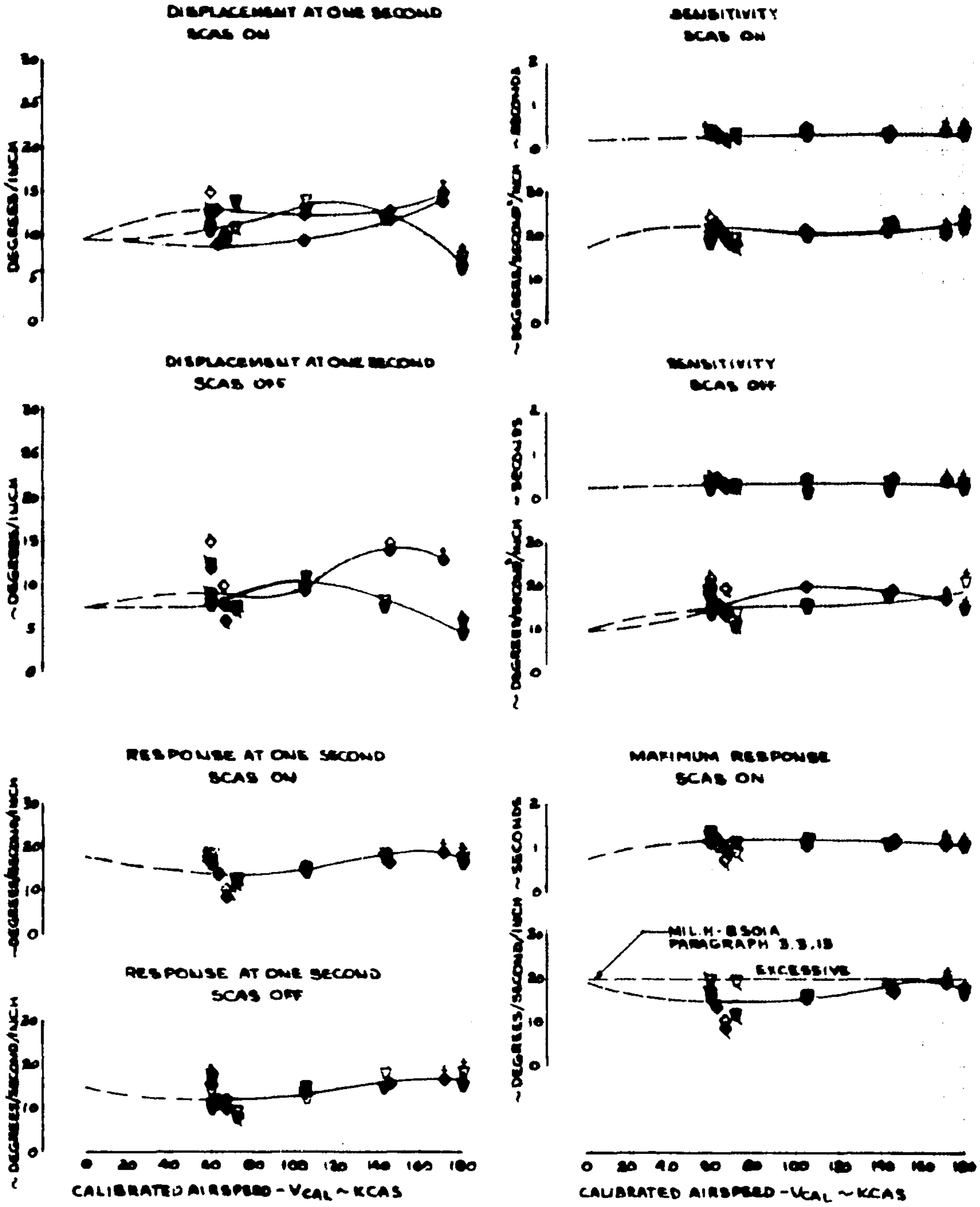


FIGURE NO 162
LATERAL CONTROLLABILITY SUMMARY
AH-1G USA S/N 715698
CONFIGURATION COMPARISON

SYM.	AVG. ALTITUDE H_p ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG C.G. ~ IN.	ROTOR RPM	CONFIG	THRUST COEFF. ~ C_T	PODS LOADING
○	5290	7800	200.2 (AFT)	324.0	HVY HOG	0.004554	PODS EMPTY
●	4270	7590	201.2 (AFT)	324.0	CLEAN	0.004281	NO PODS

NOTES:
1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 380 RPM
8. POINTS DERIVED FROM FIGURES 192 THROUGH 195 AND 216 THROUGH 218, APPENDIX VII

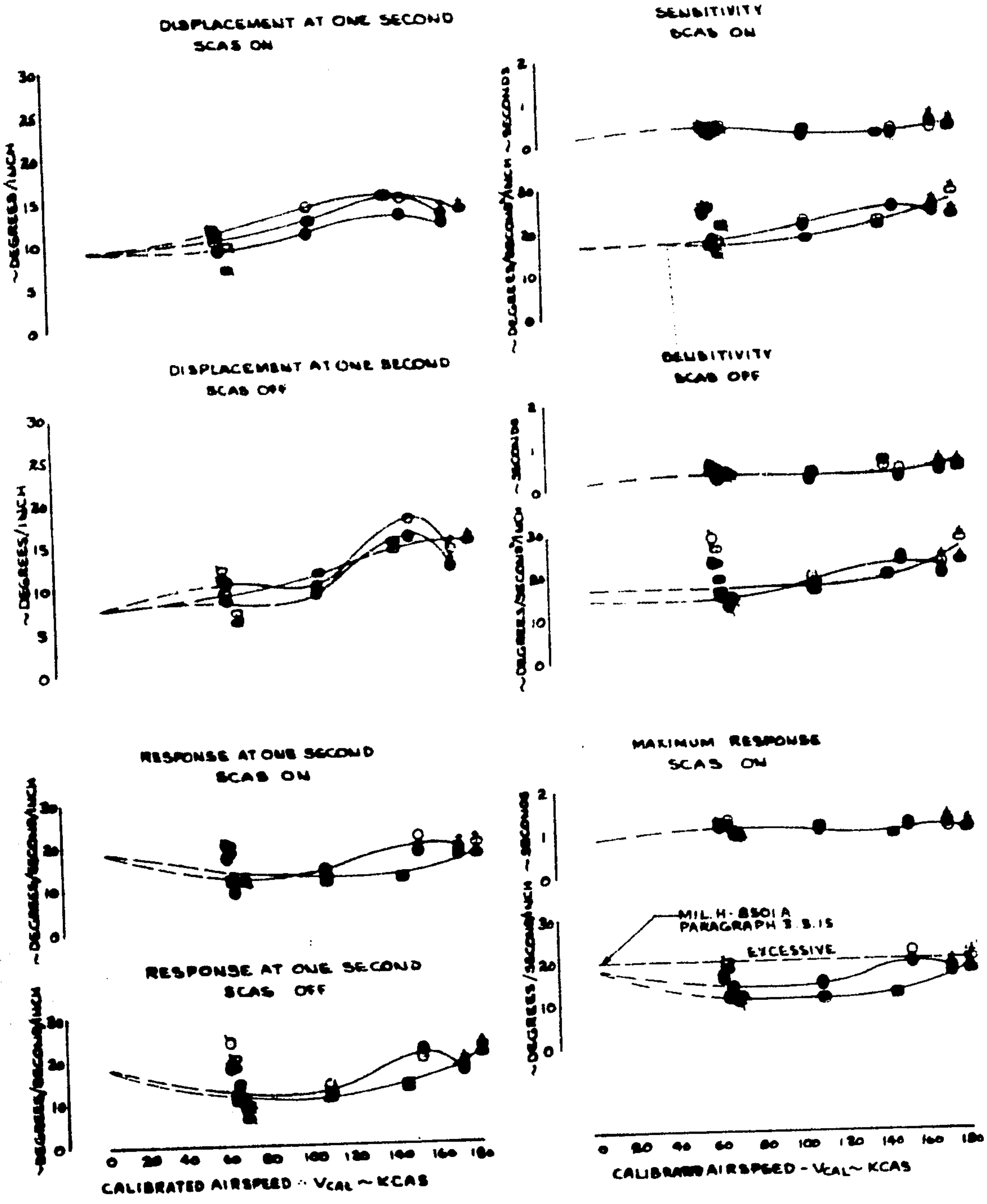


FIGURE NO. 163
LATERAL CONTROLLABILITY SUMMARY
AH-1G USA S/N 715695
ALTITUDE COMPARISON

SYM	AVG. ALTITUDE H_D ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C_T	PODS LOADING
○	5290	7800	200.2	324.0	HVY. HOG	0.004534	PODS EMPTY
△	16160	7780	200.9	324.0	HVY. HOG	0.006336	PODS EMPTY

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATION ROTOR SPEED RANGE ~ 300 → 330 RPM
8. POINTS DERIVED FROM FIGURES 216 THROUGH 222, APPENDIX VII

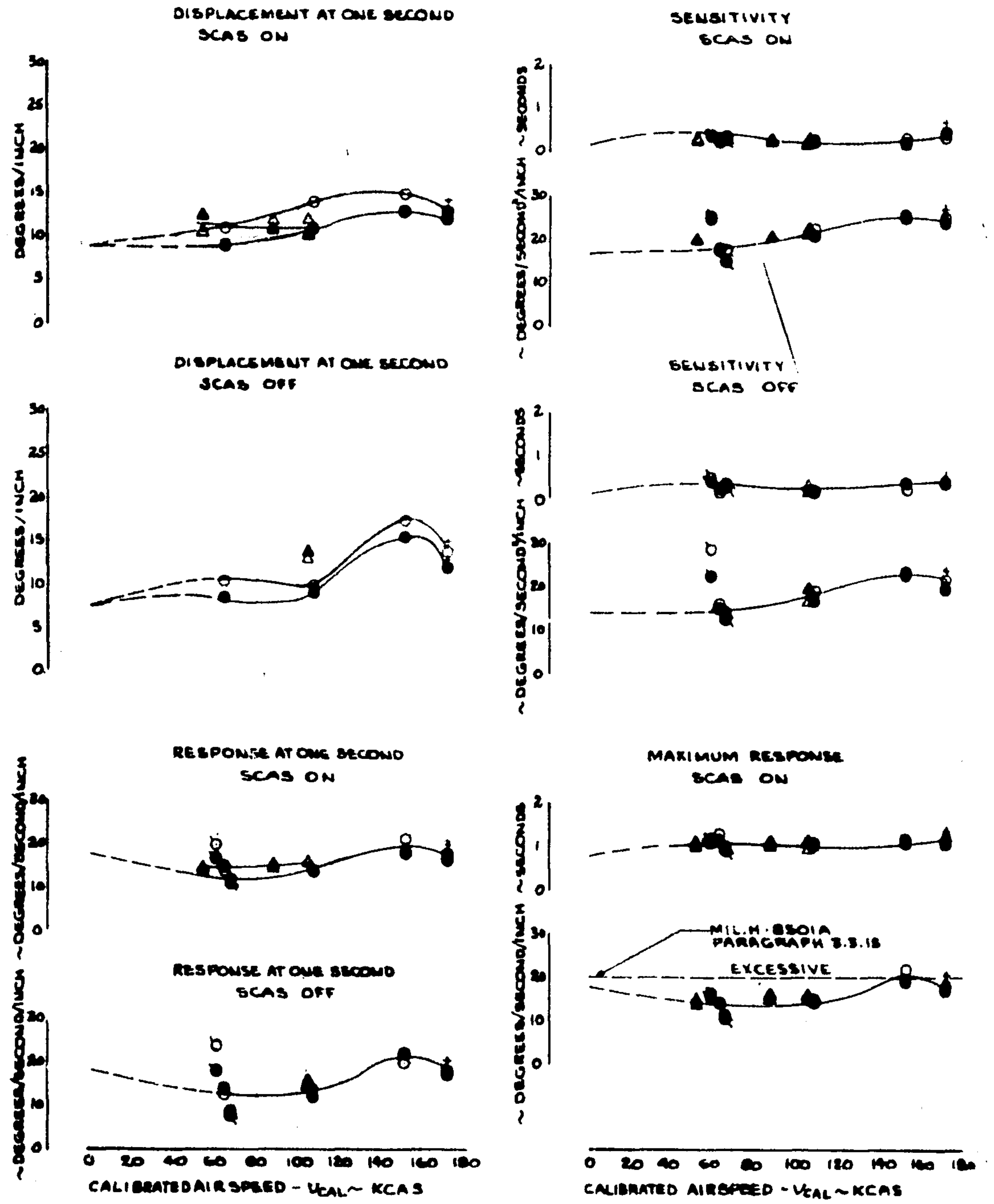


FIGURE No 164

LATERAL CONTROLLABILITY SUMMARY

AH-1G

SYM.	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	THRUST COEFF. ~C_T	CONFIGURATION	S/N
○	4270	7590	201.2(AFT)	324.0	0.004218	CLEAN	715695
◇	4070	7540	199.5(AFT)	323.0	0.004138	CLEAN(LANDING GEAR CROSS TUBE FAIRINGS REMOVED)	615267

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300→330 RPM
8. POINTS DERIVED FROM FIGURES 192 THROUGH 199, APPENDIX VII

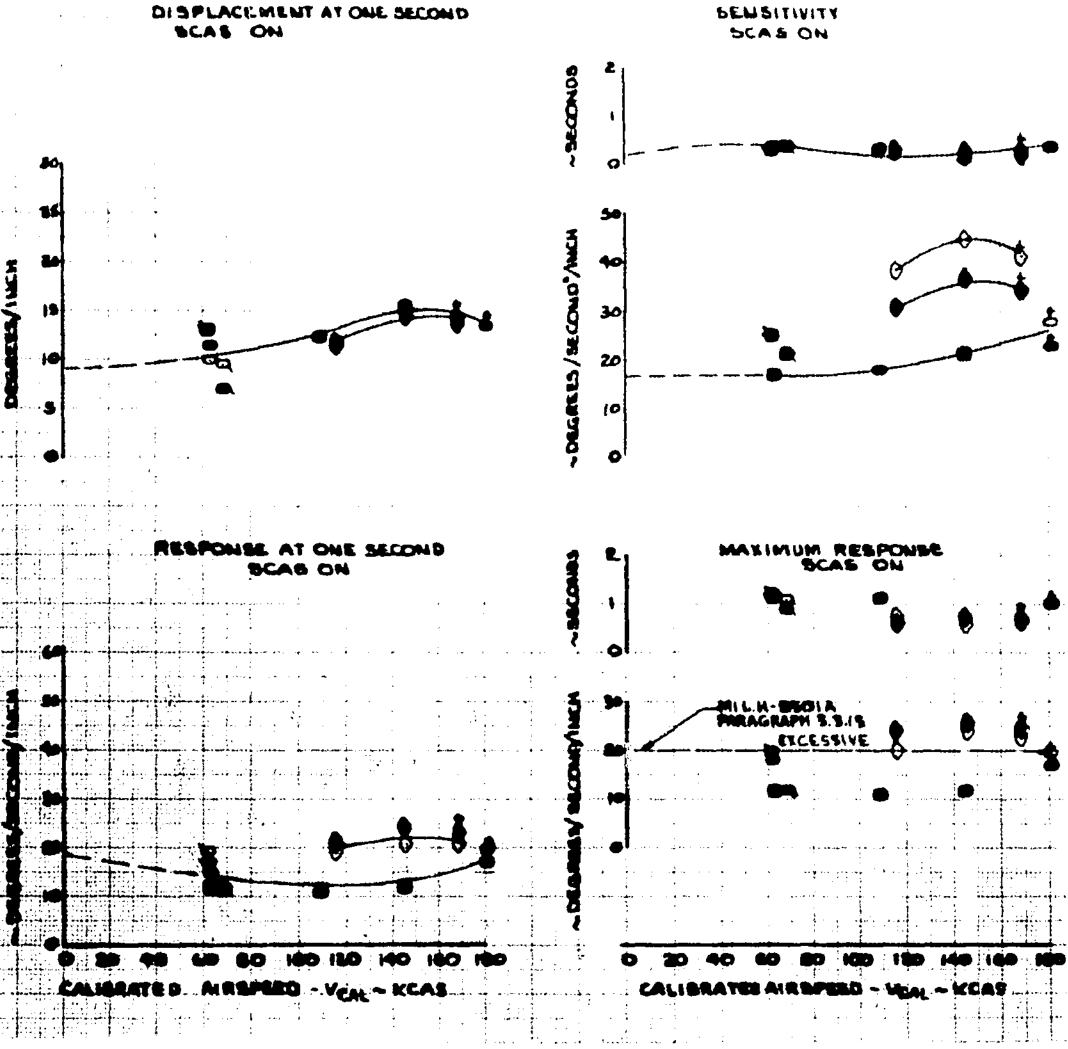


FIGURE NO. 165
DIRECTIONAL CONTROLLABILITY SUMMARY
AH-1G USA S/N 71-15695
GROSS WEIGHT COMPARISON

SYM	AVG. ALTITUDE H_p ~FT	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~C_T	PODS LOADING
○	4650	7640	200.5(AFT)	324.0	HVY. HOG	0.004356	PODS EMPTY
□	6060	9280	200.2(AFT)	324.0	HVY. HOG	0.005522	PODS LOADED (1634-LB TOTAL)

NOTES:
1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 - 330 RPM
8. POINTS DERIVED FROM FIGURES 231 THROUGH 258, APPENDIX VII

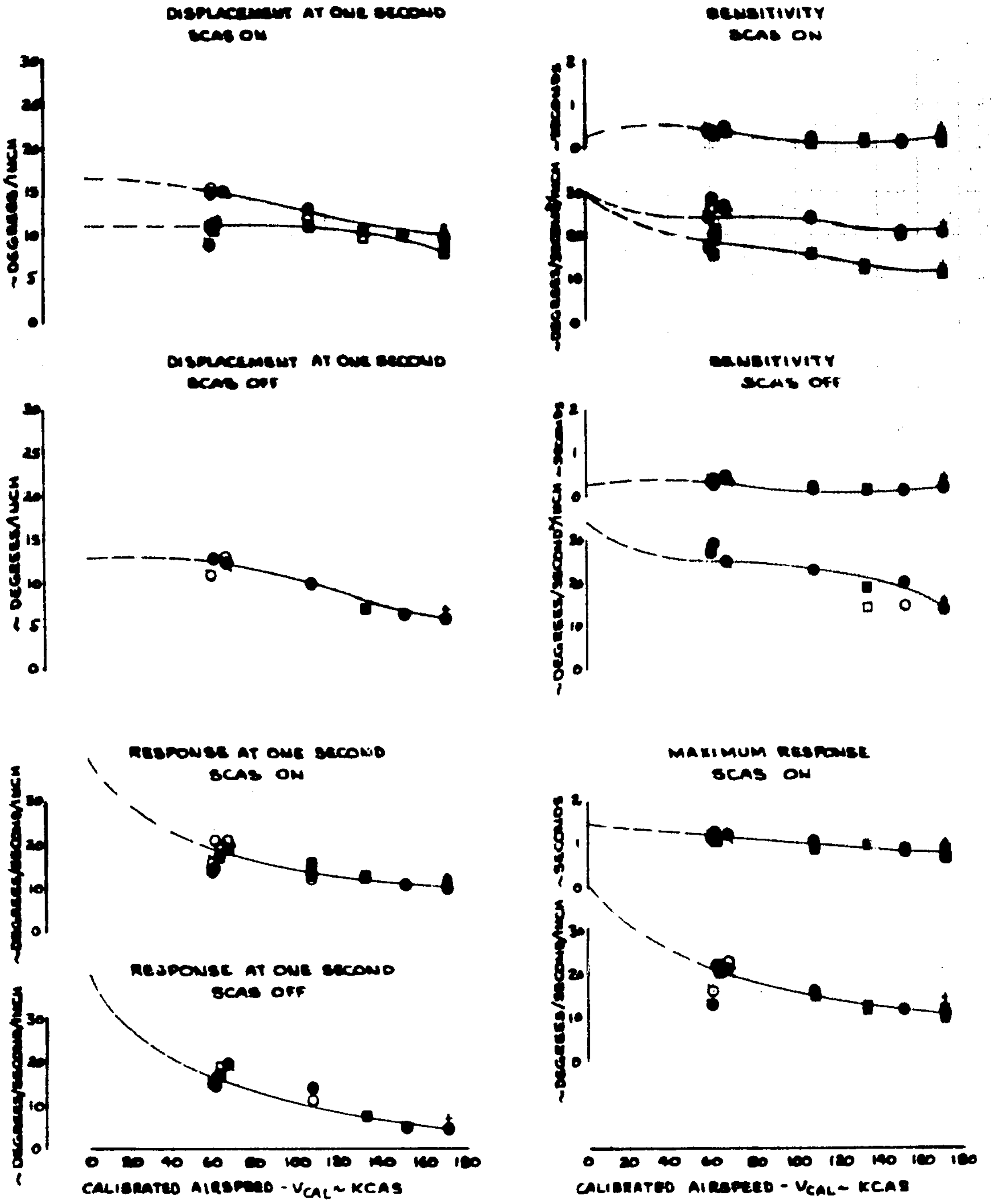


FIGURE NO. 166

DIRECTIONAL CONTROLLABILITY SUMMARY

AH-1G USA S/N 715695

CONFIGURATION COMPARISON

SYM	AVG. ALTITUDE Hp ~FT.	AVG. GROSS WEIGHT ~LB.	AVG. LONG. CG ~IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~CT	POD LOADING
○	4650	7640	200.5(AFT)	324	HVY. HOG	0.004329	PODS EMPTY
●	5900	7480	201.2(AFT)	324	CLEAN	0.004480	NO PODS

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~300-330 RPM
8. POINTS DERIVED FROM FIGURES 221 THROUGH 226, AND 235 THROUGH 238, APPENDIX VII

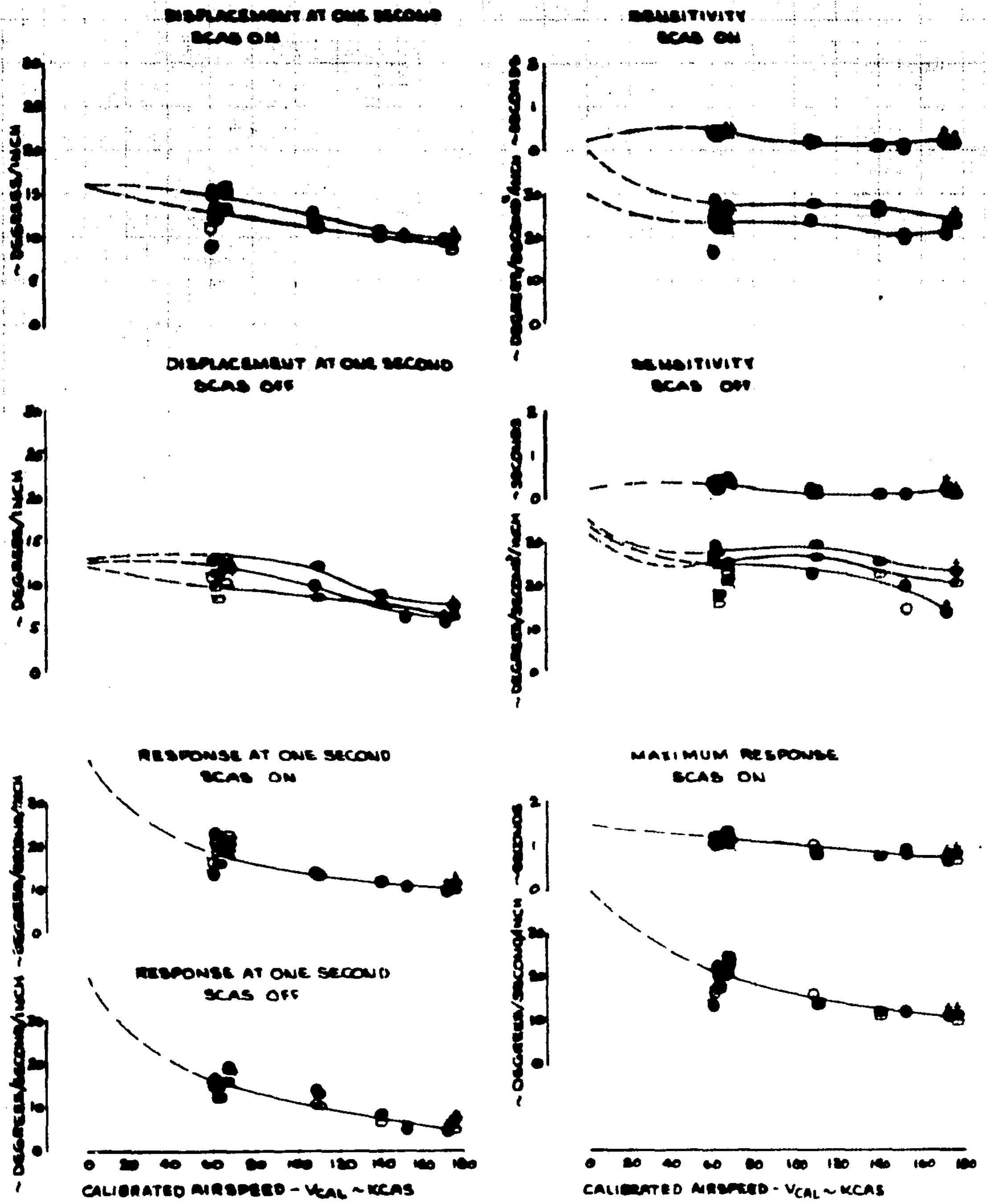


FIGURE NO. 167

DIRECTIONAL CONTROLLABILITY SUMMARY

AH-1S USA S/N [illegible]

ALTITUDE COMPARISON

SYM	AVG. ALTITUDE Hp ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR SPEED ~ RPM	CONFIG.	THRUST COEF. ~ CT	STORE LOADING
●	4650	7640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] EMPTY
▲	16460	7640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] EMPTY

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE [illegible]
8. POINTS DERIVED FROM FIGURES [illegible] THROUGH [illegible], AND [illegible] THROUGH [illegible], APPENDIX [illegible]

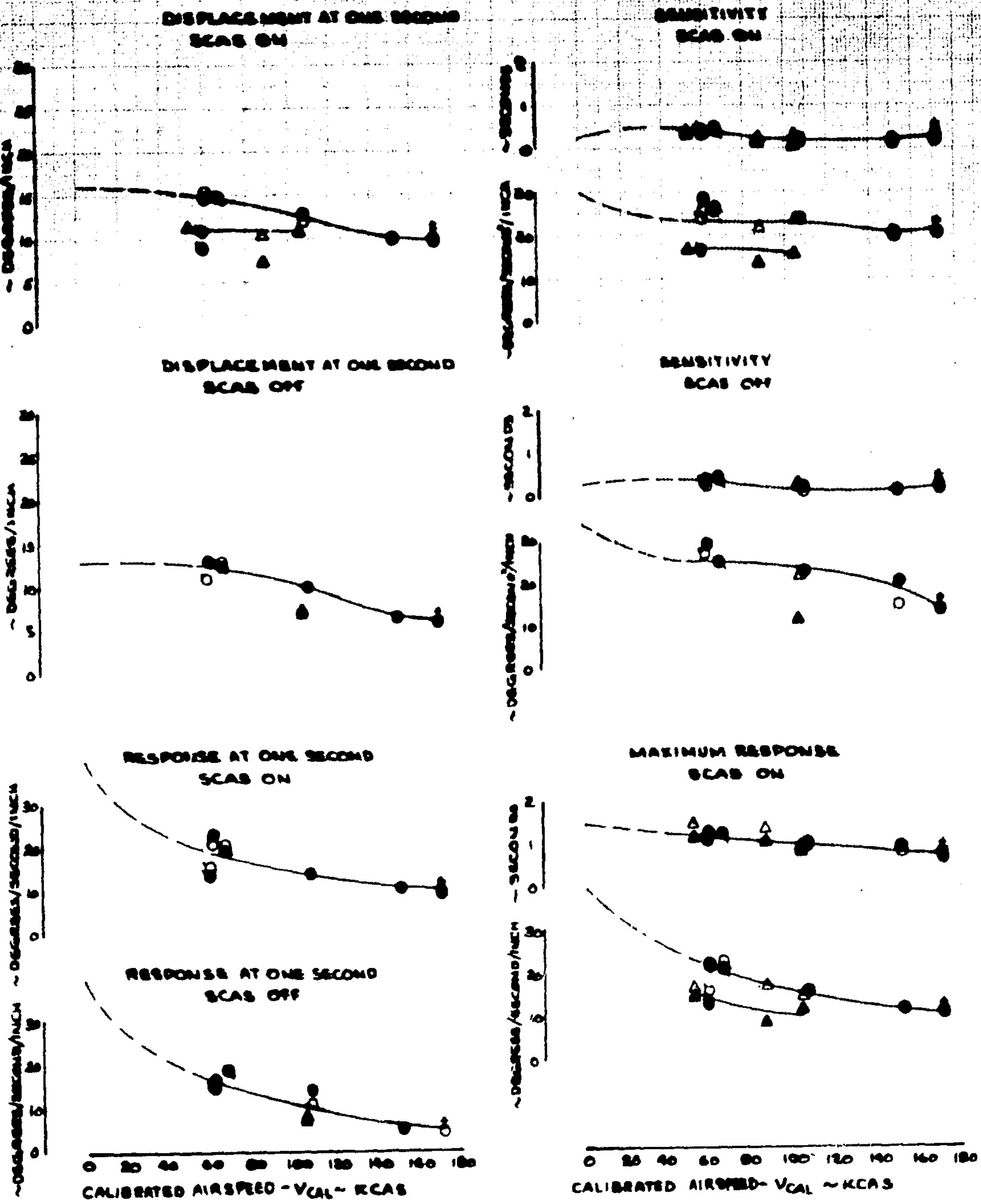


FIGURE No. 168
DIRECTIONAL CONTROLLABILITY SUMMARY
AH-1G USA S/N [illegible]

SYM	AVG ALT Hp~FT	AVG G.W. ~LB	AVG LONG C.G. ~IN.	ROTOR RPM	THRUST COEFF ~C_T	CONFIGURATION	S/N
●	5980	[illegible]	201.2(AFT)	[illegible]	0.004430	CLEAN	[illegible]
○	4880	[illegible]	199.5(AFT)	[illegible]	0.004162	CLEAN (LANDING GEAR CROSS TUBE FAIRINGS REMOVED)	615247

NOTES: 1. OPEN SYMBOL DENOTE LEFT INPUT
2. SOLID SYMBOL DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ [illegible] ~ [illegible] RPM
8. POINTS DERIVED FROM FIGURES [illegible] THROUGH [illegible], APPENDIX [illegible]

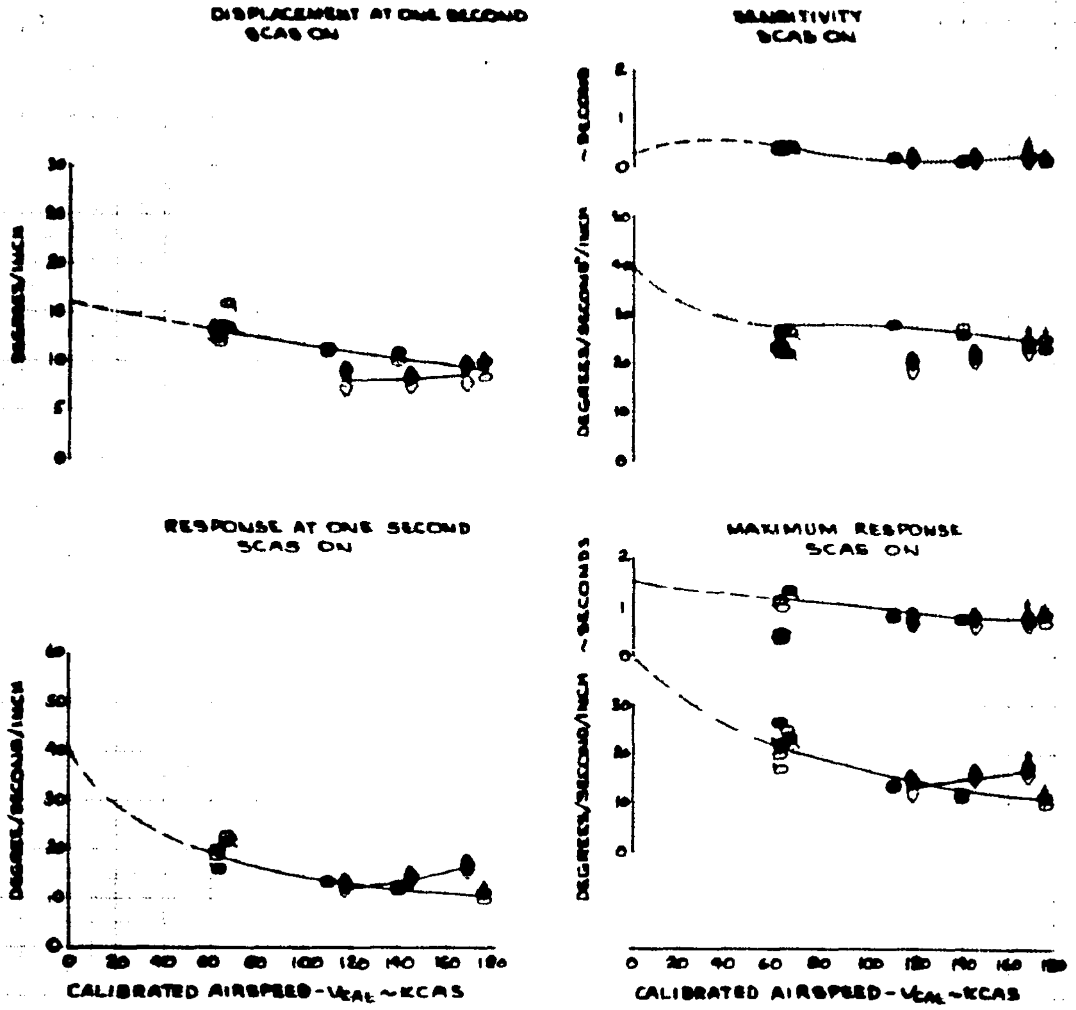


FIGURE No. 169

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA S/N 71-15698

CLEAN CONFIGURATION

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT	AVG. GROSS ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	62.0	3800	7960	190.8 (FWD)	325.0	LEVEL FLIGHT	0.004897
O	108.0	6460	7880	190.8 (FWD)	324.0	LEVEL FLIGHT	0.004566
▽	139.0	7120	7630	190.4 (FWD)	324.0	LEVEL FLIGHT	0.004569
◇	172.0	6600	6980	190.0 (FWD)	324.0	DIVE	0.004827
△	68.5	5920	7980	190.9 (FWD)	324.0	CLIMB	0.004725
□	68.5	7290	7720	190.5 (FWD)	324.0	AUTOROTATION	0.004771

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

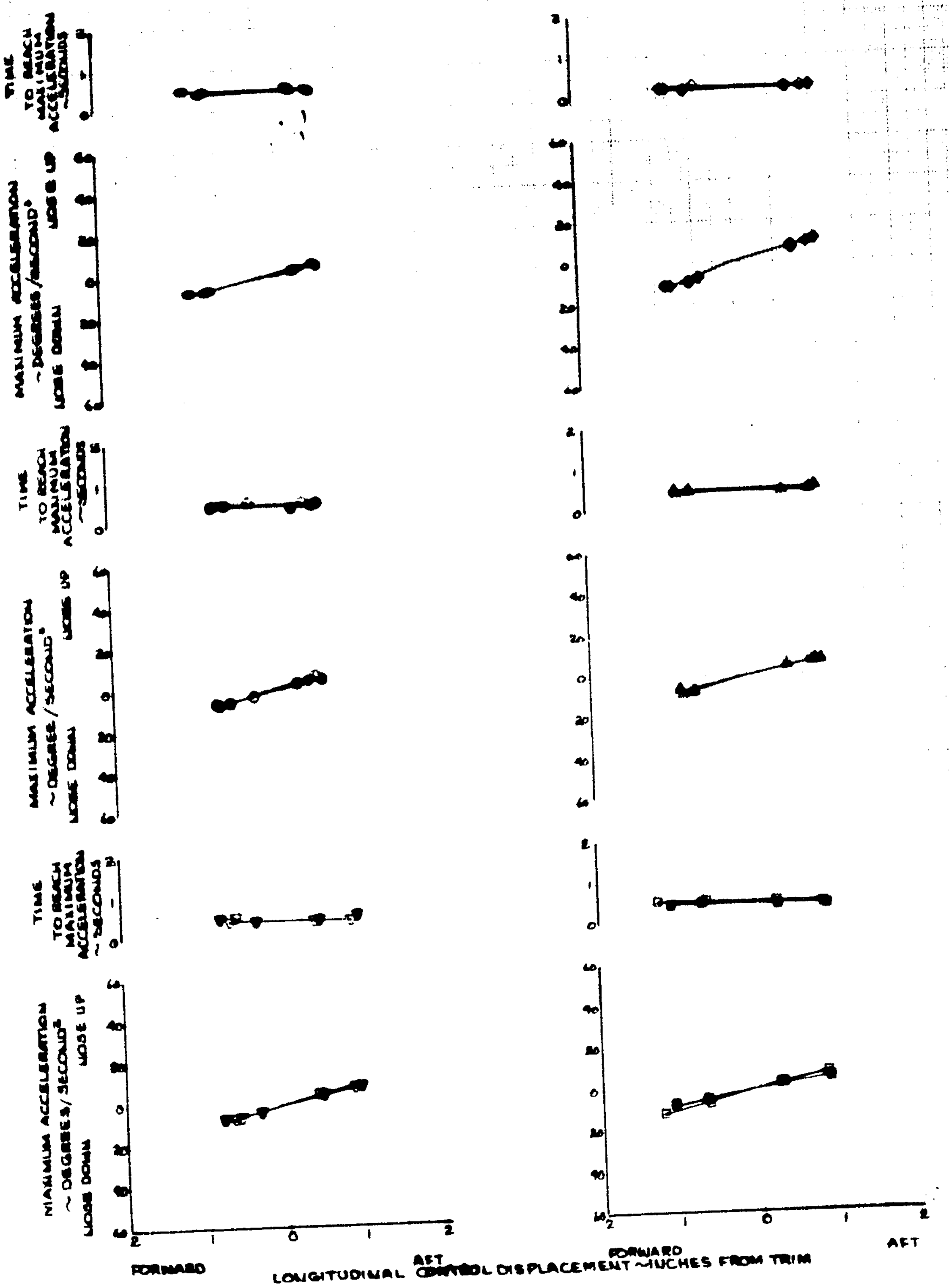


FIGURE NO. 170

LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

SCAS ON

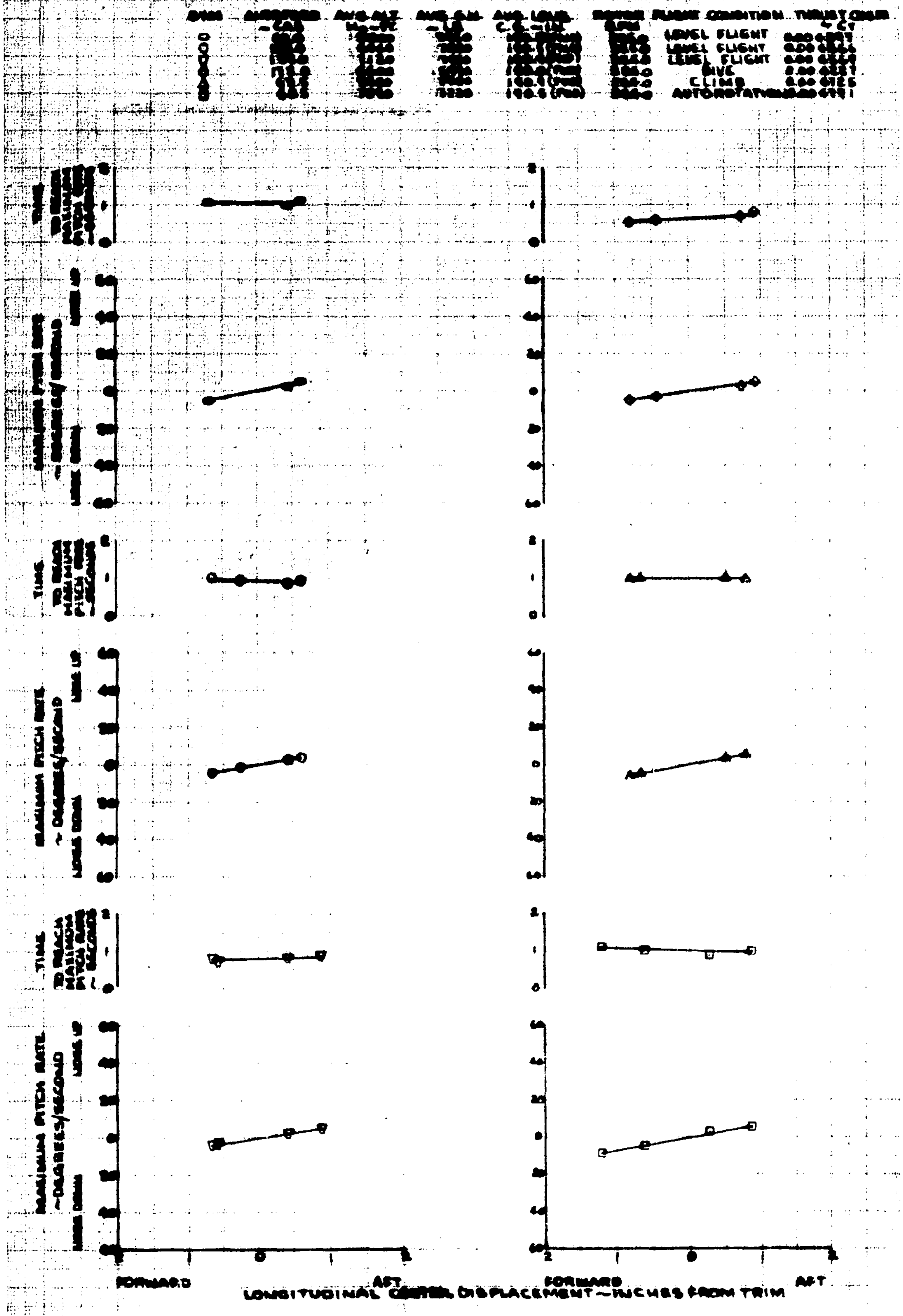


FIGURE NO. 171

LONGITUDINAL RESPONSE AT ONE SECOND

AH-1G USA S/N 15693

CLEAN CONFIGURATION

SYM	AIRSPEED ~CAS	AVG. ALT. H_c~FT	AVG. GRWT ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	[illegible]	[illegible] ~CT
○	63.0	3800	7760	190.0(MID)	[illegible]	LEVEL FLIGHT	[illegible]
○	108.5	6660	7580	190.3(MID)	[illegible]	LEVEL FLIGHT	[illegible]
▽	139.0	7120	7480	190.4(MID)	[illegible]	LEVEL FLIGHT	[illegible]
◇	172.0	6600	6980	190.0(MID)	[illegible]	DIVE	[illegible]
△	61.5	5920	[illegible]	[illegible](MID)	[illegible]	CLIMB	[illegible]
□	68.5	7290	7720	190.5(MID)	[illegible]	AUTOROTATION	[illegible]

NOTE : OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

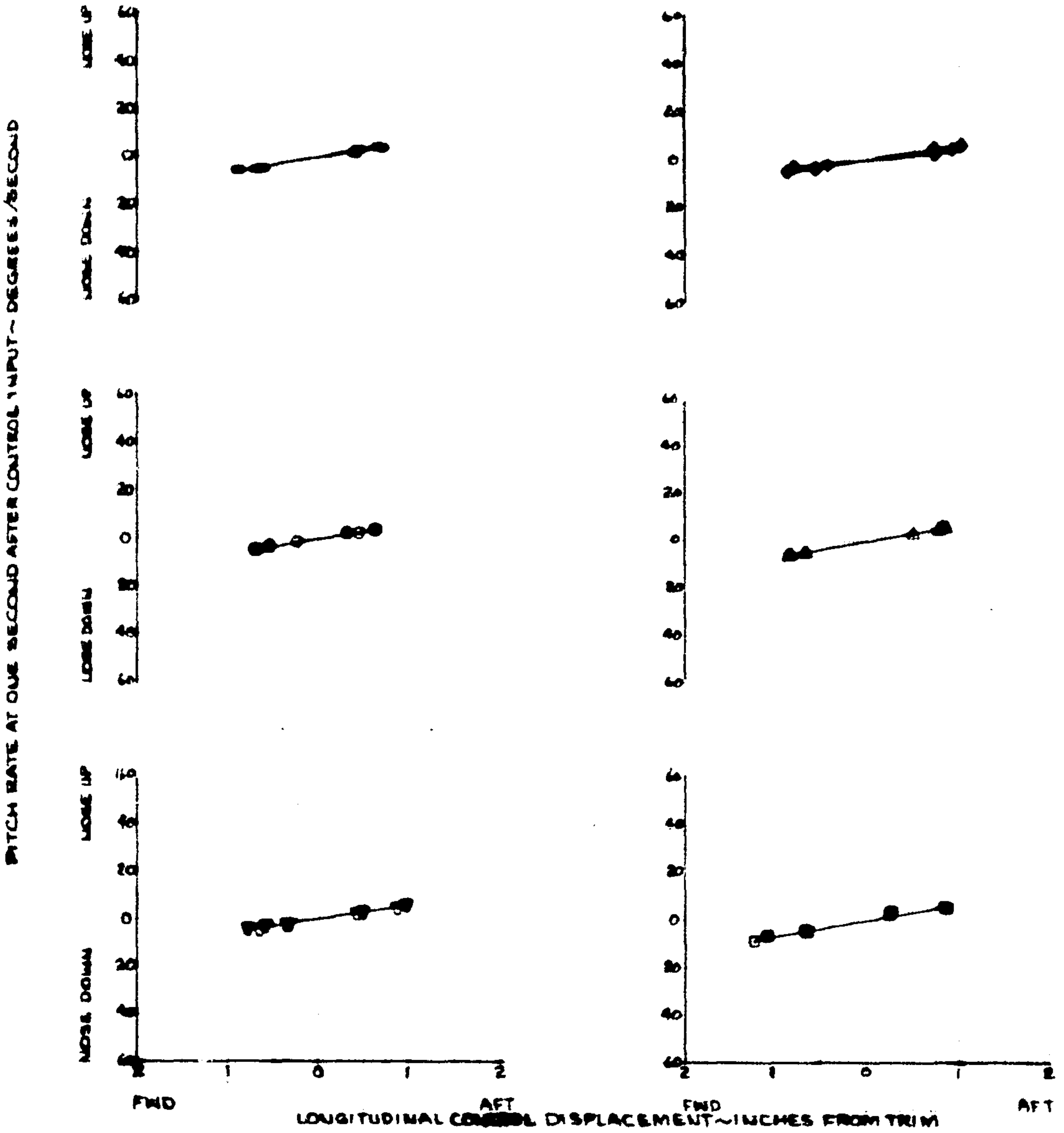


FIGURE No. 172

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA S/N 15695

CLEAN CONFIGURATION

SYM	AIRSPEED ~ CAS	AVG. ALT. Hp ~ FT.	AVG. GROSS WT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ CT
○	62.0	5760	7930	201.3 (AFT)	324.0	LEVEL FLIGHT	[illegible]
□	115.5	5950	7820	201.1 (AFT)	324.0	LEVEL FLIGHT	[illegible]
▽	145.5	4550	7760	201.2 (AFT)	324.0	LEVEL FLIGHT	[illegible]
◇	171.5	4890	7000	201.2 (AFT)	324.0	DIVE	[illegible]
△	68.5	4890	7870	200.8 (AFT)	324.0	CLIMB	[illegible]
□	68.5	8510	7920	201.2 (AFT)	300.0	AUTOROTATION	[illegible]

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

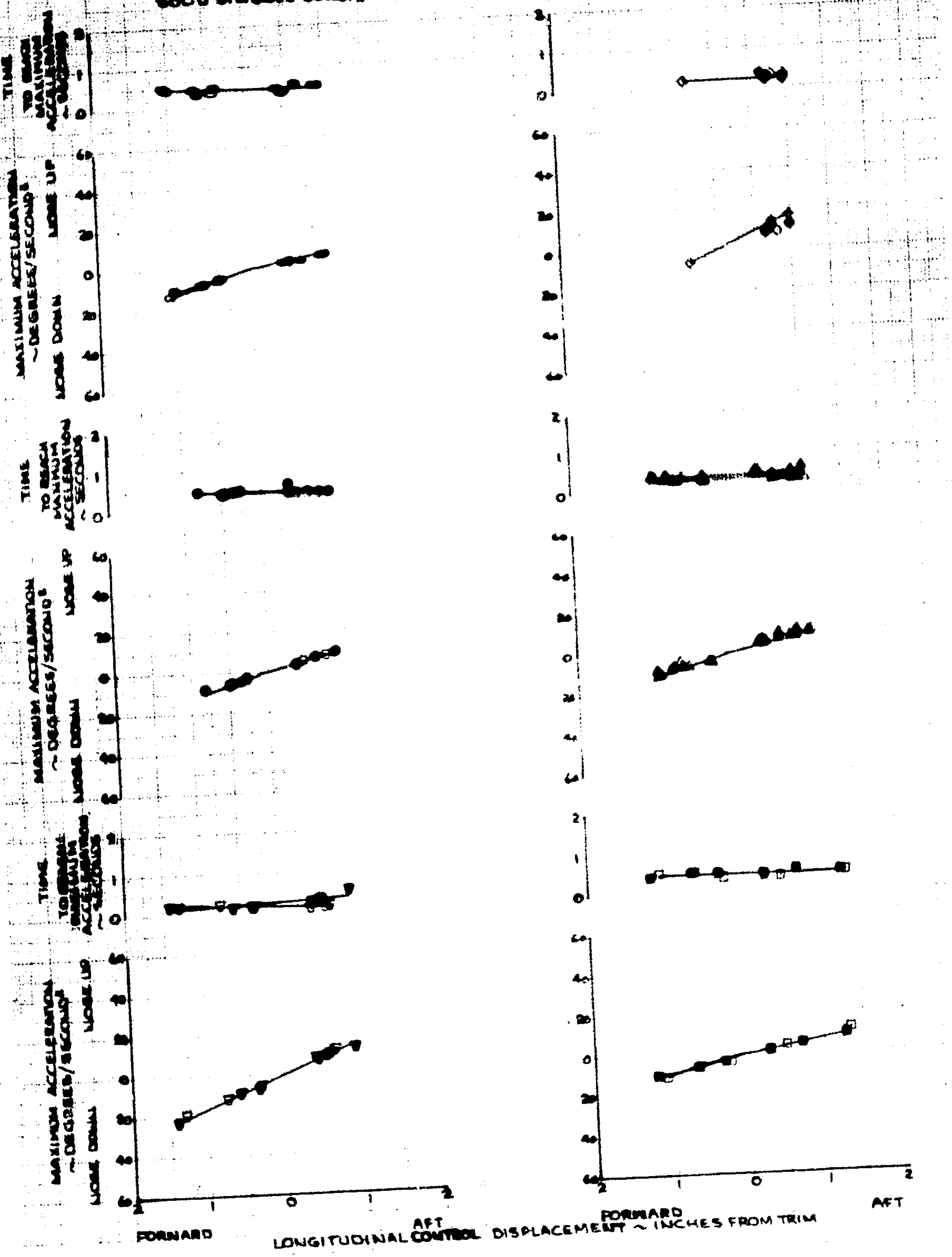


FIGURE NO. 173

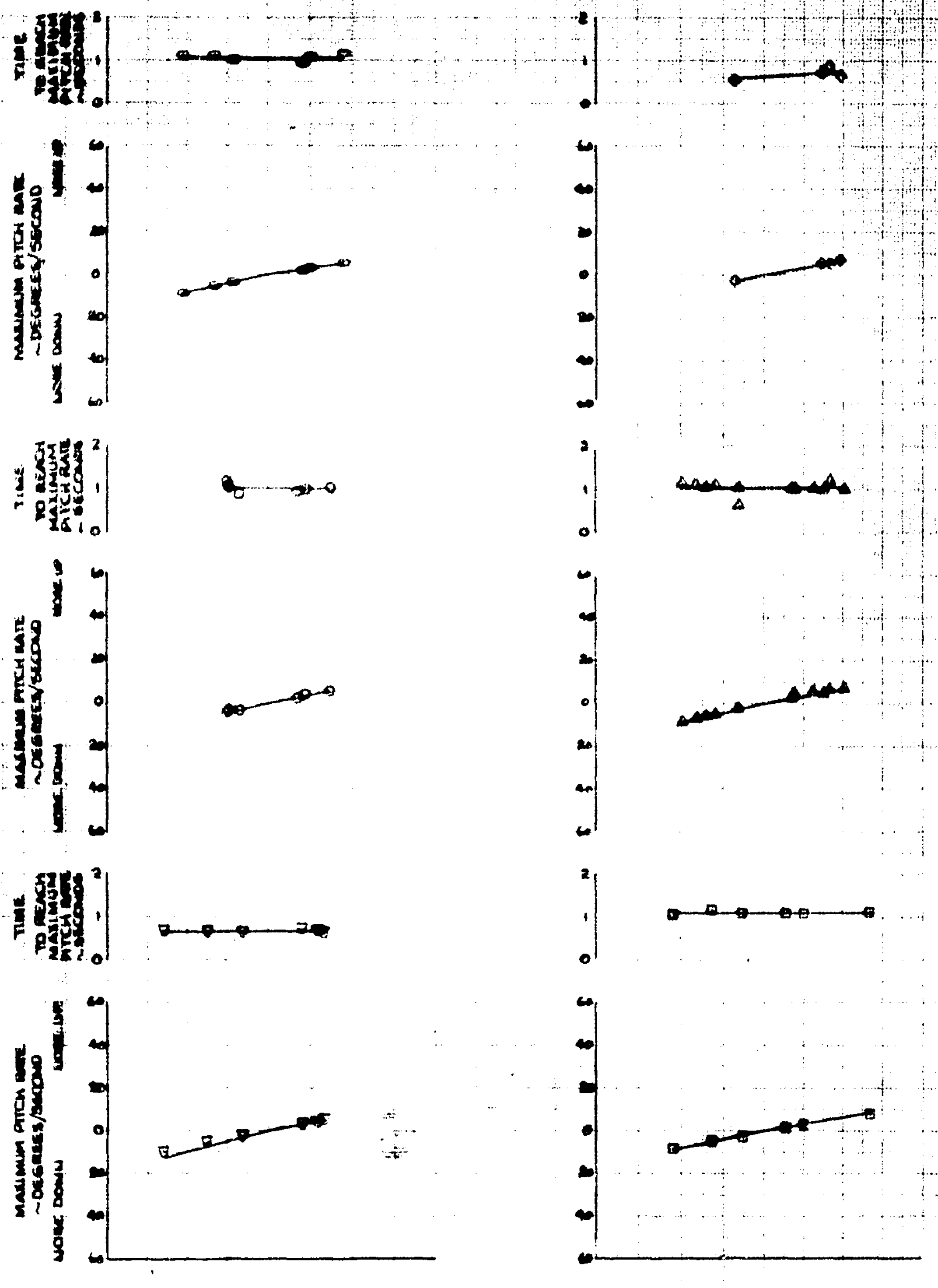
LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N 71-15695

CLEAN CONFIGURATION

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. GROSS WT. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. ~Ct
○	62.0	5760	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
⬡	115.5	5950	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
▽	105.5	4550	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
◇	177.5	[illegible]	[illegible]	[illegible]	[illegible]	DIVE	[illegible]
△	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	CLIMB	[illegible]
□	[illegible]	8570	[illegible]	[illegible]	[illegible]	AUTOROTATION	[illegible]



LONGITUDINAL CONTROL DISPLACEMENT~INCHES FROM TRIM

FIGURE NO. 174
LONGITUDINAL RESPONSE AT ONE SECOND
AH-1G USA 67-15693
CLEAN CONFIGURATION

SYM.	AIRSPEED ~KCAS	AVG. ALT. H_p~FT.	AVG. WEIGHT ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. ~C_T
○	62.9	3760	7950	201.9(AFT)	3240	LEVEL FLIGHT	0.004402
□	113.4	3420	7880	201.1(AFT)	3240	LEVEL FLIGHT	0.004242
▽	145.5	4550	7760	201.2(AFT)	3240	LEVEL FLIGHT	0.004411
◇	171.6	4040	7680	201.2(AFT)	3240	DIVE	0.004526
△	68.5	6840	7970	200.9(AFT)	3240	CLIMB	0.004550
◻	68.5	8570	7420	201.2(AFT)	3240	AUTOROTATION	0.005960

NOTE: 1. OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

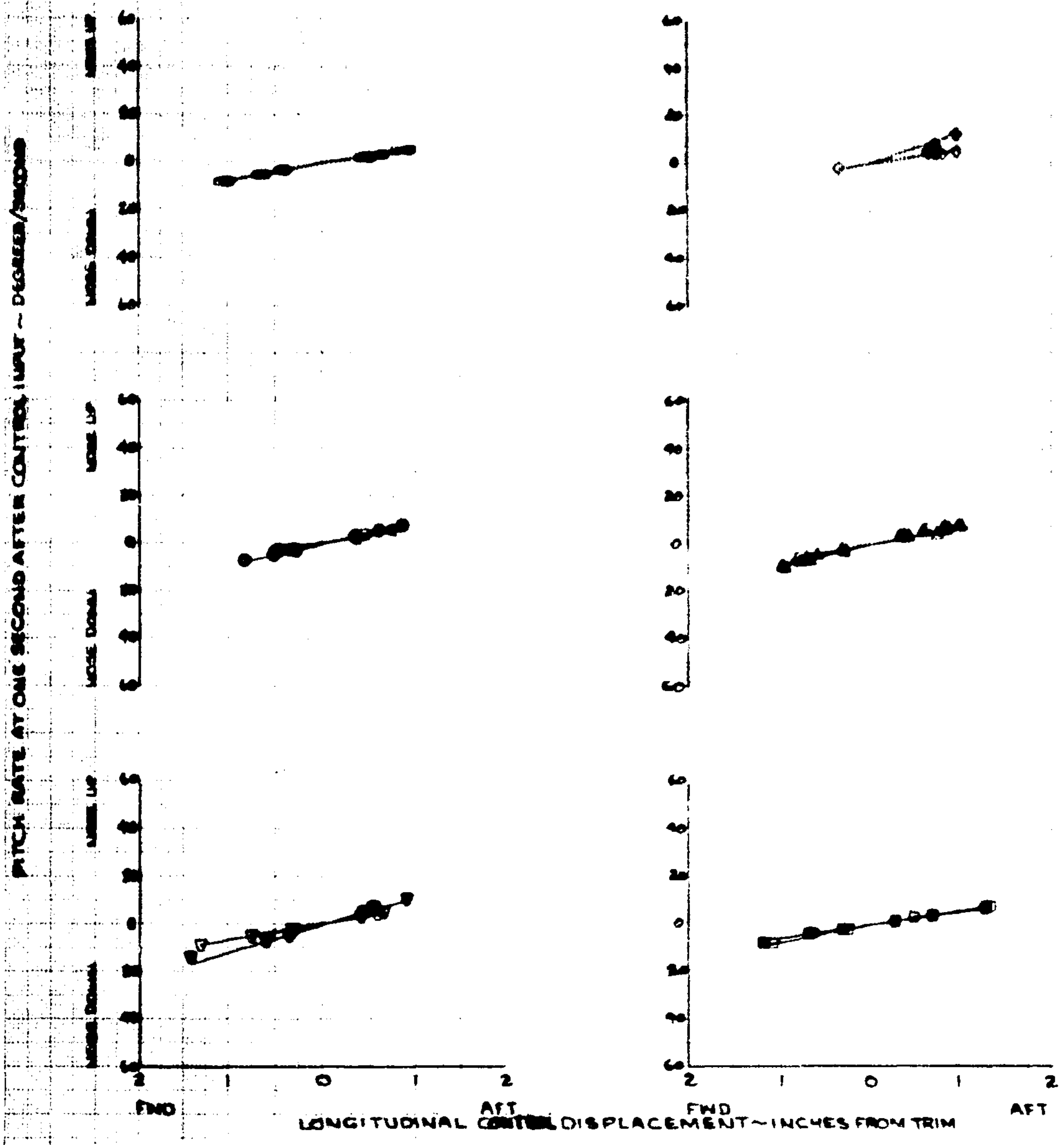


FIGURE NO. 175

ANGULAR PITCH DISPLACEMENT

AH-1G USA S/N 71-15826

CLEAN CONFIGURATION

SYM.	AIRSPEED ~CAS	AVG. ALT. H_p ~FT	AVG. GROSS WT ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	62.0	5760	7930	201.3(AFT)	[illegible]	LEVEL FLIGHT	0.004402
○	115.5	5980	7820	201.1(AFT)	324.0	LEVEL FLIGHT	[illegible]
▽	145.5	4550	7760	201.2(AFT)	324.0	LEVEL FLIGHT	0.004611
◇	177.5	4890	7880	201.3(AFT)	324.0	DIVE	0.004526
▲	60.5	4890	7870	201.3(AFT)	324.0	CLIMB	0.004520
□	68.5	8570	7920	201.2(AFT)	[illegible]	AUTOROTATION	0.003940

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

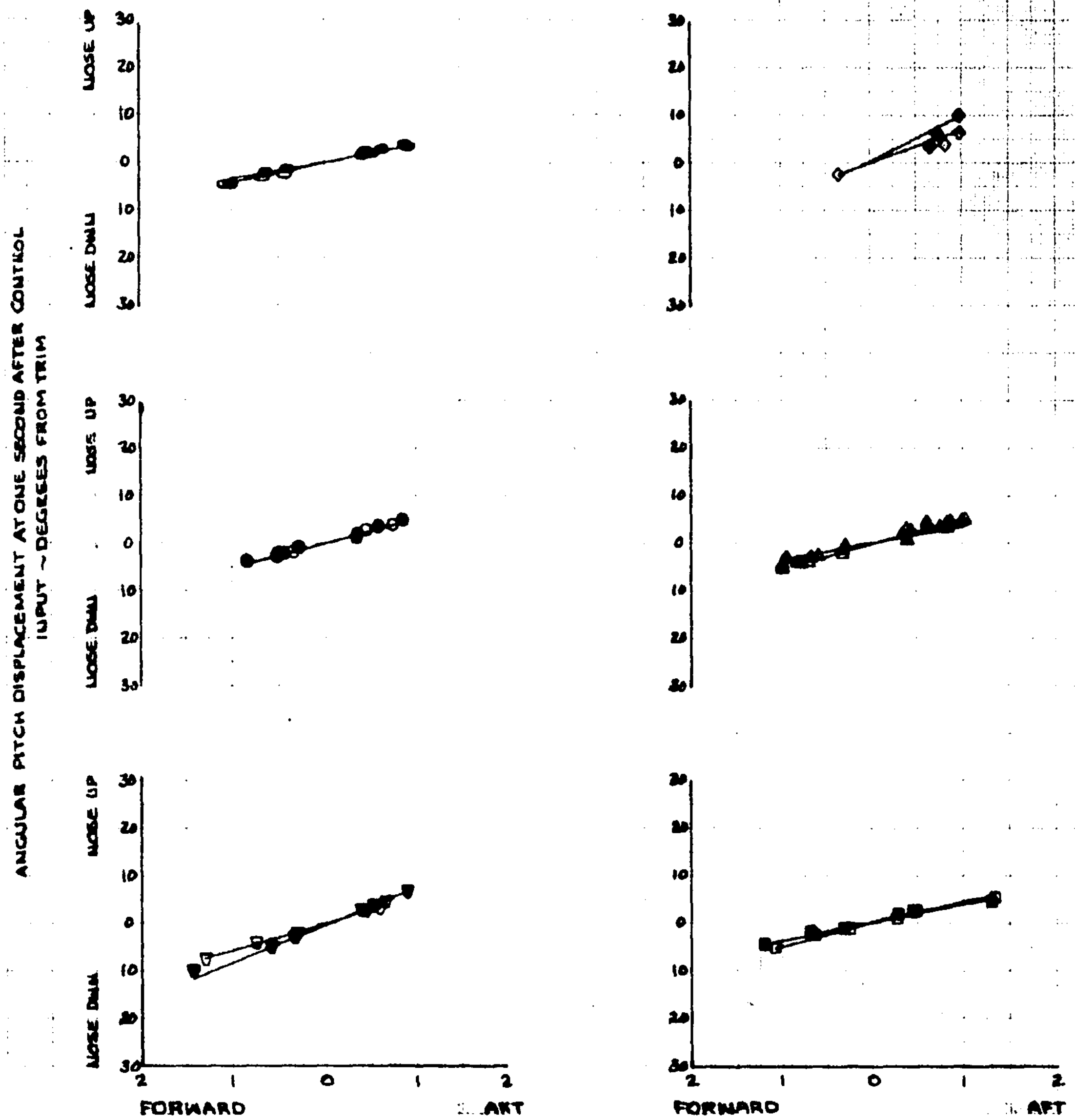


FIGURE NO. 176

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA S/N 71-15695

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT H_D ~FT	AVG. GR. WT ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	106.0	5550	9160	200.3(AFT)	3240	LEVEL FLIGHT	0.005367
▽	146.0	5140	9330	200.1(AFT)	3240	LEVEL FLIGHT	0.005399
◇	172.0	7570	9590	200.0(AFT)	3240	DIVE	0.005978
△	98.0	2730	9630	200.0(AFT)	3240	CLIMB	0.005183

NOTE: 817 LB. IN OUTB'D ROCKET PODS

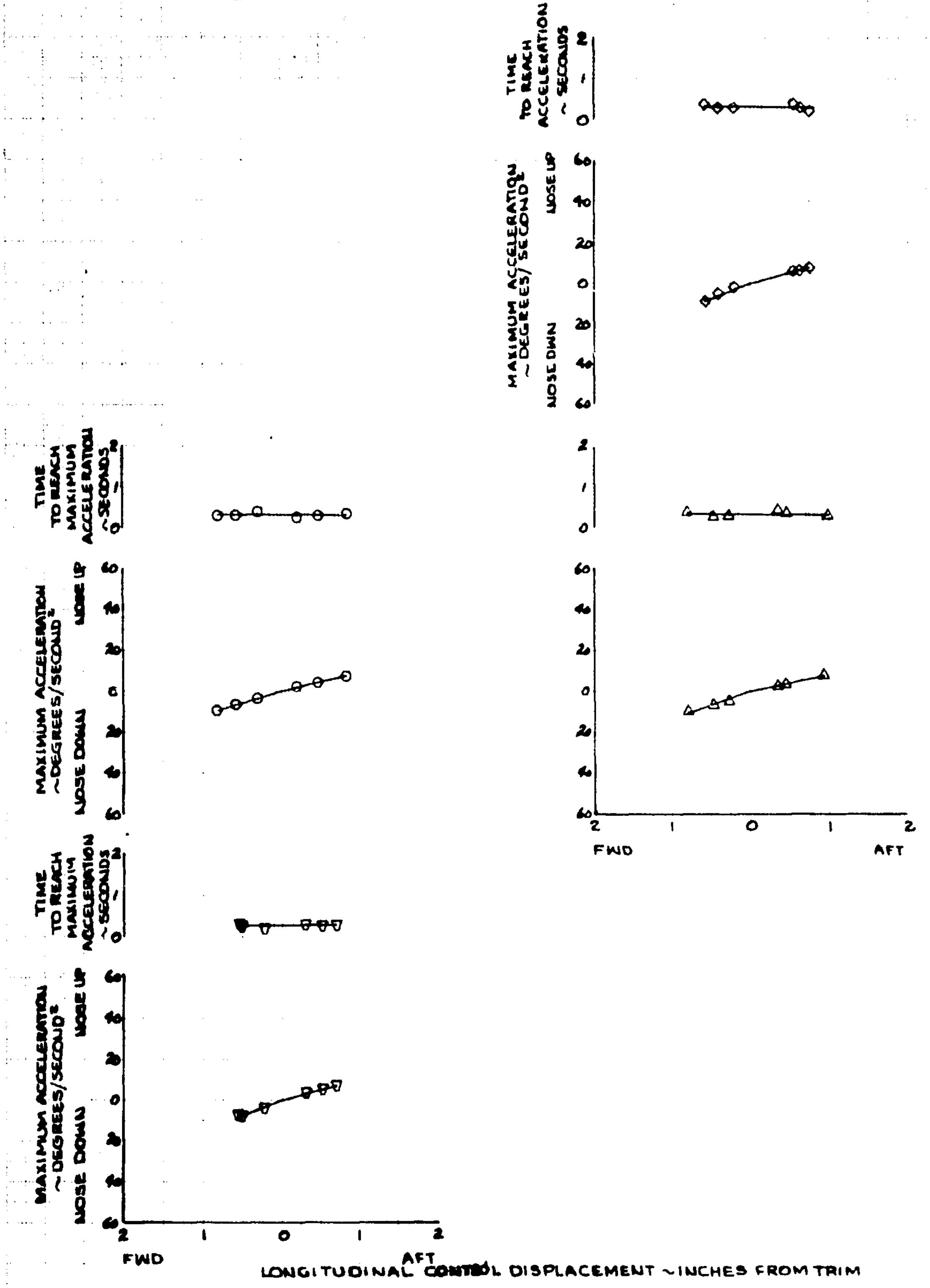


FIGURE NO. 177

LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N 71-20698

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_D~FT.	AVG. GRWT ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	106.0	5550	9160	200.3 (AFT)	324.0	LEVEL FLIGHT	0.005567
▽	146.0	5140	9330	200.1 (AFT)	324.0	LEVEL FLIGHT	0.005899
◇	172.0	7570	9590	200.0 (AFT)	324.0	DIVE	0.005978
△	58.0	2730	9630	200.0 (AFT)	324.0	CLIMB	0.005183

NOTE: 817 LB. IN OUTB'D ROCKET POD

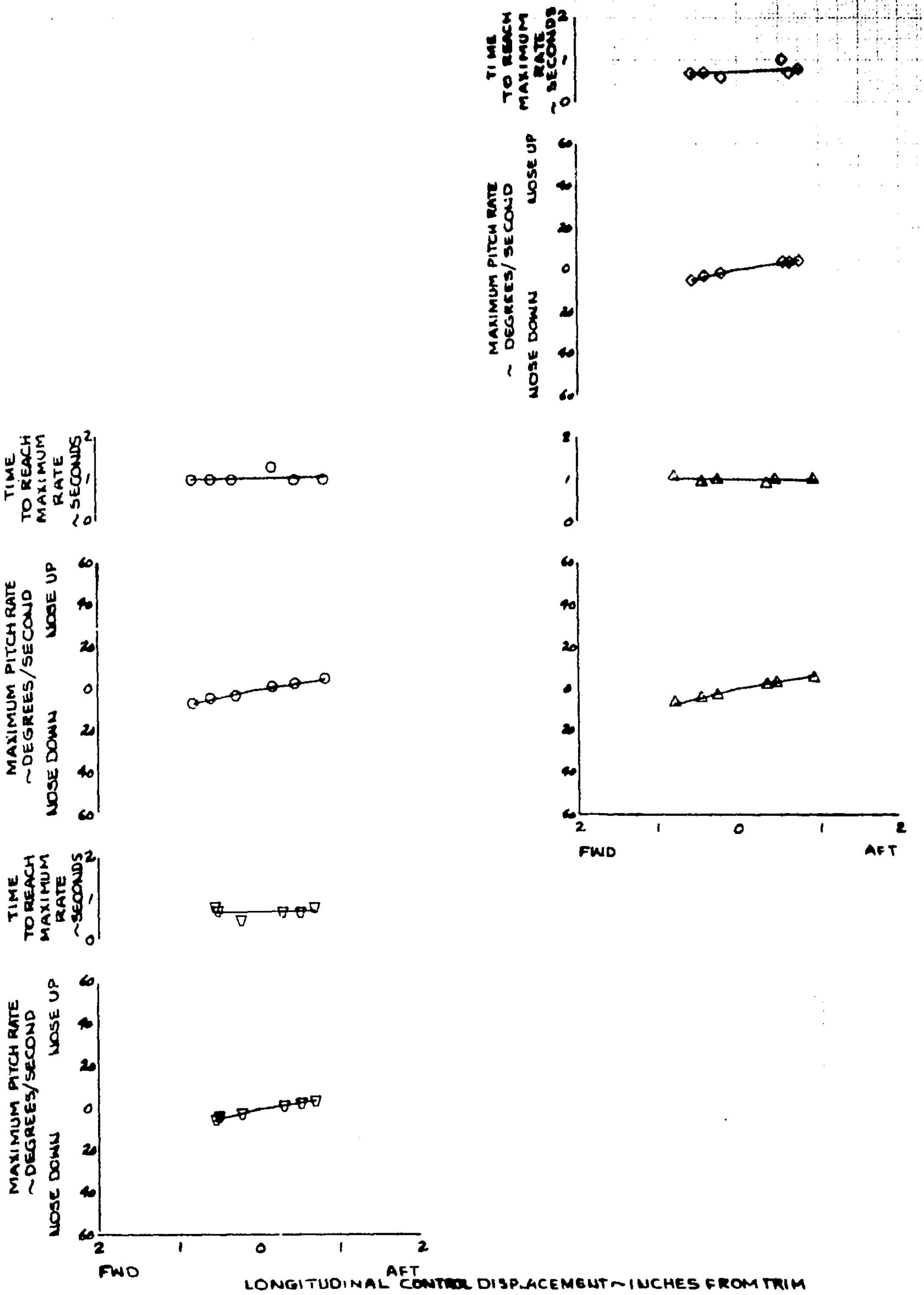


FIGURE NO. 178

LONGITUDINAL RESPONSE AT ONE SECOND

AH-1G USA S/N 71-15695

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. GRWT ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~CT
○	106.0	5550	9160	200.3(AFT)	324.0	LEVEL FLIGHT	0.005367
▽	146.0	5140	9330	200.1(AFT)	324.0	LEVEL FLIGHT	0.005399
◇	172.0	7570	9690	200.0(AFT)	324.0	DIVE	0.005978
△	58.0	2730	9630	200.0(AFT)	324.0	CLIMB	0.005183

NOTE: 817 LB.-IN. OUTB'D ROCKET PODS

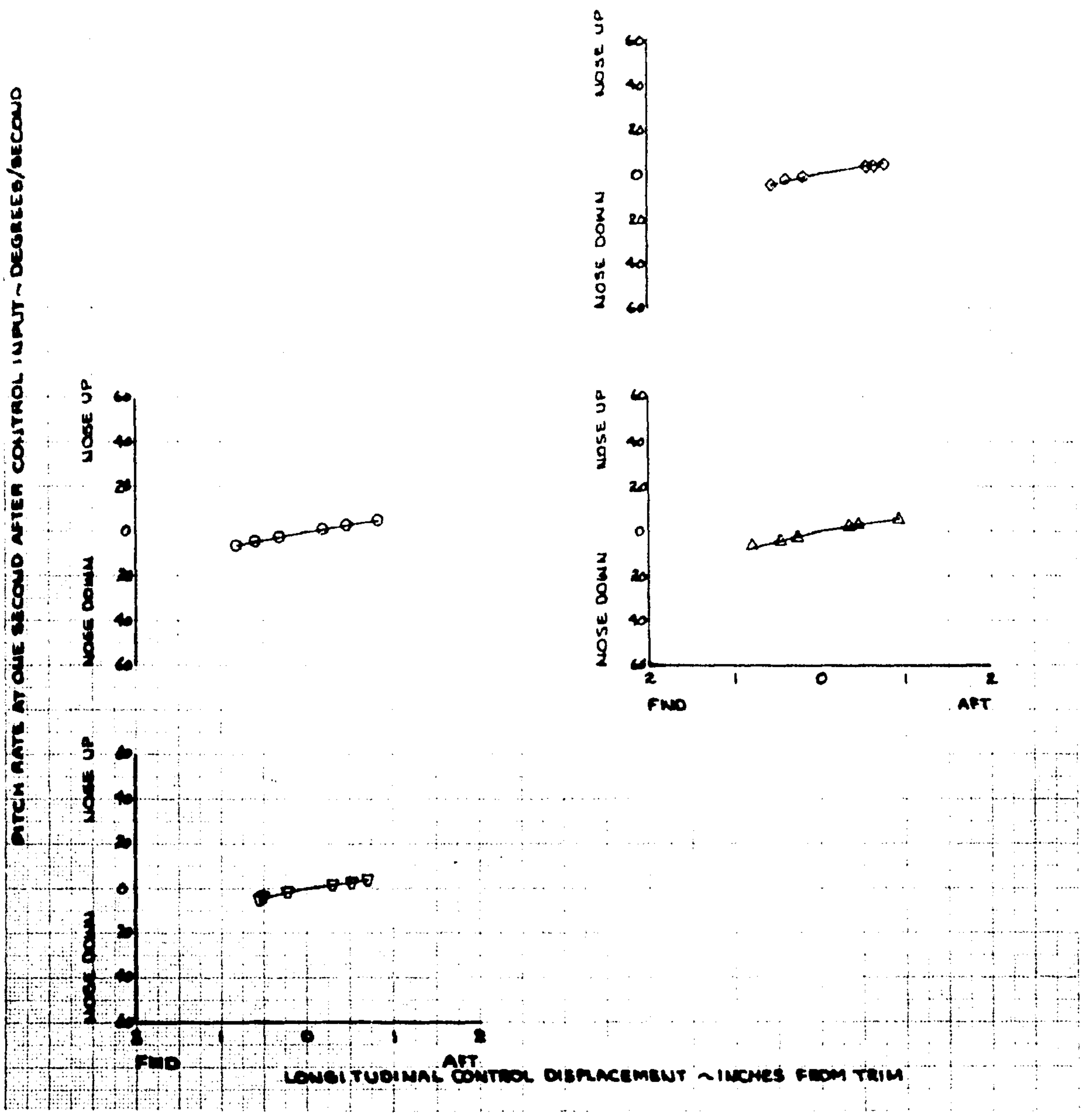


FIGURE No. 179

ANGULAR PITCH DISPLACEMENT

AH-1G USA S/N [illegible]

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. GROSS WT. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~CT
○	106.0	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLIGHT	0.00 5867
○	146.0	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLIGHT	0.00 5399
○	173.6	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	DIVE	0.00 5978
△	88.0	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	CLIMB	0.00 5183

NOTE : [illegible] ROCKET POD

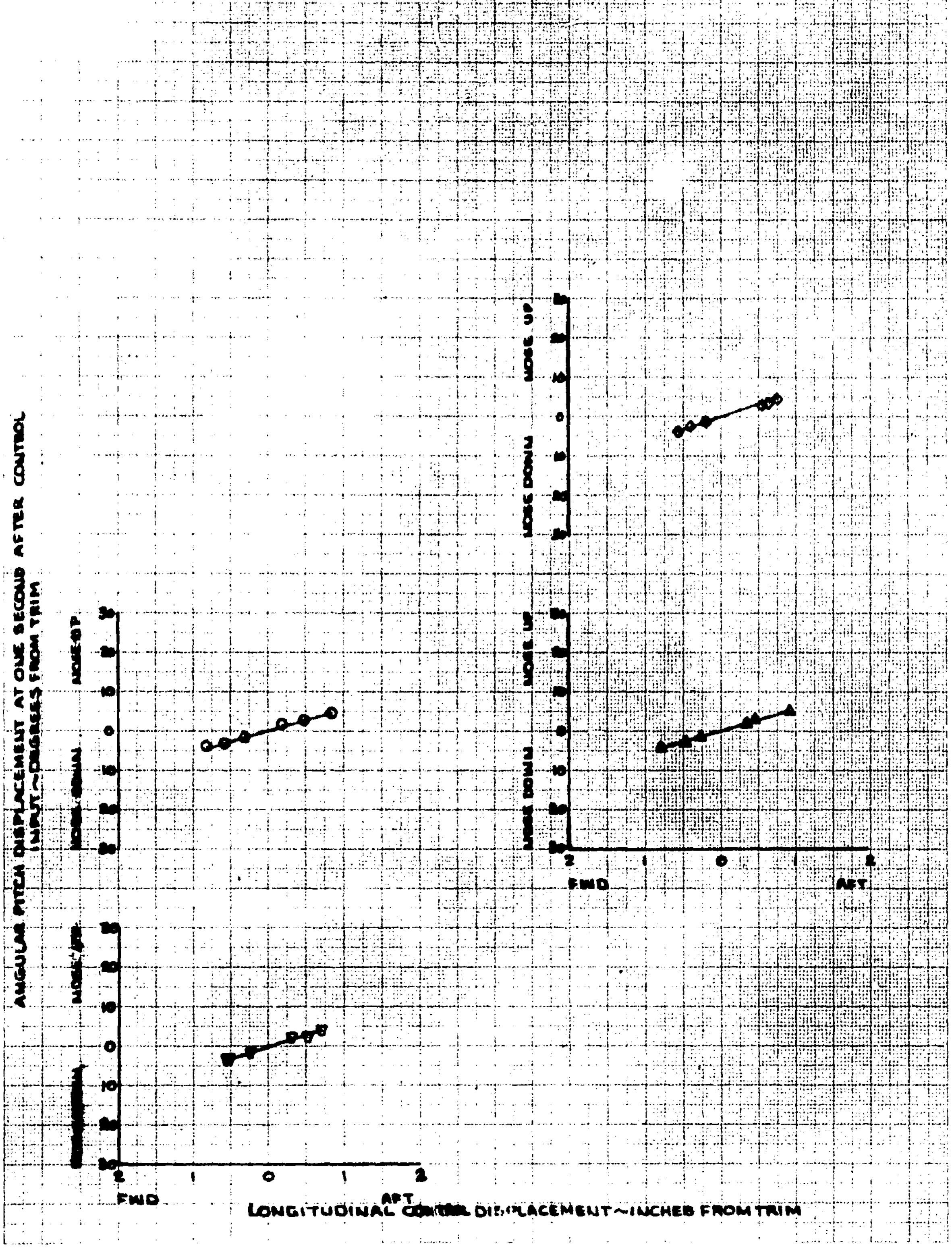


FIGURE NO. 180

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. ~CT
○	68.5	5000	8010	200.9(AFT)	324.0	LEVEL FLIGHT	0.004378
⬡	102.5	5930	7980	200.9(AFT)	324.0	LEVEL FLIGHT	0.004632
▽	152.[illegible]	4770	7790	200.9(AFT)	324.0	LEVEL FLIGHT	0.004458
◇	172.0	6310	8040	200.9(AFT)	324.0	DIVE	0.004821
△	60.0	3660	8010	201.0(AFT)	324.0	CLIMB	0.004439
□	66.5	6720	8040	201.0(AFT)	324.0	AUTOROTATION	0.006332

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

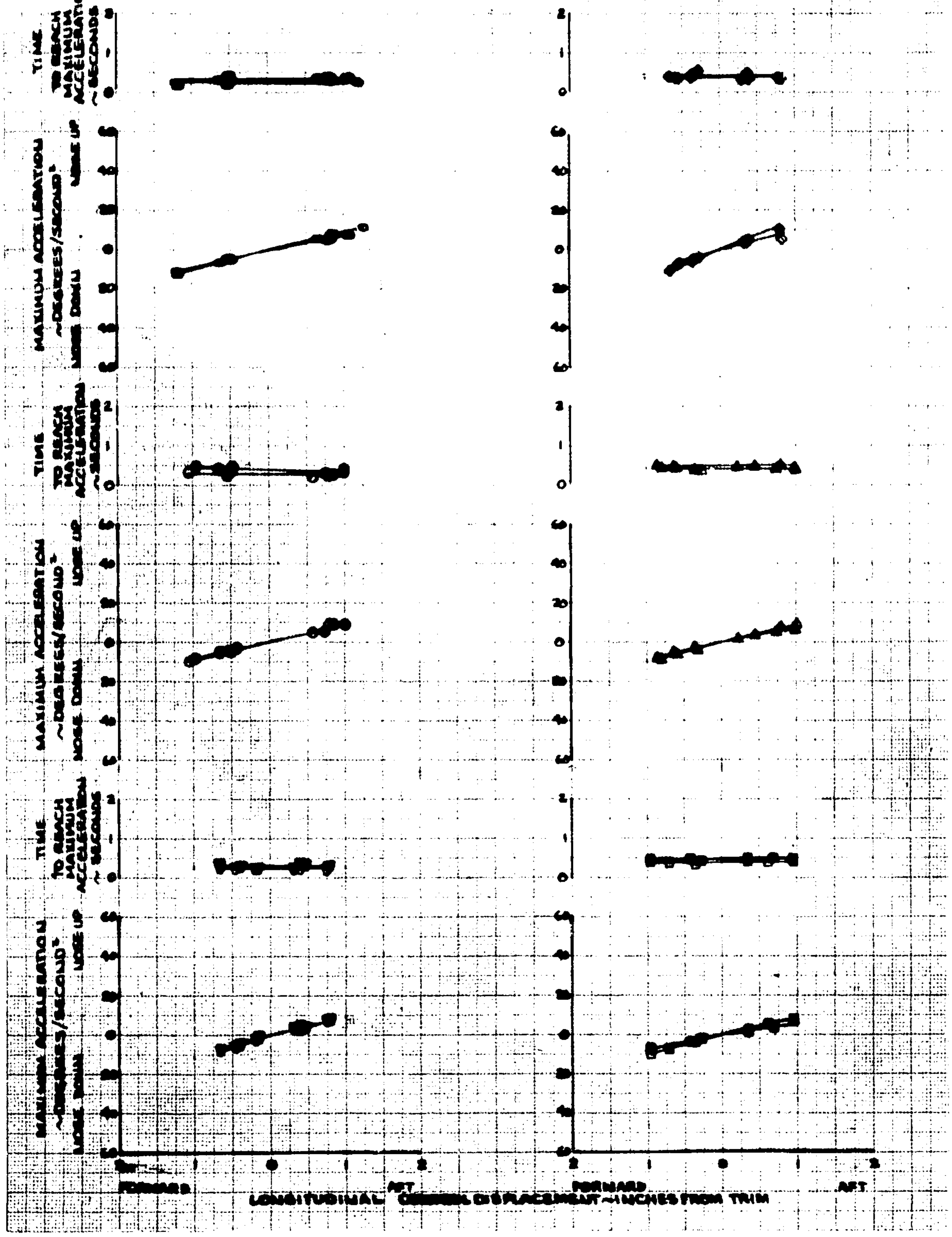


FIGURE NO. 101

LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N 15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. GW. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. ~CT
●	60.5	3000	[illegible]	[illegible] (AFT)	324.0	LEVEL FLIGHT	0.004379
○	109.5	5720	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLIGHT	0.004482
▽	162.5	4770	7790	[illegible] (AFT)	324	LEVEL FLIGHT	0.004458
◆	172.0	6310	[illegible]	[illegible] (AFT)	[illegible]	DIVE	0.004820
△	60.0	3660	[illegible]	[illegible] (AFT)	[illegible]	CLIMB	0.004439
□	66.0	6720	[illegible]	[illegible] (AFT)	[illegible]	AUTOROTATION	0.005332

NOTE: ALL ROCKET PODS EMPTY

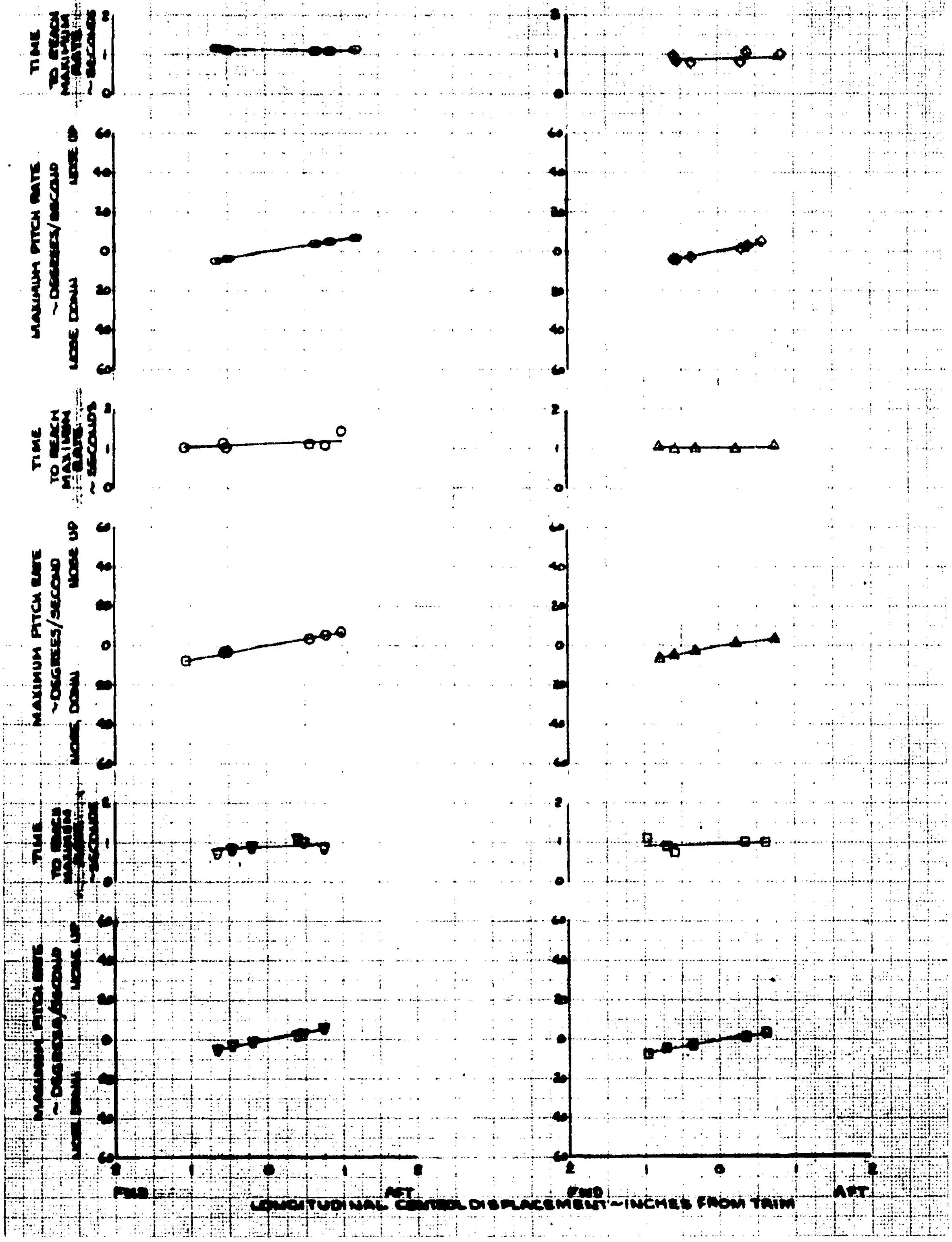


FIGURE NO. 182

LONGITUDINAL RESPONSE AT ONE SECOND

AH-1G USA S/N 71-15[illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT Hp~FT.	AVG. G.W. ~LB	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. ~C_T
○	60.5	3000	8070	200.9(AFT)	324	LEVEL FLIGHT	0.004379
○	109.5	5920	7980	200.8(AFT)	324	LEVEL FLIGHT	0.004632
▽	152.0	4770	7790	200.9(AFT)	324	LEVEL FLIGHT	0.004658
◇	172.0	6310	8040	200.9(AFT)	324	DIVE	0.004820
△	66.0	3960	8070	201.0(AFT)	324	CLIMB	0.004439
□	66.0	6720	8040	201.0(AFT)	324	AUTOROTATION	0.005832

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

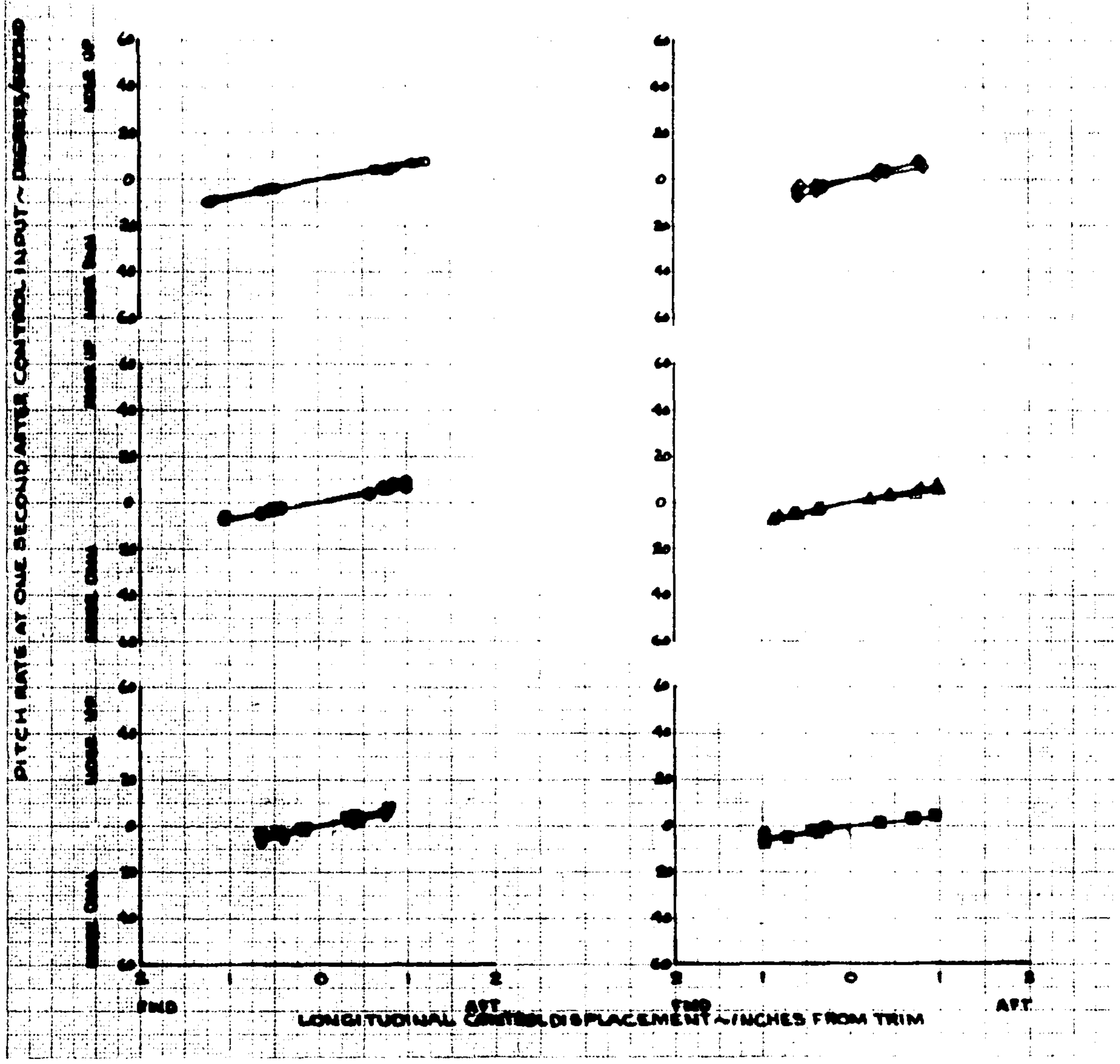


FIGURE No. 183

ANGULAR PITCH DISPLACEMENT

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR SPEED RPM	FLIGHT CONDITION	THRUST COEFF. ~CT
○	60.5	3000	8070	200.9(AFT)	324	LEVEL FLIGHT	[illegible]
⬡	109.5	5920	7680	200.8(AFT)	324	LEVEL FLIGHT	[illegible]
▽	152.5	4770	7790	200.9(AFT)	324	LEVEL FLIGHT	0.004658
◇	172.0	6310	8040	200.9(AFT)	324	DIVE	0.004820
△	60.0	3460	8070	201.0(AFT)	324	CLIMB	0.004489
□	66.0	6720	8040	201.0(AFT)	324	AUTOROTATION	0.005382

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

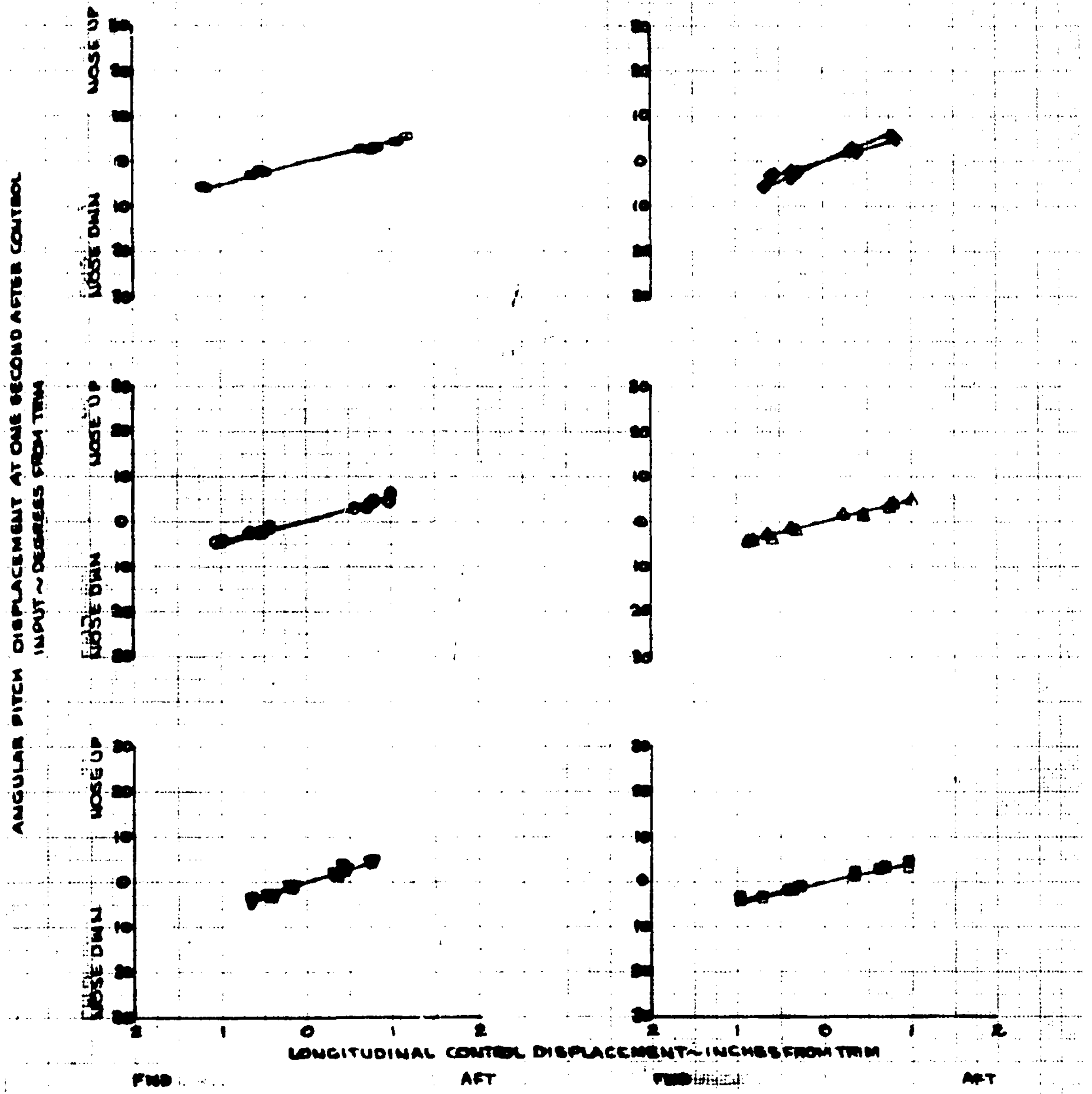


FIGURE NO. 184

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH [illegible] FAIRINGS REMOVED

SYMBOL	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. GROSS WT. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR SPEED RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	[illegible]	[illegible]	[illegible]	199.9(AFT)	[illegible]	LEVEL FLIGHT	[illegible]
○	[illegible]	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLIGHT	[illegible]
▽	1005	[illegible]	9090	200.1(AFT)	3240	LEVEL FLIGHT	0.00 [illegible]
◇	1720	7070	8600	199.8(AFT)	3240	DIVE	0.00 [illegible]
△	650	3850	8660	199.3(AFT)	3240	CLIMB	0.00 [illegible]

NOTES: 1. ALL ROCKET PODS EMPTY
2. OPEN SYMBOLS DENOTE SCAS ON
3. SOLID SYMBOLS DENOTE SCAS OFF

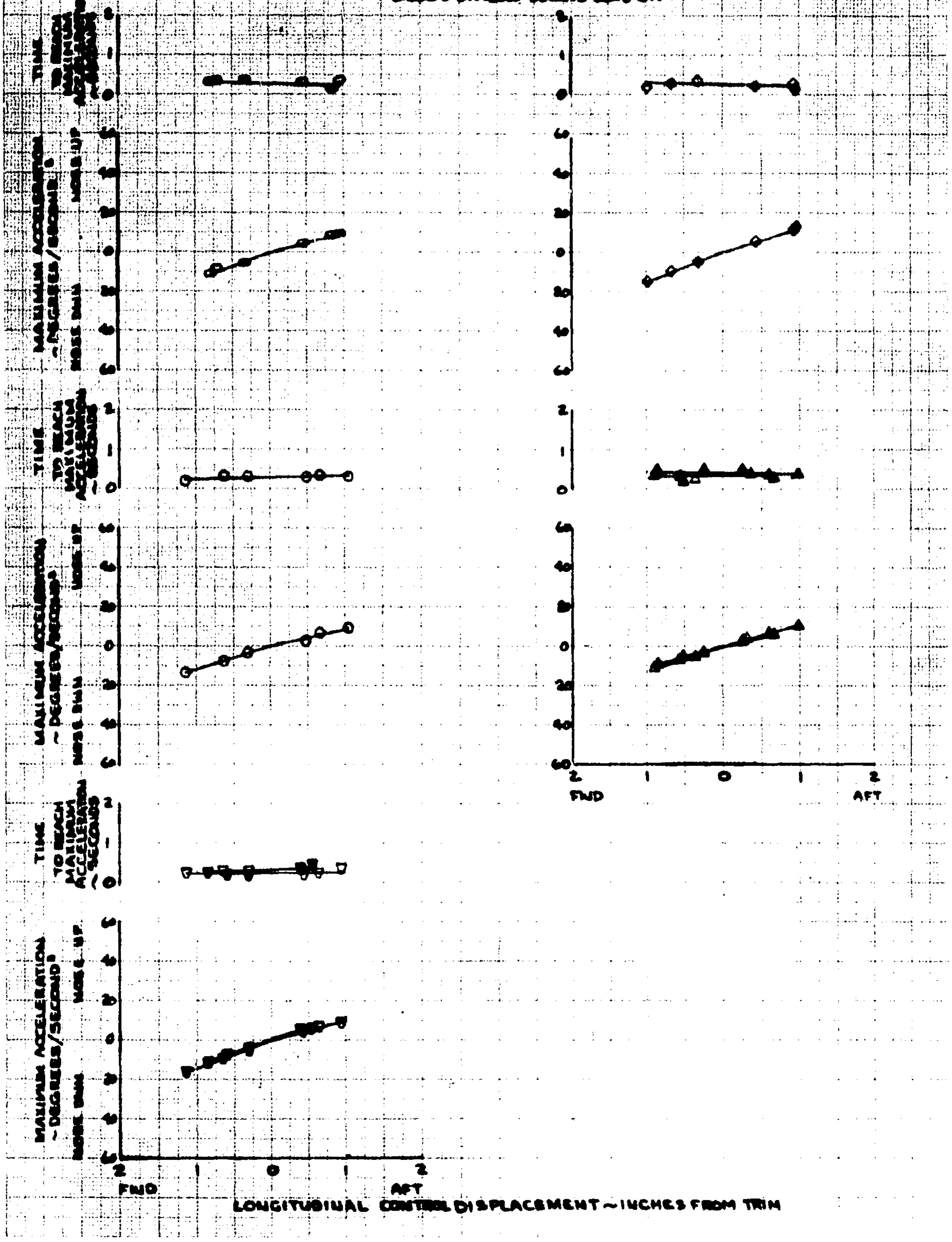


FIGURE NO. 185

LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_D~FT.	AVG. G.W. ~FT.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~C_T
●	63.5	4340	9660	199.9(AFT)	324.0	LEVEL FLIGHT	0.00 5457
○	108.0	5290	9440	200.0(AFT)	324.0	LEVEL FLIGHT	0.00 5488
▽	134.5	6580	9090	200.1(AFT)	324.0	LEVEL FLIGHT	0.00 5496
◇	172.0	7890	9600	199.7(AFT)	324.0	DIVE	0.00 6044
△	61.0	3250	9660	199.7(AFT)	324.0	CLIMB	0.00 5281

NOTE: ALL ROCKET PODS LOADED (1634 LB.)

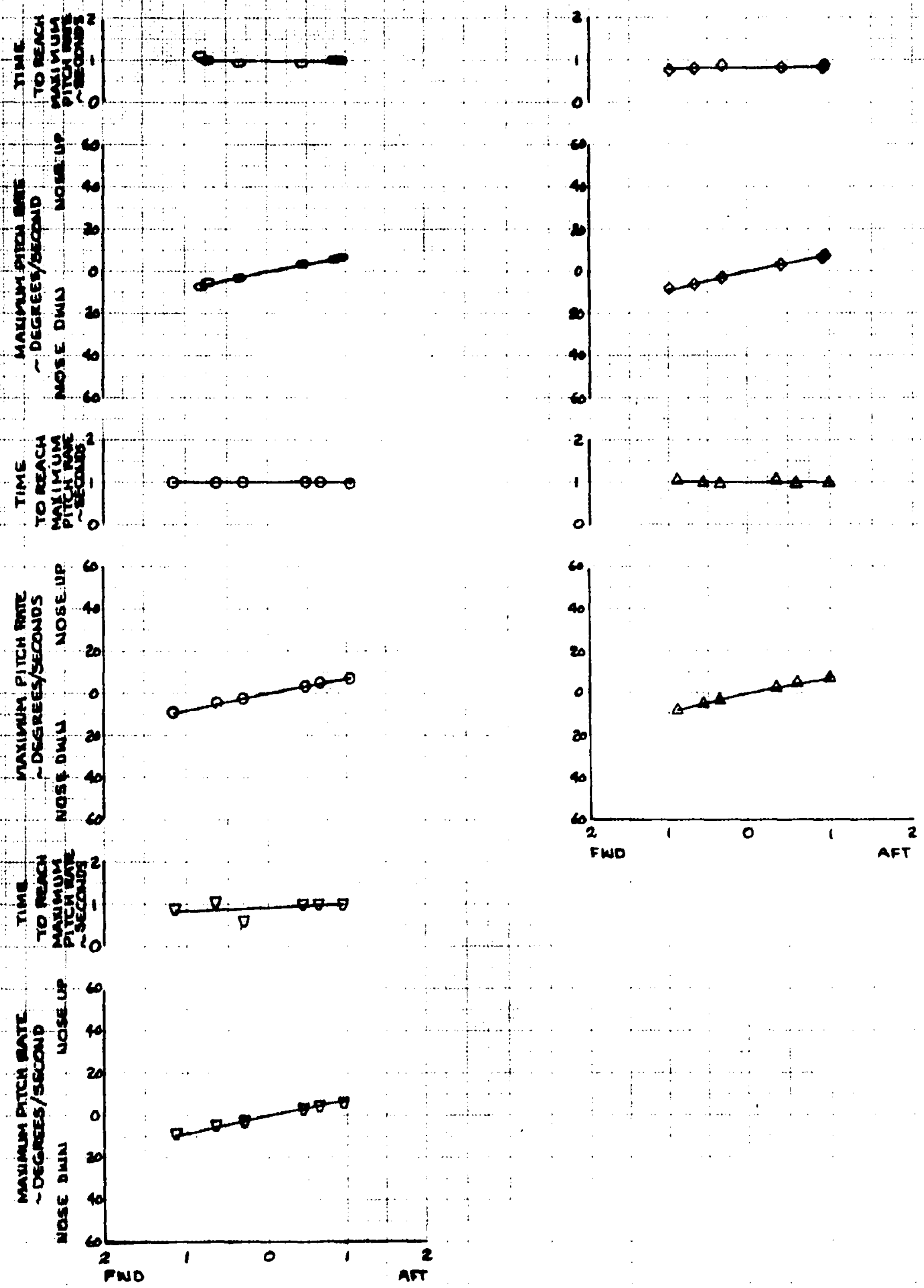


FIGURE NO. 186
LONGITUDINAL RESPONSE AT ONE SECOND
AH-1G USA [illegible]15696
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_D~FT	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
●	65.5	4340	9660	199.9(AFT)	3240	LEVEL FLIGHT	0.005457
○	100.0	3290	9640	200.0(AFT)	3240	LEVEL FLIGHT	0.00[illegible]
▽	139.5	6580	9090	200.1(AFT)	3240	LEVEL FLIGHT	0.00[illegible]96
◇	172.0	7890	9600	199.7(AFT)	3240	DIVE	0.006044
△	61.0	3350	9660	199.7(AFT)	3240	CLIMB	0.006281

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB.)

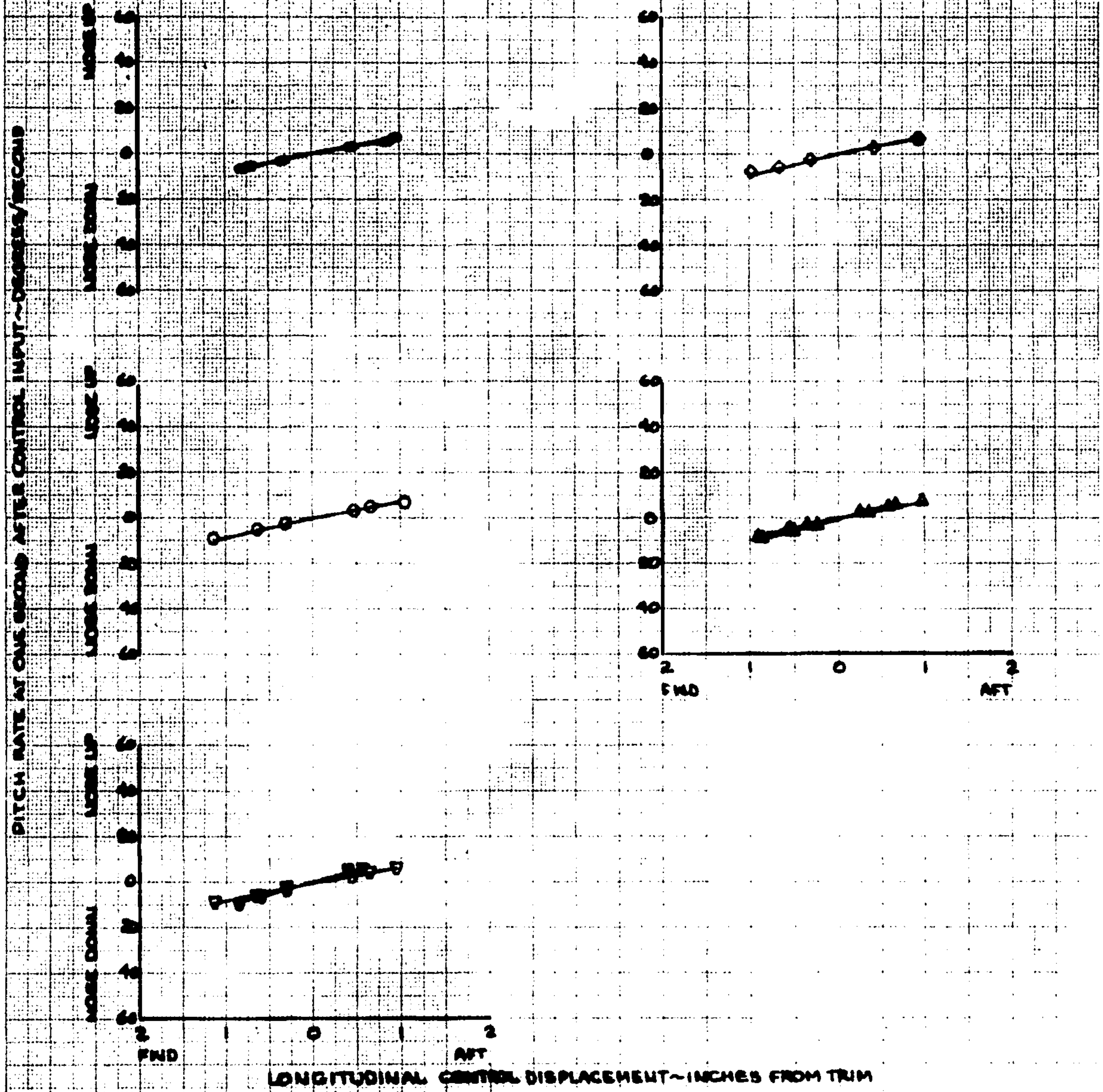


FIGURE No. 187

ANGULAR PITCH DISPLACEMENT

AH-1G USA S/N 71-15696

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT COND.	THRUST COEFF ~CT
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	161.4	[illegible]	[illegible]	[illegible]	[illegible]	CLIMB	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1684 LB.)

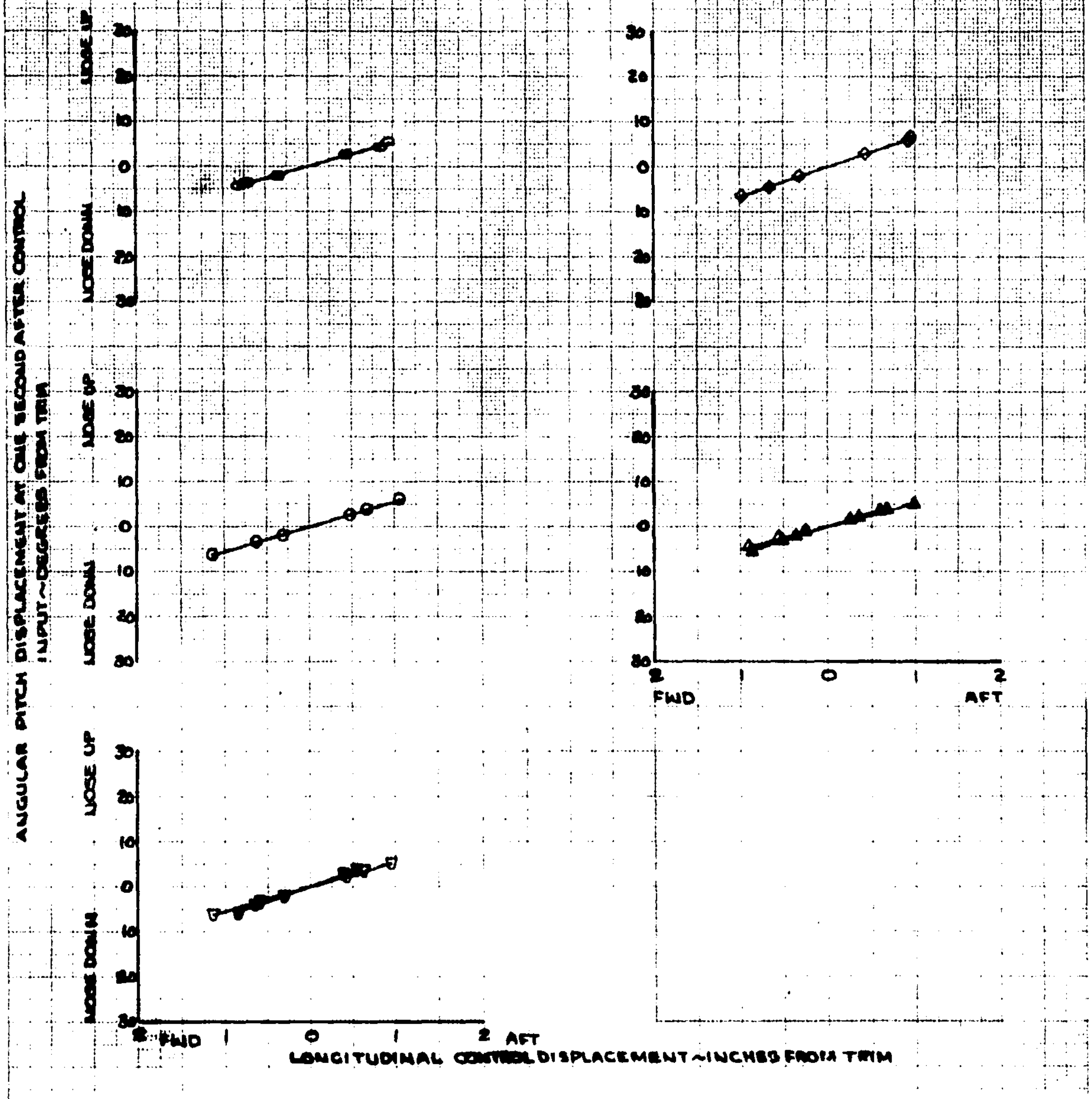


FIGURE NO. 185

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA S/N 71-15698

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AIRSPEED ~CAS	AVG. ALT. H_p~FT	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	55.0	15330	7970	200.9(AFT)	324.0	LEVEL FLIGHT	0.006370
◇	88.0	15720	7710	200.9(AFT)	324.0	LEVEL FLIGHT	[illegible]
▽	101.0	15420	7850	200.9(AFT)	324.0	LEVEL FLIGHT	0.006195

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

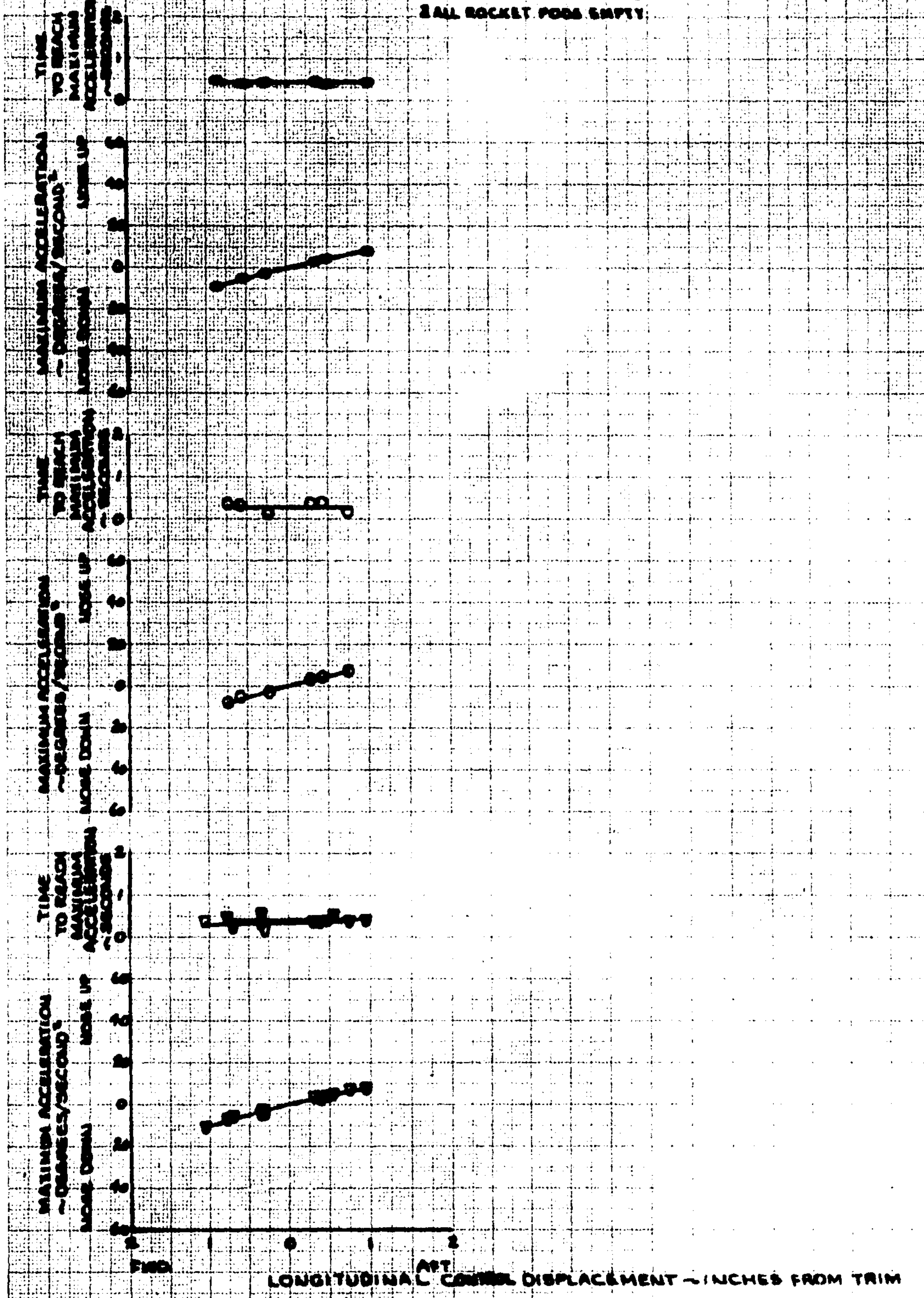


FIGURE NO. 189

LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N 71-15[illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM.	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR SPEED ~RPM	FLIGHT CONDITION	THRUST COEFF. ~CT
●	[illegible]	15550	7770	[illegible] (AFT)	324	LEVEL FLIGHT	0.006370
○	[illegible]	15730	7710	[illegible] (AFT)	324	LEVEL FLIGHT	0.006229
▽	105.0	15490	7850	[illegible] (AFT)	324	LEVEL FLIGHT	0.006395

NOTE: 1. [illegible]

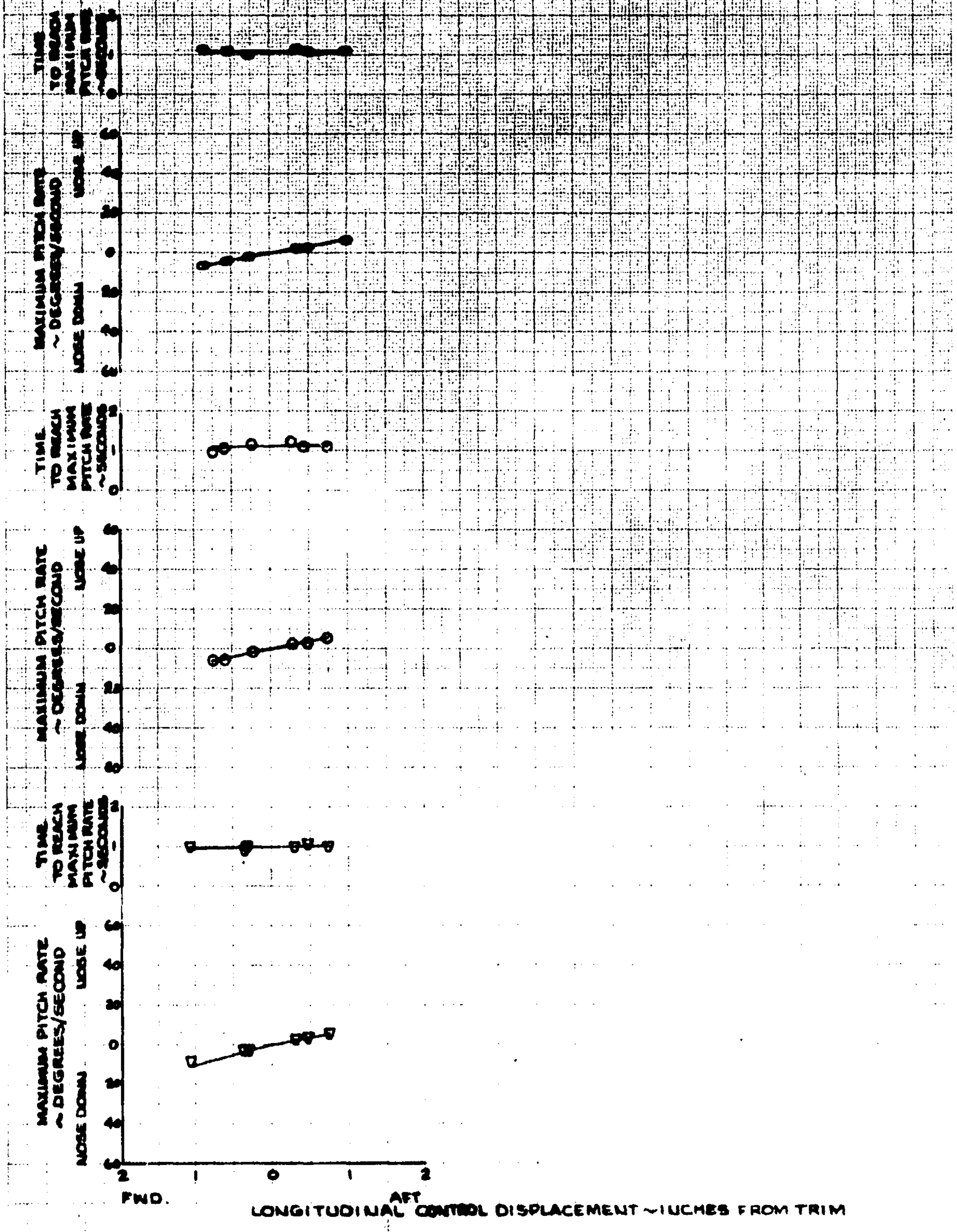


FIGURE NO. 170

LONGITUDINAL RESPONSE AT ONE SECOND

[illegible]

[illegible]

SYM	AIRSPEED ~KCAS	AVG. ALT. ~FT	AVG. GW ~LB	AVG. C.G. LONG. ~IN.	ROTOR SPEED ~RPM	FLIGHT CONDITION	THRUST COEF ~C_T
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
▽	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

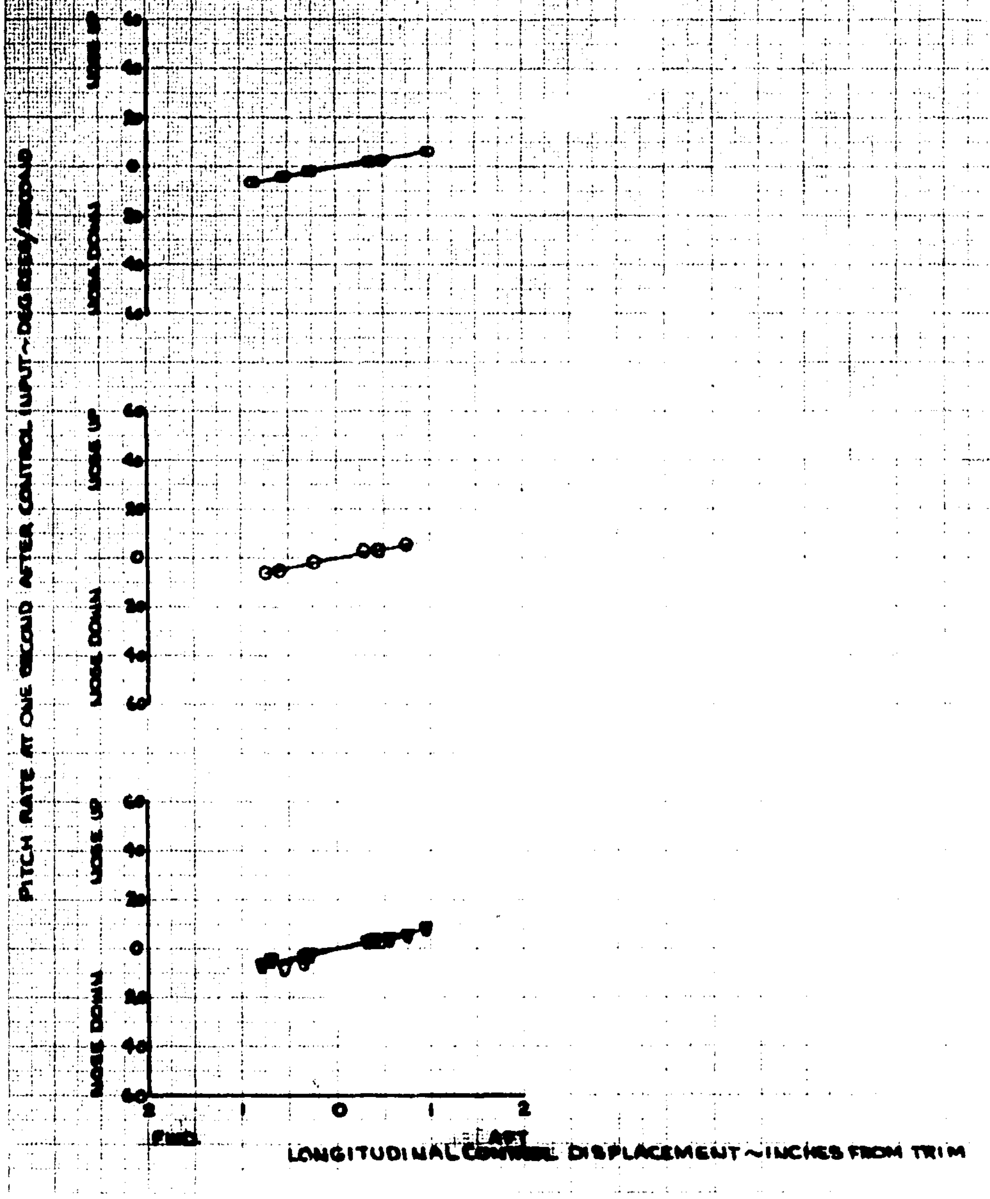


FIGURE NO. 191
ANGULAR PITCH DISPLACEMENT
AH-1G USA [illegible]
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. AIRSPEED ~[illegible]	AVG. ALT. Hp~FT	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR SPEED ~RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	[illegible]	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.006370
□	[illegible]	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.006229
◇	[illegible]	[illegible]	[illegible]	[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.006395

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

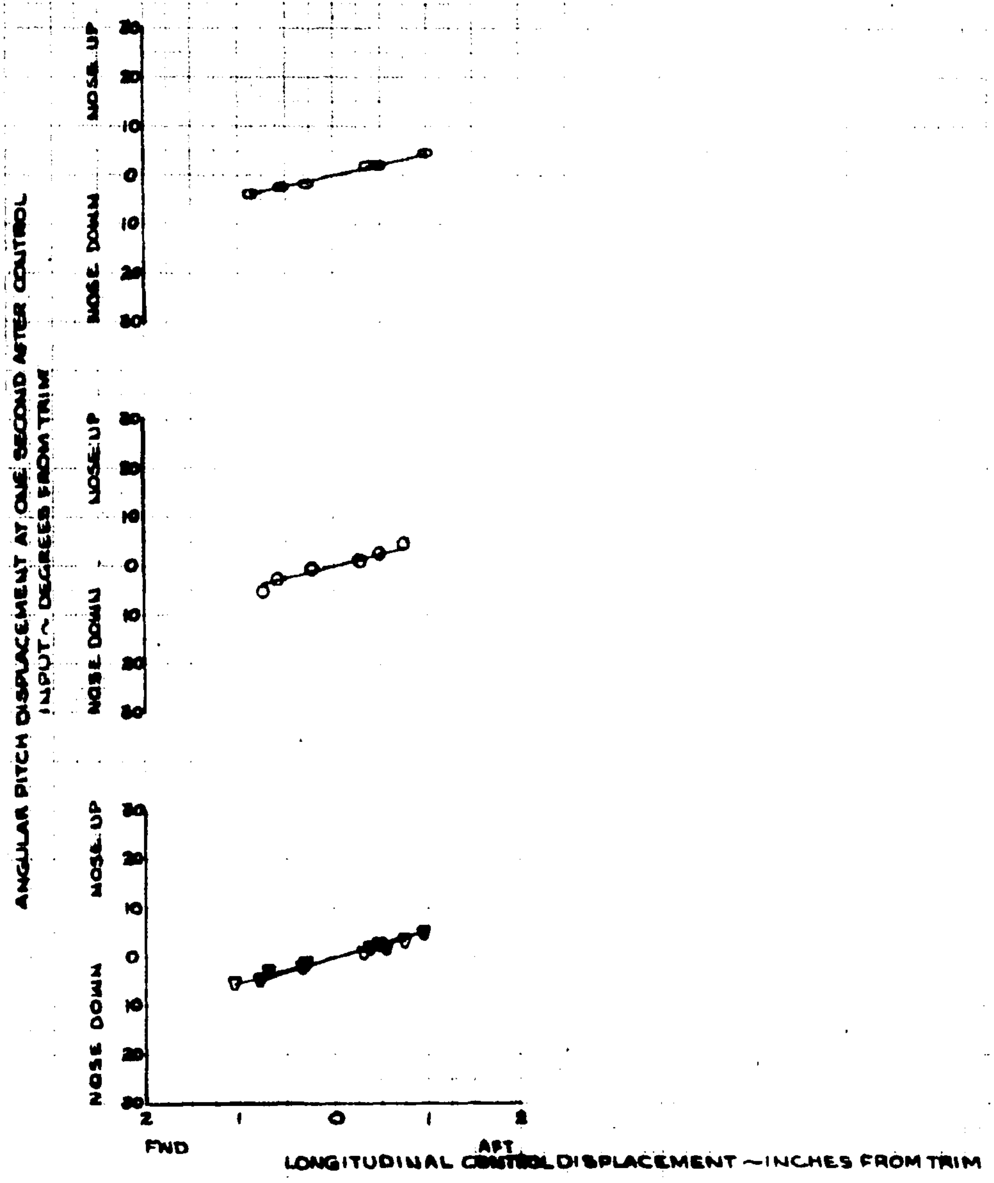


FIGURE No. 182

LATERAL CONTROL SENSITIVITY

AH-1G USA S/N 15698

CLEAN CONFIGURATION

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT	AVG. G.W. ~LB	AVG. LONG. C.G.~IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF.
⬭	65.0	4970	7710	201.2 (AFT)	3240	LEVEL FLIGHT	0.004439
○	109.0	6790	7300	201.1 (AFT)	3240	LEVEL FLIGHT	0.004443
▽	145.0	4960	7460	201.2 (AFT)	3240	LEVEL FLIGHT	0.004320
◇	181.0	3140	7700	201.2 (AFT)	3240	DIVE	0.004183
△	62.0	2440	7620	201.2 (AFT)	3240	CLIMB	0.004066
□	68.5	3290	7130	201.2 (AFT)	3000	AUTOROTATION	0.004935

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

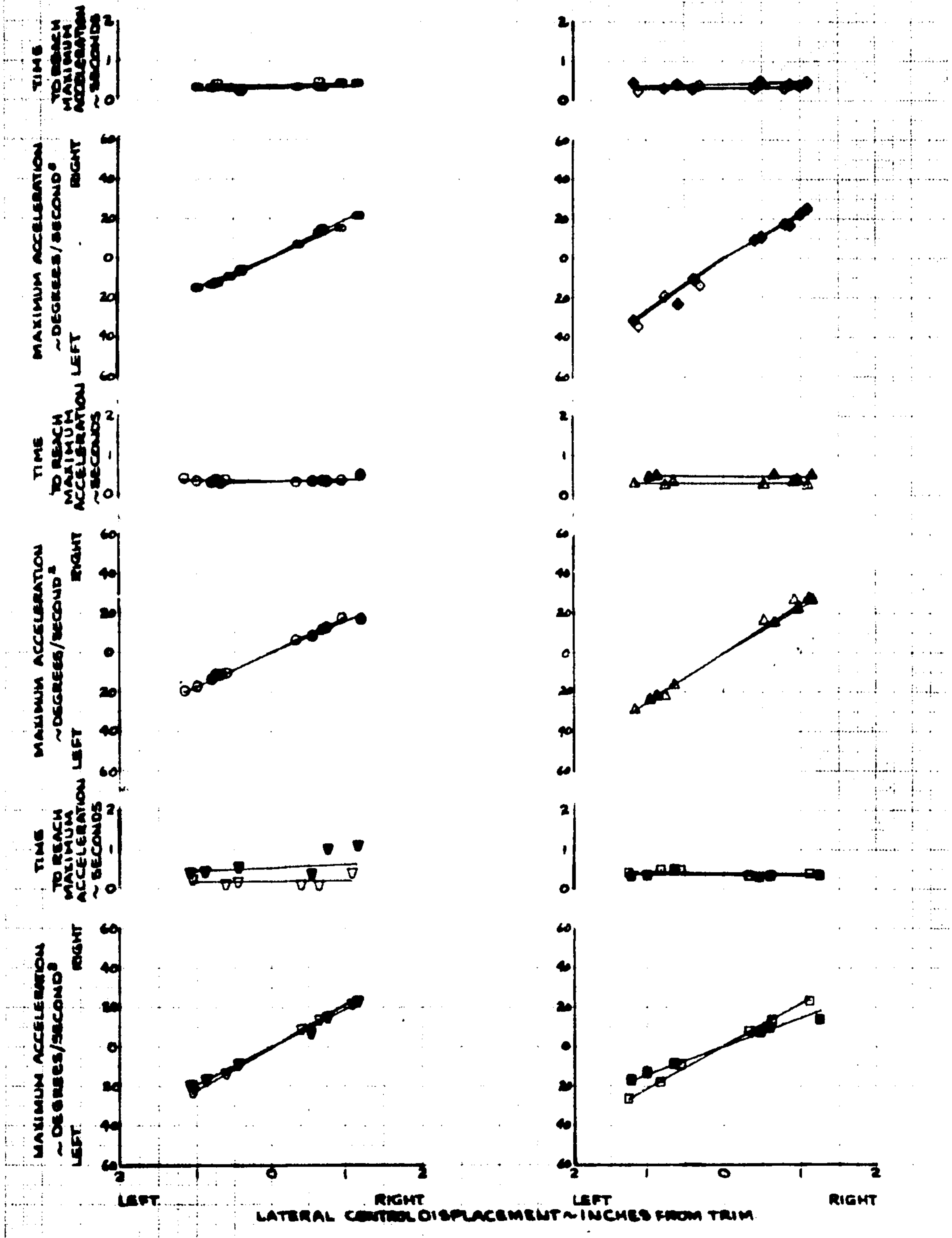


FIGURE NO. 193

LATERAL CONTROL RESPONSE

AH-1G USA S/N 715698
CLEAN CONFIGURATION
SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF.
⬭	68.0	4970	7710	201.2(AFT)	3240	LEVEL FLIGHT	0.004439
○	109.0	6790	7800	201.1(AFT)	3240	LEVEL FLIGHT	0.004443
▽	145.0	6960	7460	201.2(AFT)	3240	LEVEL FLIGHT	0.004820
◇	191.0	8140	7700	201.2(AFT)	3240	DIVE	0.004183
△	62.0	2440	7620	201.2(AFT)	3240	CLIMB	0.004066
□	68.5	3290	7730	201.2(AFT)	[illegible]	AUTOROTATION	0.004433

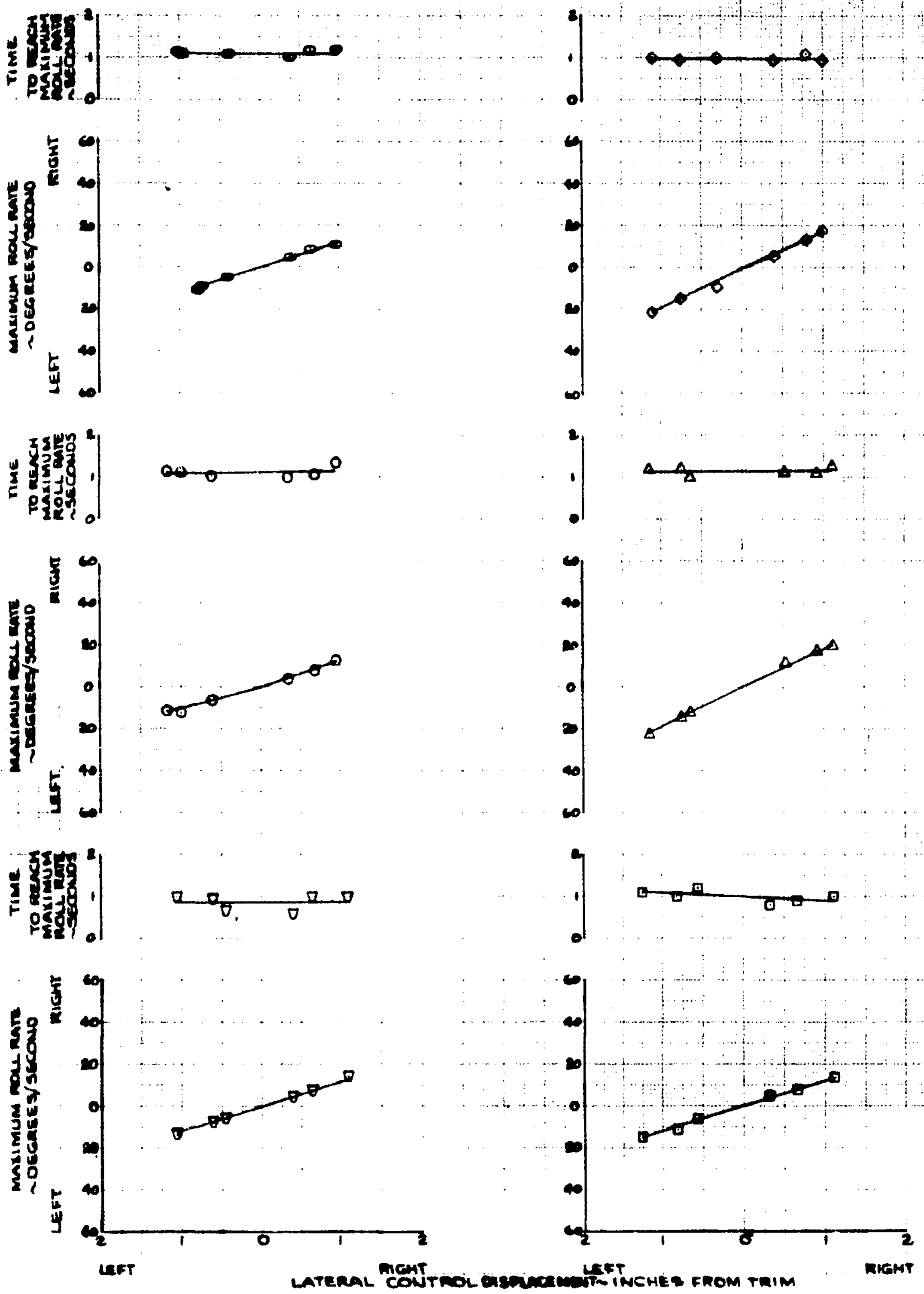


FIGURE NO. 194

LATERAL RESPONSE AT ONE SECOND

AH-1G USA S/N 15086

CLEAN CONFIGURATION

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~ FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	62.0	4970	7710	201.2 (AFT)	3240	LEVEL FLIGHT	[illegible]
⬡	104.0	6790	7300	201.1 (AFT)	3240	LEVEL FLIGHT	[illegible]
▽	145.0	4960	7960	201.2 (AFT)	3240	LEVEL FLIGHT	[illegible]
◇	181.0	3140	7700	201.2 (AFT)	3240	DIVE	0.004183
△	62.0	2440	7620	201.2 (AFT)	3240	CLIMB	[illegible]
□	68.5	5290	7730	201.2 (AFT)	3000	AUTOROTATION	[illegible]

NOTE: 1. OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

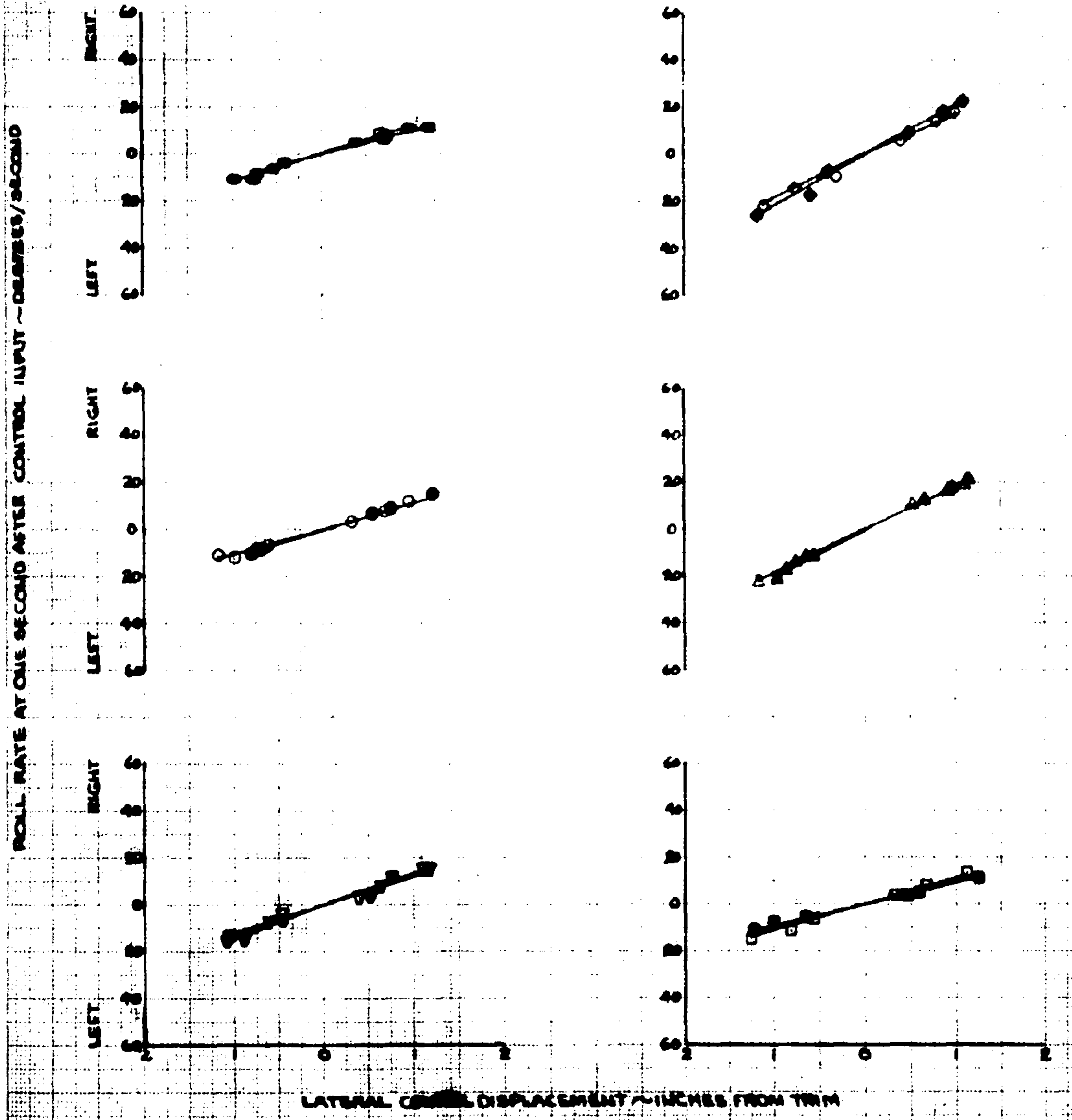


FIGURE NO. 195

ANGULAR ROLL DISPLACEMENT

AH-1G USA 66-15246

CLEAN CONFIGURATION

SYM.	AIRSPEED ~CAS	AVG.ALT. Hp~FT.	AVG.G.W. ~LB.	AVG.LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. ~CT
○	65.0	4970	7710	201.2(AFT)	324.0	LEVEL FLIGHT	0.004634
○	109.0	6790	7800	201.1(AFT)	324.0	LEVEL FLIGHT	0.004493
▽	143.0	4960	7760	201.2(AFT)	324.0	LEVEL FLIGHT	0.004820
◇	181.0	3140	7700	201.2(AFT)	324.0	DIVE	0.004187
△	62.0	2440	7680	201.2(AFT)	324.0	CLIMB	0.004066
□	68.5	3290	7780	201.2(AFT)	308.0	AUTOROTATION	0.004985

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

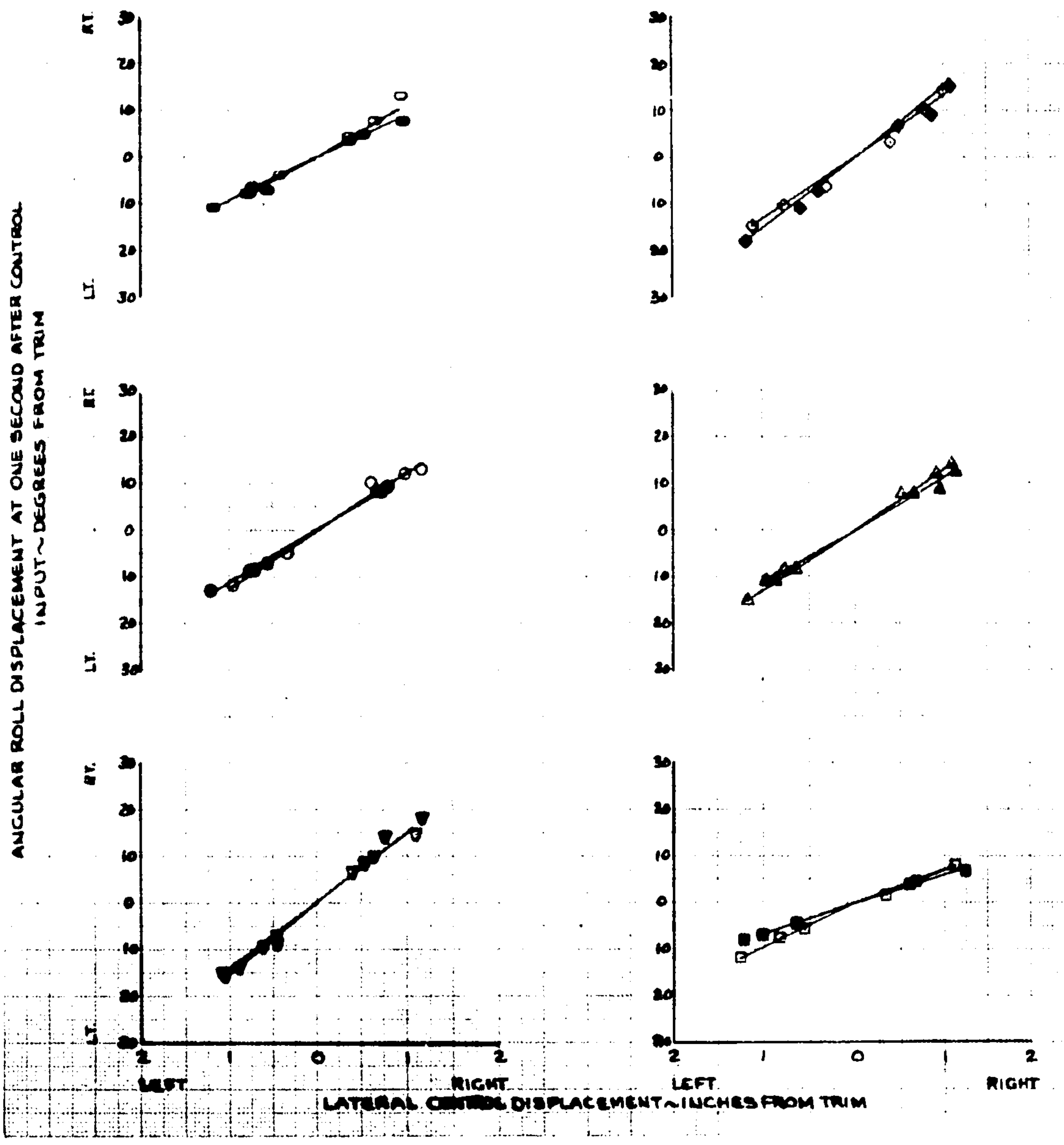


FIGURE NO. 196

LATERAL CONTROL SENSITIVITY

AH-1G USA [illegible]

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SCAS ON

SYM.	AIRSPEED ~ CAS	AVG. ALT. H_p ~ FT.	AVG. G.W. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND	THRUST COEFF. ~ C_T
○	116.0	3360	[illegible]	199.6(AFT)	[illegible]	LEVEL FLIGHT	0.004899
▽	145.5	3760	[illegible]	199.5(AFT)	[illegible]	LEVEL FLIGHT	0.004867
◇	169.0	5090	[illegible]	199.4(AFT)	[illegible]	DIVE	0.004881

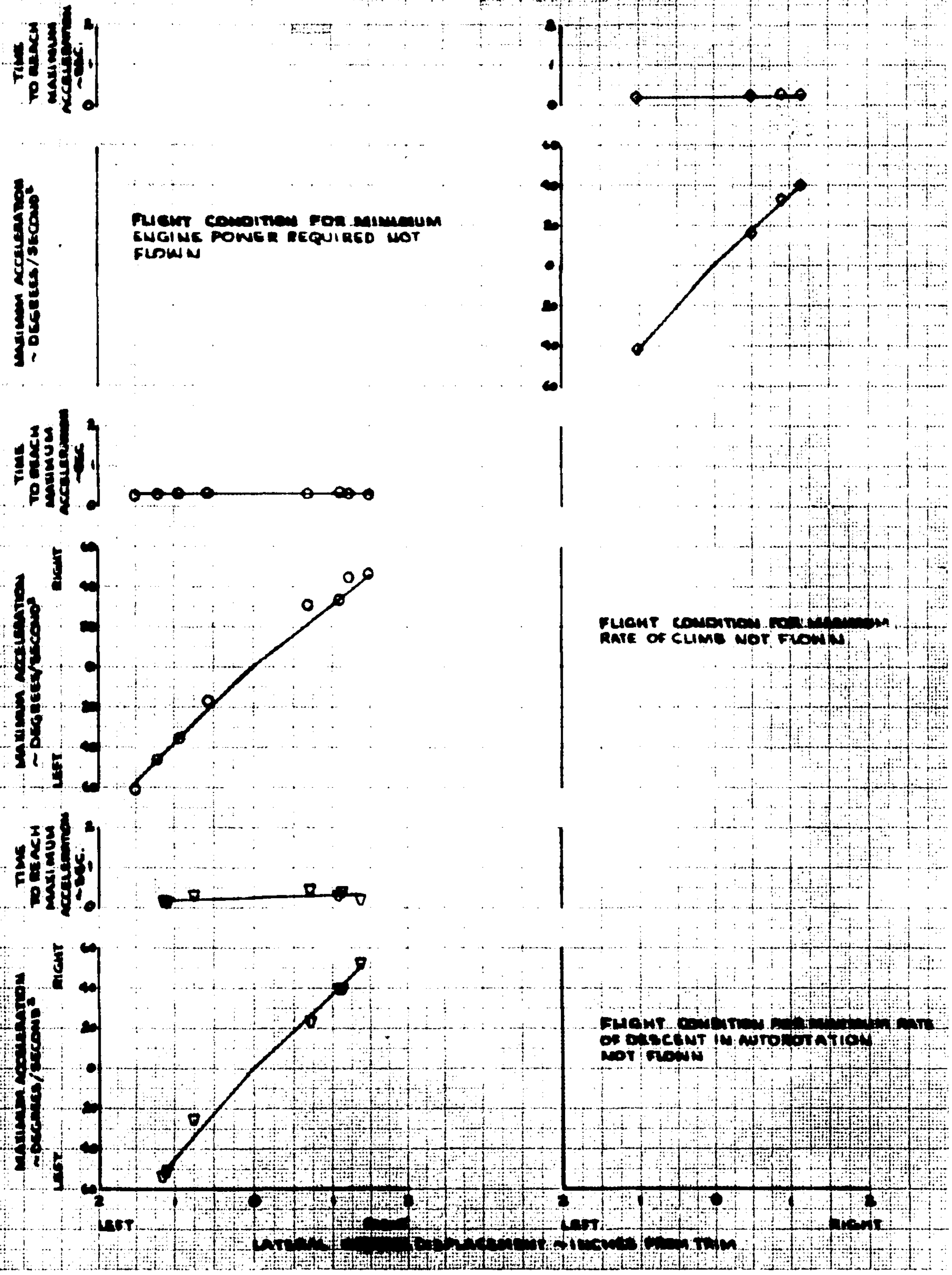


FIGURE No 197

LATERAL CONTROL RESPONSE

AH-1G USA S/N 615247

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	115.0	3760	8880	199.6(AFT)	3230	LEVEL FLIGHT	0.004899
▽	145.5	3760	8680	199.5(AFT)	3230	LEVEL FLIGHT	0.004847
◇	169.0	5090	8370	199.4(AFT)	322.5	DIVE	0.004881

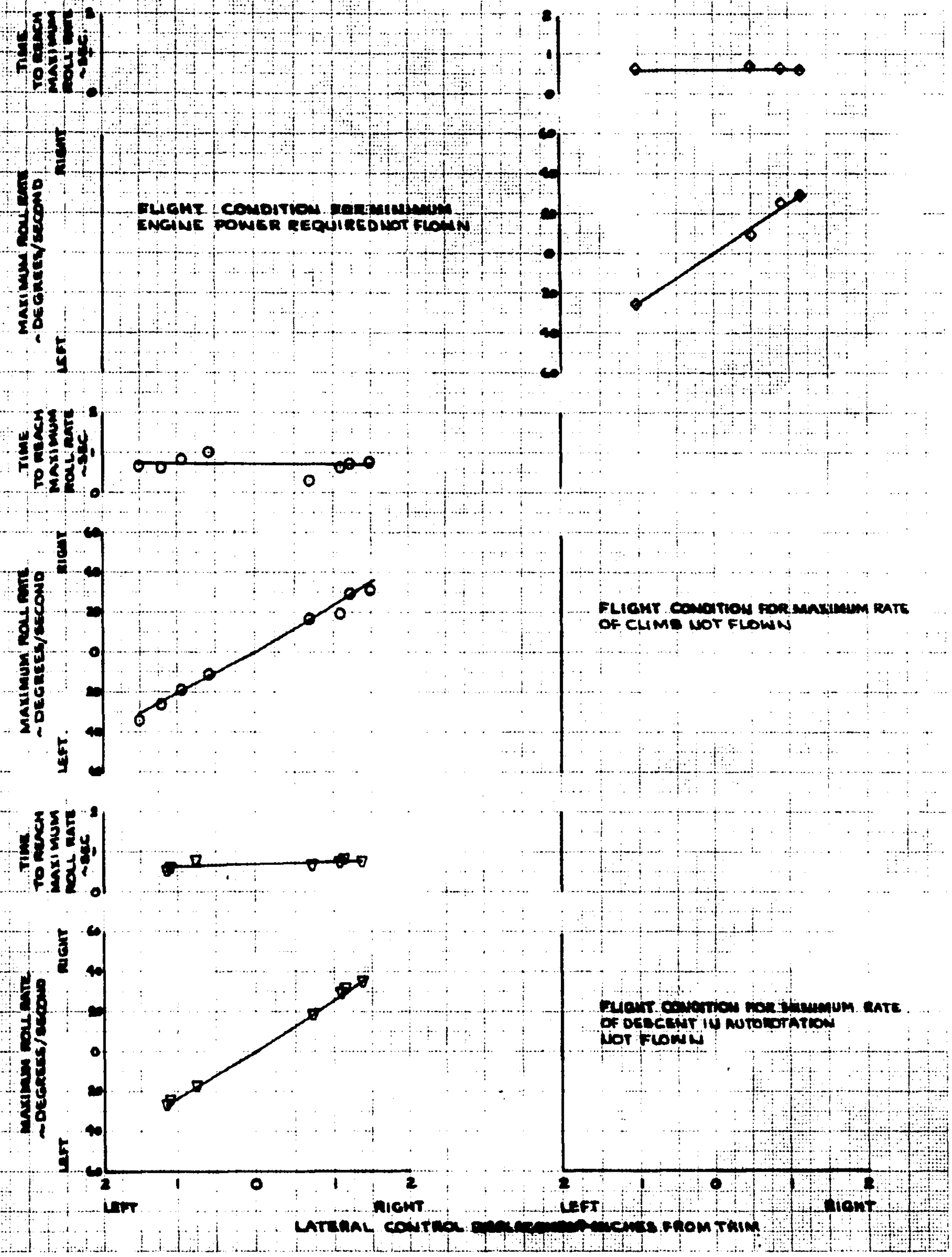


FIGURE NO. 198

LATERAL RESPONSE AT ONE SECOND

AH-1G USA S/N 615247
CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED
SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. Hp ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ CT
○	116.0	3560	8880	199.6(AFT)	323.0	LEVEL FLIGHT	0.004899
▽	145.5	3760	8680	199.5(AFT)	323.0	LEVEL FLIGHT	0.004847
◇	169.0	5090	8370	199.4(AFT)	322.5	DIVE	0.004881

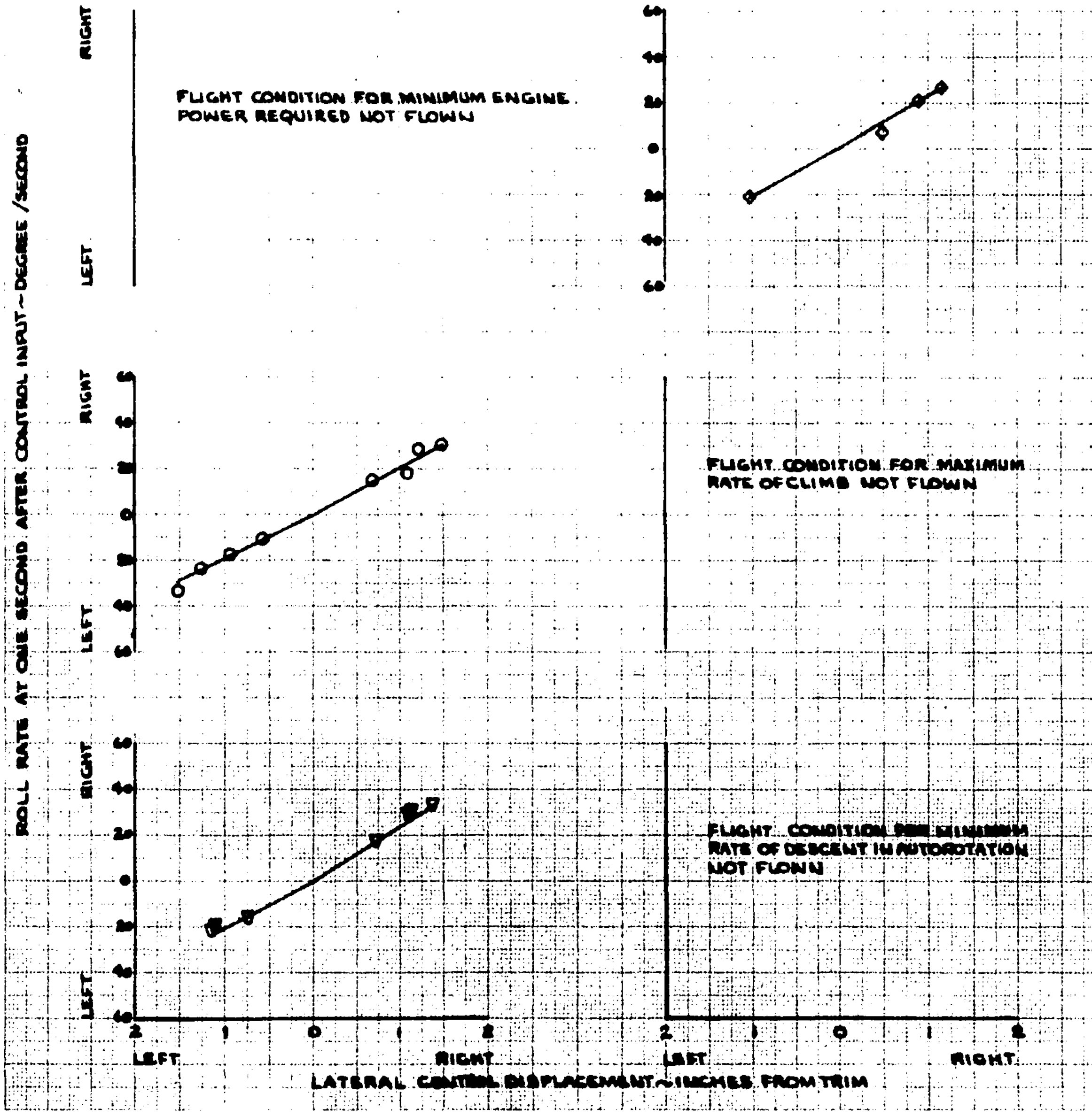


FIGURE NO. 199

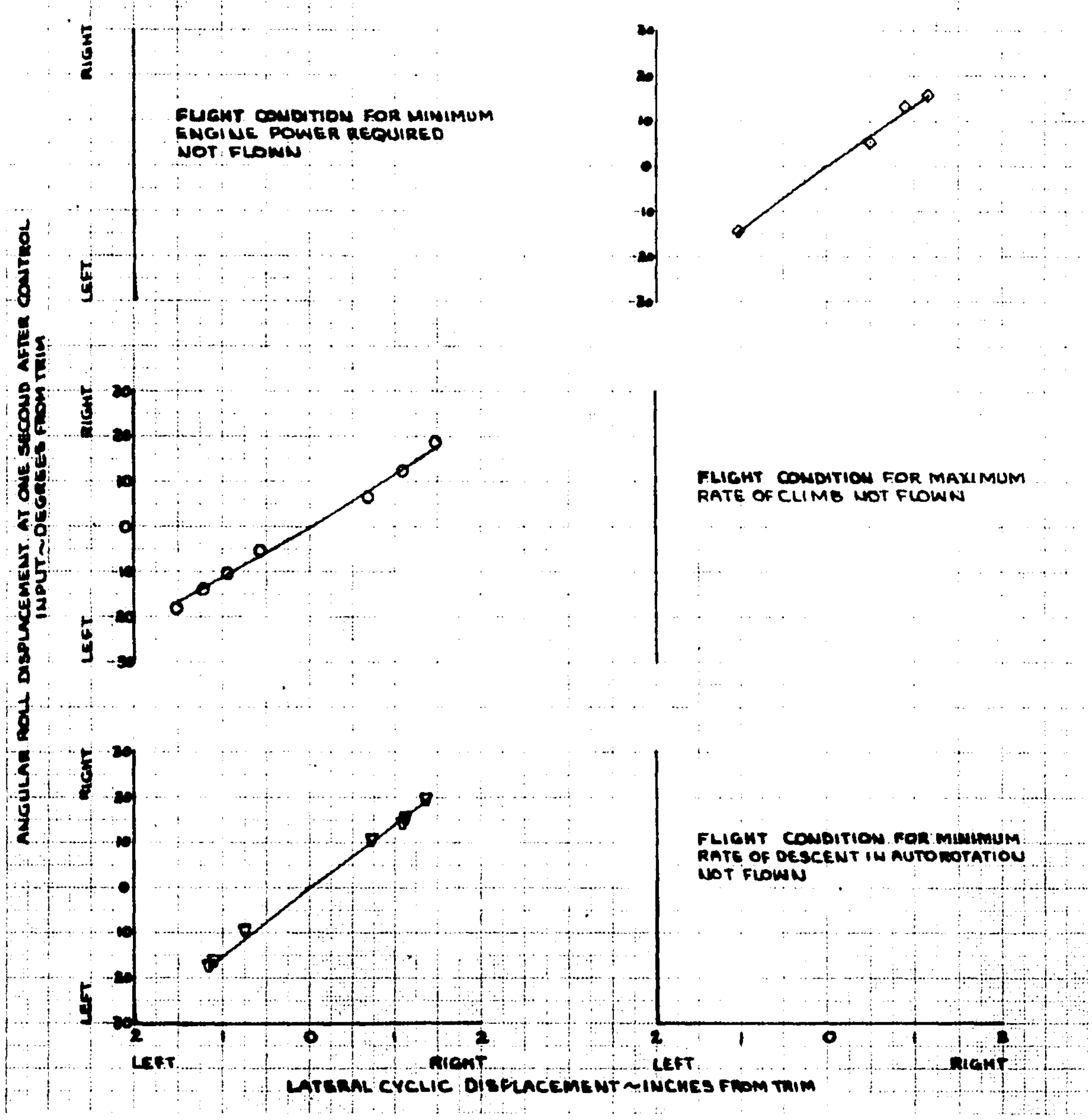
ANGULAR ROLL DISPLACEMENT

AH-1G USA [illegible]

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	116.0	3360	8880	199.6(AFT)	323.0	LEVEL FLIGHT	0.004899
▽	146.5	3760	8680	199.5(AFT)	323.0	LEVEL FLIGHT	0.004847
◇	169.0	5090	8570	199.4(AFT)	322.5	DIVE	0.004881



FLIGHT CONDITION FOR MINIMUM ENGINE POWER REQUIRED NOT FLOWN

FLIGHT CONDITION FOR MAXIMUM RATE OF CLIMB NOT FLOWN

FLIGHT CONDITION FOR MINIMUM RATE OF DESCENT IN AUTOROTATION NOT FLOWN

FIGURE NO. 200

LATERAL CONTROL SENSITIVITY

AH-1G USA S/N 715698

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~CT
○	105.0	5770	9070	200.3(AFT)	3240	LEVEL FLIGHT	0.005350
▽	143.0	5490	9240	200.2(AFT)	3240	LEVEL FLIGHT	0.005404
◇	172.0	6510	9440	200.0(AFT)	3240	DIVE	0.005661
△	58.0	2870	9480	200.0(AFT)	3240	CLIMB	0.006124

NOTE: [illegible] LB. IN OUTBD ROCKET PODS

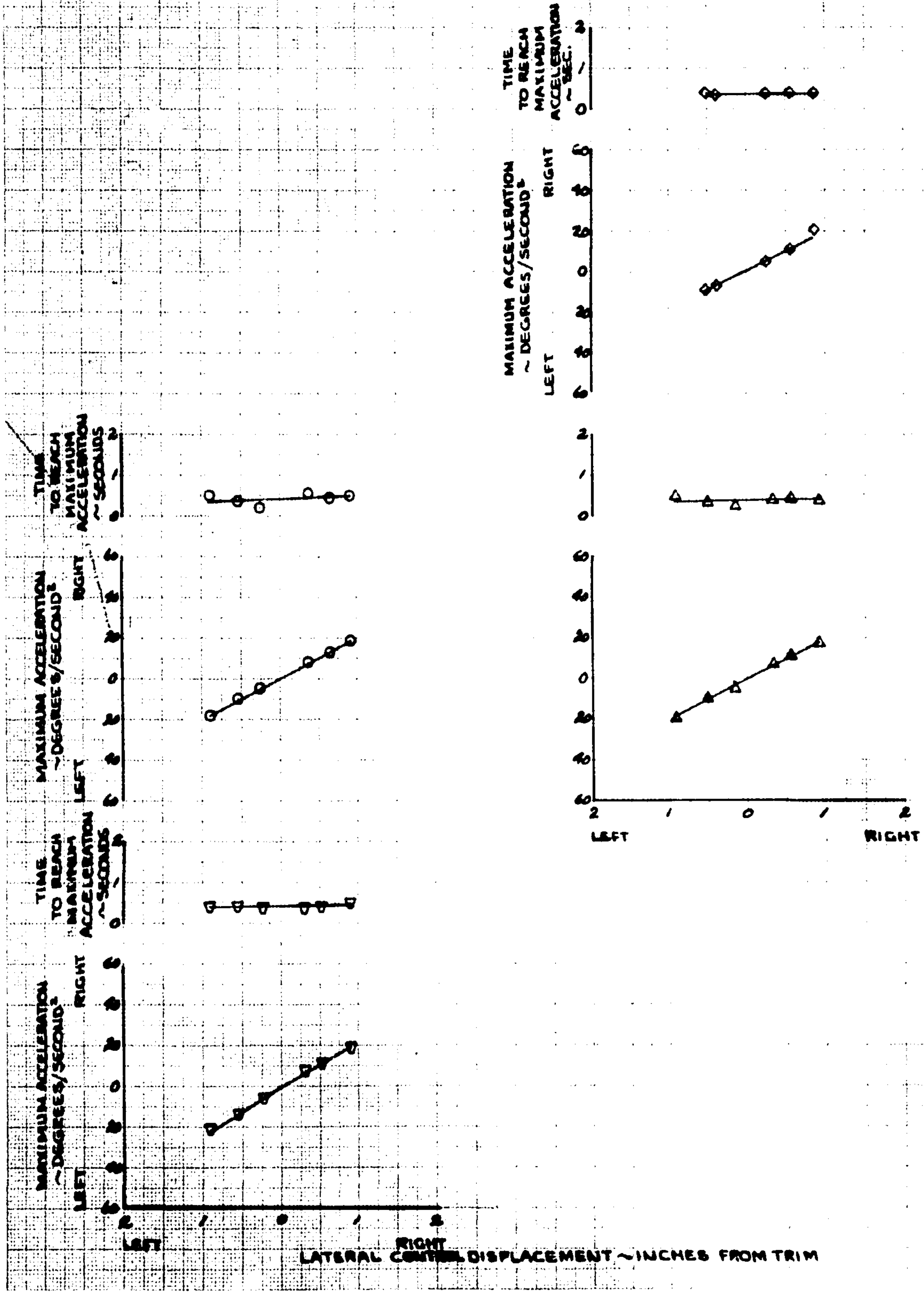


FIGURE NO. 201
LATERAL CONTROL RESPONSE

AH-1G USA S/N 71-15695
HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM.	AIRSPEED ~CAS	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. $\sim C_T$
○	105.0	5770	9070	200.2(AFT)	324.0	LEVEL FLIGHT	0.005350
▽	143.0	5490	9240	200.2(AFT)	324.0	LEVEL FLIGHT	0.005404
◇	172.0	6310	9640	200.0(AFT)	324.0	DIVE	0.005661
△	88.0	2870	9480	200.0(AFT)	324.0	CLIMB	0.005124

NOTE: 817 LB IN OUTBD ROCKET POD

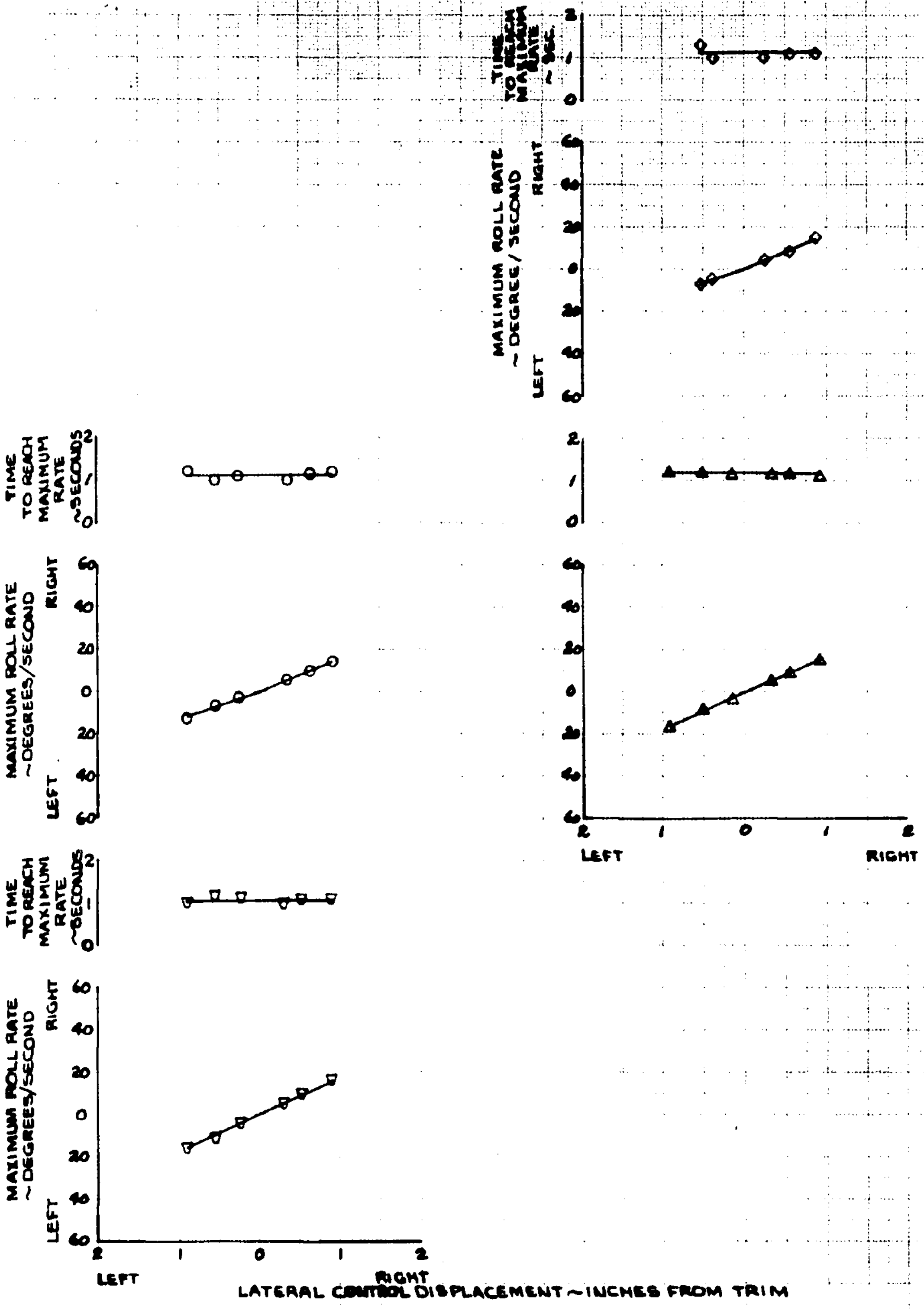


FIGURE NO. 202
LATERAL RESPONSE AT ONE SECOND
AH-1G USA S/N 7115695
HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	105.0	5770	9070	200.2(AFT)	324.0	LEVEL FLIGHT	0.005350
▽	142.0	5490	9240	200.2(AFT)	324.0	LEVEL FLIGHT	0.005404
◇	173.0	6310	9440	200.0(AFT)	324.0	DIVE	0.005661
△	88.0	2870	9480	200.0(AFT)	324.0	CLIMB	0.005124

NOTE: 817 LB. IN OUTB'D ROCKET PODS

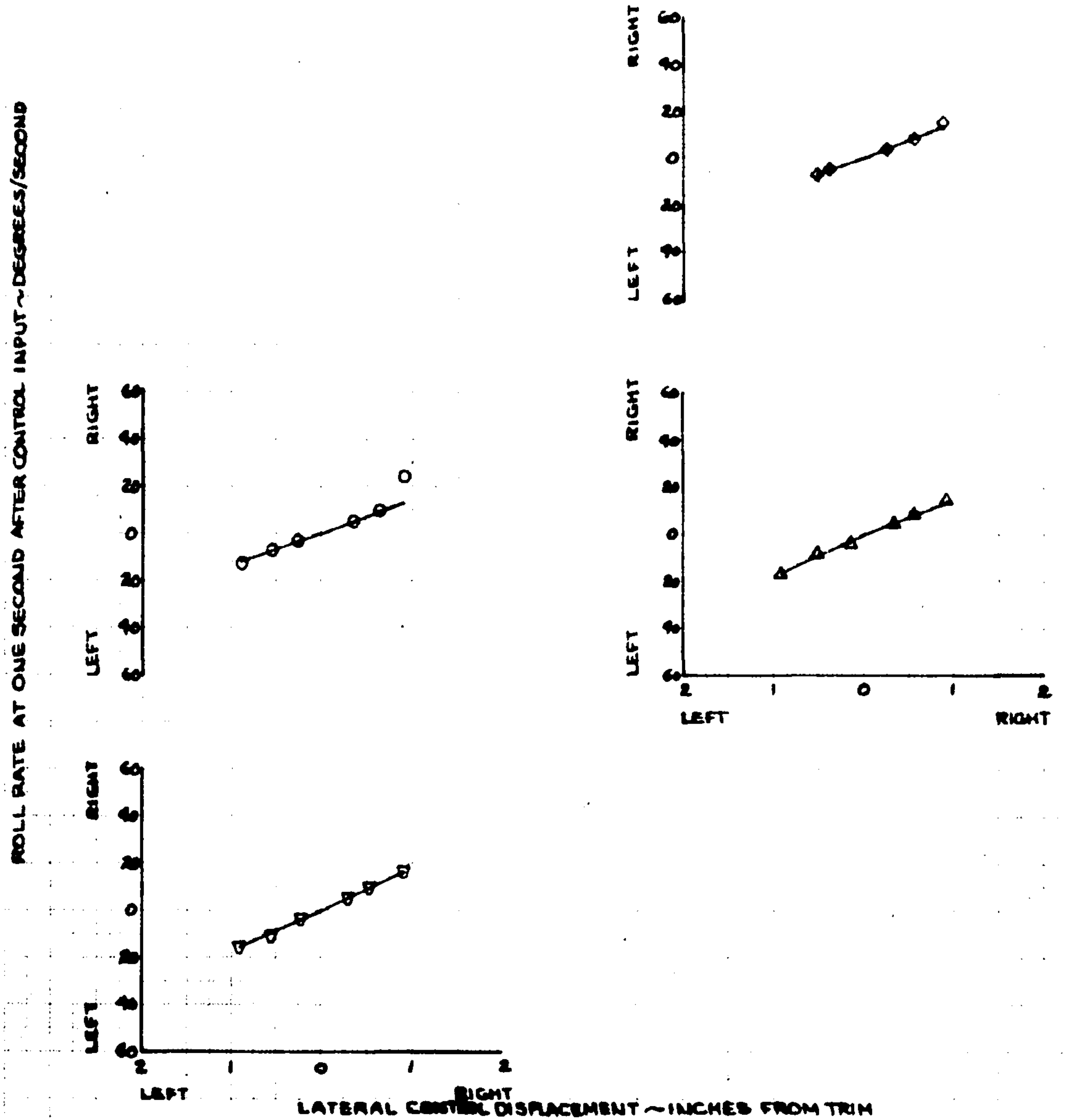


FIGURE NO. 205

ANGULAR ROLL DISPLACEMENT

AH-1G USA S/N 7115698
HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~C_T
○	105.0	5770	9070	200.3(AFT)	324.0	LEVEL FLIGHT	0.005550
▽	145.0	5440	9240	200.2(AFT)	324.0	LEVEL FLIGHT	0.005404
◇	172.0	6310	9440	200.0(AFT)	324.0	DIVE	0.005661
△	58.0	2810	9480	200.0(AFT)	324.0	CLIMB	0.005124

NOTE: 817 LB IN OUTBD ROCKET PODS

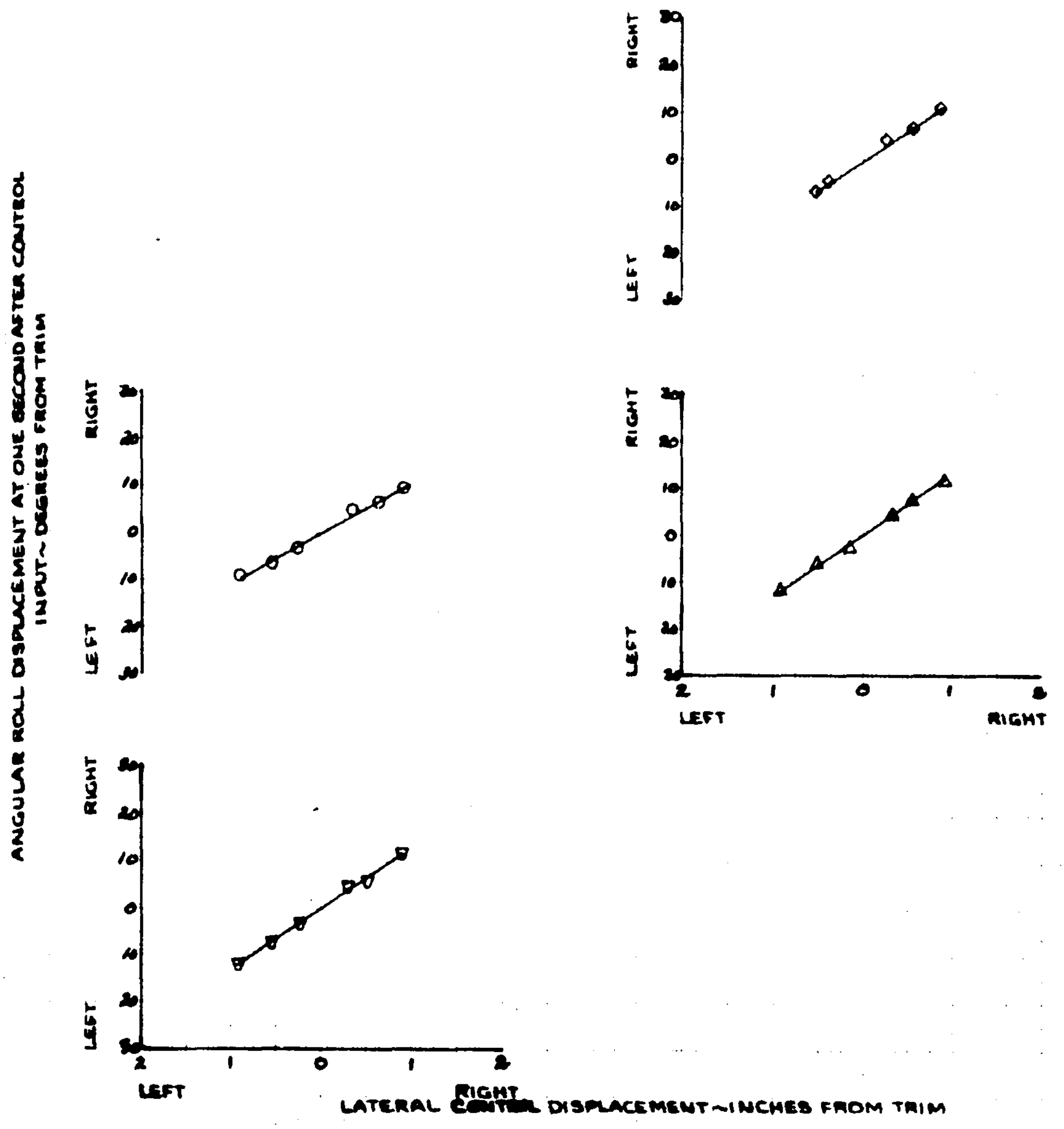


FIGURE No. 204

LATERAL CONTROL SENSITIVITY

AH-1G USA S/N 71-5695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
⊖	63.0	3970	8790	195.1(MID)	3250	LEVEL FLIGHT	0.004879
○	106.0	5160	8530	195.1(MID)	325.0	LEVEL FLIGHT	0.004909
▽	146.5	5740	8550	196.0(MID)	324.5	LEVEL FLIGHT	0.005024
◇	172.0	8180	8680	198.2(MID)	3240	DIVE	0.005515
△	60.0	1550	8450	195.0(MID)	3240	CLIMB	0.004890
□	67.0	6480	8460	195.0(MID)	3100	AUTOROTATION	0.005573

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

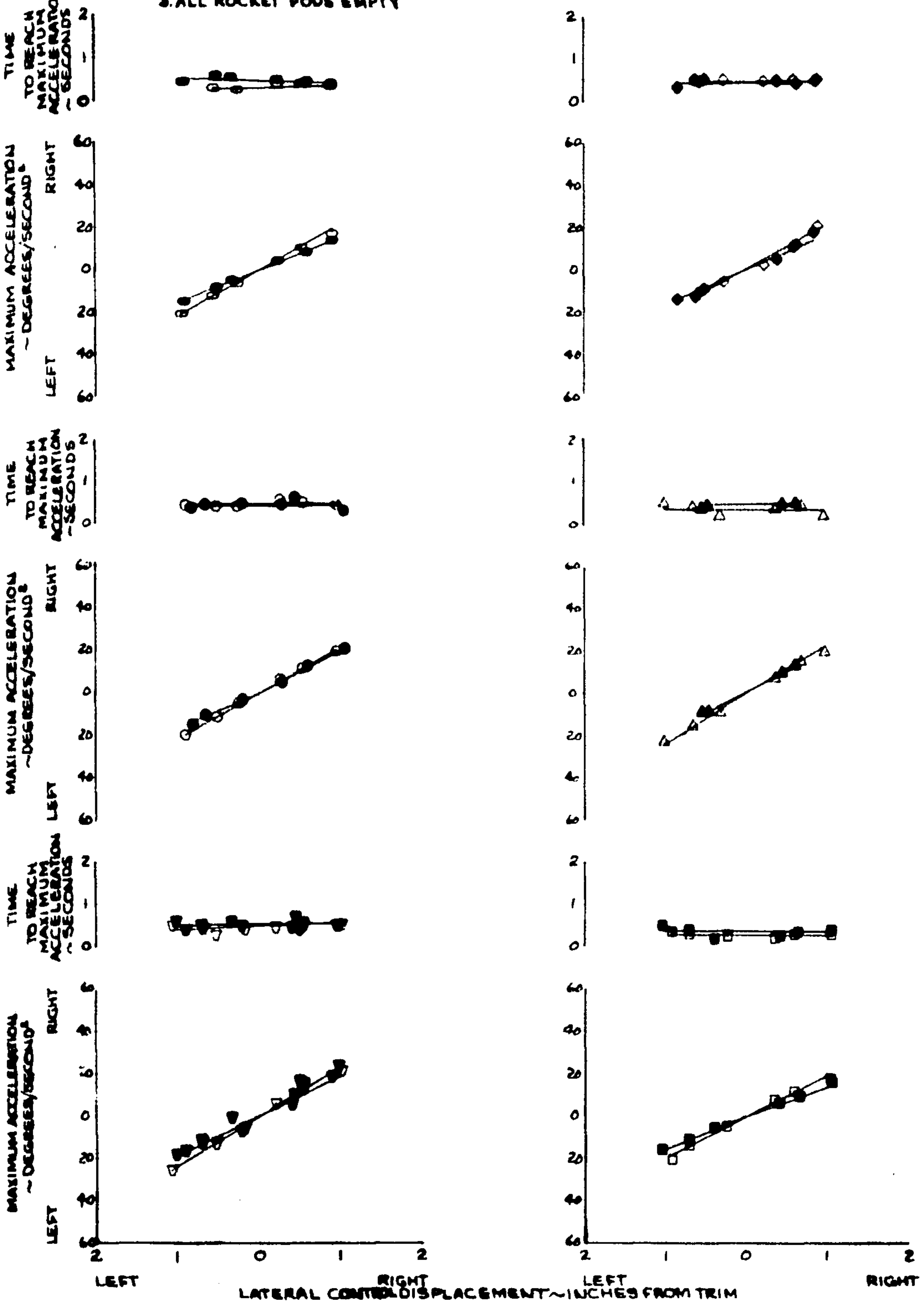


FIGURE NO. 205

LATERAL CONTROL RESPONSE

AH-1G USA[illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	68.0	3910	8790	195.1 (MID)	325.0	LEVEL FLIGHT	0.00 4819
○	105.0	5160	8630	195.1 (MID)	323.0	LEVEL FLIGHT	0.00 4409
▽	146.5	5740	8550	196.0 (MID)	324.5	LEVEL FLIGHT	0.00 5024
◇	172.0	8180	8680	195.2 (MID)	324.0	DIVE	0.00 5515
△	60.0	1550	8450	195.0 (MID)	324.0	CLIMB	0.00 4390
□	67.0	6480	8460	196.0 (MID)	310.0	AUTOROTATION	0.00 5573

NOTE : ALL PODS EMPTY

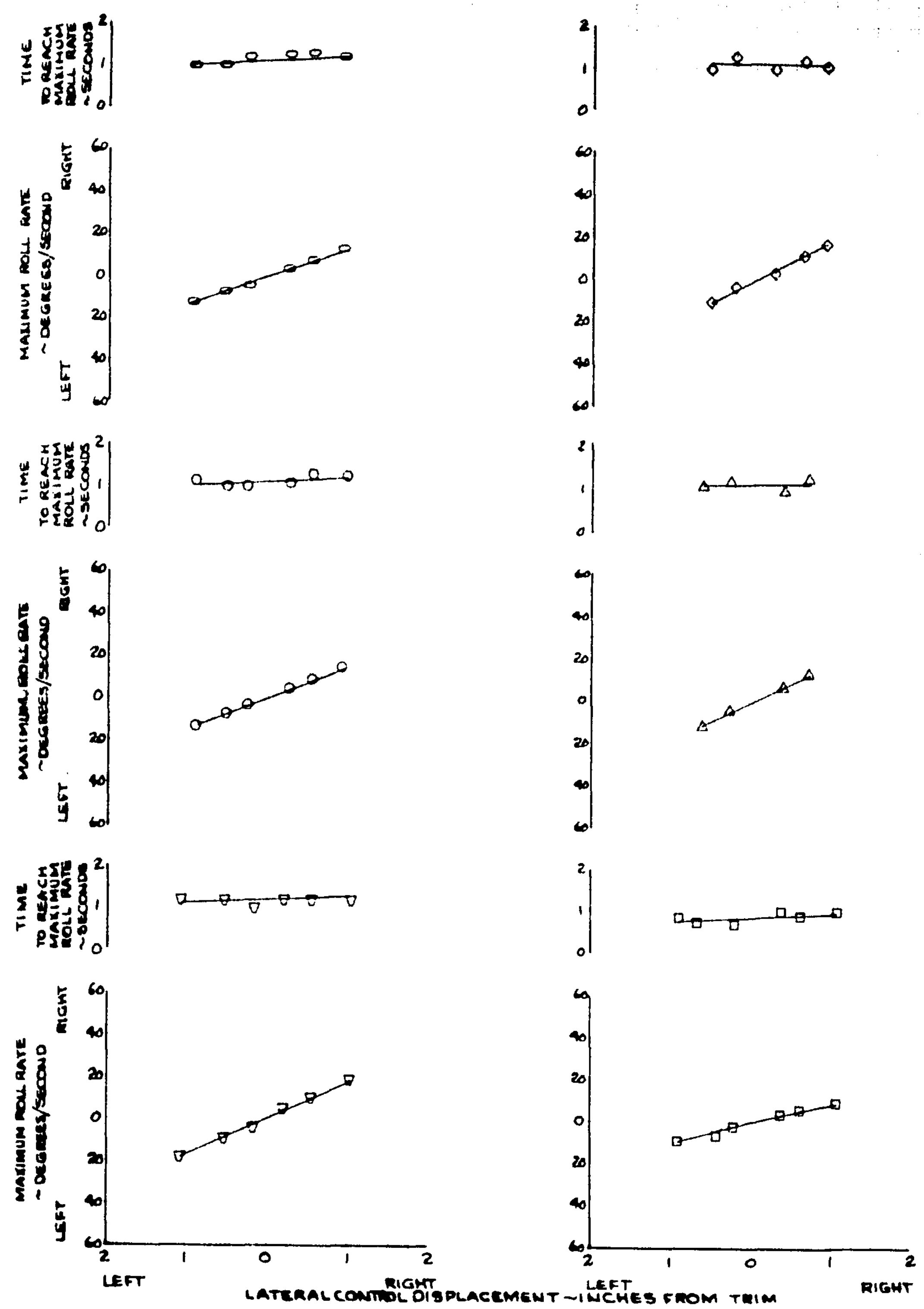


FIGURE NO. 206

LATERAL RESPONSE AT ONE SECOND

AH-1G USA S/N 15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~C_T
●	63.0	[illegible]10	8790	195.1(MID)	325.0	LEVEL FLIGHT	0.004879
○	103.0	3160	8830	195.1(MID)	325.0	LEVEL FLIGHT	0.004404
▽	146.5	5140	8550	195.0(MID)	324.5	LEVEL FLIGHT	0.005024
◇	172.0	8180	8680	195.2(MID)	324.0	DIVE	0.005515
△	60.0	1550	8450	195.0(MID)	324.0	CLIMB	0.004996
□	61.0	6480	8960	195.0(MID)	310.0	AUTOROTATION	0.003373

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

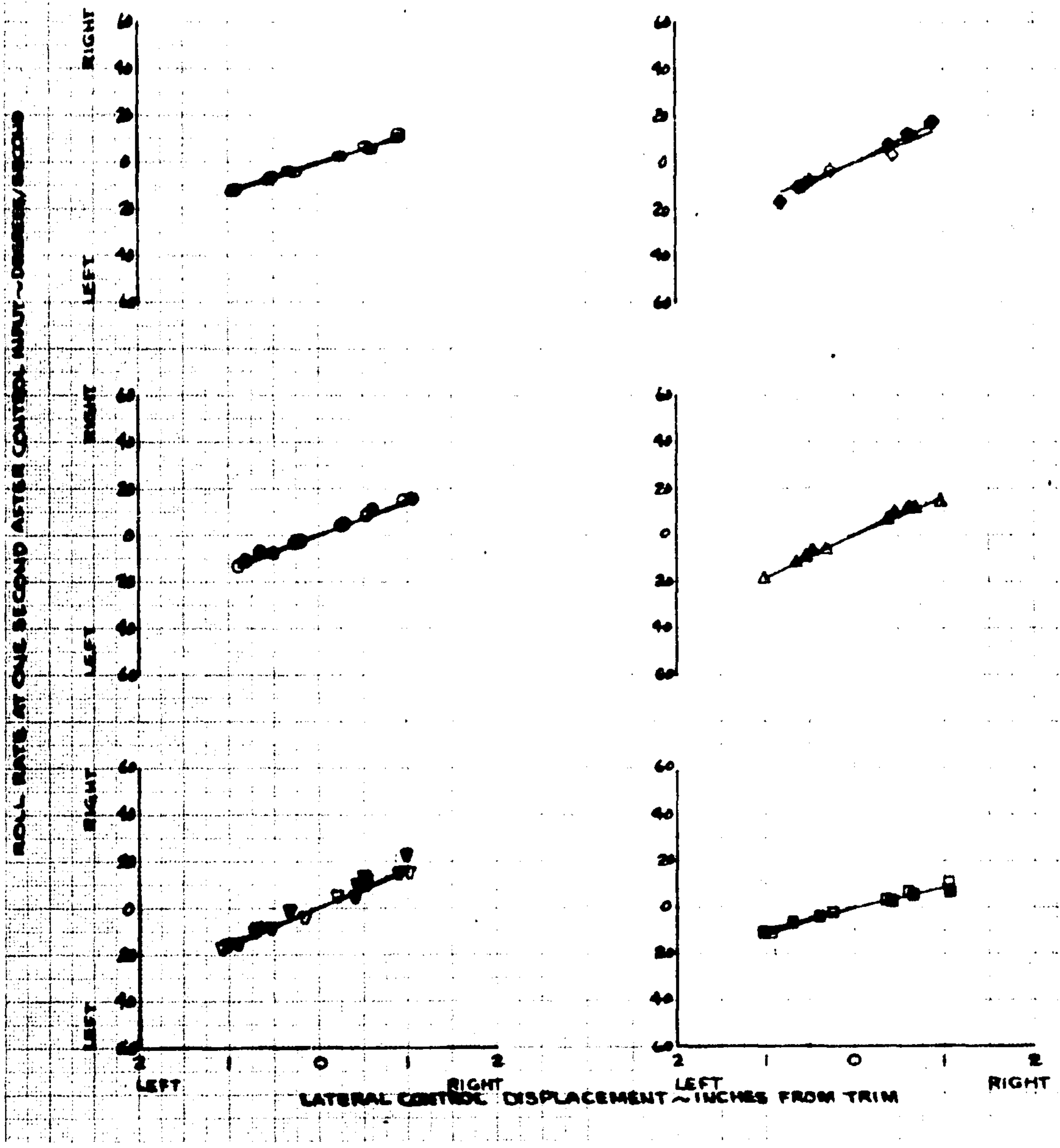


FIGURE No. 207

ANGULAR ROLL DISPLACEMENT

AH-1G USA S/N 15695
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~CT
○	[illegible]	3970	8780	193.1(MID)	[illegible]	LEVEL FLIGHT	0.004879
◇	[illegible]	3160	8550	193.1(MID)	[illegible]	LEVEL FLIGHT	0.004901
▽	146.6	5790	8530	195.0(MID)	324.5	LEVEL FLIGHT	0.005024
⬠	173.5	6180	8680	195.2(MID)	324.0	DIVE	0.005515
△	60.0	1550	8650	193.0(MID)	324.0	CLIMB	0.004590
□	67.0	6480	8460	195.0(MID)	3100	AUTOROTATION	0.005573

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

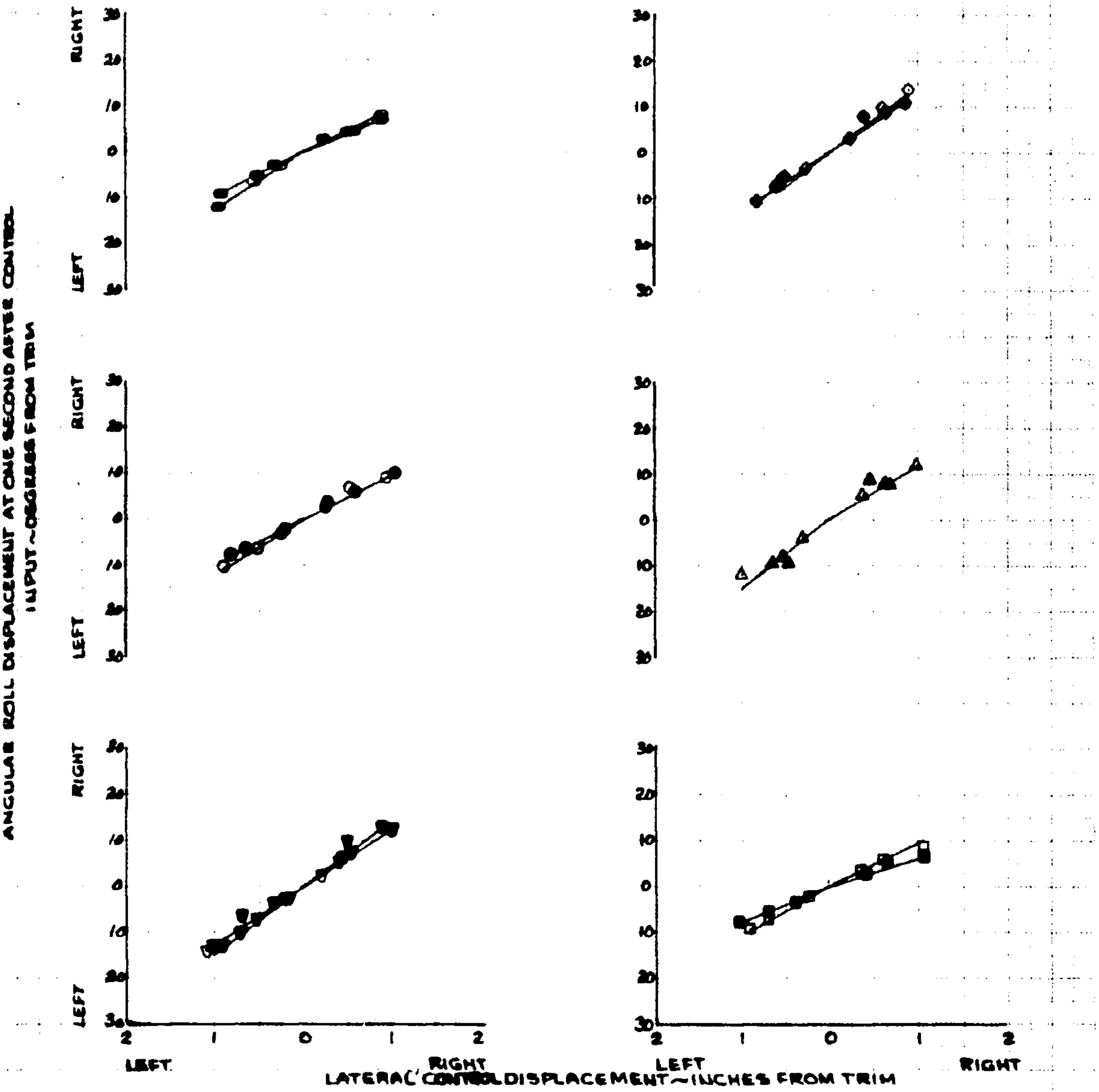


FIGURE No. 208
LATERAL CONTROL SENSITIVITY
AH-1G USA S/N 71-15695

SYM	AIRSPEED ~CAS	AVG. ALT. H_P ~ FT	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR SPEED ~ RPM	FLIGHT CONDITION	THRUST COEFF ~ C_T
○	60.0	3180	8850	195.1	324.0	LEVEL FLIGHT	0.004817
○	106.0	3630	8730	195.0	324.0	LEVEL FLIGHT	0.004827
▽	144.0	4100	8610	196.1	324.0	LEVEL FLIGHT	0.004940
◇	181.0	6680	8560	199.8	324.0	DIVE	0.005192
△	60.0	980	9050	197.5	324.0	CLIMB	0.004625
□	72.0	5580	9000	197.5	310.0	AUTO ROTATION	0.005766

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1654 LB)

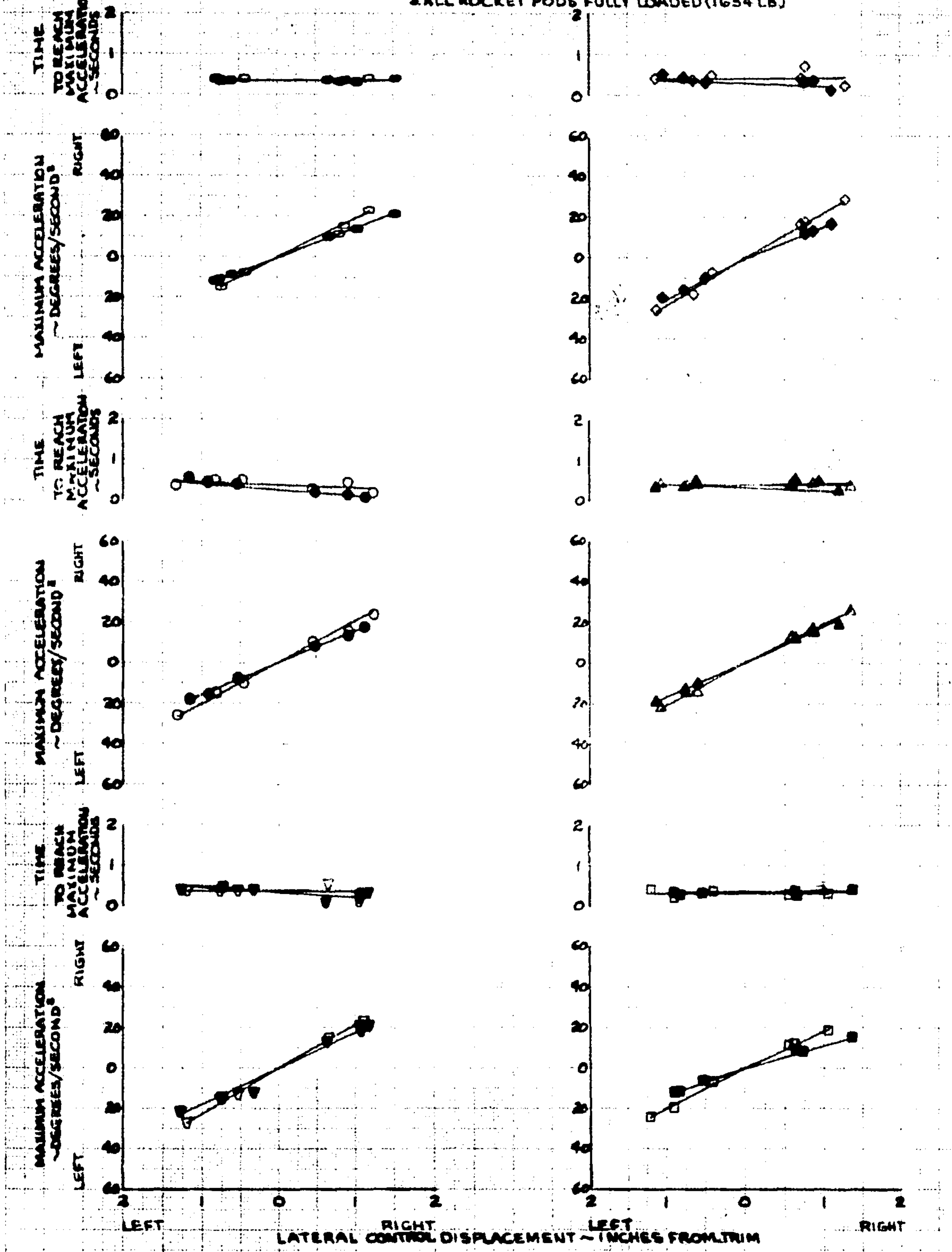


FIGURE No. 209
LATERAL CONTROL RESPONSE
AH-1G USA S/N 715698
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C_T
⬭	60.0	3180	8830	195.1(MID)	3240	LEVEL FLIGHT	0.004817
○	106.0	3630	8730	195.0(MID)	3240	LEVEL FLIGHT	0.004827
▽	144.0	4100	8810	195.1(MID)	3240	LEVEL FLIGHT	0.004[illegible]
◇	181.0	6680	8560	196.[illegible](MID)	3240	DIVE	0.005192
△	60.0	980	9050	197.5(MID)	3240	CLIMB	0.004625
□	72.0	5580	9000	197.5(MID)	3100	AUTOROTATION	0.005762

NOTE: ALL ROCKET PODS FULLY LOADED (1634 LB)

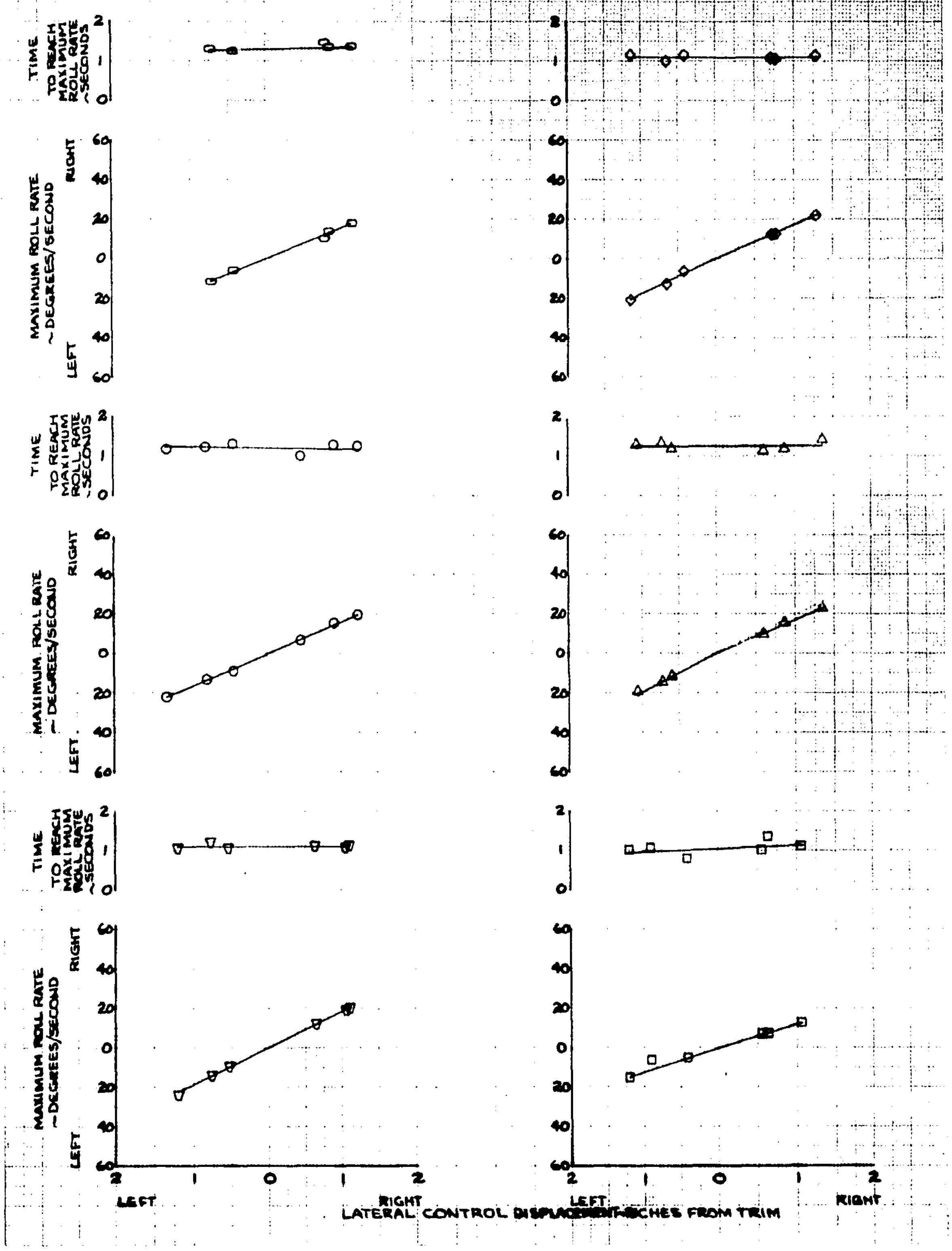


FIGURE No. 210

LATERAL RESPONSE AT ONE SECOND

AH-1G USA [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_P~FT.	AVG. GW. ~LB.	AVG. LONG. C.G ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~C_T
●	60.0	3180	8830	195.1(MID)	324.0	LEVEL FLIGHT	0.004817
○	106.0	3680	8730	195.0(MID)	324.0	LEVEL FLIGHT	0.004821
▽	144.0	4100	8810	195.1(MID)	324.0	LEVEL FLIGHT	0.004940
◇	181.0	6680	8560	194.8(MID)	324.0	DIVE	0.005192
▲	60.0	980	9050	197.5(MID)	324.0	CLIMB	0.004685
□	72.0	5680	9000	197.5(MID)	310.0	AUTOROTATION	0.003766

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB)

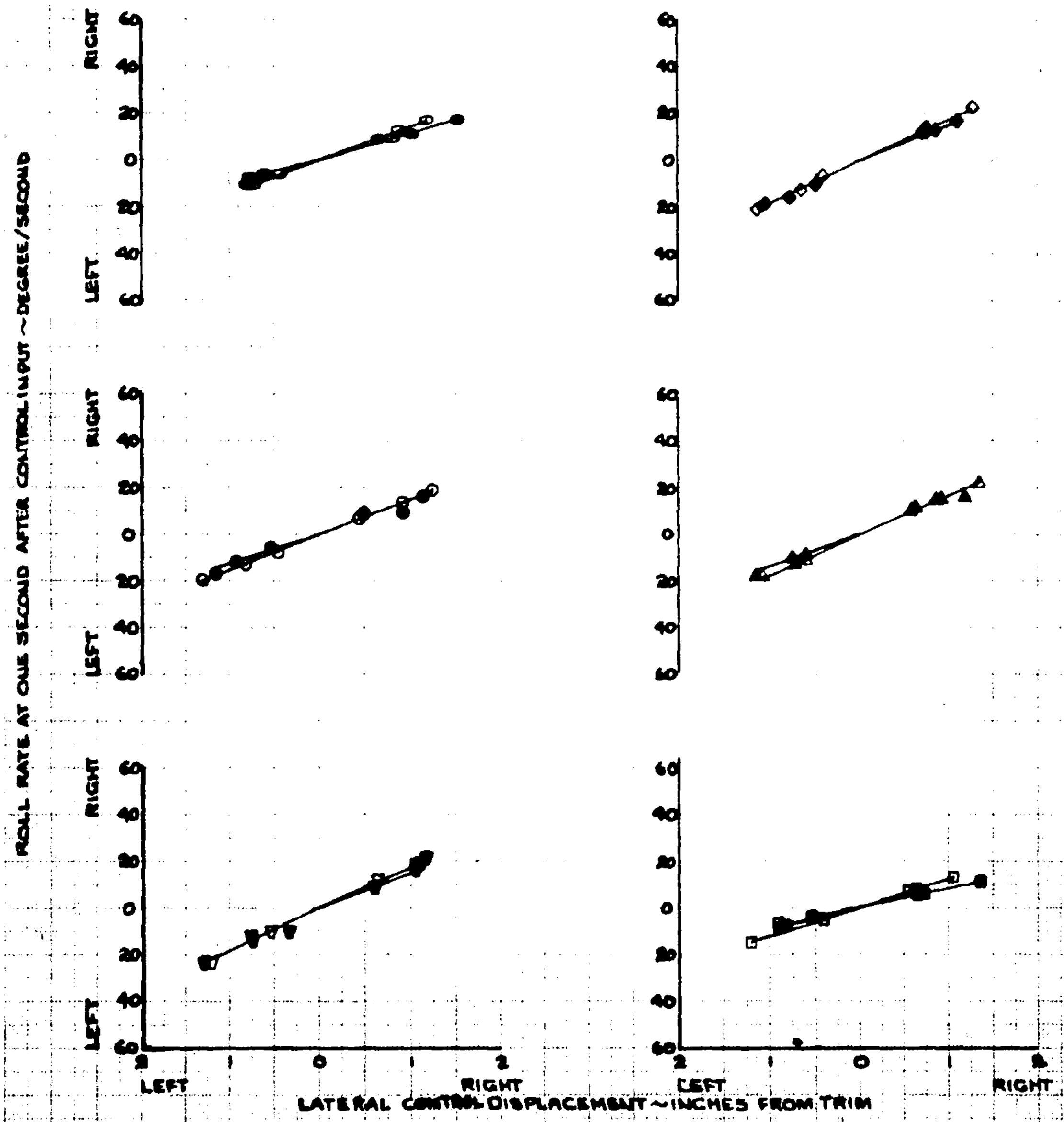


FIGURE No. 211

ANGULAR ROLL DISPLACEMENT

AH-1G USA S/N 71-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF~C_T
⊖	66.0	3100	[illegible]	195.1(MID)	324.0	LEVEL FLIGHT	0.004817
○	108.0	3650	8130	195.0(MID)	324.0	LEVEL FLIGHT	0.004827
▽	144.0	4100	8810	195.1(MID)	324.0	LEVEL FLIGHT	0.004990
◇	181.0	6500	8560	194.8(MID)	324.0	DIVE	0.005192
△	60.0	950	9060	197.5(MID)	324.0	CLIMB	0.004625
□	72.0	8500	9000	197.5(MID)	310.0	AUTOROTATION	0.005766

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB)

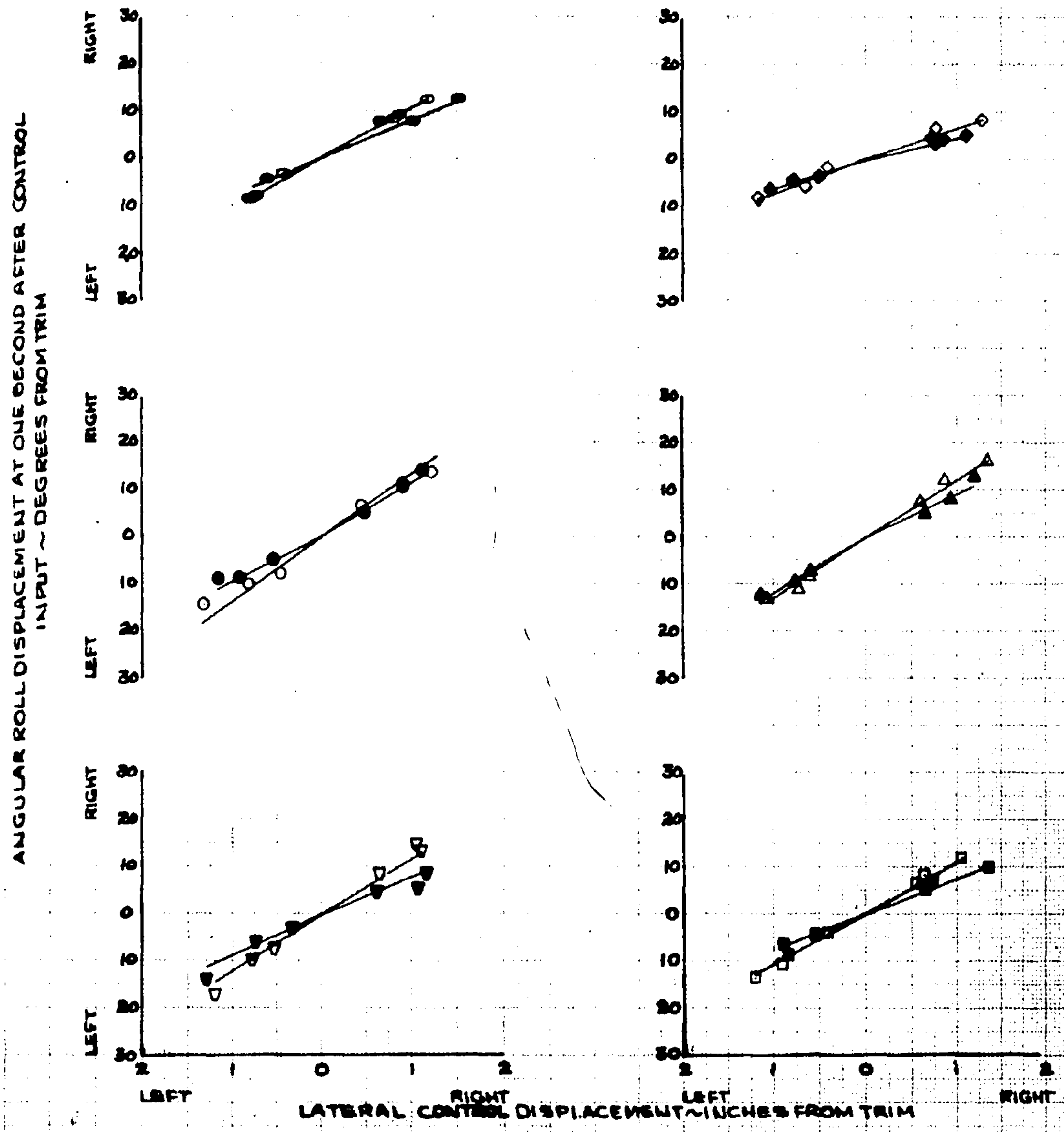


FIGURE NO. 212
LATERAL CONTROL SENSITIVITY
AH-1G USA [illegible]
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~ CAS	AVG. ALT. Hp ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. CT
■	62.0	[illegible]	[illegible]	200.0 (MID)	3240	LEVEL FLIGHT	0.00 [illegible]
○	108.0	[illegible]	[illegible]	200.1 (MID)	3240	LEVEL FLIGHT	0.00 [illegible]
▽	135.0	6450	9020	200.1 (AFT)	3240	LEVEL FLIGHT	0.00 5432
◇	170.5	[illegible]	[illegible]	199.6 (AFT)	[illegible]	DIVE	0.00 [illegible]
◆	[illegible]	[illegible]	[illegible]	199.7 (AFT)	[illegible]	CLIMB	0.00 [illegible]

NOTES: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
ALL ROCKET PODS FULLY LOADED (1684 LB)

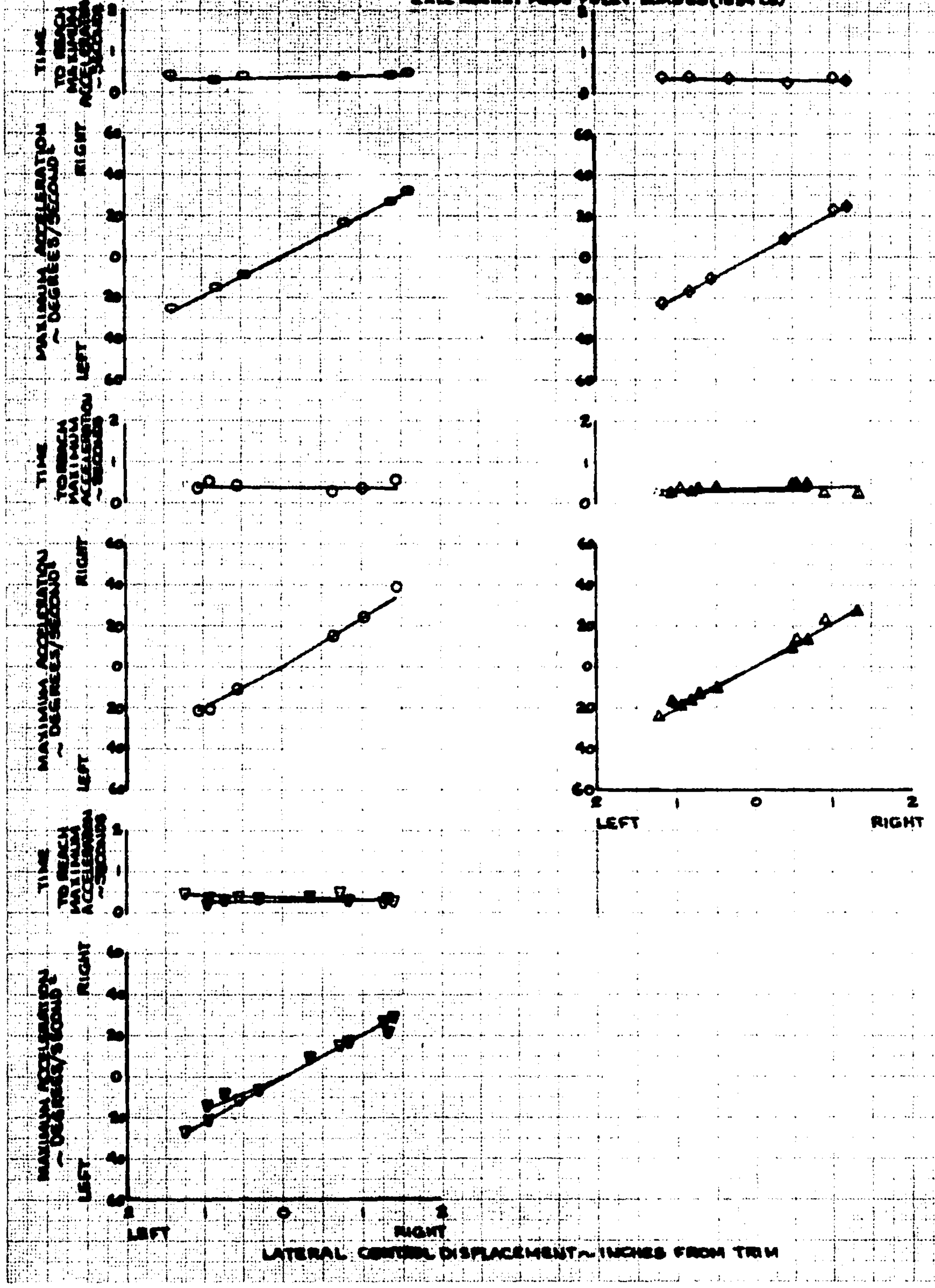


FIGURE NO. 813

LATERAL CONTROL RESPONSE

AH-1G USA S/N 71-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	65.5	4590	9630	200.4(AFT)	3240	LEVEL FLIGHT	0.00 5475
○	108.0	5270	9550	200.1(AFT)	3240	LEVEL FLIGHT	0.00 5432
▽	136.0	6450	9020	200.1(AFT)	3240	LEVEL FLIGHT	0.00 5432
◇	170.5	6830	9420	199.6(AFT)	3240	DIVE	0.00 5747
△	61.5	3190	9560	199.7(AFT)	3240	CLIMB	0.00 5217

NOTE: ALL ROCKET PODS FULLY LOADED (1634 LB.)

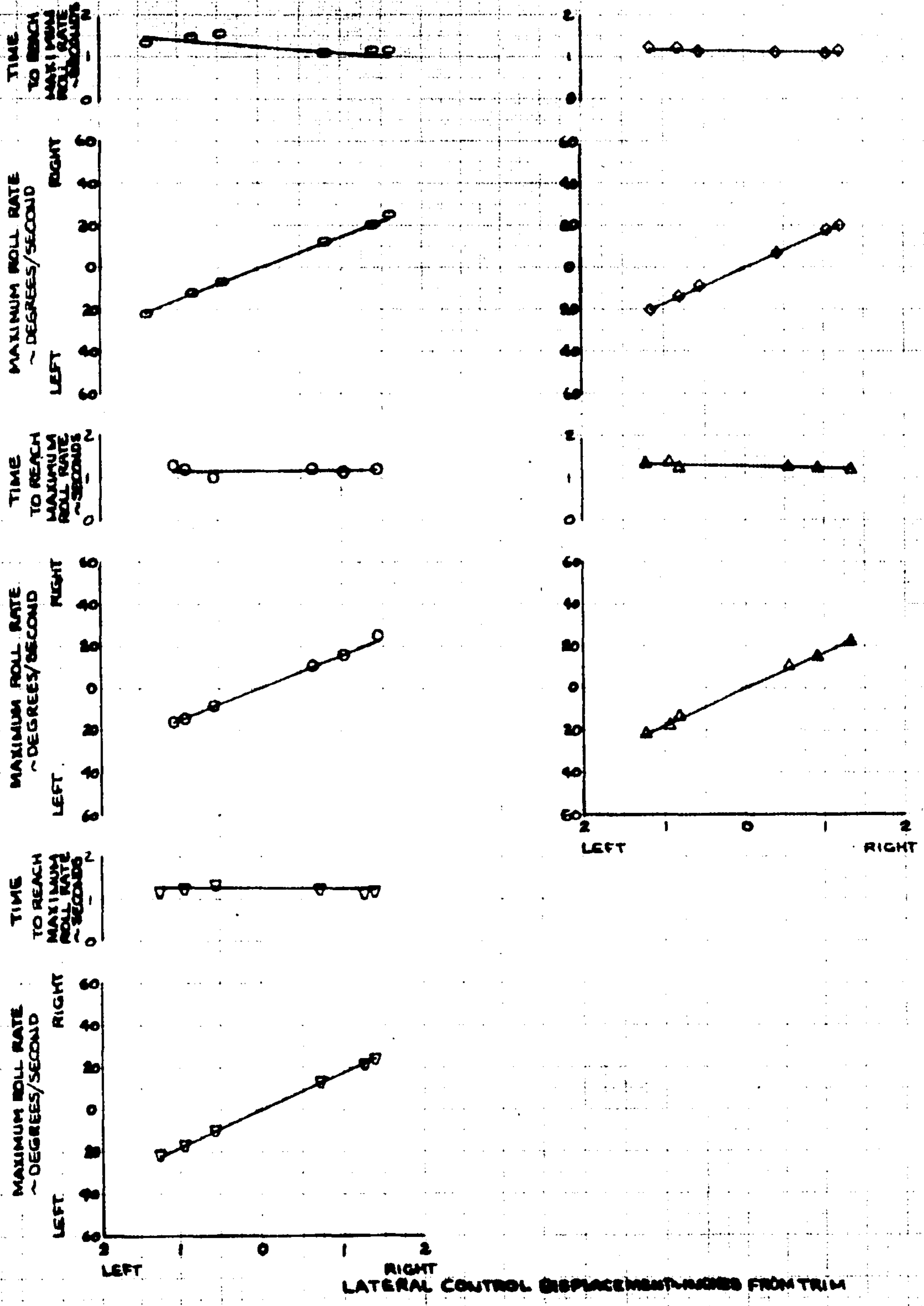


FIGURE NO. 214

LATERAL RESPONSE AT ONE SECOND

AH-1G USA S/N 71-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~CT
○	62.5	4590	9620	200.0(AFT)	3240	LEVEL FLIGHT	0.005475
□	108.0	5270	9550	200.0(AFT)	3240	LEVEL FLIGHT	0.005682
▽	135.0	6450	9020	200.1(AFT)	3240	LEVEL FLIGHT	0.005432
◇	170.5	6870	9420	199.6(AFT)	3240	DIVE	0.005747
△	61.5	3190	9560	199.7(AFT)	3240	CLIMB	0.006217

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON

2. SOLID SYMBOLS DENOTE SCAS OFF

3. ALL ROCKET PODS FULLY LOADED (1634 LB)

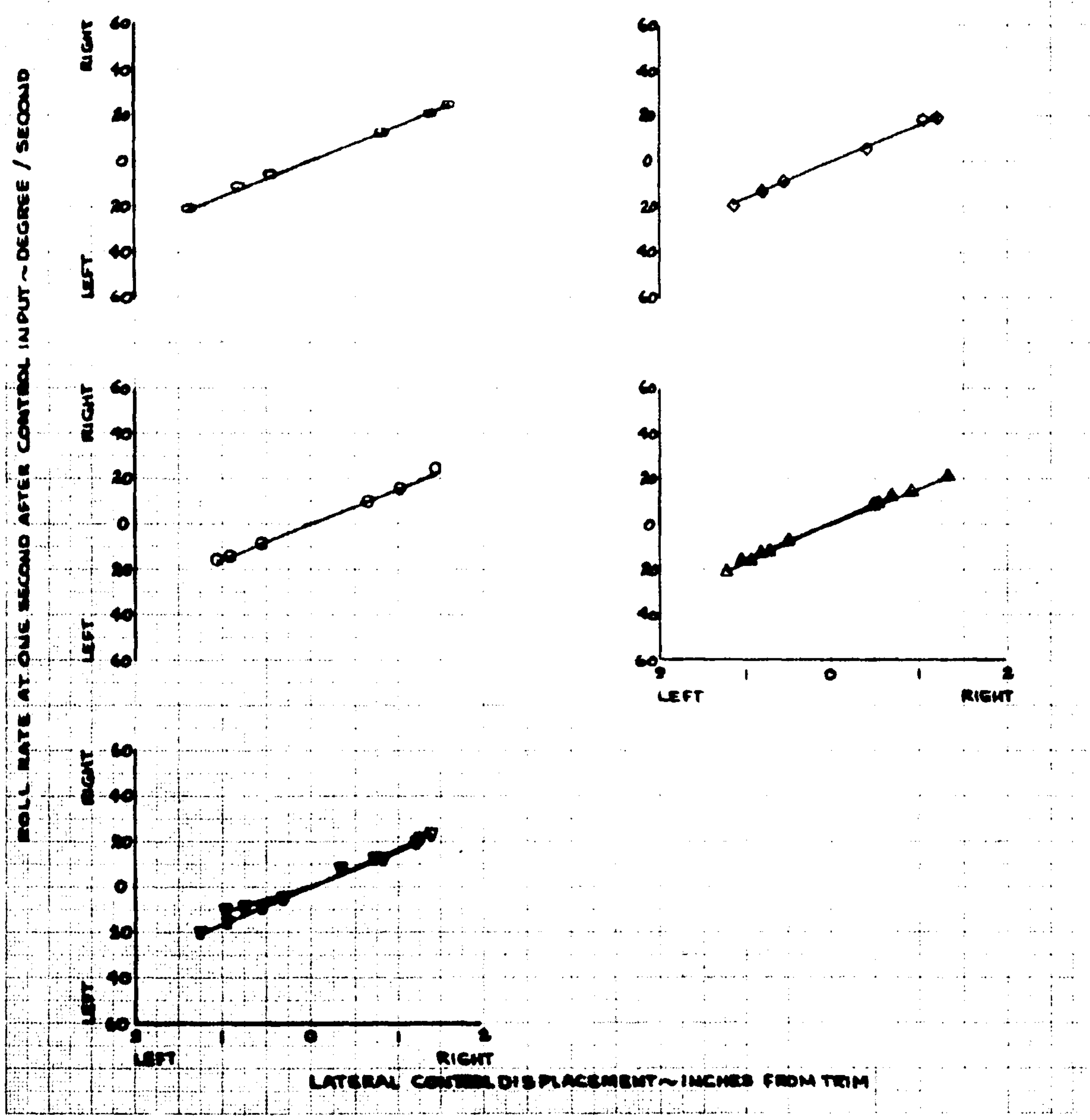


FIGURE NO. 215
ANGULAR ROLL DISPLACEMENT
AH-1G USA 715698
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
●	63.5	4590	9620	200.0(AFT)	3240	LEVEL FLIGHT	0.005475
○	108.0	5270	9350	200.1(AFT)	3240	LEVEL FLIGHT	0.005432
▽	135.0	6450	9020	200.1(AFT)	3240	LEVEL FLIGHT	0.005452
◇	170.5	6870	9420	199.6(AFT)	3240	DIVE	0.005747
▲	61.5	3190	9560	199.7(AFT)	3240	CLIMB	0.005217

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB)

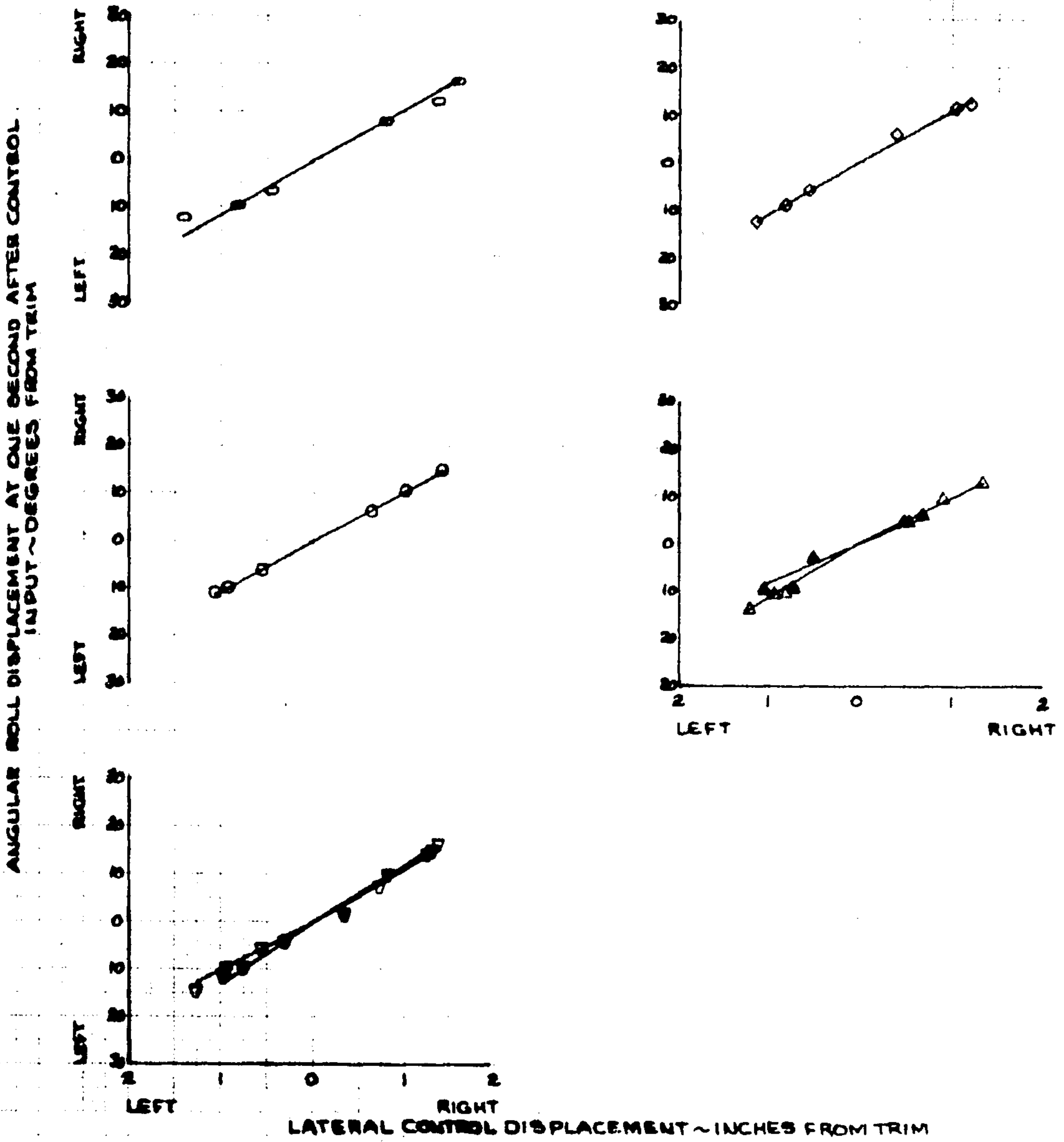


FIGURE No. 316

LATERAL CONTROL SENSITIVITY

AH-1G USA S/N 15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AIRSPEED ~ CAS	AVG. ALT. Hp ~ FT	AVG. GW. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEF. ~ CT
○	64.0	3980	7770	200.9(AFT)	324.0	LEVEL FLIGHT	0.004361
⬡	102.0	3690	8080	200.9(AFT)	323.0	LEVEL FLIGHT	0.004487
▽	152.5	5840	7580	200.9(AFT)	324.0	LEVEL FLIGHT	0.004481
◇	172.0	7640	7800	200.9(AFT)	325.0	DIVE	0.004046
△	60.0	3510	7790	200.9(AFT)	324.0	CLIMB	0.004306
□	67.0	7200	7800	200.9(AFT)	324.0	AUTOROTATION	0.004607

NOTE: OPEN SYMBOLS DENOTE SCAS ON

SOLID SYMBOLS DENOTE SCAS OFF

& ALL ROCKET PODS EMPTY

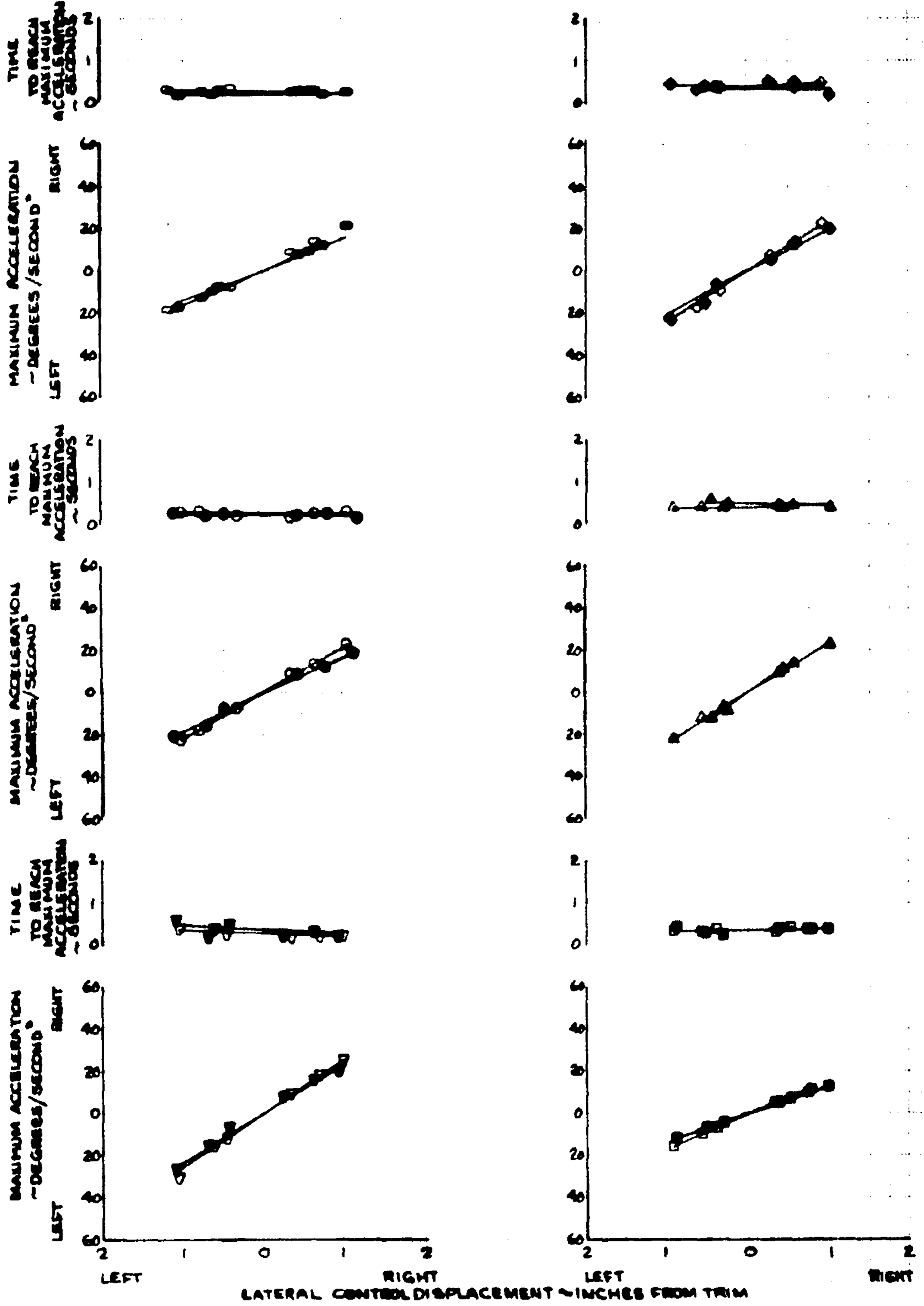


FIGURE NO 217

LATERAL CONTROL RESPONSE

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

DATA	AIRSPEED ~CAS	AVG. ALT. Hp~FT	AVG. GW ~LB	AVG. LONG. CG ~IN.	ROTOR RPM	FLIGHT CONDITION	[illegible] ~C.
●	[illegible]	1280	7710	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
○	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
▽	152.5	5840	7580	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
◇	172.0	7640	[illegible]	[illegible]	[illegible]	DIVE	[illegible]
△	60.0	[illegible]	7770	[illegible]	[illegible]	CLIMB	[illegible]
□	61.0	7200	[illegible]	[illegible]	[illegible]	AUTOROTATION	[illegible]

NOTE: [illegible]

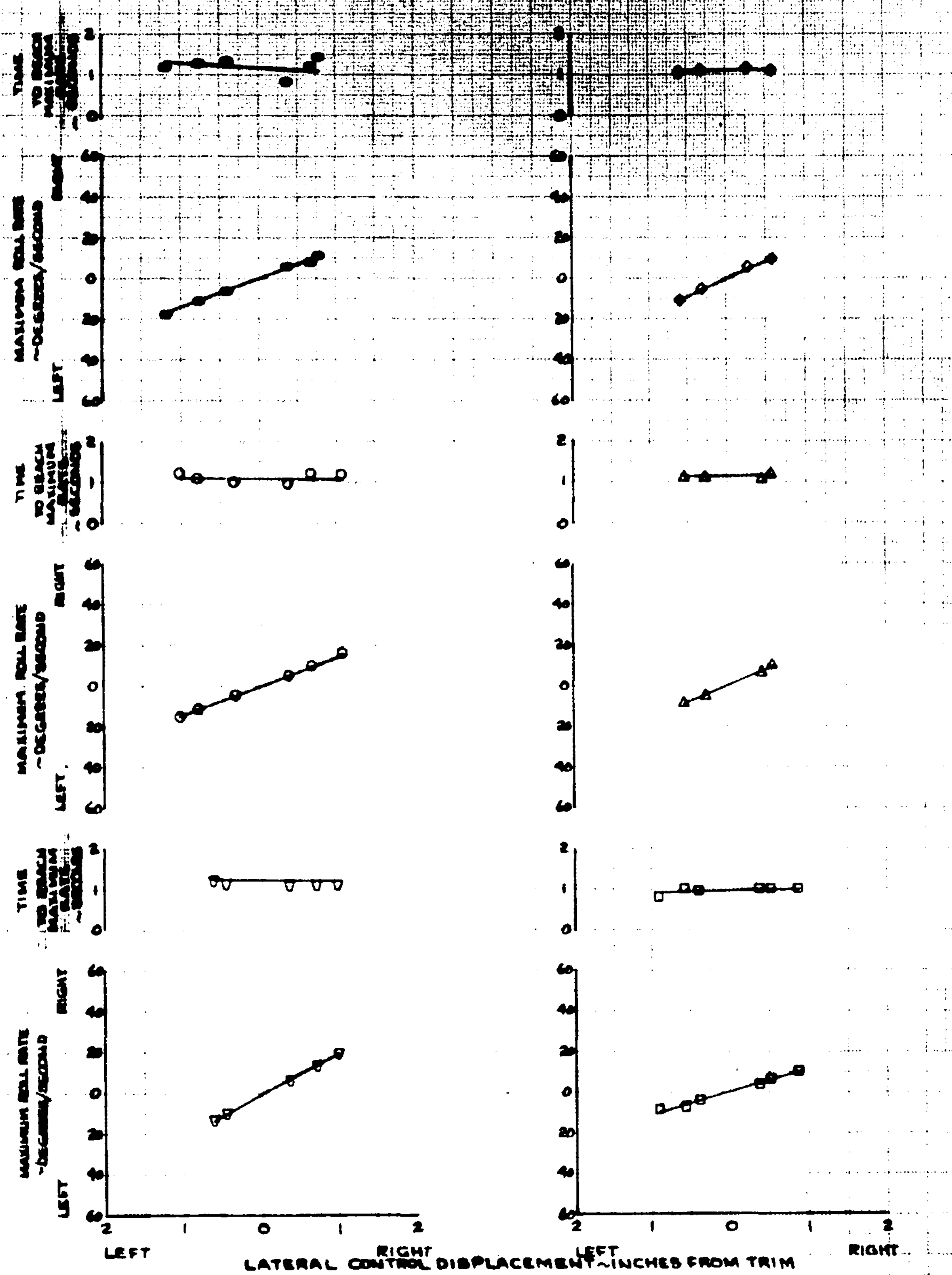


FIGURE No. 218

LATERAL RESPONSE AT ONE SECOND

AH-1G USA[illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR SPEED ~RPM	FLIGHT CONDITION	THRUST COEFF. ~CT
○	64.0	[illegible]	7770	200.9(AFT)	[illegible]	LEVEL FLIGHT	[illegible]
◯	[illegible]	[illegible]	8050	200.1(AFT)	[illegible]	LEVEL FLIGHT	[illegible]
▽	152.5	5840	7580	200.8(AFT)	3240	LEVEL FLIGHT	[illegible]
◇	172.0	7640	7800	200.9(AFT)	[illegible]	DIVE	[illegible]
△	60.0	[illegible]	7790	200.9(AFT)	[illegible]	CLIMB	[illegible]
□	67.0	7200	7800	200.9(AFT)	[illegible]	AUTOROTATION	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

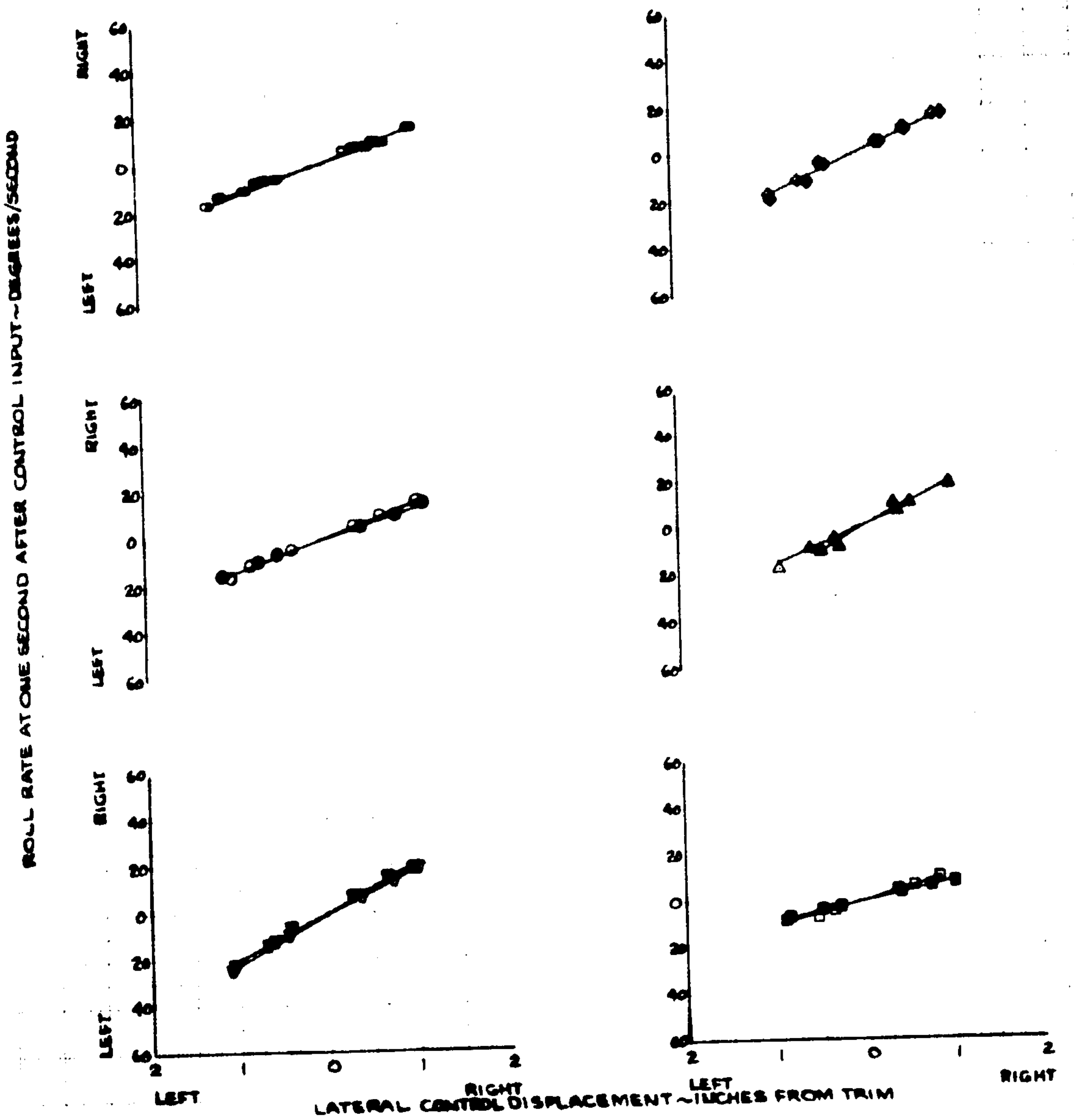


FIGURE NO. 219

ANGULAR ROLL DISPLACEMENT

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS [illegible]

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT	AVG. GW ~LB.	AVG. LONG. C.G.~IN.	[illegible]		[illegible]
●	[illegible]	[illegible]	7770	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
○	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	[illegible]
▽	132.5	[illegible]	7590	200.[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.004481
◇	172.0	7540	7500	200.9 (AFT)	[illegible]	DIVE	0.004843
▲	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	CLIMB	[illegible]
□	61.0	[illegible]	[illegible]	[illegible]	[illegible]	AUTOROTATION	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON

2. SOLID SYMBOLS DENOTE SCAS OFF

3. ALL ROCKET PODS EMPTY

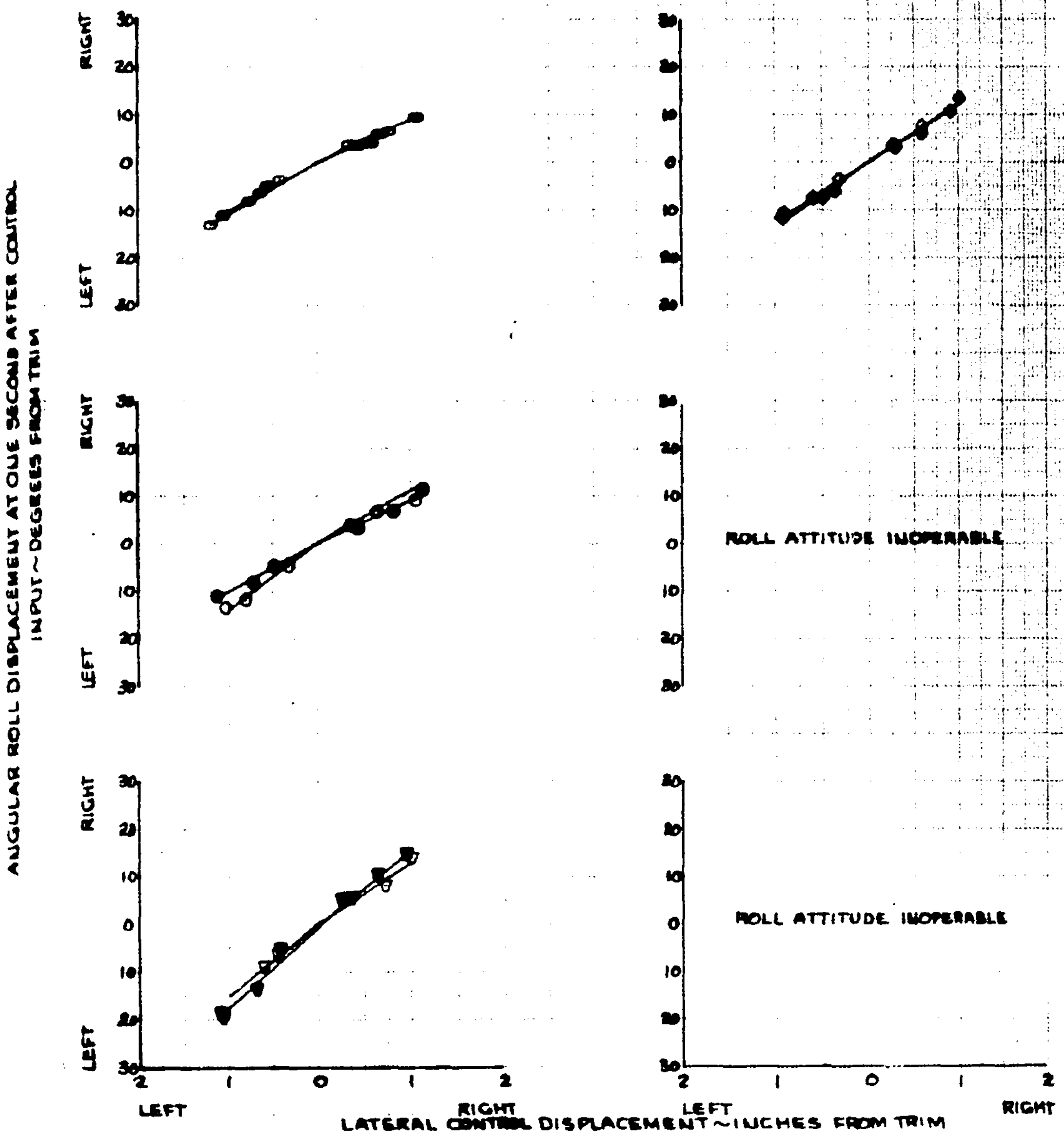


FIGURE No. 220

LATERAL CONTROL SENSITIVITY

AH-1G USA S/N 7115095
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	53.0	16160	7790	200.9(AFT)	324.0	LEVEL FLIGHT	0.006885
○	88.0	17010	7800	200.8(AFT)	324.0	LEVEL FLIGHT	0.006836
▽	105.0	16160	7680	200.8(AFT)	324.0	LEVEL FLIGHT	0.006884

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

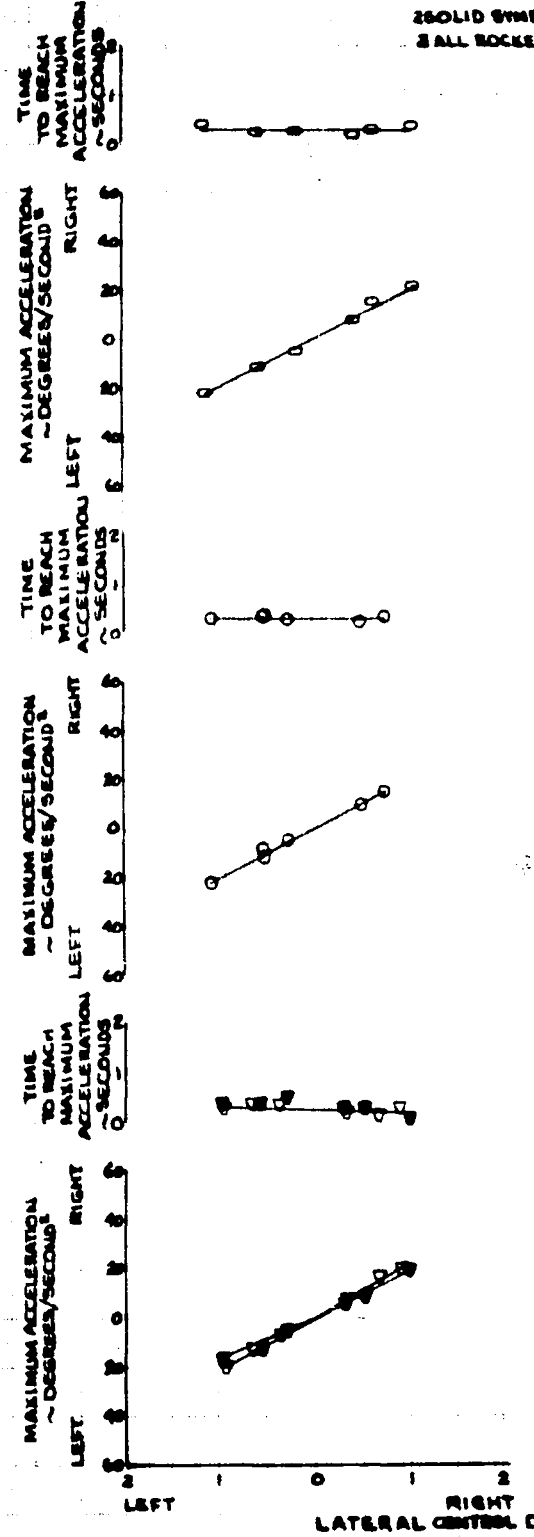


FIGURE NO. 221

LATERAL CONTROL RESPONSE

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR SPEED RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
●	53.0	16160	7790	200.9(AFT)	324	LEVEL FLIGHT	[illegible]
○	[illegible]	17010	7500	200.8(AFT)	324	LEVEL FLIGHT	[illegible]
▽	1050	16160	7630	200.8(AFT)	324	LEVEL FLIGHT	0.006284

NOTE: ALL ROCKET PODS EMPTY

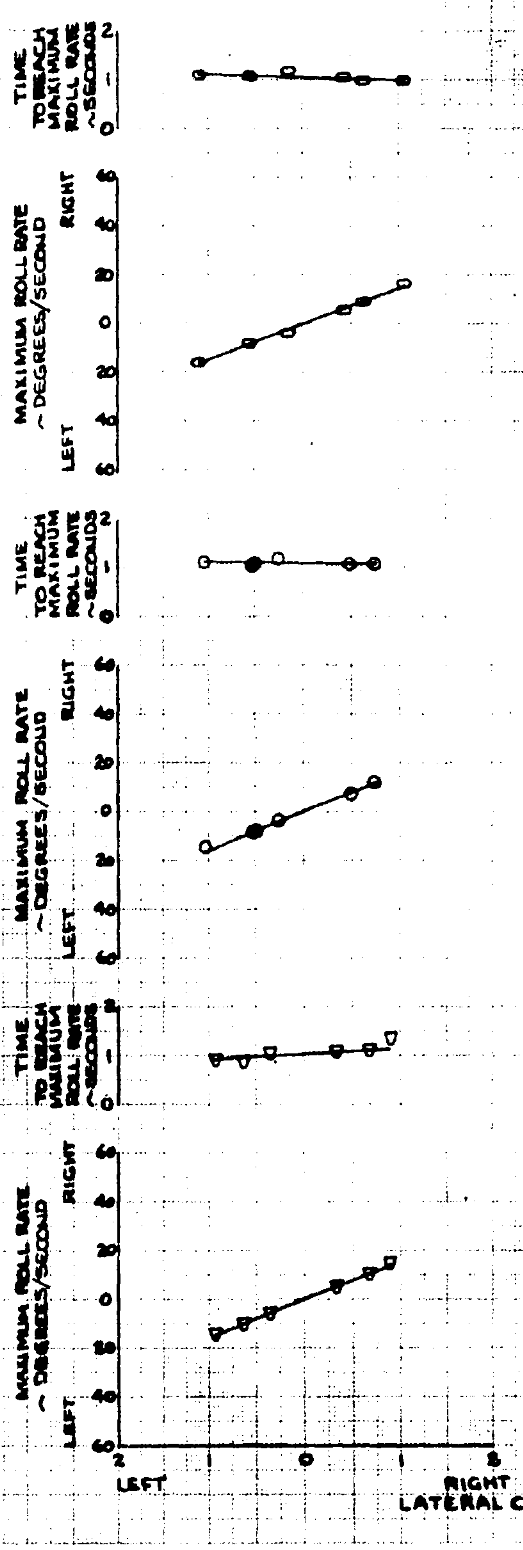


FIGURE NO. 222

LATERAL RESPONSE AT ONE SECOND

AH-1G USA S/N 615695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR SPEED RPM	FLIGHT CONDITION	[illegible]
●	53.0	16160	7790	200.9(AFT)	324	LEVEL FLIGHT	[illegible]
○	86.0	17010	7500	200.8(AFT)	324	LEVEL FLIGHT	[illegible]
▽	105.0	16160	7630	200.8(AFT)	324	LEVEL FLIGHT	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

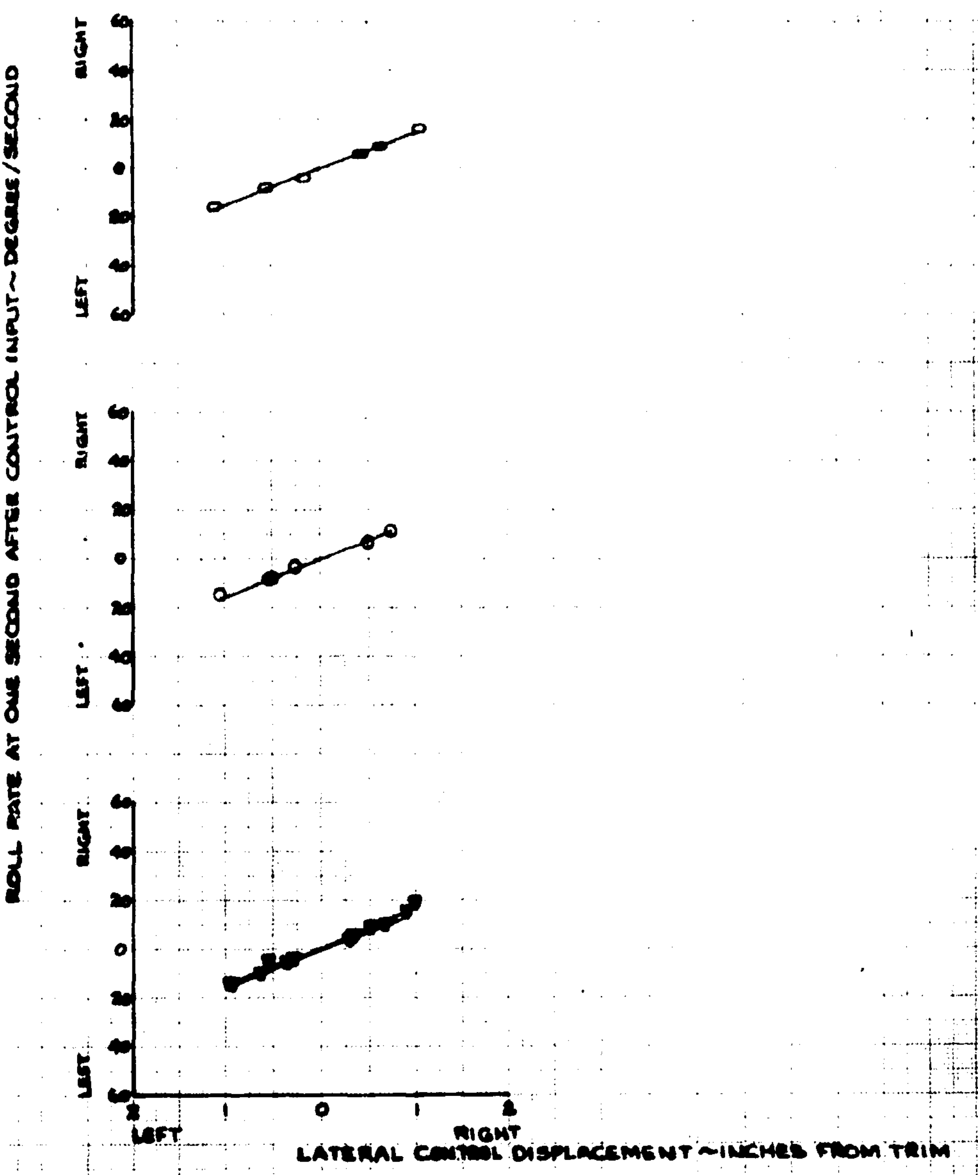


FIGURE NO. 223

ANGULAR ROLL DISPLACEMENT

AH-1G USA [illegible]15698

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	[illegible] RPM	[illegible]	[illegible] ~CT
○	[illegible]	15700	7860	[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.006[illegible]
○	[illegible]	15810	7500	[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.006[illegible]
▽	1020	[illegible]	7720	[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.006[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

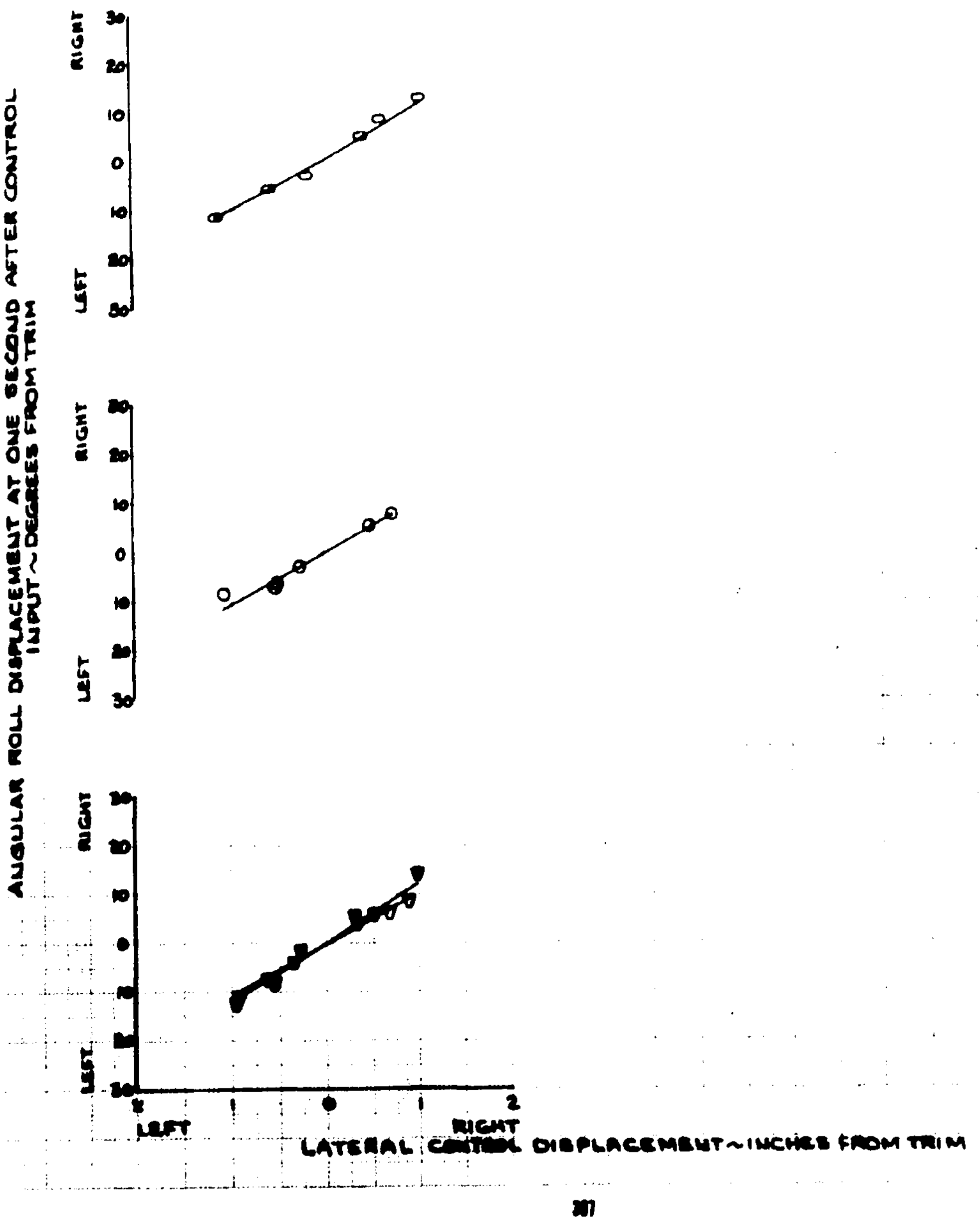


FIGURE NO. 224

DIRECTIONAL CONTROL SENSITIVITY

AH-1G USA 67-15695

CLEAN CONFIGURATION

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~IN.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C_T
○	63.0	4970	7710	201.3 (AFT)	3240	LEVEL FLIGHT	0.004439
○	109.0	6790	7300	201.1 (AFT)	3240	LEVEL FLIGHT	0.004448
▽	145.0	4960	7460	201.2 (AFT)	3230	LEVEL FLIGHT	0.004320
◇	181.0	3140	7700	201.2 (AFT)	3240	DIVE	0.004183
△	62.0	2440	7620	201.2 (AFT)	3240	CLIMB	0.004066
□	68.5	3290	7730	201.2 (AFT)	3000	AUTOROTATION	0.004935

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

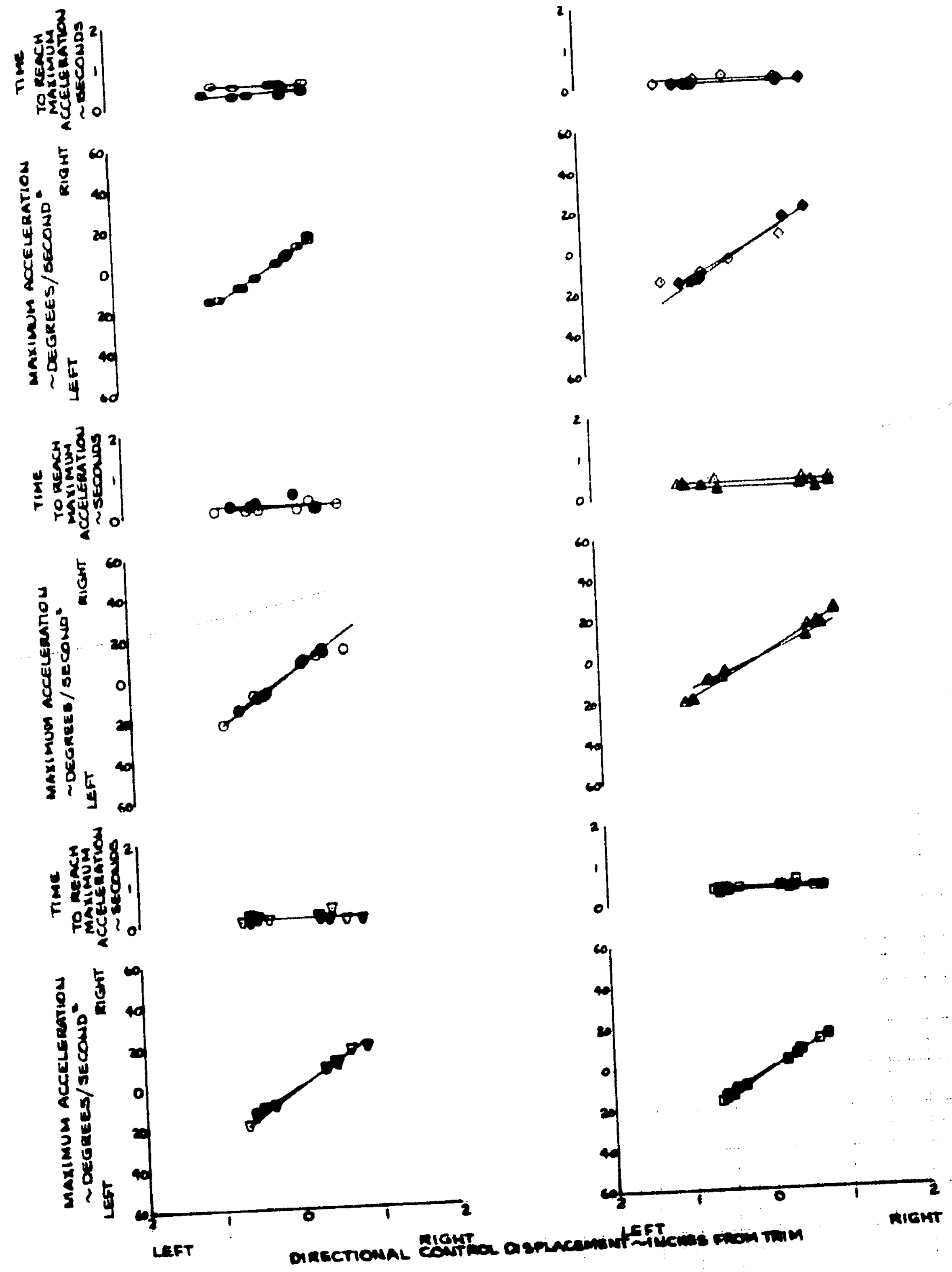


FIGURE NO. 225
DIRECTIONAL CONTROL RESPONSE
AH-1G USA S/N 71-15695
CLEAN CONFIGURATION
SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C_T
⬡	63.0	4970	7710	201.2(AFT)	324.0	LEVEL FLIGHT	0.004438
○	109.0	6790	7800	201.1(AFT)	324.0	LEVEL FLIGHT	0.004443
▽	145.0	4960	7460	201.2(AFT)	323.0	LEVEL FLIGHT	0.004320
◇	181.0	3140	7700	201.2(AFT)	324.0	DIVE	0.004183
△	62.0	2440	7620	201.2(AFT)	324.0	CLIMB	0.004066
□	68.5	3290	7750	201.2(AFT)	300.0	AUTOROTATION	0.004986

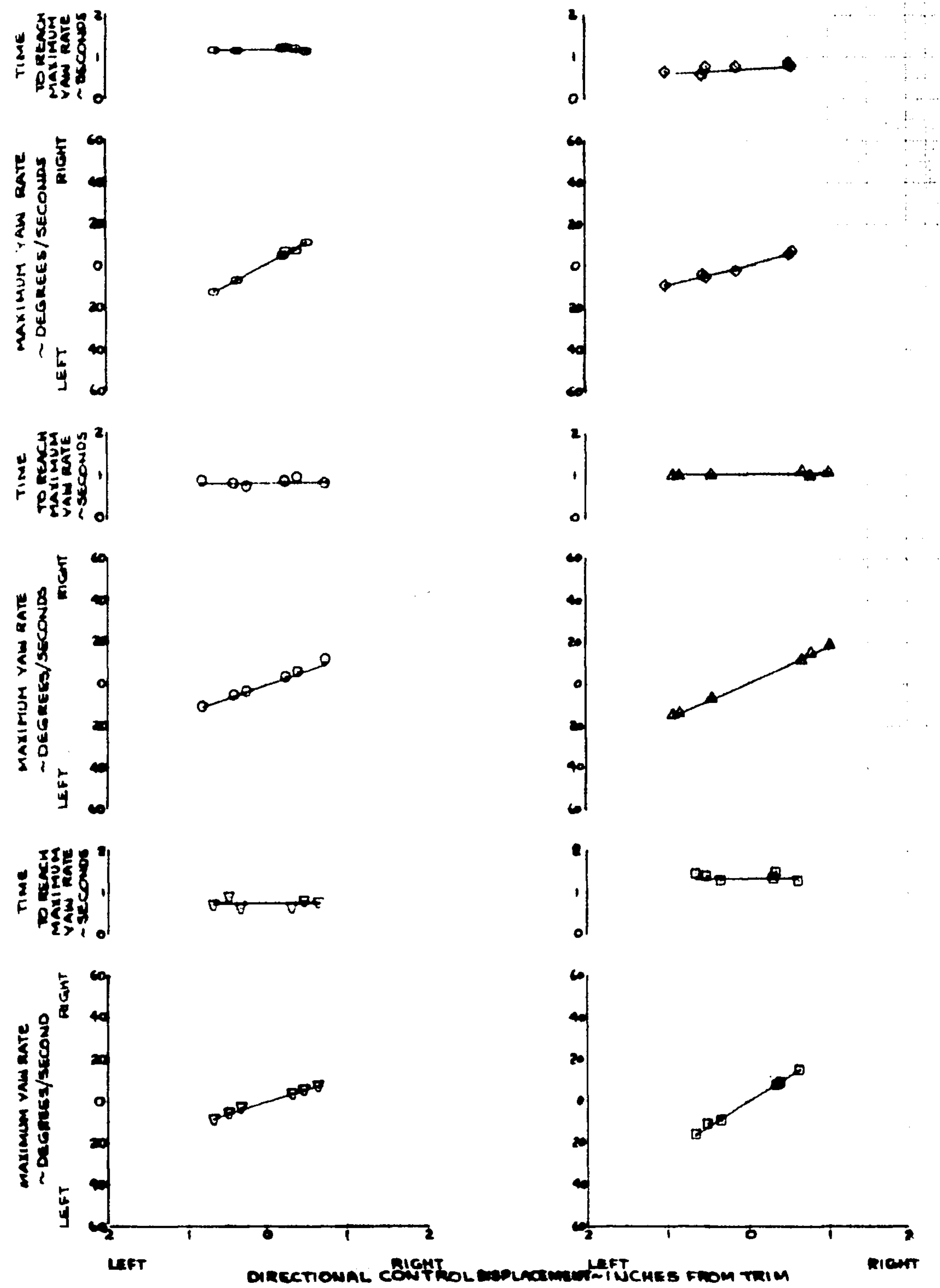


FIGURE NO. 226

DIRECTIONAL RESPONSE AT ONE SECOND

AH-1G USA [illegible]

CLEAN CONFIGURATION

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	63.0	4970	7710	201.2(AFT)	3240	LEVEL FLIGHT	0.004629
○	109.0	6190	7300	201.1(AFT)	3240	LEVEL FLIGHT	0.004443
▽	145.0	6960	7460	201.2(AFT)	3230	LEVEL FLIGHT	0.004320
◇	181.0	3140	7700	201.2(AFT)	3240	DIVE	0.004183
△	62.0	2440	7620	201.2(AFT)	3240	CLIMB	0.004066
□	68.5	3290	7730	201.2(AFT)	3200	AUTOROTATION	0.004485

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

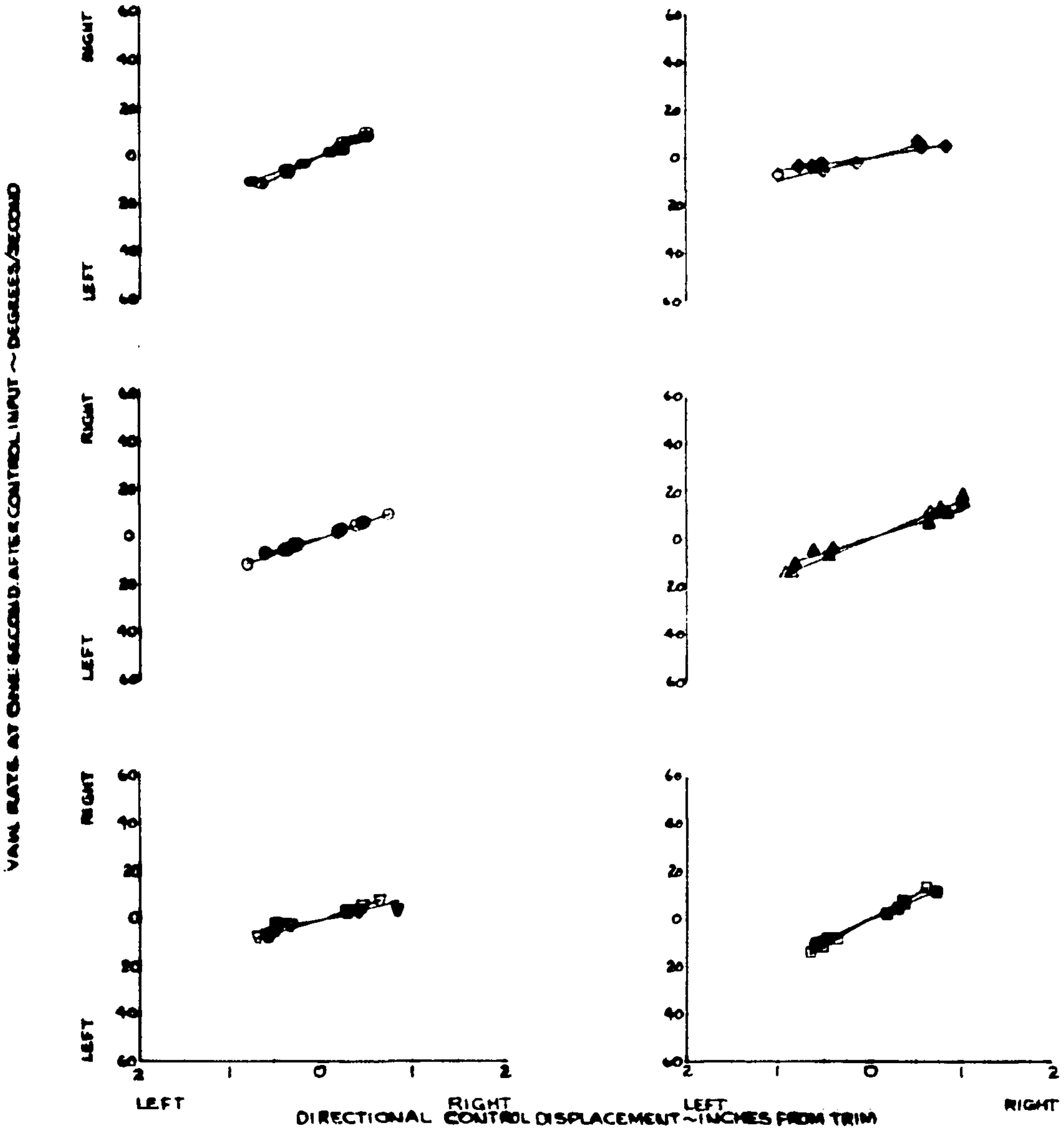


FIGURE NO. 227
ANGULAR YAW DISPLACEMENT
AH-1G USA S/N 715696
CLEAN CONFIGURATION

SYM	AIRSPEED ~CAS	AVG. ALT. H_0~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
●	65.0	4910	7710	201.3(AFT)	3240	LEVEL FLIGHT	0.004439
○	109.0	6790	7300	201.1(AFT)	3240	LEVEL FLIGHT	0.004443
▽	145.0	4960	7460	201.2(AFT)	3240	LEVEL FLIGHT	0.004520
◇	181.0	5140	7700	201.2(AFT)	3240	DIVE	0.004185
△	64.0	2440	7620	201.3(AFT)	3240	CLIMB	0.004266
□	65.5	5290	7780	201.3(AFT)	3000	AUTO ROTATION	0.004935

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

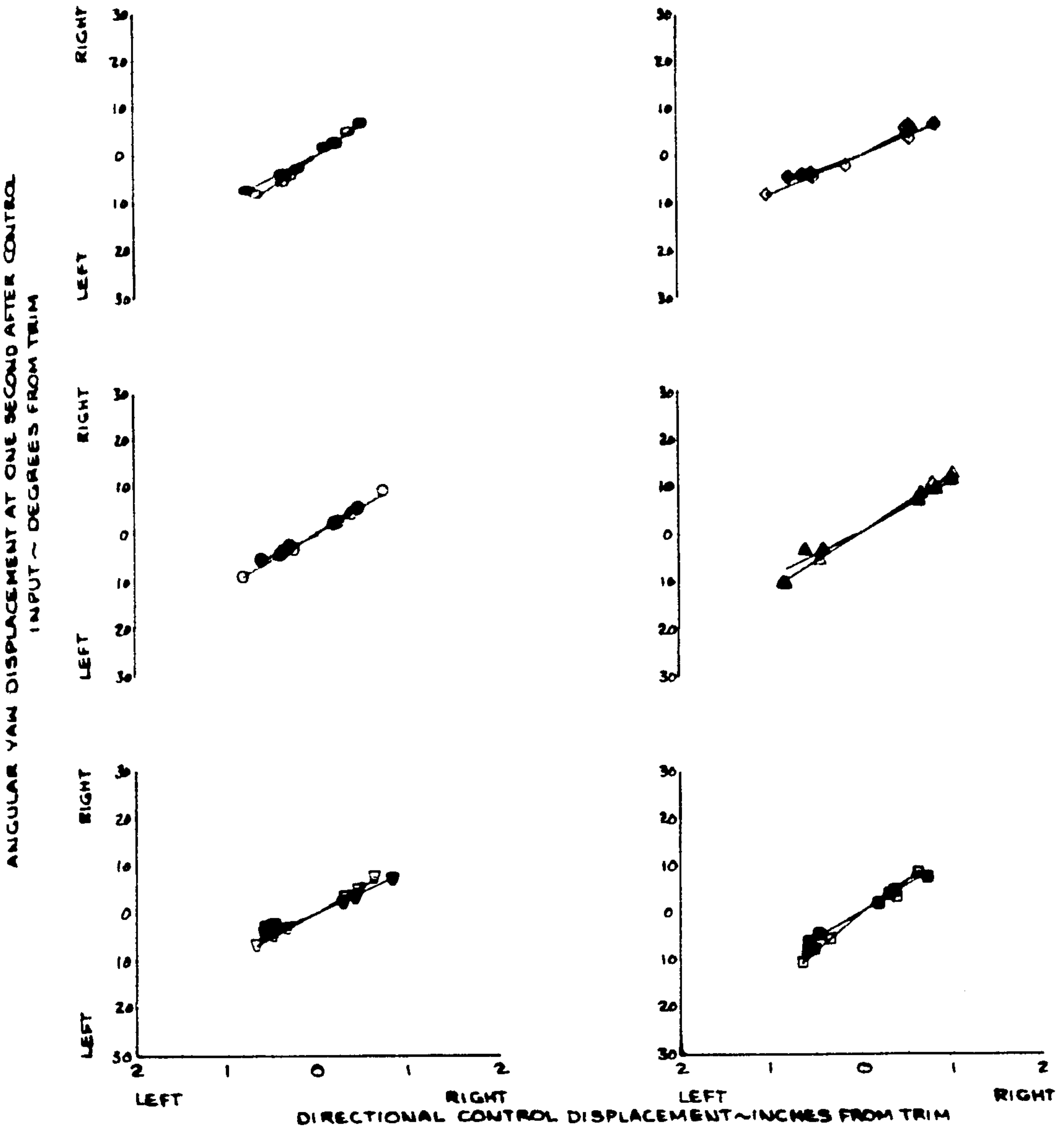
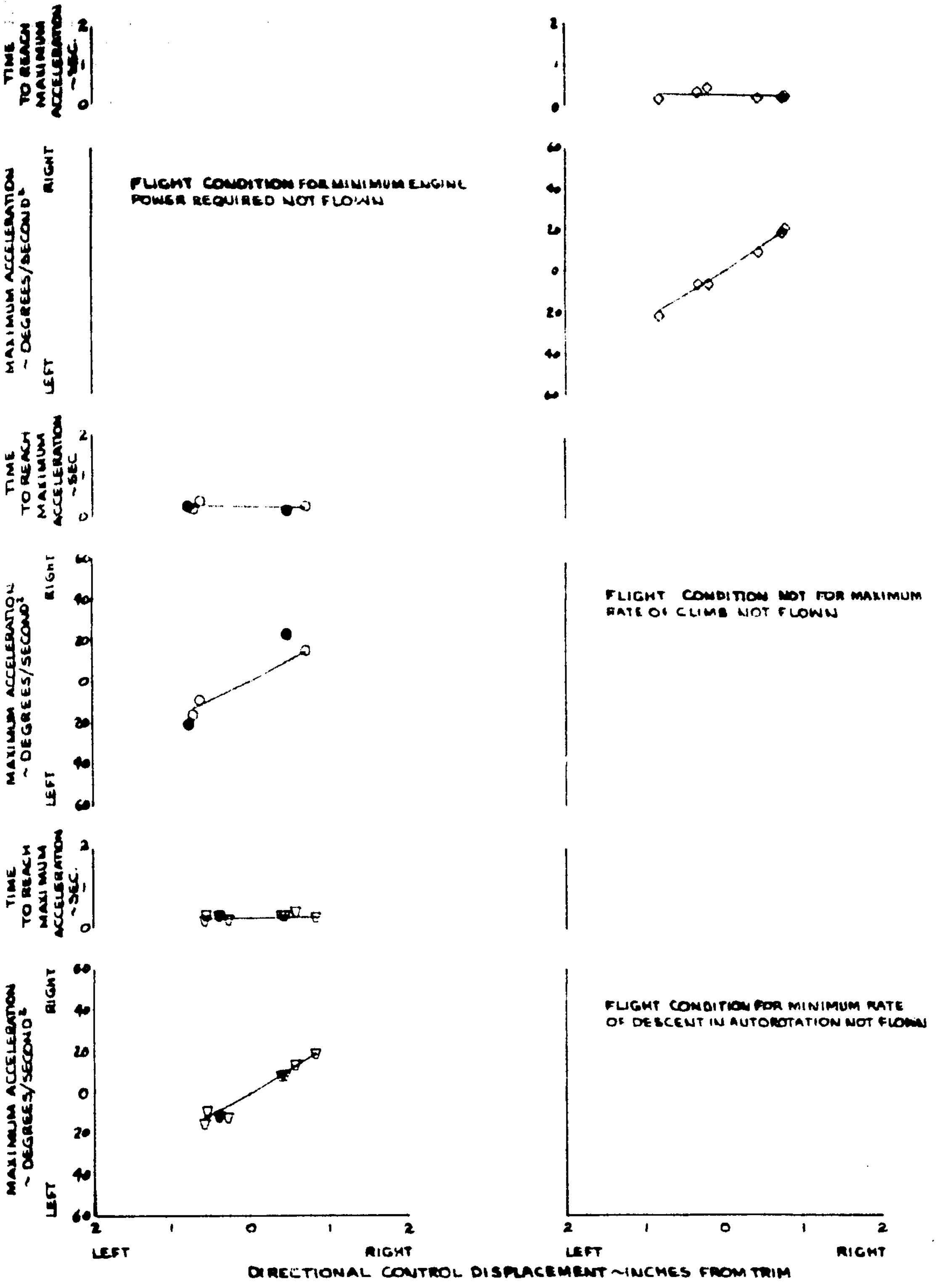


FIGURE NO. 228
DIRECTIONAL CONTROL SENSITIVITY
AH-1G USA S/N 15261
CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp ~FT	AVG. G.W. ~LB	AVG LONG. C.G ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	118.0	5150	8820	199.6(AFT)	323.0	LEVEL FLIGHT	0.004857
▽	145.5	4010	8690	199.5(AFT)	322.0	LEVEL FLIGHT	0.004929
◇	169.0	5780	8540	199.5(AFT)	322.0	DIVE	0.005103

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF



FLIGHT CONDITION FOR MINIMUM ENGINE POWER REQUIRED NOT FLOWN

FLIGHT CONDITION NOT FOR MAXIMUM RATE OF CLIMB NOT FLOWN

FLIGHT CONDITION FOR MINIMUM RATE OF DESCENT IN AUTOROTATION NOT FLOWN

DIRECTIONAL CONTROL DISPLACEMENT ~INCHES FROM TRIM

FIGURE NO. 229

DIRECTIONAL CONTROL RESPONSE

AH-1G USA S/N 66-15297

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM.	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~CT
○	118.0	3150	8820	198.6(AFT)	323.0	LEVEL FLIGHT	0.004837
▽	145.5	4070	8690	199.5(AFT)	322.0	LEVEL FLIGHT	0.004929
◇	169.0	5780	8540	199.5(AFT)	322.0	DIVE	0.005103

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

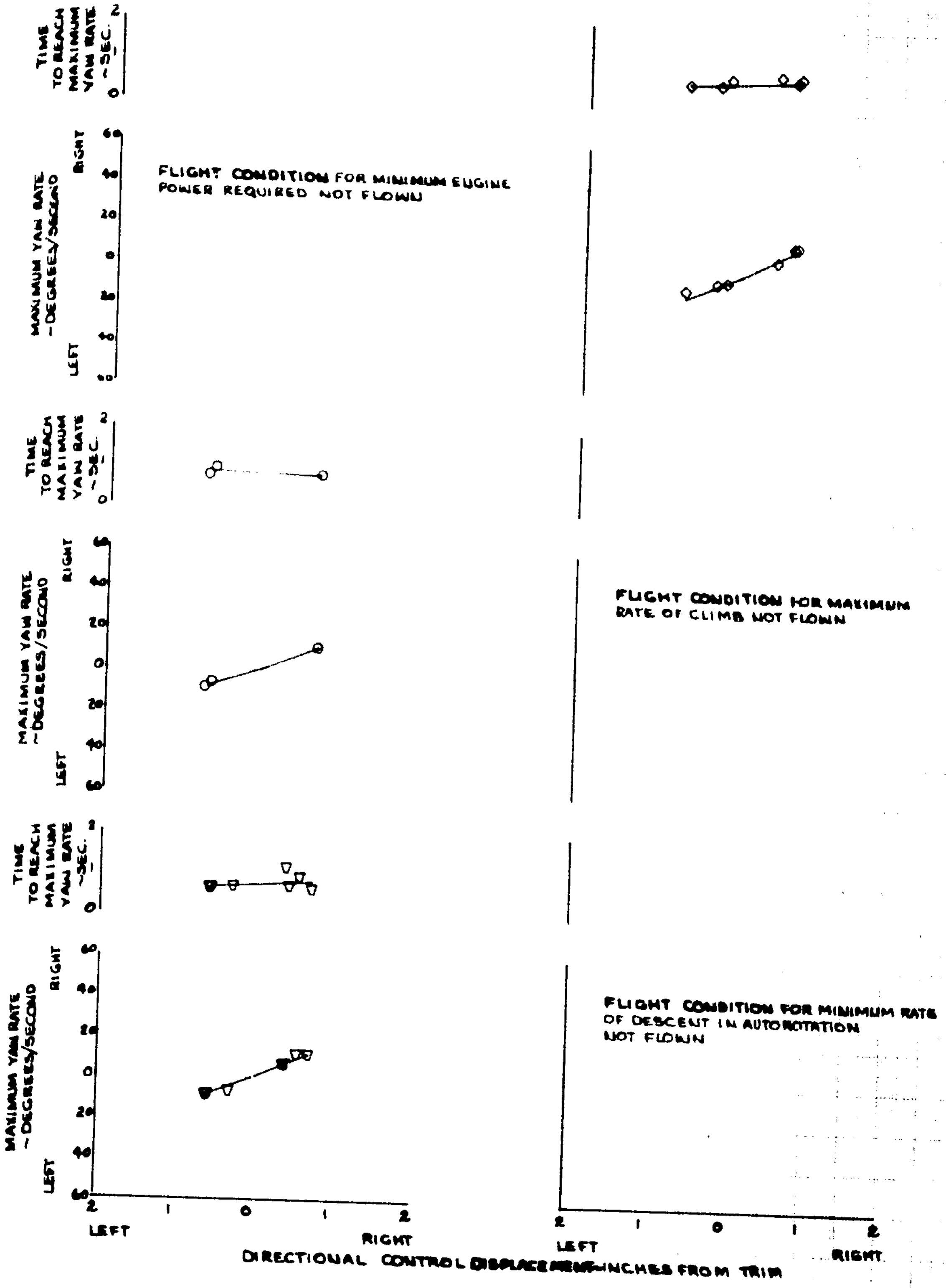


FIGURE NO. 230

DIRECTIONAL RESPONSE AT ONE SECOND

AH-1G USA [illegible]

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM.	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~CT
○	110.0	5180	8820	199.6(AFT)	323.0	LEVEL FLIGHT	0.00 4857
■	145.5	4070	8690	199.5(AFT)	323.0	LEVEL FLIGHT	0.00 4929
●	169.0	5780	8540	199.5(AFT)	323.0	DIVE	0.00 5103

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

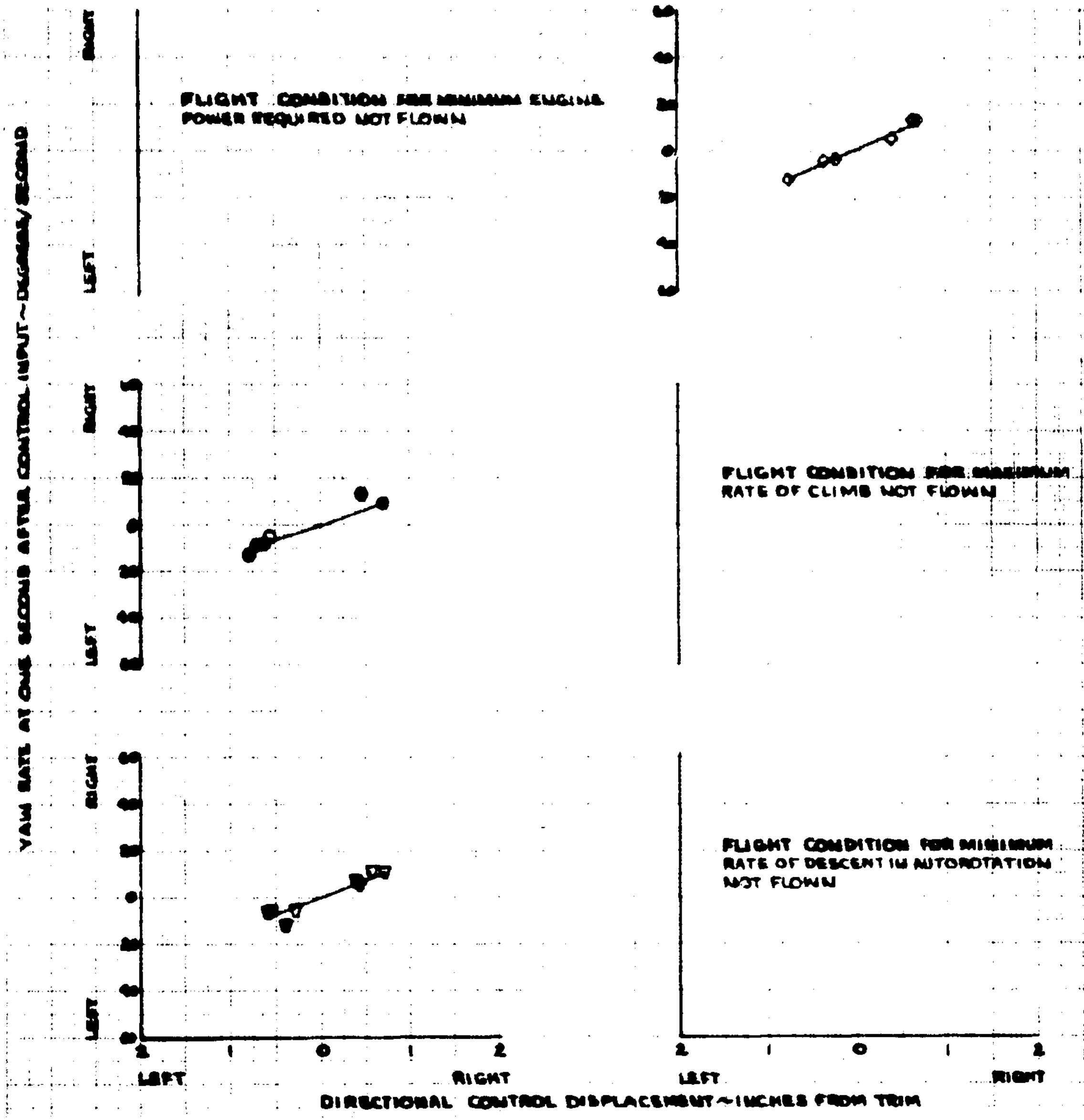


FIGURE NO. 231

ANGULAR YAW DISPLACEMENT

AH-1G USA [illegible]

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	118.0	5150	[illegible]	198.6(AFT)	[illegible]	LEVEL FLIGHT	0.00 4837
○	145.5	4870	[illegible]	199.5(AFT)	[illegible]	LEVEL FLIGHT	0.00 4929
◇	161.0	5700	[illegible]	199.5(AFT)	[illegible]	DIVE	0.00 5103

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

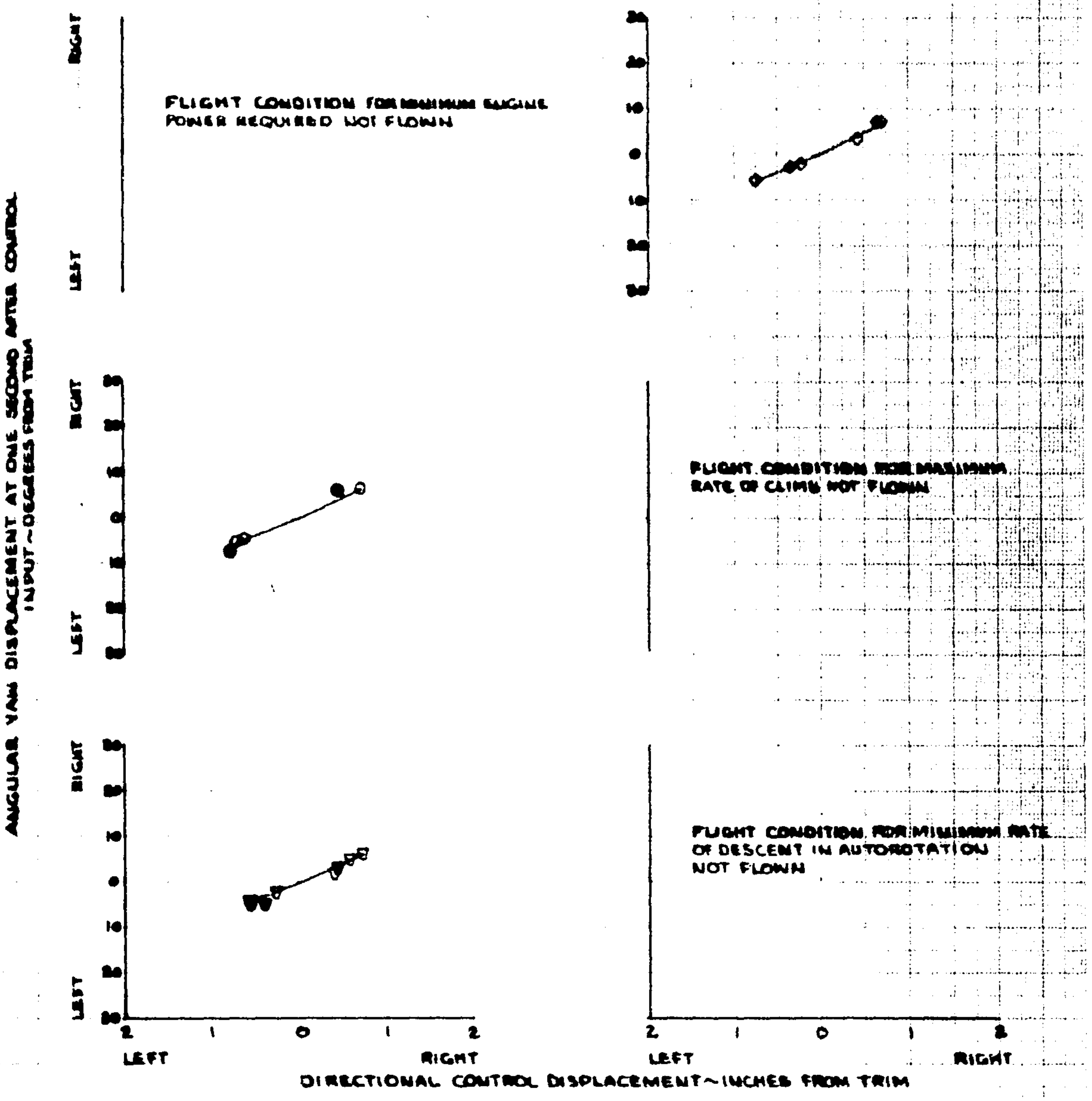


FIGURE No. 232

DIRECTIONAL CONTROL SENSITIVITY

AH-1G USA S/N 718695

HVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG ALT H_D~FT	AVG. G.W. ~LB	AVG. LONG. C.G ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
⬭	63.0	4800	9540	200.0(AFT)	324.0	LEVEL FLIGHT	0.00 5464
○	108.0	5300	9280	200.2(AFT)	324.0	LEVEL FLIGHT	0.00 5396
▽	134.0	6940	8920	200.0(AFT)	324.0	LEVEL FLIGHT	0.00 5454
◇	172.0	6870	9250	199.6(AFT)	324.0	DIVE	0.00 5643
▲	62.0	6580	9420	199.6(AFT)	324.0	CLIMB	0.00 5661

NOTE: OPEN SYMBOLS DENOTE SCAS ON

SOLID SYMBOLS DENOTE SCAS OFF

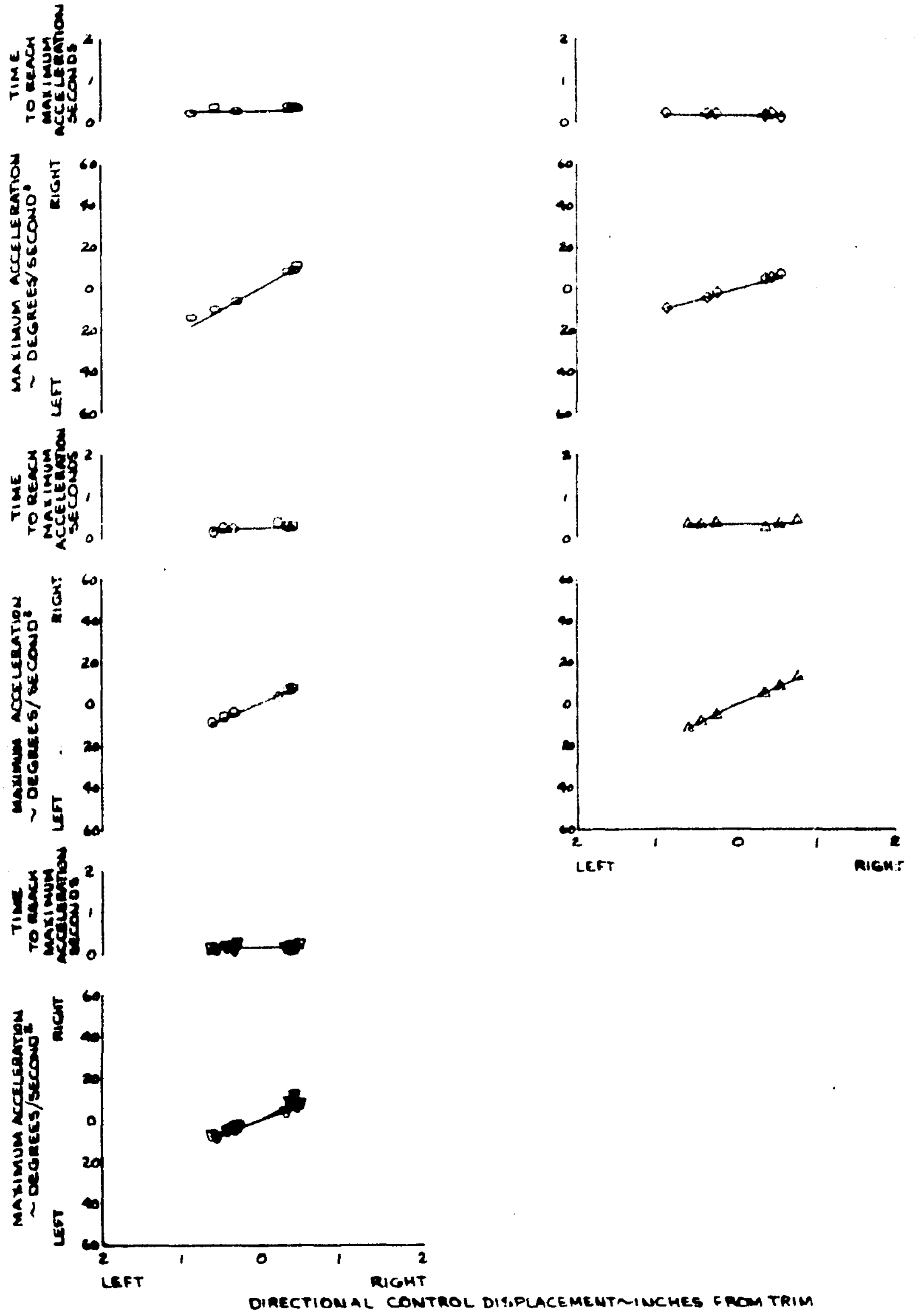


FIGURE No. 233

DIRECTIONAL CONTROL RESPONSE

AH-1G USA 715695

HVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM.	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	65.0	4800	9540	200.0(AFT)	324.0	LEVEL FLIGHT	0.00 5464
□	108.0	5800	9280	200.2(AFT)	324.0	LEVEL FLIGHT	0.00 5396
▽	134.0	6940	8920	200.8(AFT)	324.0	LEVEL FLIGHT	0.00 5454
◇	172.0	6870	9250	199.6(AFT)	324.0	DIVE	0.00 5648
△	62.0	6380	9420	199.6(AFT)	324.0	CLIMB	0.00 5661

NOTE: ALL ROCKET PODS FULLY LOADED (1654 LB)

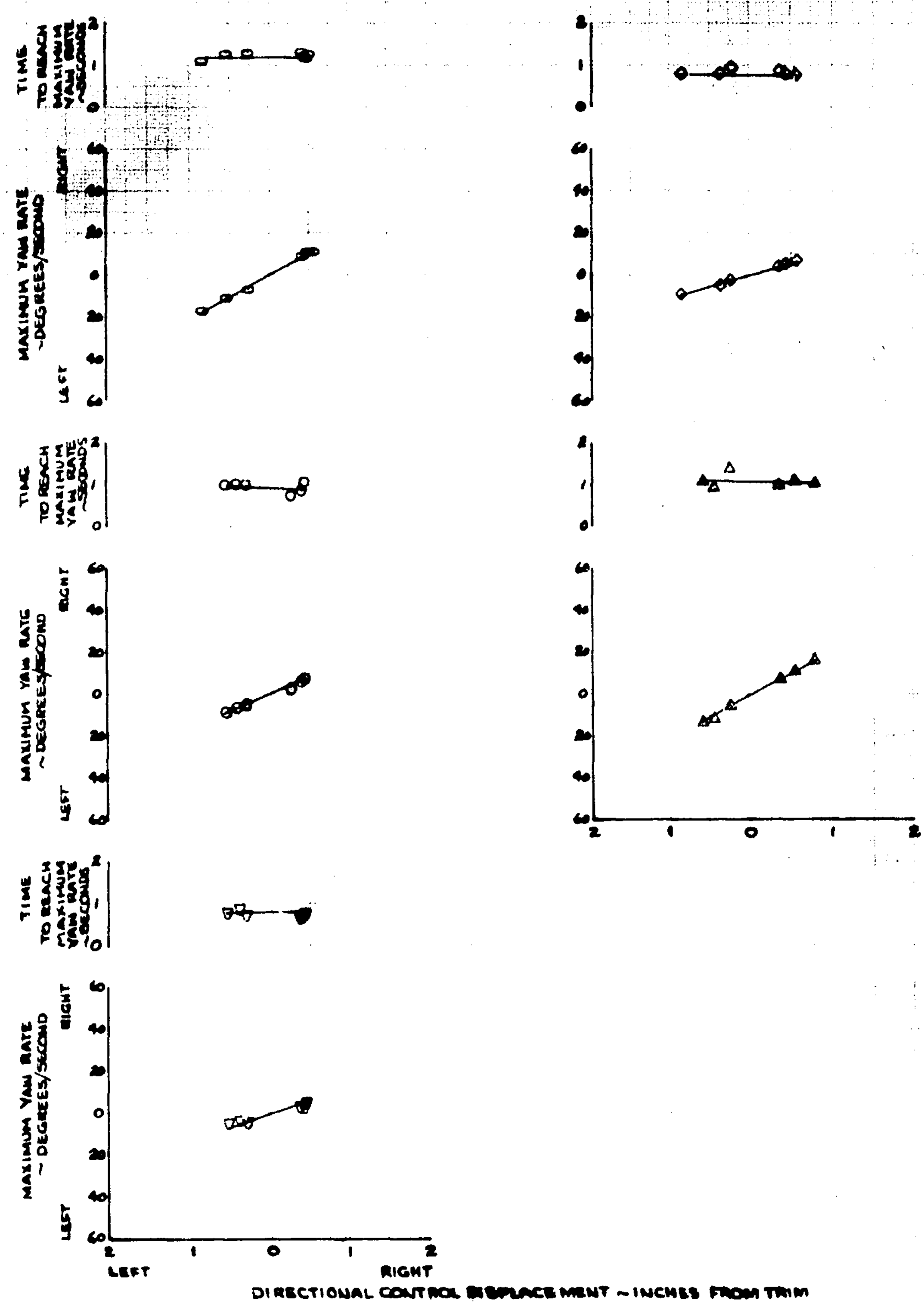


FIGURE NO. 234

DIRECTIONAL RESPONSE AT ONE SECOND

AH-1G USA 67-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. HD ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~CT
○	65.0	4800	9860	200.0(AFT)	3240	LEVEL FLIGHT	0.005464
□	108.0	5800	9280	200.2(AFT)	3240	LEVEL FLIGHT	0.005897
▽	134.0	6940	8920	200.0(AFT)	3240	LEVEL FLIGHT	0.005454
◇	172.0	6870	9250	199.6(AFT)	3240	DIVE	0.005643
▲	62.0	6380	9420	199.6(AFT)	3240	CLIMB	0.005661

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB)

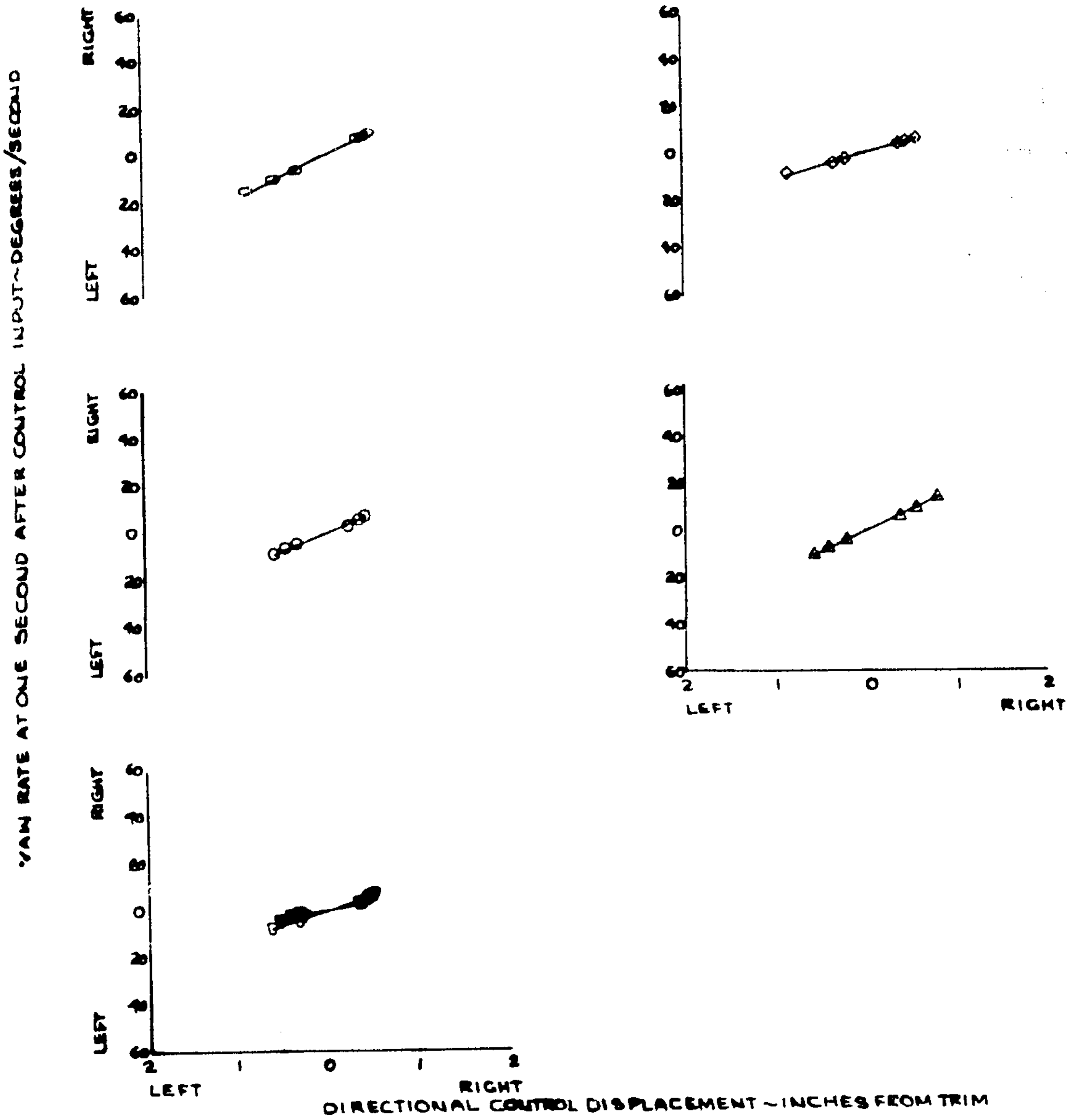


FIGURE No. 235

ANGULAR YAW DISPLACEMENT

AH-1G USA [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
●	62.0	4900	9560	200.0(AFT)	324.0	LEVEL FLIGHT	0.005464
○	102.0	5200	9380	200.2(AFT)	324.0	LEVEL FLIGHT	0.005396
▽	134.0	6940	8930	200.0(AFT)	324.0	LEVEL FLIGHT	0.005454
◇	172.0	6870	9260	199.6(AFT)	324.0	DIVE	0.005643
▲	62.0	6380	9620	199.6(AFT)	324.0	CLIMB	0.005661

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON

2. SOLID SYMBOLS DENOTE SCAS OFF

3. ALL ROCKET PODS FULLY LOADED

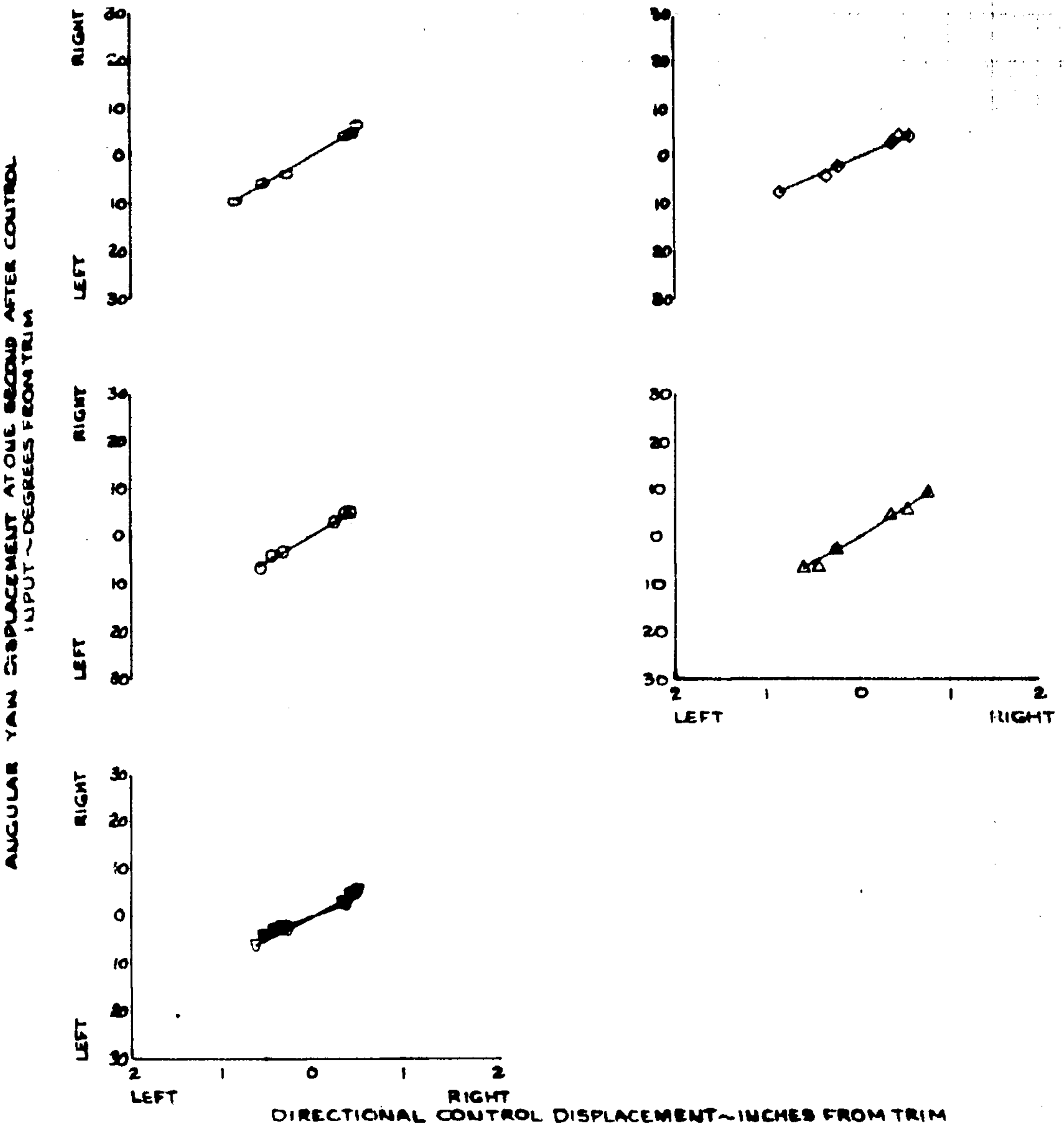


FIGURE NO. 236

DIRECTIONAL CONTROL SENSITIVITY

AH-1G USA S/N [illegible]

HVY HOG CONFIGURATION WITH ROCKET [illegible] REMOVED

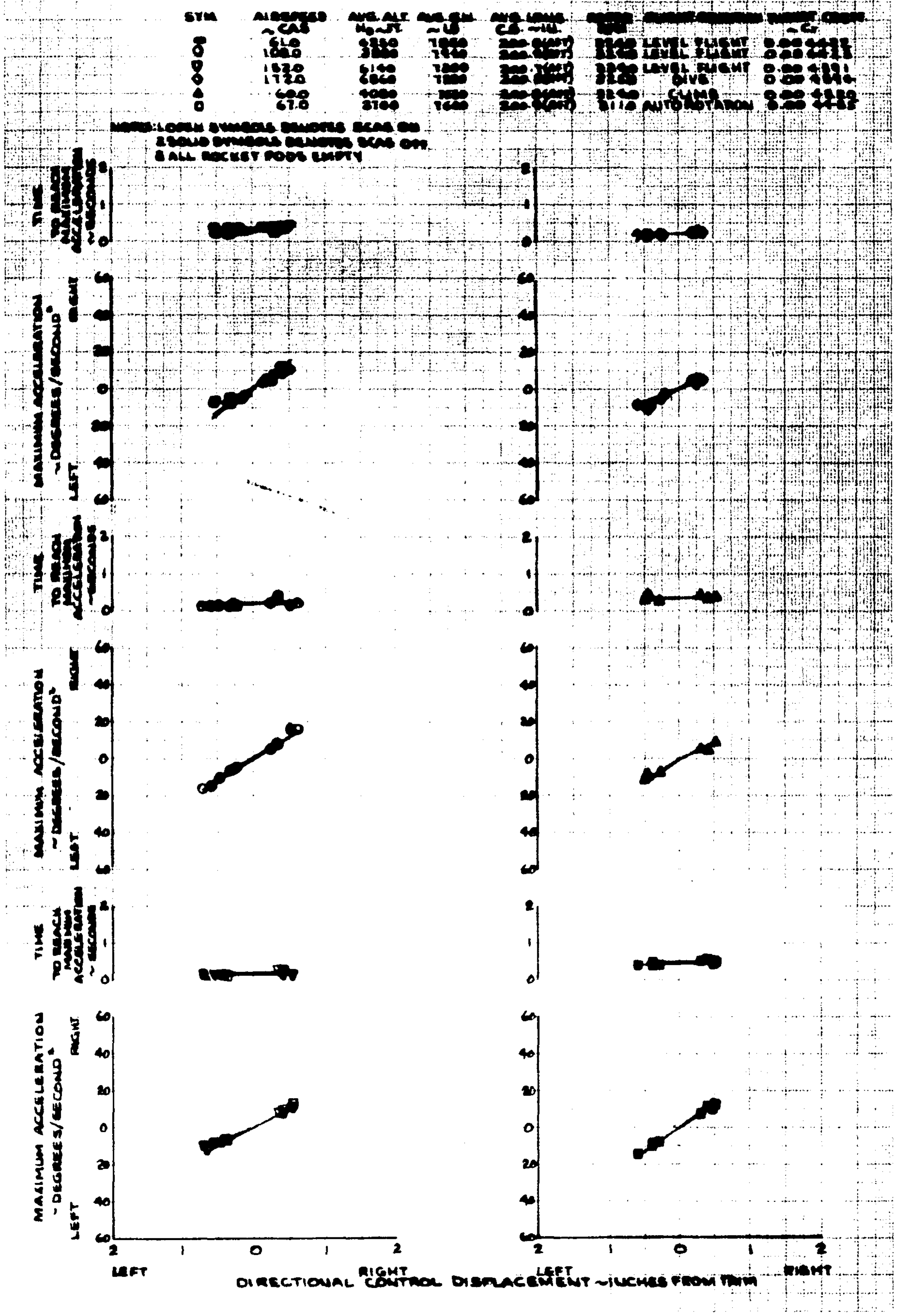


FIGURE No. 237

DIRECTIONAL CONTROL RESPONSE

AH-1G USA S/N 15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT	AVG. GW ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF.
○	61.0	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLIGHT	0.00 [illegible]
●	[illegible]	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	LEVEL FLIGHT	0.00 [illegible]
▽	132.5	6160	7860	200.1 (AFT)	[illegible]	LEVEL FLIGHT	0.00 [illegible]
◆	172.0	[illegible]	7580	200.[illegible] (AFT)	[illegible]	DIVE	0.00 [illegible]
△	[illegible]	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	CLIMB	0.00 [illegible]
□	[illegible]	[illegible]	[illegible]	200.[illegible] (AFT)	3114	AUTOROTATION	0.00 [illegible]

NOTE: ALL ROCKET PODS EMPTY

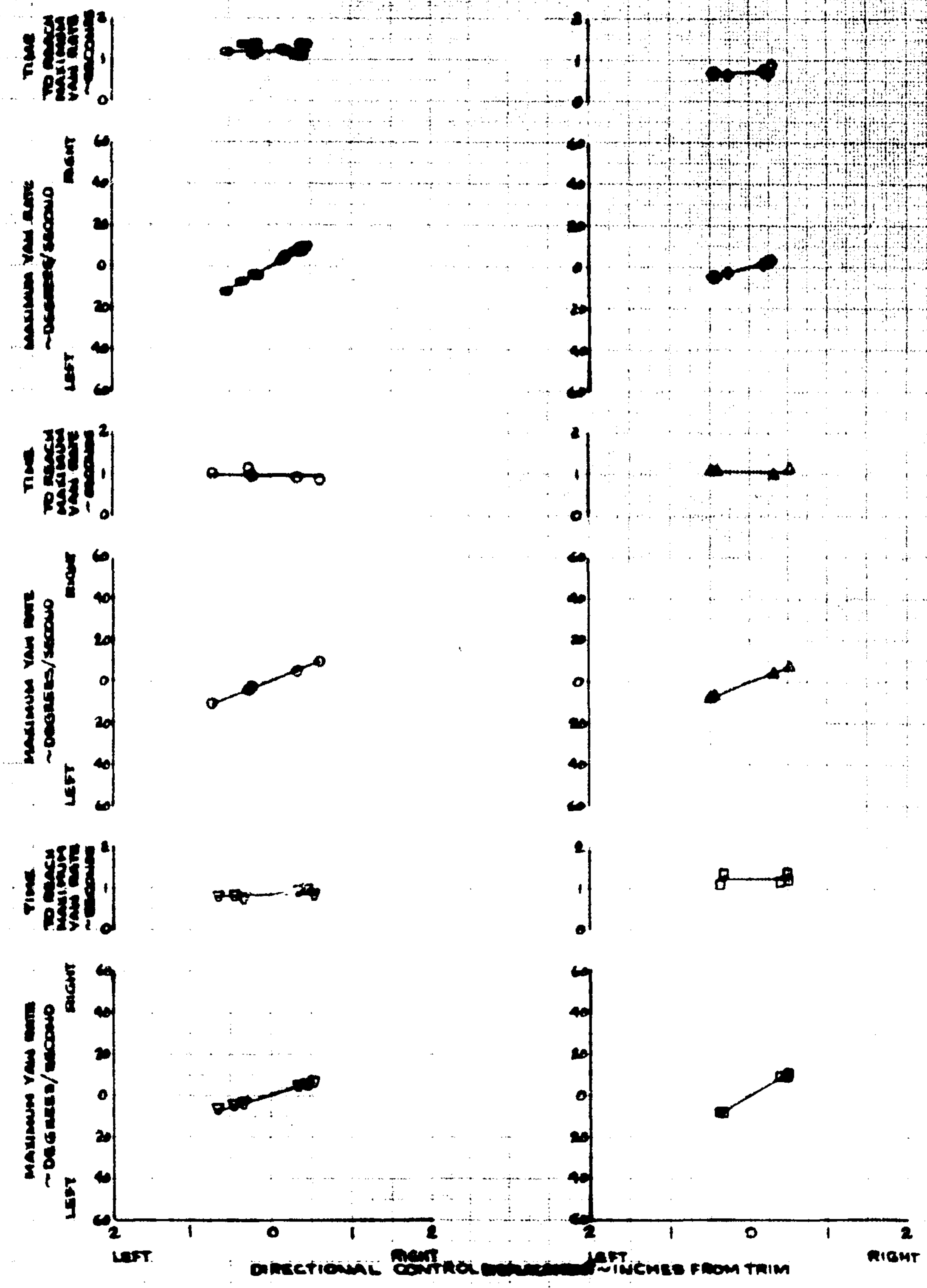


FIGURE NO. 238
DIRECTIONAL RESPONSE AT ONE SECOND
AH-1G USA S/N [illegible]
HVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~CT
○	61.0	6250	7850	200.8(AFT)	324.0	LEVEL FLIGHT	0.00 4422
⬡	108.0	[illegible]	7940	200.9(AFT)	324.0	LEVEL FLIGHT	0.00 4625
▽	153.5	6140	7860	200.7(AFT)	324.0	LEVEL FLIGHT	0.00 4591
◇	173.0	6860	7590	200.8(AFT)	325.0	DIVE	0.00 4594
△	60.0	4080	7530	200.8(AFT)	324.0	CLIMB	0.00 4220
□	67.0	2700	7600	200.9(AFT)	311.0	AUTOROTATION	0.00 4485

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

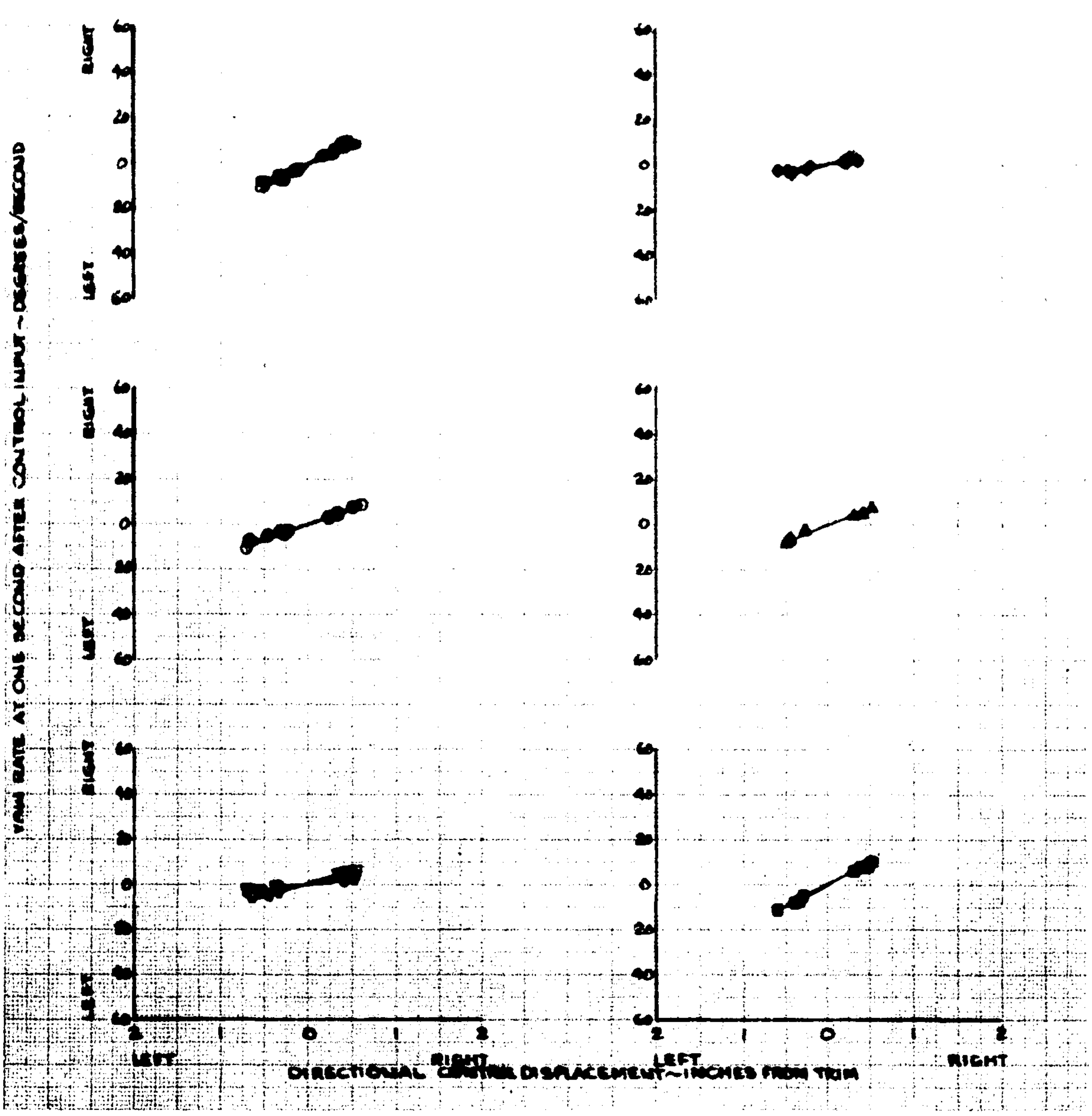


FIGURE NO. 239

ANGULAR YAW DISPLACEMENT

AH-1G USA S/N 71-15085

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	DNS.ALT. Hp~FT	AVG.G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
○	61.0	[illegible]	[illegible]	200.8(AFT)	[illegible]	LEVEL FLIGHT	[illegible]
□	[illegible]	[illegible]	[illegible]	[illegible]	324.0	LEVEL FLIGHT	[illegible]
▽	152.5	6160	[illegible]	[illegible]	[illegible]	LEVEL FLIGHT	0.004391
◇	172.0	[illegible]	[illegible]	[illegible]	[illegible]	DIVE	[illegible]
△	60.0	[illegible]	[illegible]	[illegible]	[illegible]	CLIMB	[illegible]
○	61.0	2100	7600	[illegible]	311.0	AUTOROTATION	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY.

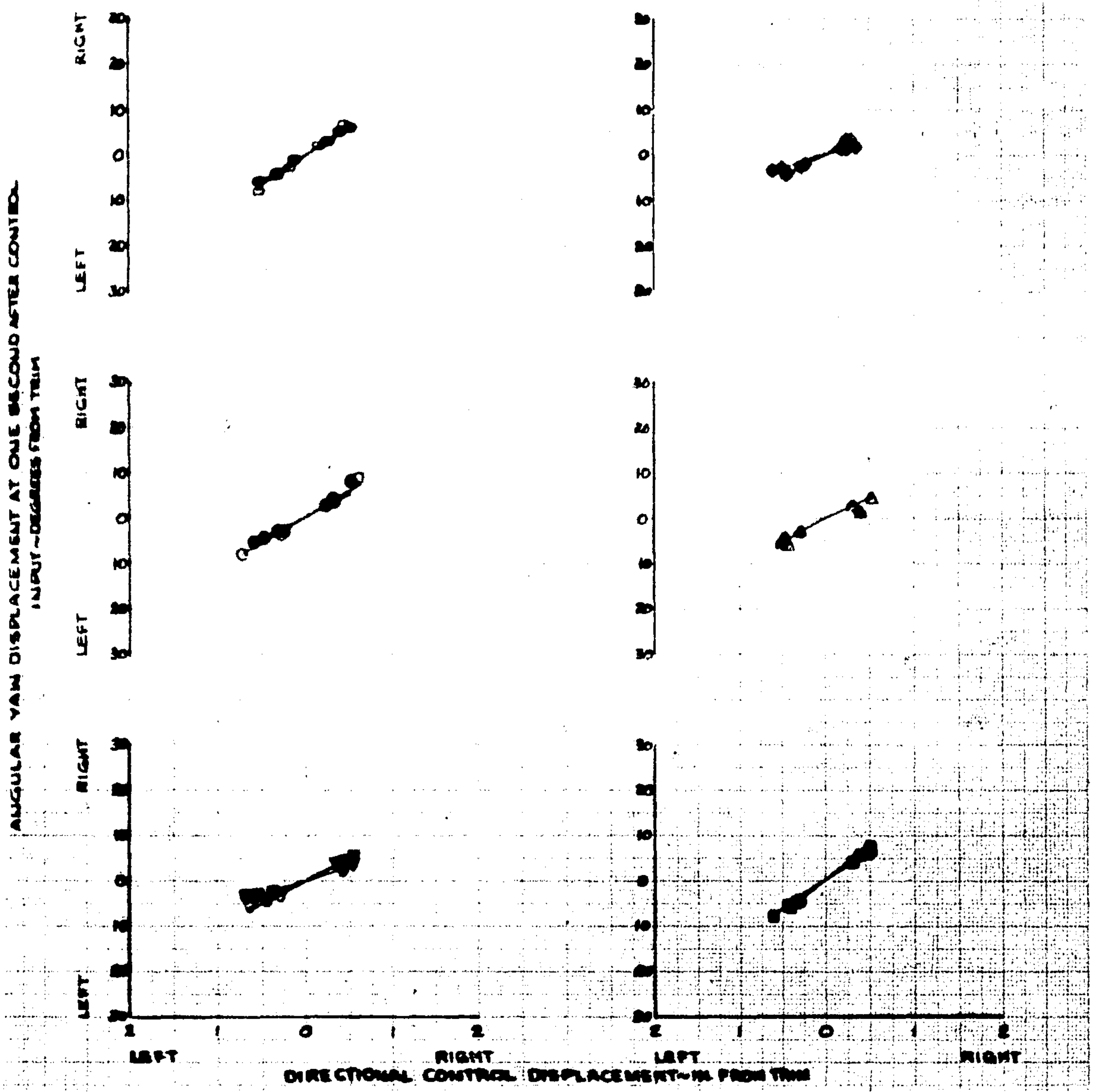


FIGURE NO. 240
DIRECTIONAL CONTROL SENSITIVITY
AH-1G USA [illegible]
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p ~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
□	58.0	15780	7860	200.9(AFT)	324[illegible]	LEVEL FLIGHT	0.00[illegible]
○	88.0	16810	7600	200.[illegible](AFT)	[illegible]	LEVEL FLIGHT	0.00[illegible]
▽	105.0	15860	7730	200.9(AFT)	[illegible]	LEVEL FLIGHT	0.006274

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

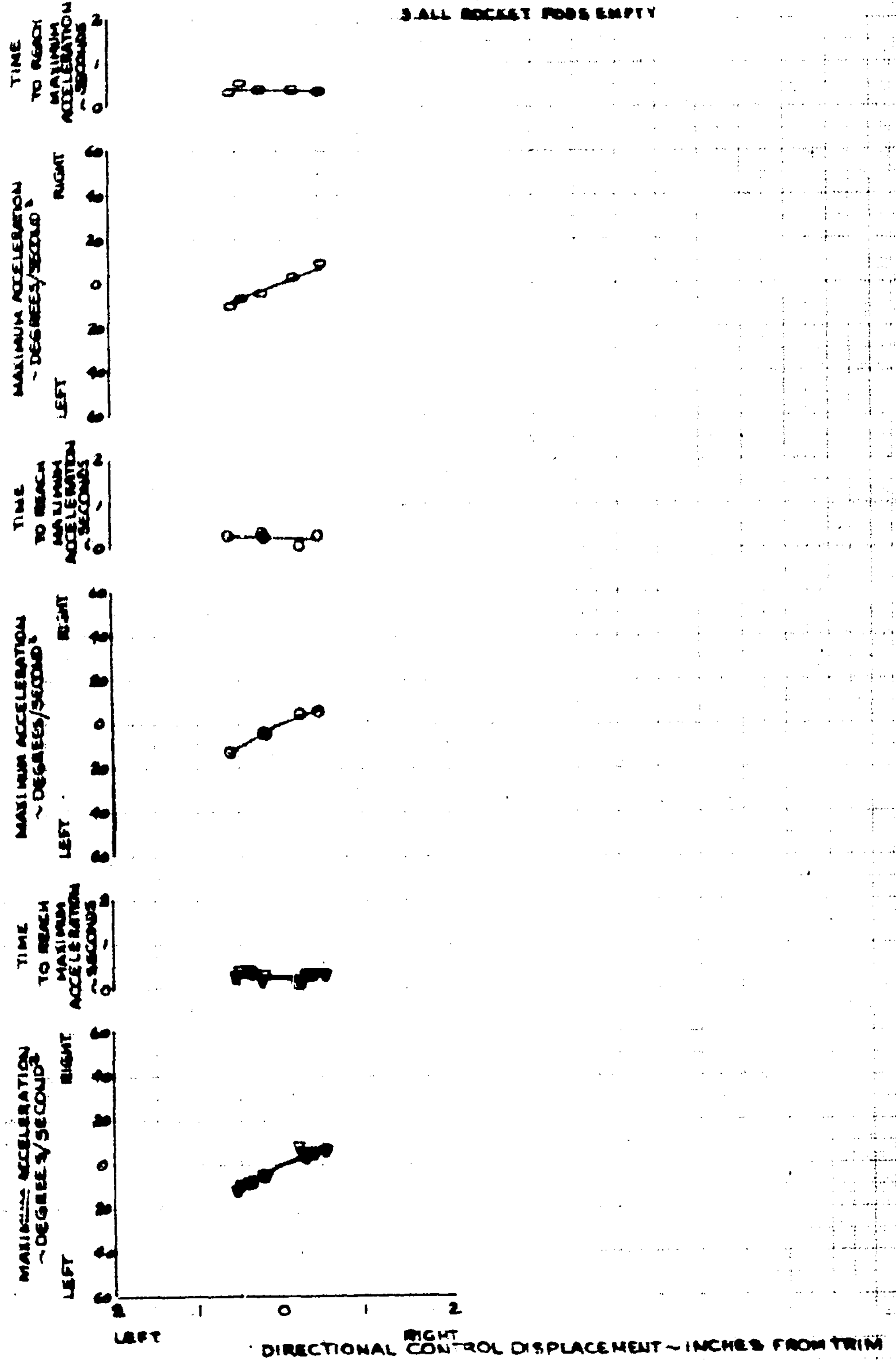


FIGURE NO. 241

DIRECTIONAL CONTROL RESPONSE

AH-1G USA S/N 71-15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AIRSPEED ~CAS	AVG. ALT. Hp~FT	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	ROTOR SPEED ~RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
●	51.0	15700	7960	200.9(AFT)	[illegible]	STEADY LEVEL FLIGHT	0.00 [illegible]
○	[illegible]	15810	7800	200.[illegible]	[illegible]	STEADY LEVEL FLIGHT	0.00 [illegible]
▽	105.0	15860	7750	200.9(AFT)	[illegible]	STEADY LEVEL FLIGHT	0.00 6274

NOTE: ALL ROCKET PODS EMPTY

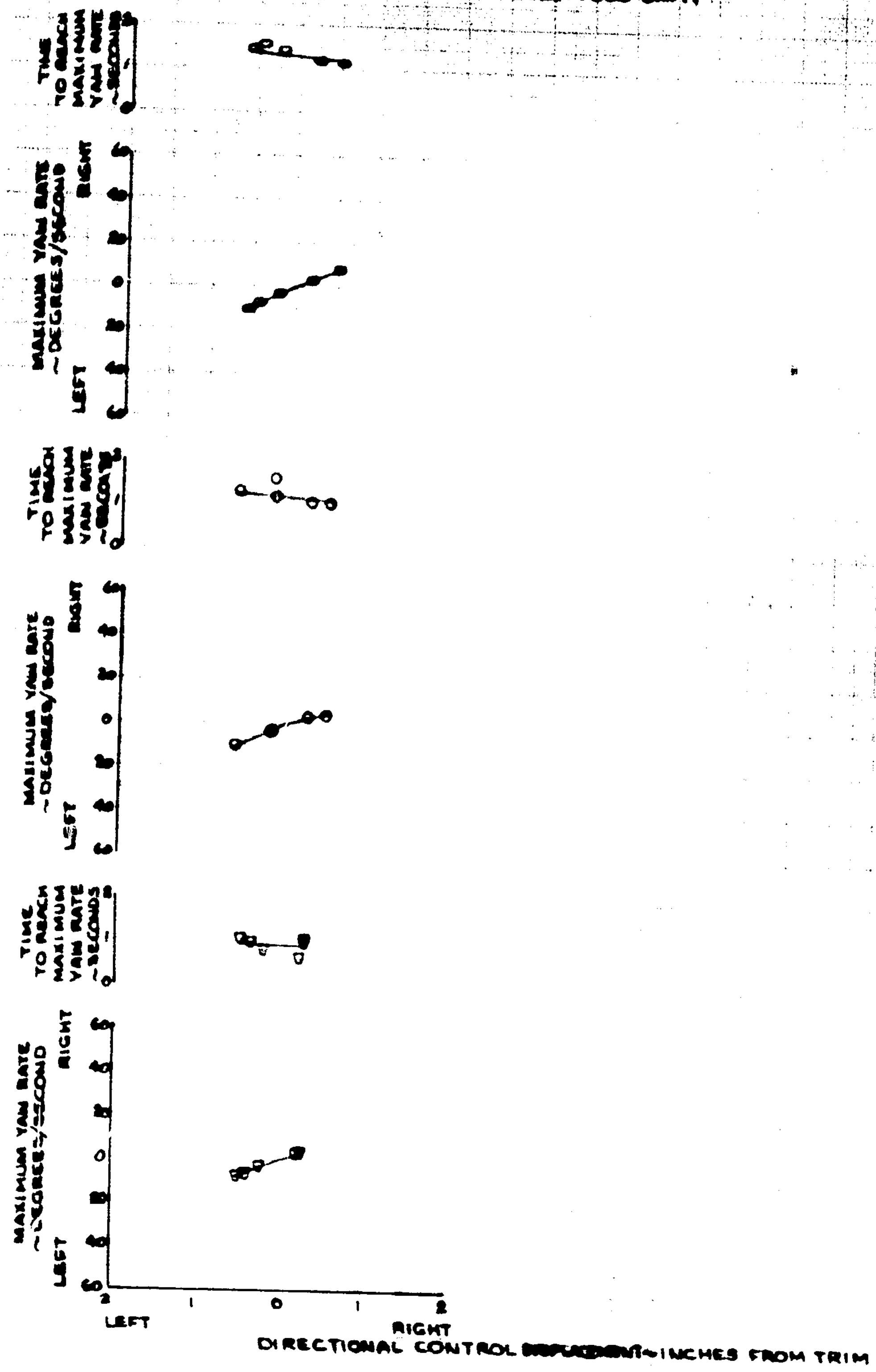


FIGURE NO. 242

DIRECTIONAL RESPONSE AT ONE SECOND

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C_T
●	53.0	15780	7860	200.9(AFT)	324.0	LEVEL FLIGHT	0.006363
○	84.0	16810	7600	200.9(AFT)	324.0	LEVEL FLIGHT	0.006368
▽	105.0	16860	7780	200.9(AFT)	324.0	LEVEL FLIGHT	0.006274

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

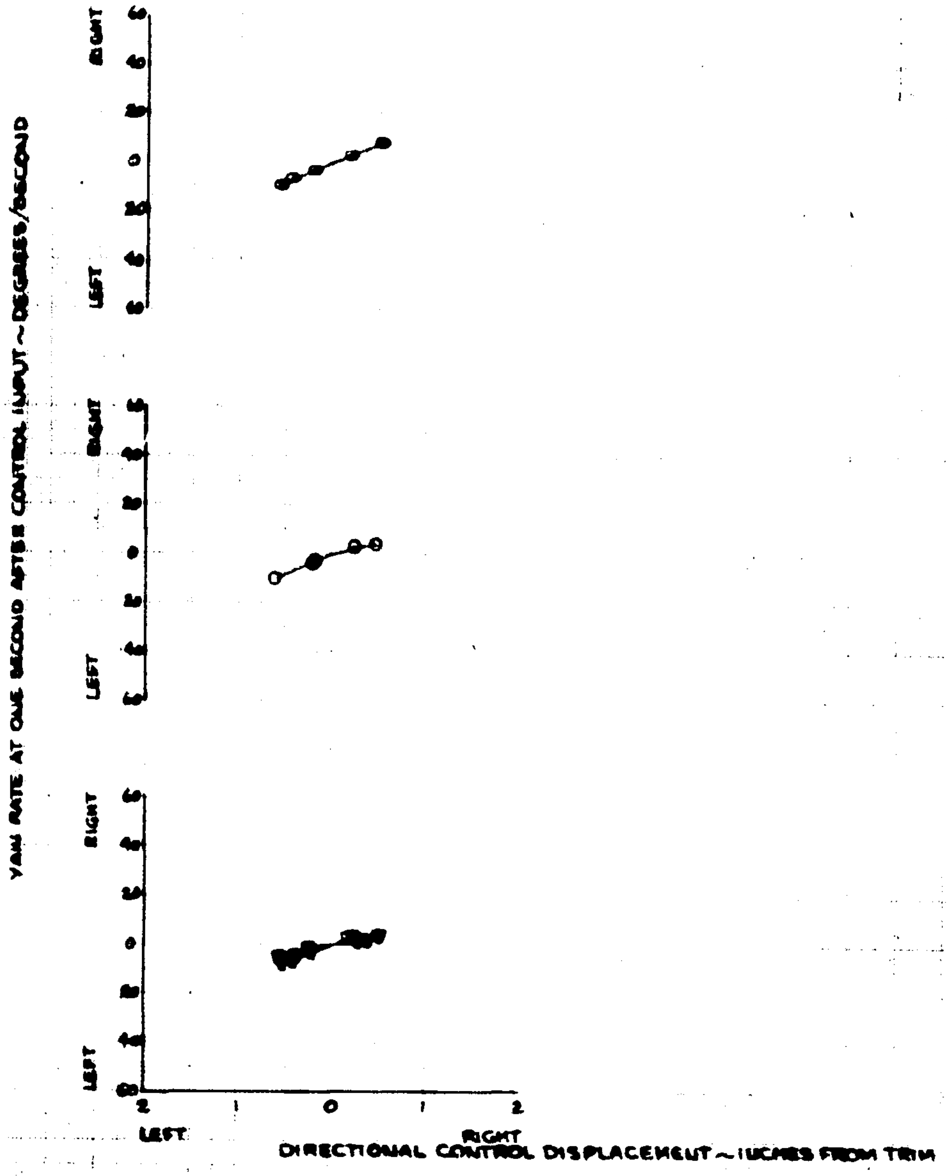


FIGURE No. 243

ANGULAR YAW DISPLACEMENT

AH-1G USA S/N 718698

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. Hp ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~C_T
○	52.0	16160	7700	200.9 (AFT)	3240	LEVEL FLIGHT	0.00 6385
◇	[illegible]	17870	7500	200.8 (AFT)	3240	LEVEL FLIGHT	0.00 6336
▽	1020	16160	7650	200.9 (AFT)	3240	LEVEL FLIGHT	0.00 6254

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON

2. SOLID SYMBOLS DENOTE SCAS OFF

3. ALL ROCKET PODS EMPTY

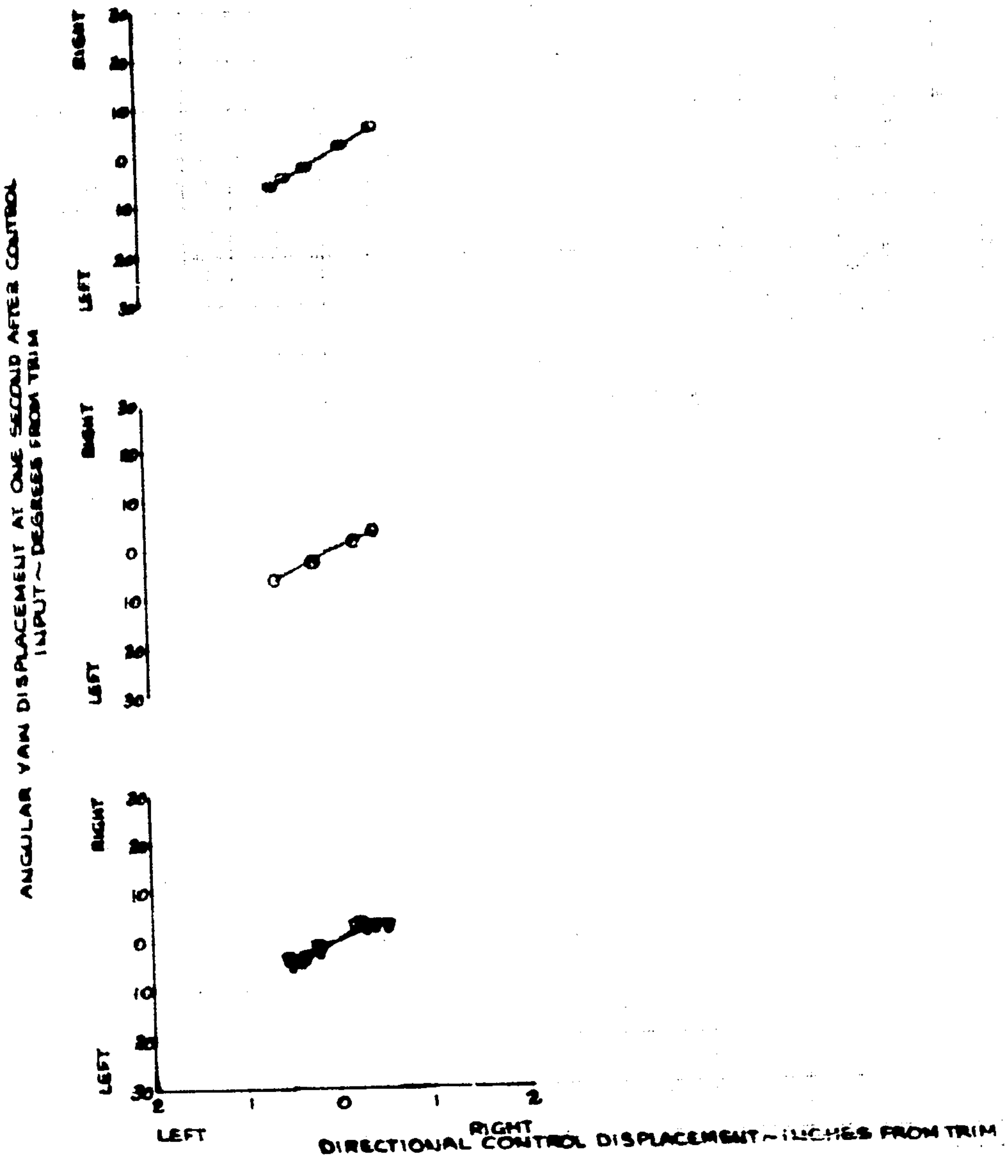


FIGURE NO. 244

LONGITUDINAL CONTROLLABILITY SUMMARY DURING HOVER

AH-1G

SYM	CONFIG	S/N	POD LOADING
○	CLEAN	[illegible]	NO PODS
▽	HVY. HOG	[illegible]	NOTED
◆	HVY. HOG	[illegible]	PODS EMPTY
□	HVY. HOG	[illegible]	NOTED

NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
2. SOLID SYMBOLS DENOTE AFT INPUT
3. PLAIN SYMBOLS DENOTE SCAS ON
4. FLAGGED SYMBOLS DENOTE SCAS OFF
5. (▽) ALL ROCKET PODS EMPTY
6. (□) 817 LB. IN INBD ROCKET PODS, 559 LB. IN OUTBD ROCKET PODS. 1376 LB. TOTAL
7. POINTS DERIVED FROM FIGURES [illegible] THROUGH [illegible], APPENDIX [illegible]

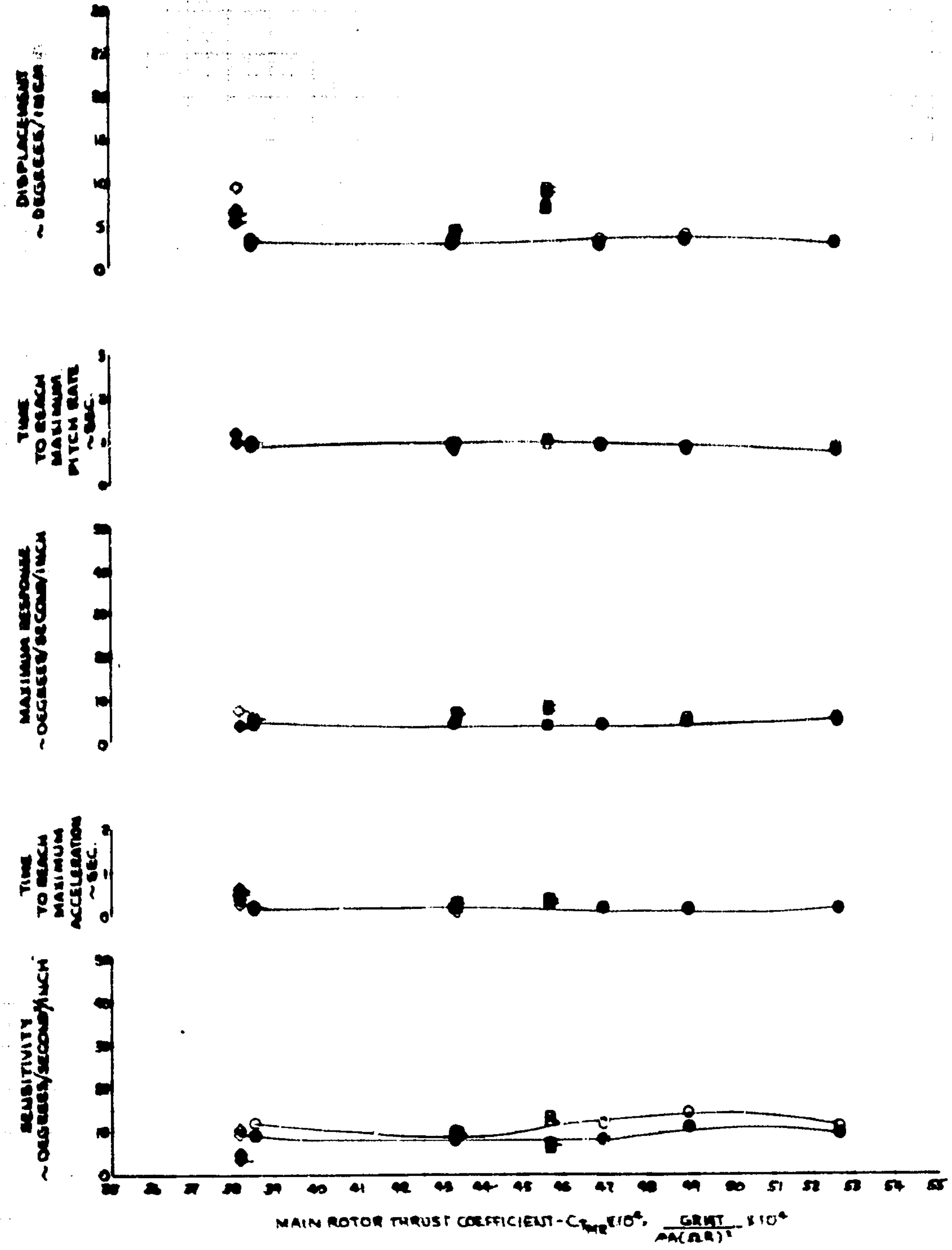


FIGURE NO. 245
LATERAL CONTROLLABILITY SUMMARY DURING HOVER
AH-1G

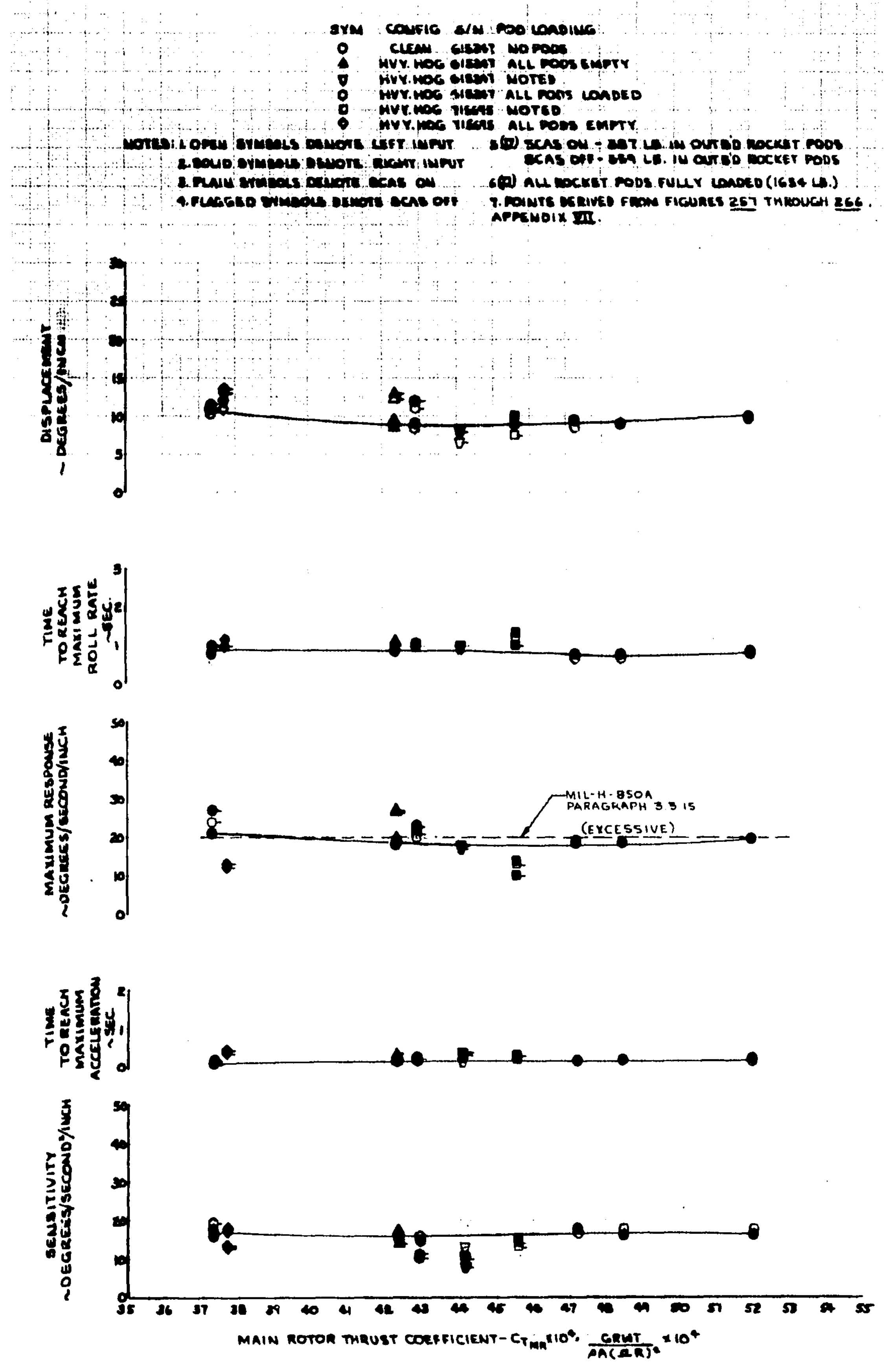


FIGURE NO. 246

DIRECTIONAL CONTROLLABILITY SUMMARY DURING HOVER

AH-1G

SYM	CONFIG	S/N	POD LOADING
○	CLEAN	615247	NO PODS
△	HVY. HOG	615247	PODS EMPTY
▽	HVY. HOG	615247	NOTED
◇	HVY. HOG	715695	PODS EMPTY
□	HVY. HOG	715695	NOTED

NOTES:
1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE SCAS ON
4. FLAGGED SYMBOLS DENOTE SCAS OFF
5. (▽) $C_T = 0.004651$ ~ ALL ROCKET PODS EMPTY
   $C_T = 0.004304$ ~ 359 LB. IN OUTB'D ROCKET PODS
6. (□) 817 LB. INB'D ROCKET PODS, 301 LB. IN OUTB'D ROCKET PODS, 1118 LB. TOTAL
7. DATA POINTS ADJUSTED TO COMLY WITH MAXIMUM AVAILABLE PEDAL AT MOST CRITICAL SKID HEIGHT
8. POINTS DERIVED FROM FIGURES 267 THROUGH 279, APPENDIX VII

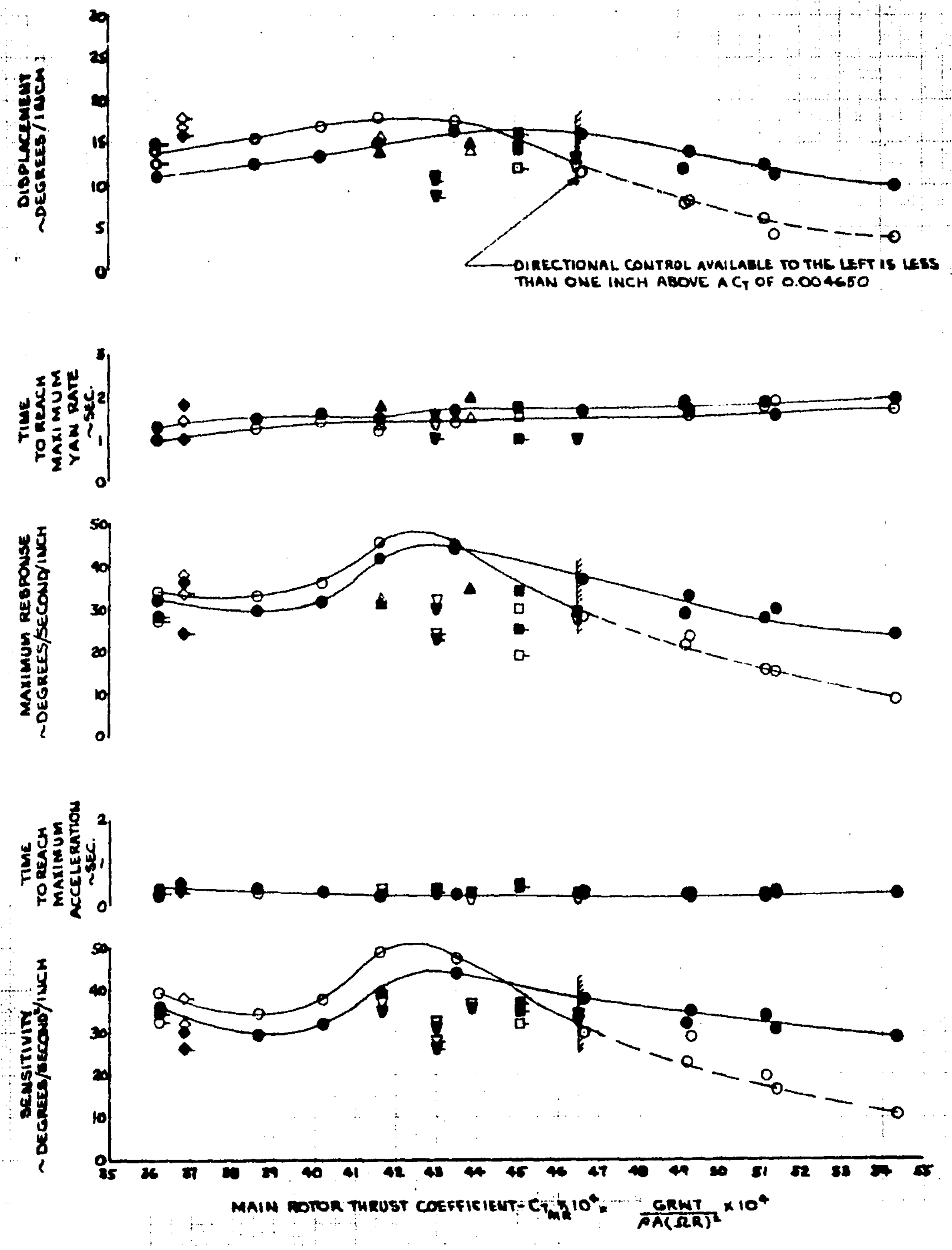


FIGURE NO. 247
LONGITUDINAL CONTROL SENSITIVITY
AH-1G USA S/N [illegible]
CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_p ~ FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	4460	7590	195.9(MID)	323.0	HOVER	0.00[illegible]
△	4850	8460	195.3(MID)	324.5	↓	0.00[illegible]
D	8550	7370	195.5(MID)	324.0		0.00[illegible]
◁	10 320	7750	195.4(MID)	324.0		0.00[illegible]
⬡	610	7670	195.6(MID)	324.0		0.00[illegible]
▽	SEA LEVEL	8635	200.4(FWD)	322.0		0.00[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE = 3FT → 15 FT.

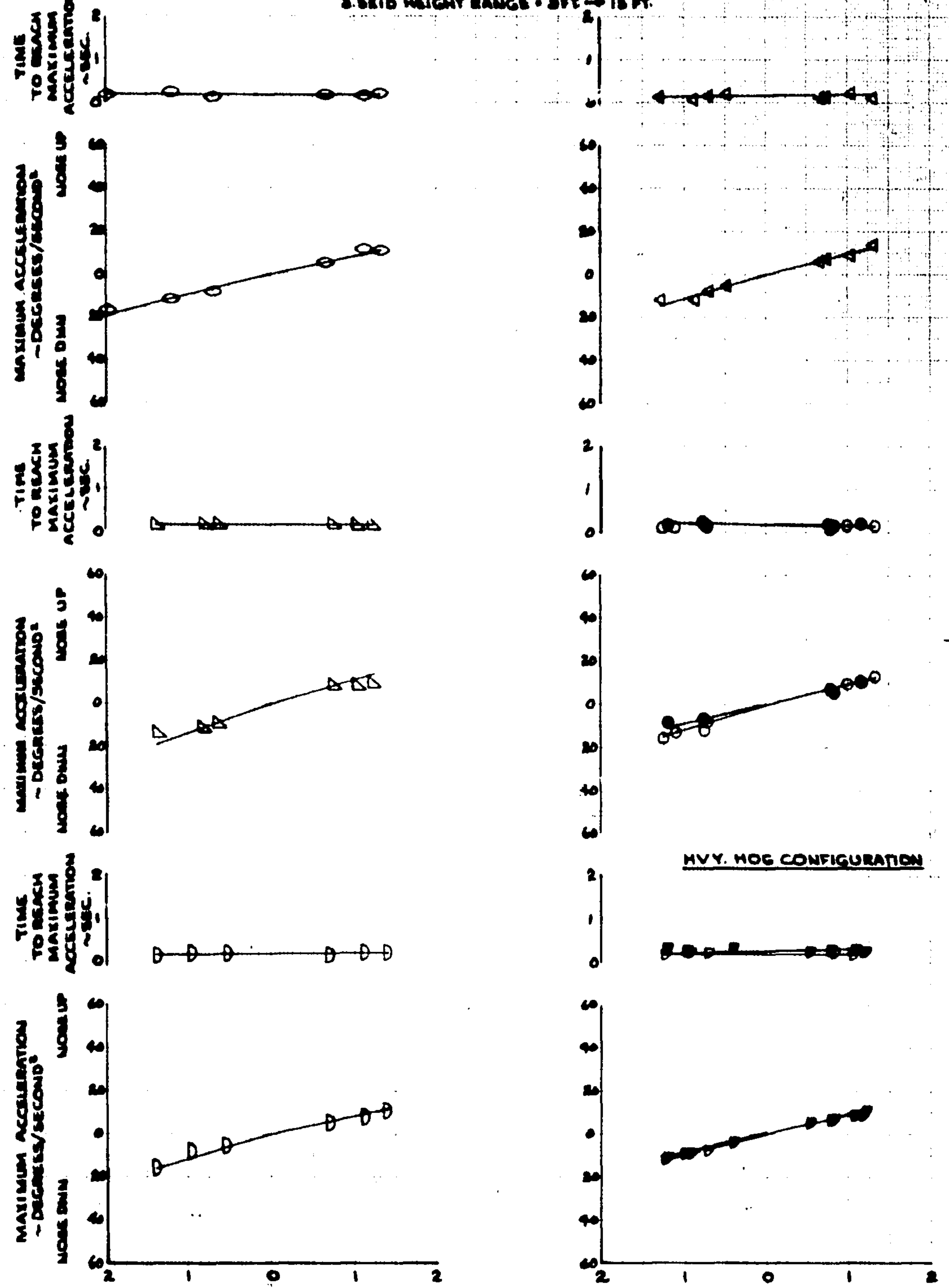


FIGURE NO. 248

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

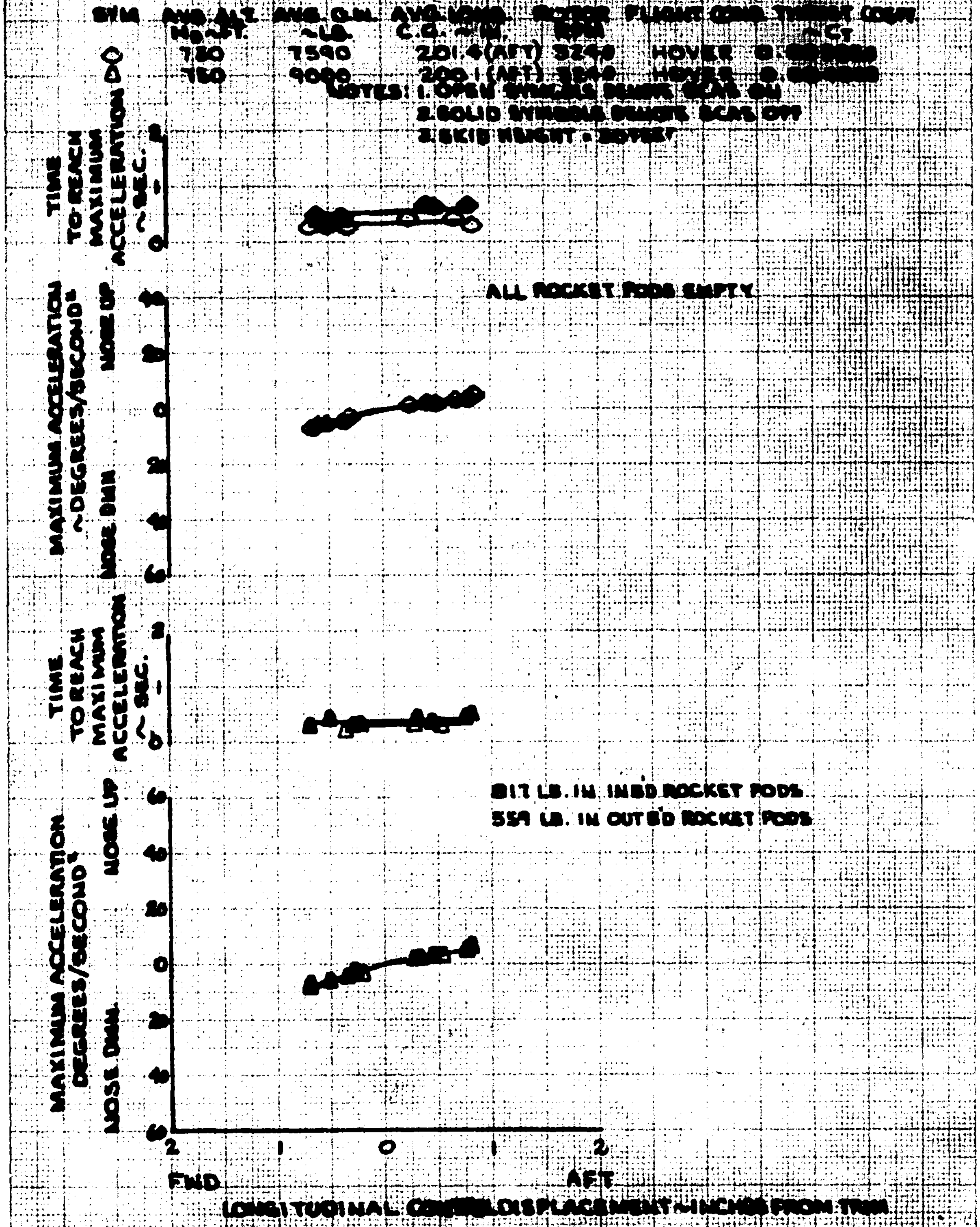


FIGURE NO 249

LONGITUDINAL CONTROL SENSITIVITY

AH-1G USA S/N 615847

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALT. H_p ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
◻	SEA LEVEL	8685	200.4	322.0	HOVER	0.004341

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS OFF VALUES READ AT ONE SECOND
4. SKID HEIGHT RANGE = 5 FT. → 15 FT.

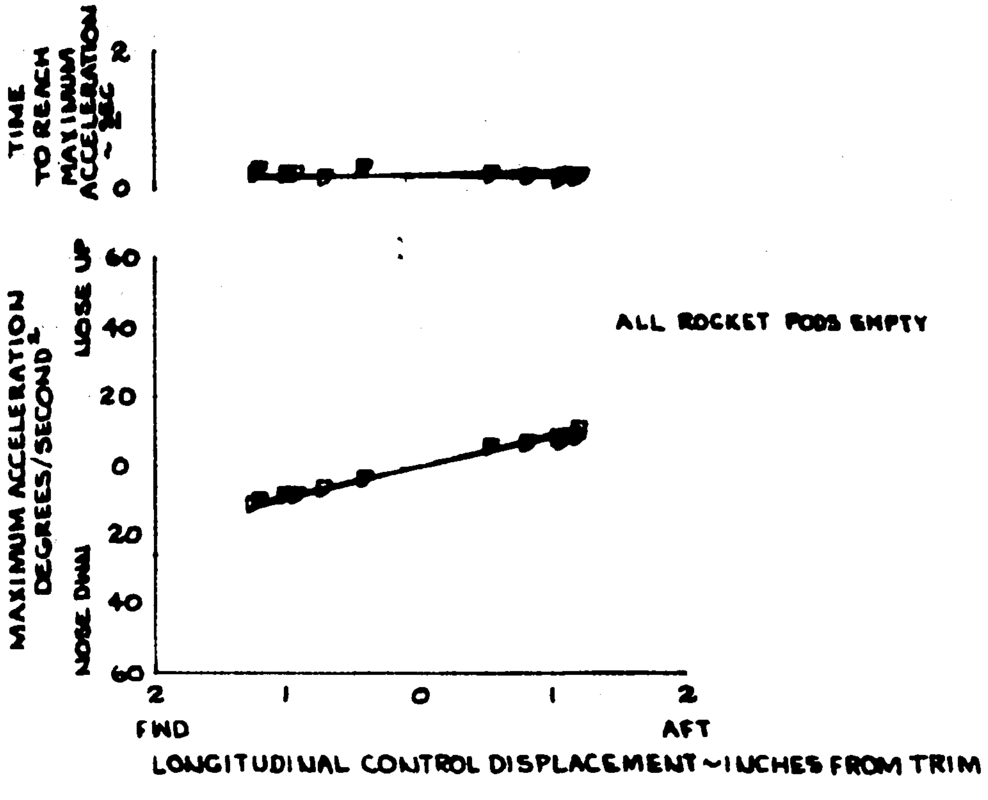


FIGURE NO. 250

LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_D ~ FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	4460	7590	195.9(MID)	323.0	HOVER	0.004320
△	4850	8560	195.3(MID)	324.5	↓	[illegible]
D	8550	7810	195.5(MID)	324.0	↓	0.004700
◁	10320	7750	195.9(MID)	324.0	↓	0.005268
○	610	7670	196.6(MID)	324.0	↓	0.003871

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE: 5 FT. → 15 FT.

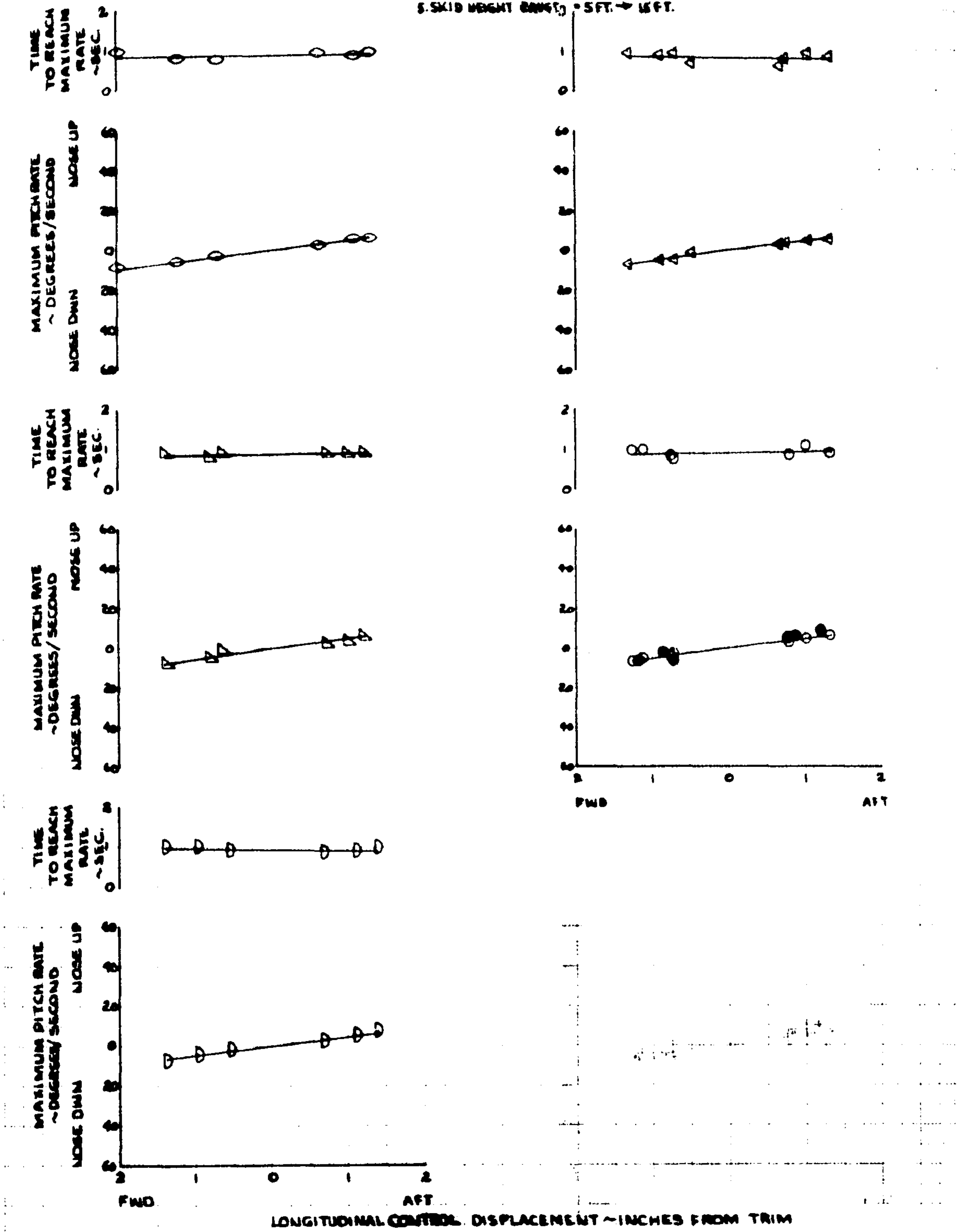


FIGURE NO. 251
LONGITUDINAL CONTROL RESPONSE
AH-1G USA S/N 715695
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AVG. ALT. Hp~FT	AVG. G.W. ~LB	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	730	7590	201.4 (AFT)	324.0	HOVER	0.003[illegible]
△	750	9000	200.1 (AFT)	324.0	HOVER	0.004[illegible]

NOTES 1. ALL SCAS VALUES ARE MAXIMUM
2. SKID HEIGHT = 30 FT.

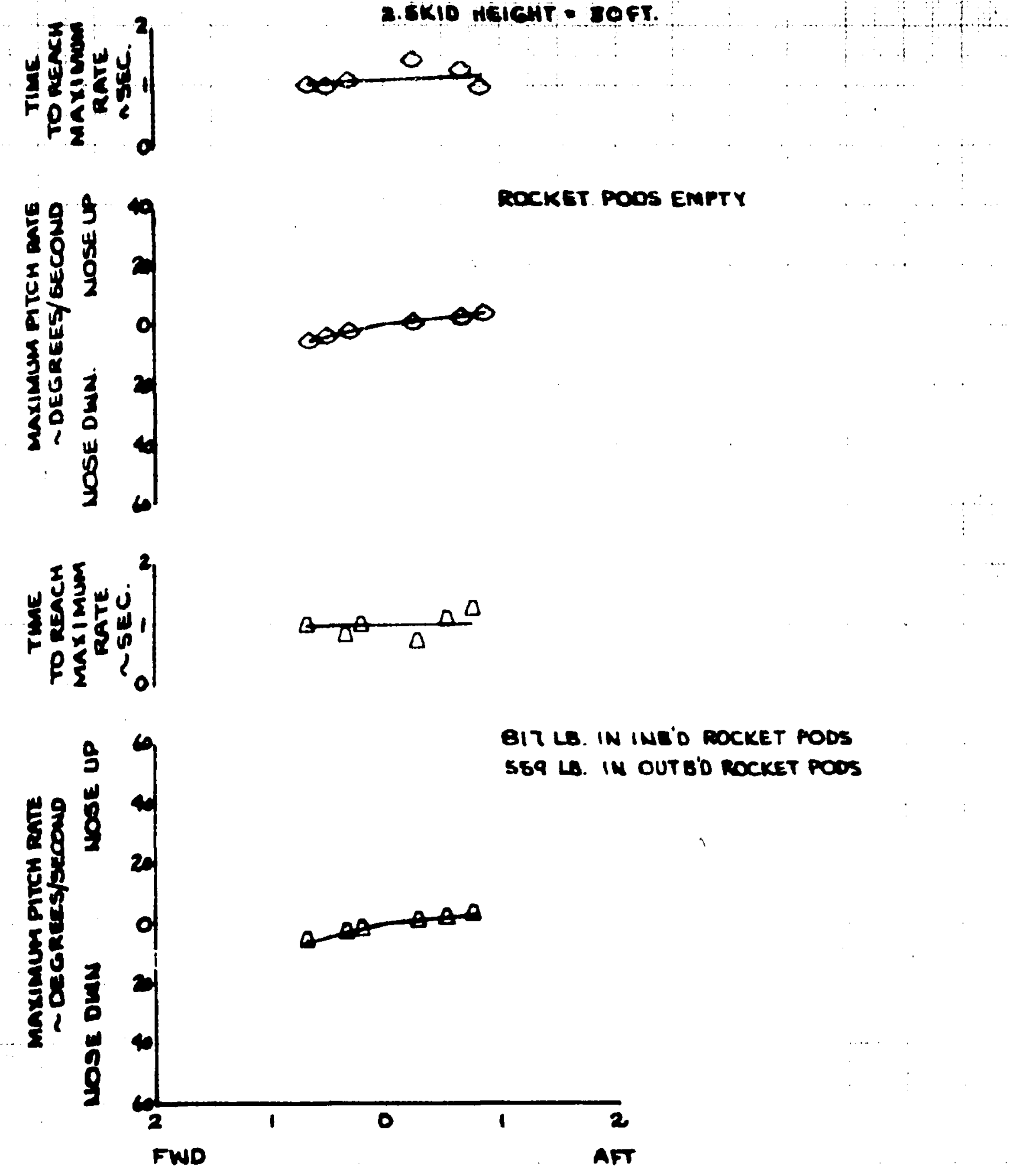


FIGURE NO. 252

LONGITUDINAL RESPONSE AT ONE SECOND

AH-1G USA [illegible]15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS OFF

SYM	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	730	7590	201.4 (AFT)	324.0	HOVER	0.003[illegible]
△	750	9000	200.1 (AFT)	324.0	HOVER	0.004[illegible]

NOTE: SKID HEIGHT = 30 FT.

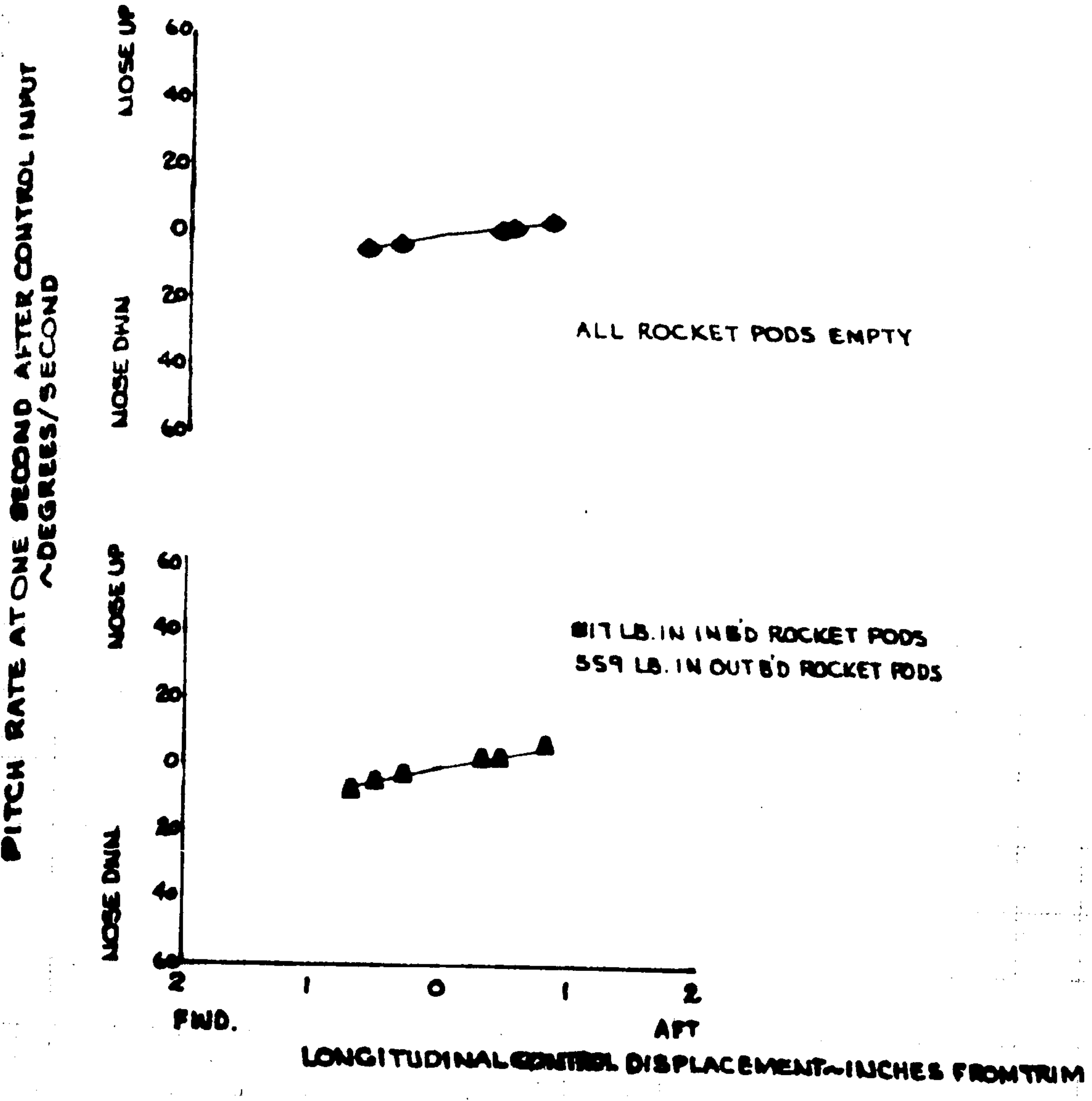


FIGURE No. 253

LONGITUDINAL CONTROL RESPONSE

AH-1G USA S/N [illegible]

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~CT
▽	SEA LEVEL	8635	200.4(AFT)	322.0	HOVER	0.004361

NOTES:
1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON VALUES ARE MAXIMUMS
4. ALL SCAS OFF VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE = 5 FT. → 15 FT.

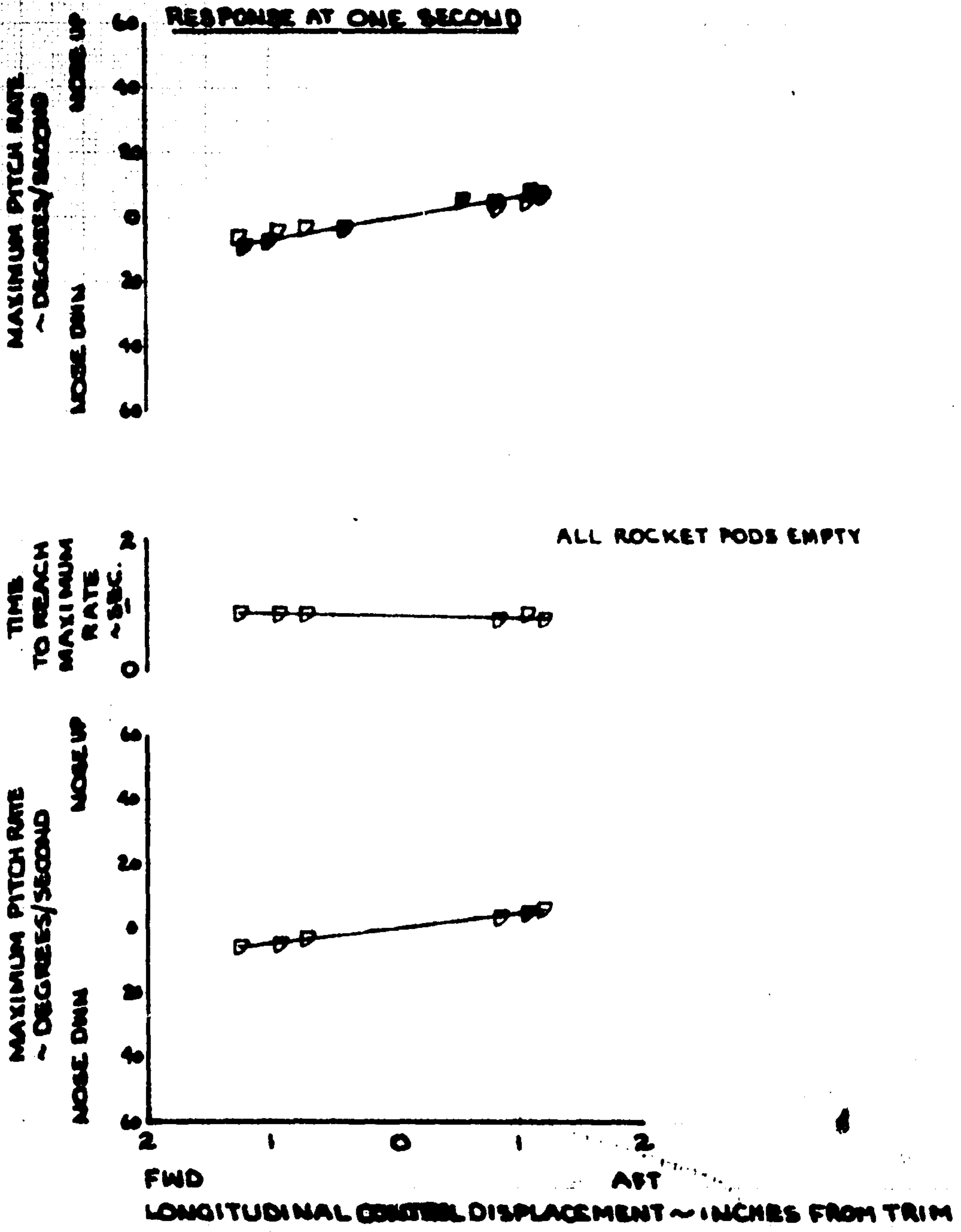


FIGURE No. 254

ANGULAR PITCH DISPLACEMENT

AH-1G USA S/N 615247

CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE Hp ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEF. ~ CT
○	4460	7950	195.9 (MID)	324.0	HOVER	[illegible]
△	4650	8060	195.3 (MID)	324.5	↓	[illegible]
D	5650	7870	195.5 (MID)	324.0		[illegible]
◁	10330	7750	195.9 (MID)	324.0		[illegible]
○	610	7670	195.6 (MID)	324.0		[illegible]
D	SEA LEVEL	8585	200.4 (AFT)	324.0		[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE = 5 FT. ~ 15 FT.

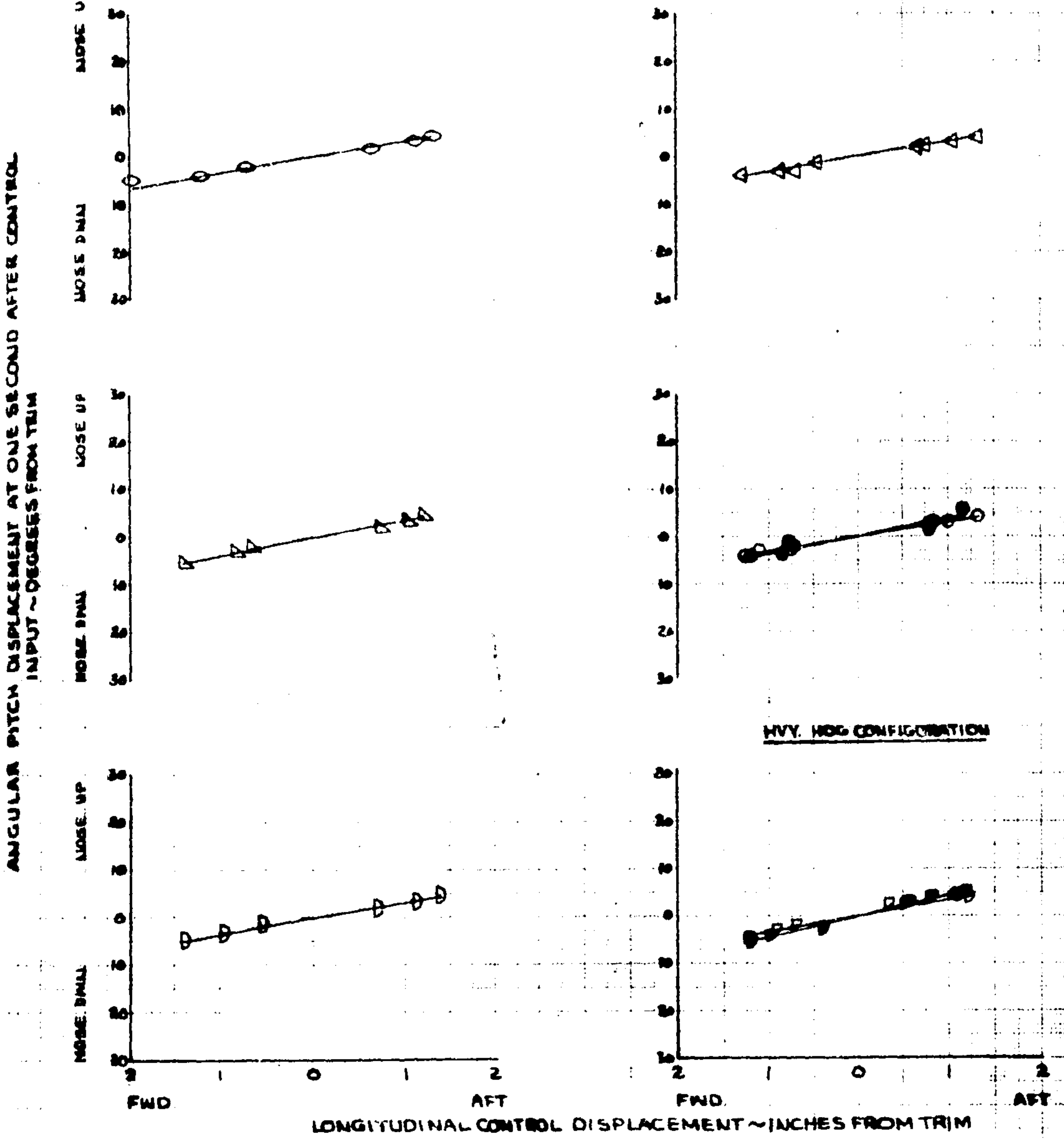


FIGURE NO. 255

ANGULAR PITCH DISPLACEMENT

AH-1G USA S/N 7115695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_D ~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C_T
○	730	7590	201.4 (AFT)	324.0	HOVER	0.003[illegible]
△	750	9000	200.1 (AFT)	324.0	HOVER	0.004[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON

2. SOLID SYMBOLS DENOTE SCAS OFF

3. SKID HEIGHT = 30 FT.

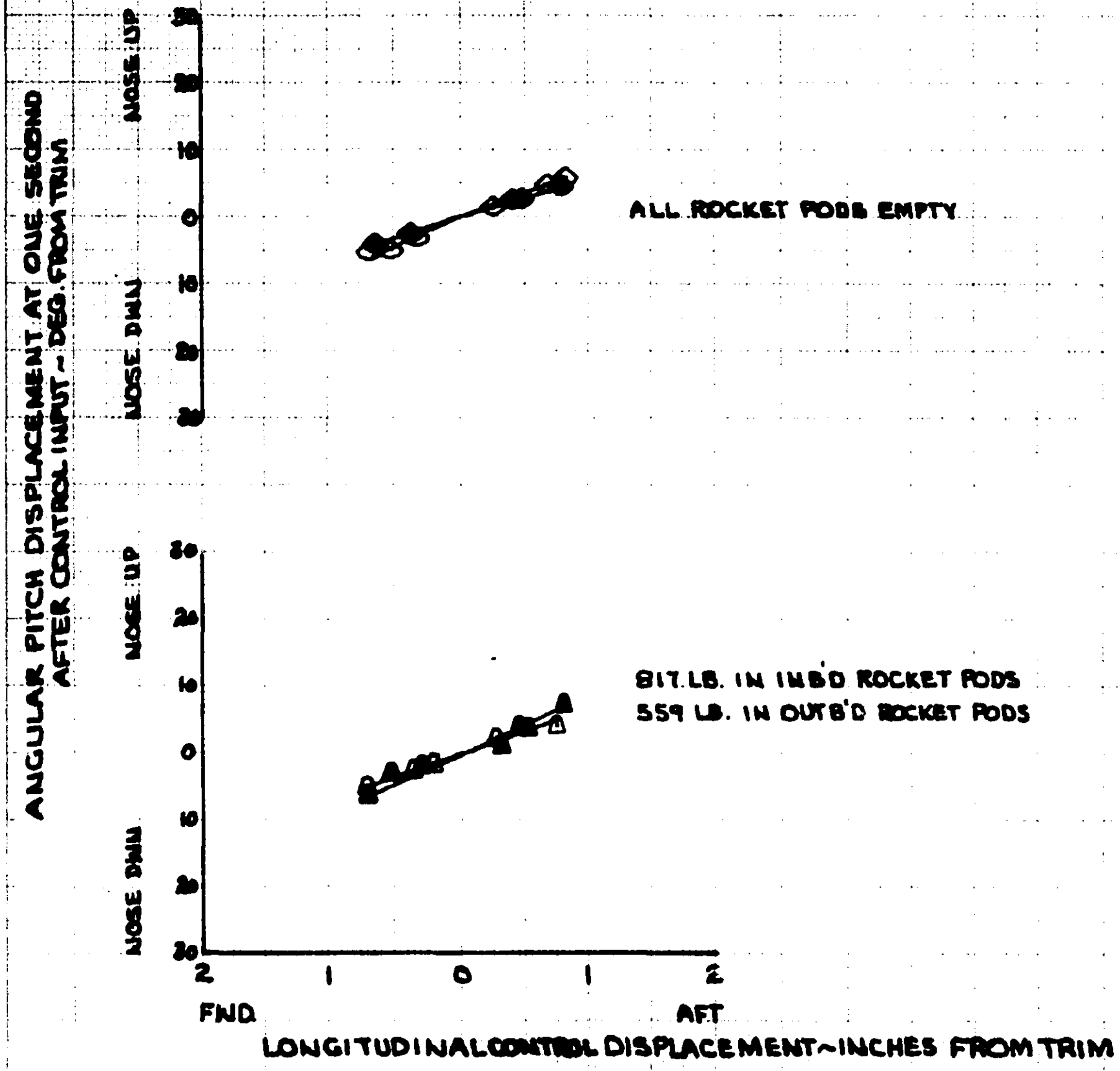


FIGURE NO. 256
ANGULAR PITCH DISPLACEMENT
AH-1G USA S/N 615247
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
□	SEA LEVEL	8635	200.4	322.0	HOVER	0.004341

NOTES:
1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE - 5 FT → 15 FT.

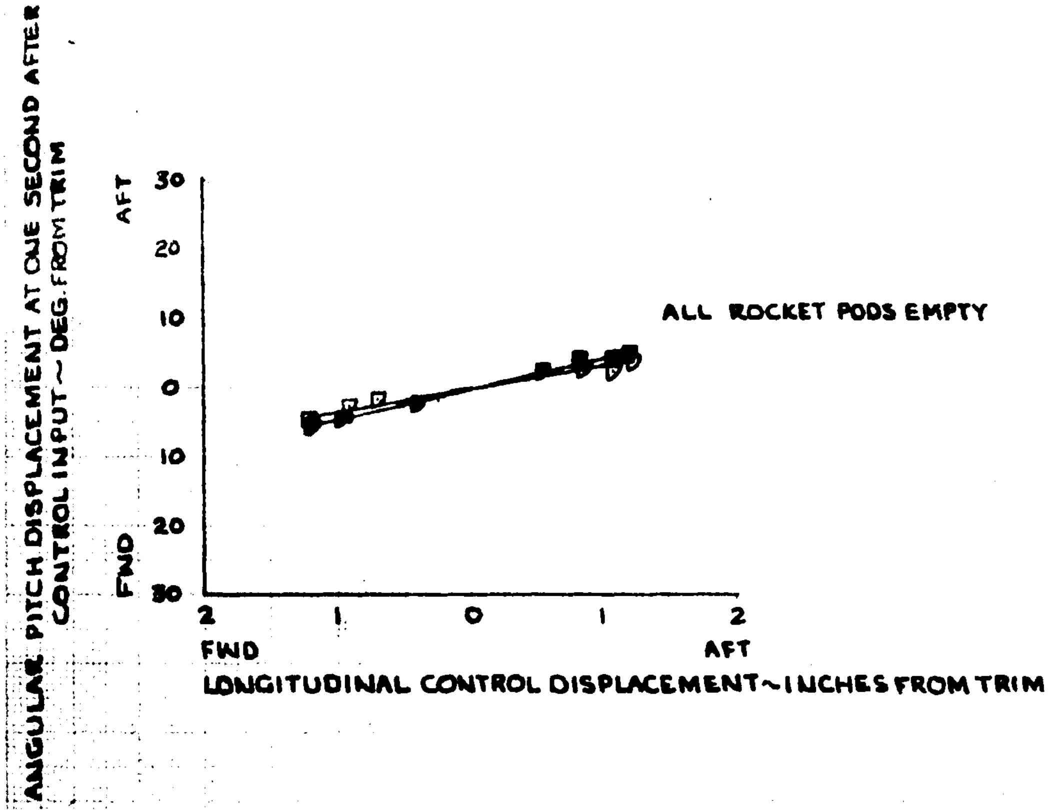


FIGURE NO. 257

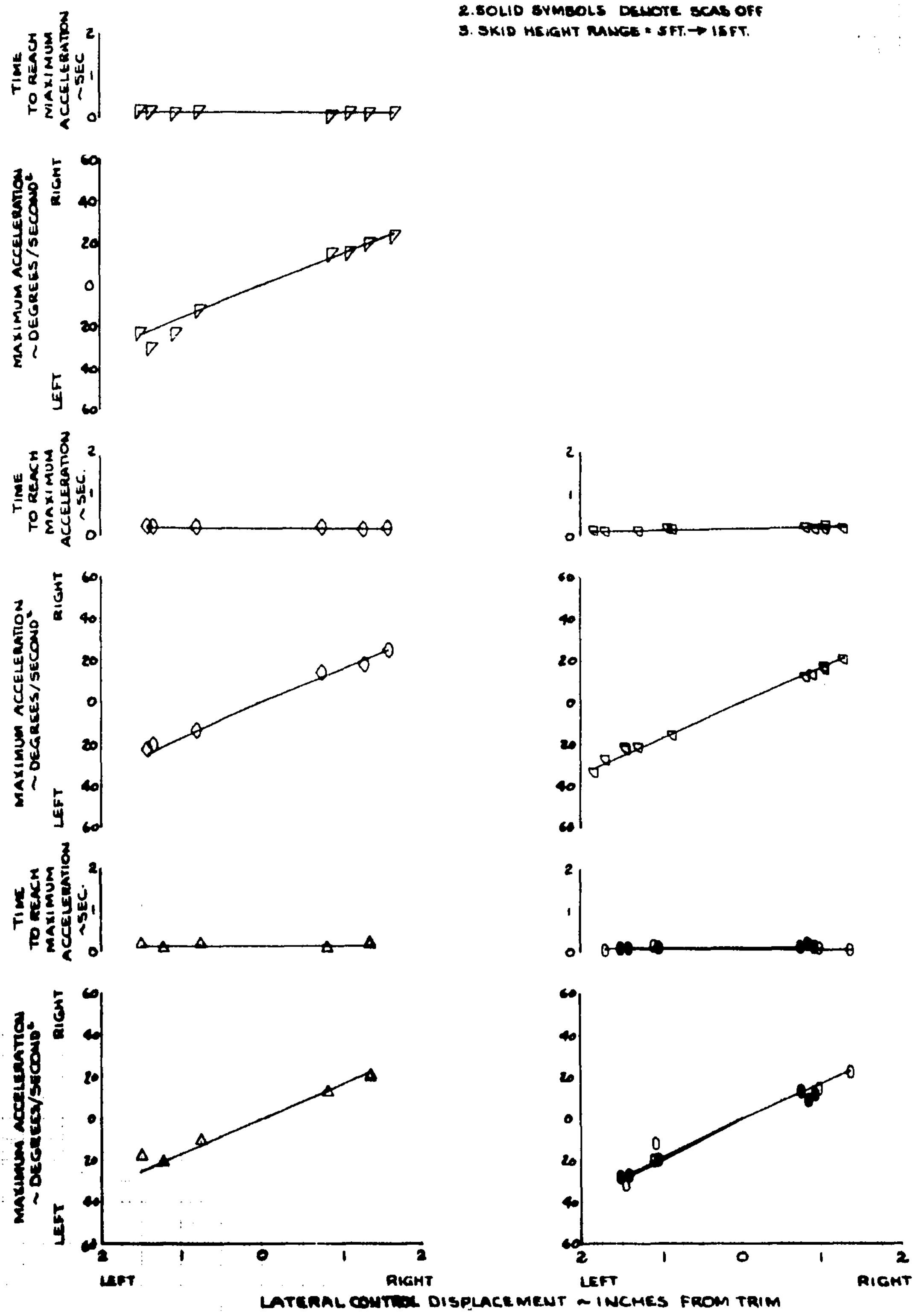
LATERAL CONTROL SENSITIVITY

AH-1G USA S/N 615247

CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_D ~FT.	AVG. G.W. ~LB.	AVG. LONG C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
▽	4460	7420	195.8(MID)	323.0	HOVER	0.004232
◇	4850	8480	195.3(MID)	326.5	↓	0.004899
△	8550	7420	195.6(MID)	324.0	↓	0.004768
◁	10320	7660	195.8 (MID)	324.0	↓	0.005282
0	550	7400	195.4 (MID)	324.0	↓	0.003734

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE = 5FT. → 15FT.



LATERAL CONTROL DISPLACEMENT ~ INCHES FROM TRIM

FIGURE NO. 258

LATERAL CONTROL SENSITIVITY

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H_D ~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
◁	850	7620	201.4 (AFT)	324.0	HOVER	0.003777
◁	770	8980	199.8 (AFT)	324.0	HOVER	0.004560

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON

2. SOLID SYMBOLS DENOTE SCAS OFF

3. SKID HEIGHT = 30 FT.

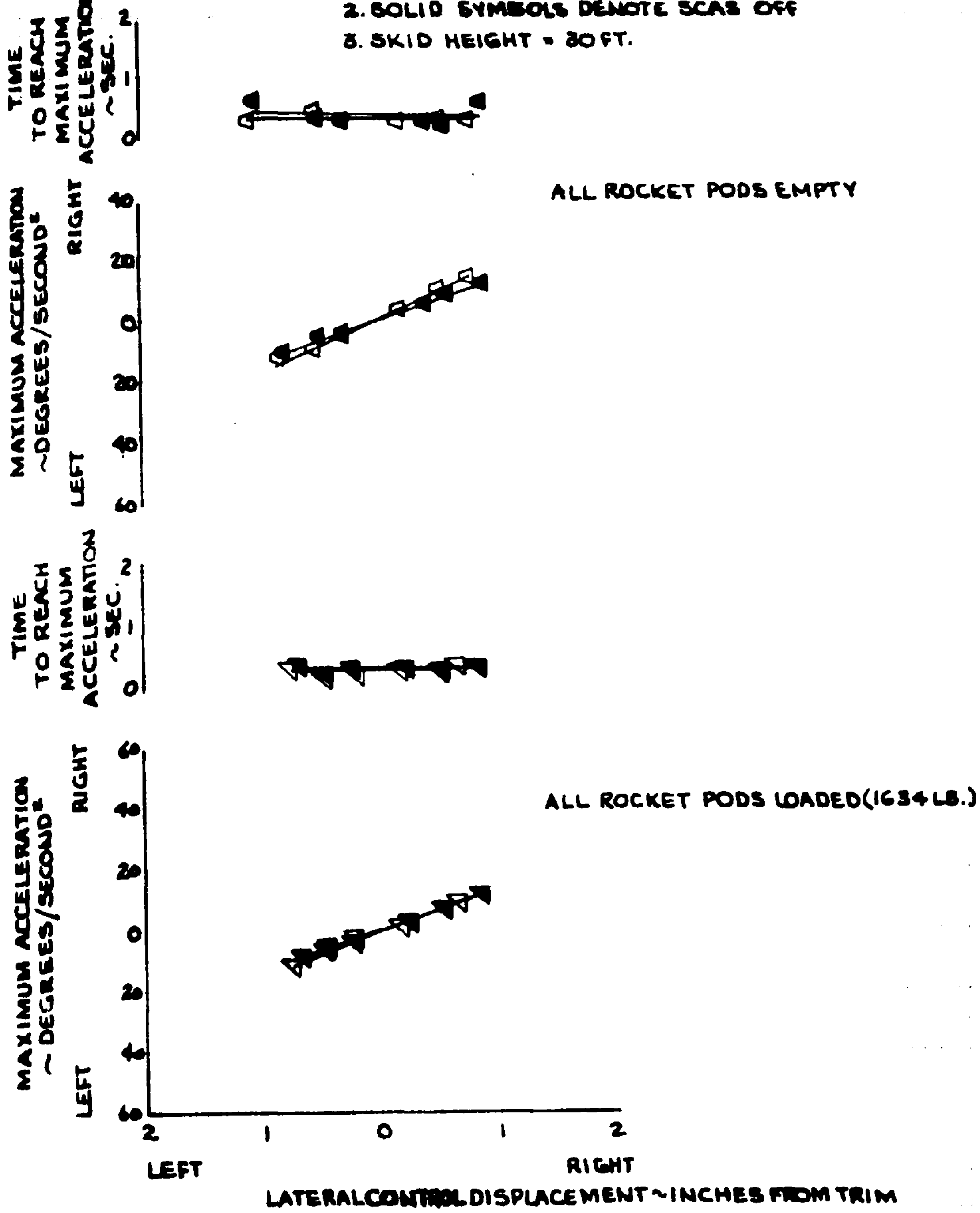


FIGURE No 259

LATERAL CONTROL RESPONSE

AH-1G USA S/N 15247

CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_D ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
▽	4460	7420	195.8 (MID)	322.0	HOVER	0.004338
◇	4850	8480	195.3 (MID)	326.5	↓	0.004809
△	8550	7420	195.6 (MID)	324.0	↓	0.004768
◻	10320	7660	195.8 (MID)	324.0	↓	0.005282
○	550	7600	193.4 (MID)	324.0	↓	0.003734

NOTES:
1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE = 5 FT. → 15 FT.

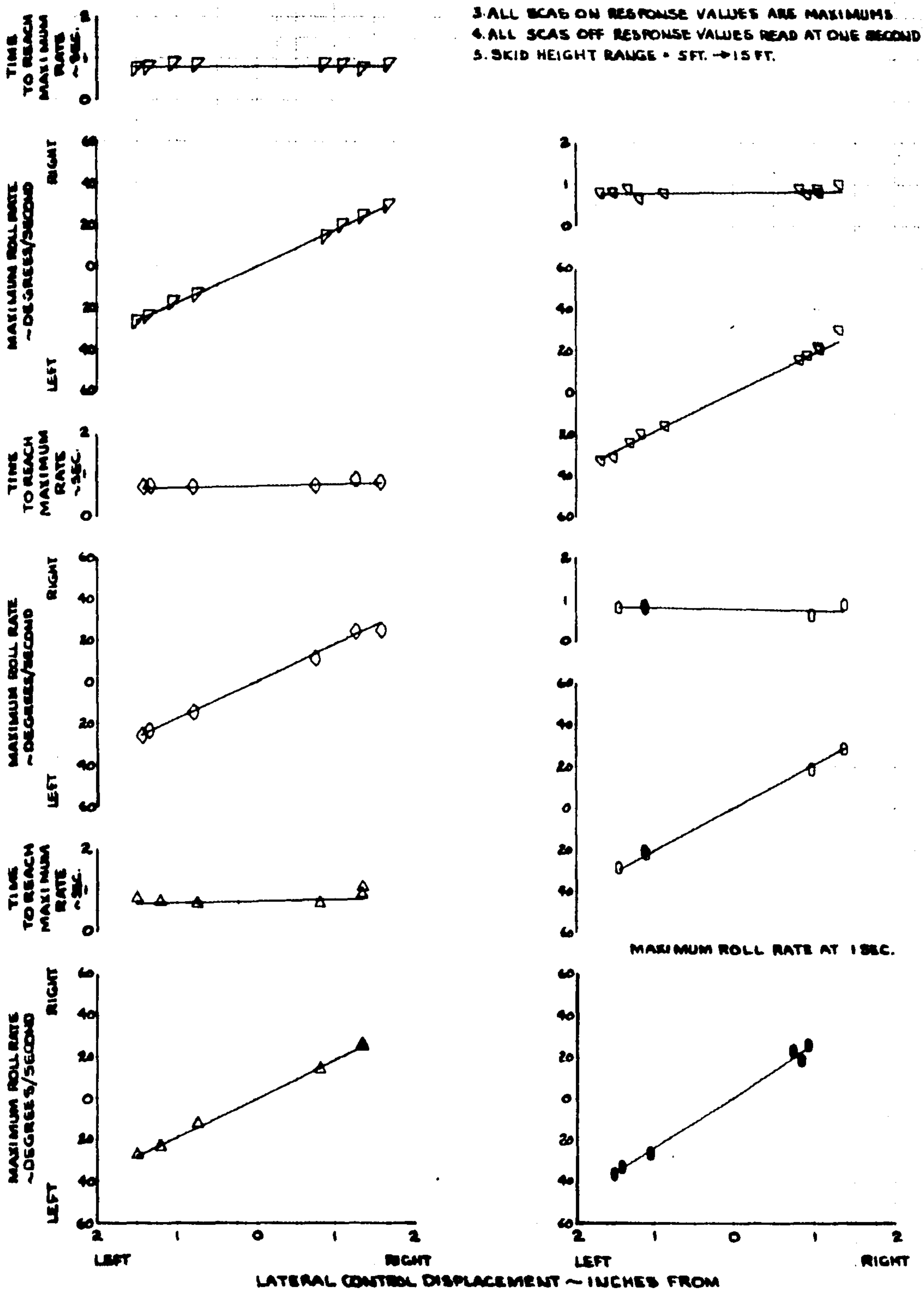


FIGURE No. 260

LATERAL CONTROL SENSITIVITY

AH-1G USA [illegible]615249

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H_D ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND	THRUST COEFF. ~ C_T
▽	-160	8600	196.7(MID)	322.5	HOVER	0.004[illegible]
◇	400	8600	198.0(AFT)	325.0	HOVER	0.004[illegible]
□	030	8700	200.0(AFT)	322.5	HOVER	0.004[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE - 5 FT. → 15 FT.

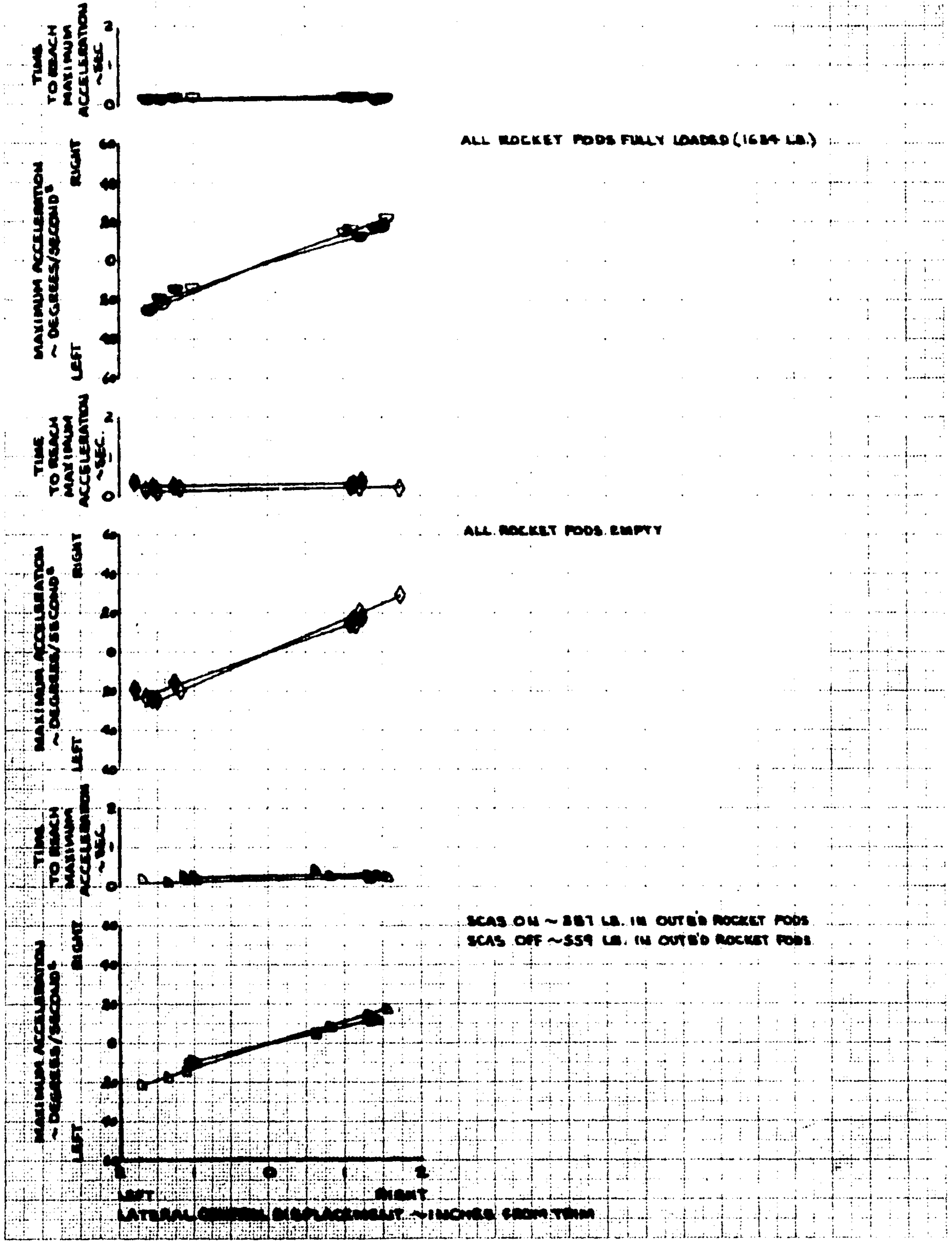


FIGURE No. 261

LATERAL CONTROL RESPONSE

AH-1G USA [illegible]

HVY. HOG CONFIGURATION: WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG ALTITUDE H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
▽	-160	8600	196.7 (MID)	322.5	HOVER	0.004280
◇	480	9600	198.0 (AFT)	328.0	HOVER	0.004587
▷	030	8780	200.0 (AFT)	322.5	HOVER	0.004484

NOTES:
1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE: 3 FT → 15 FT.

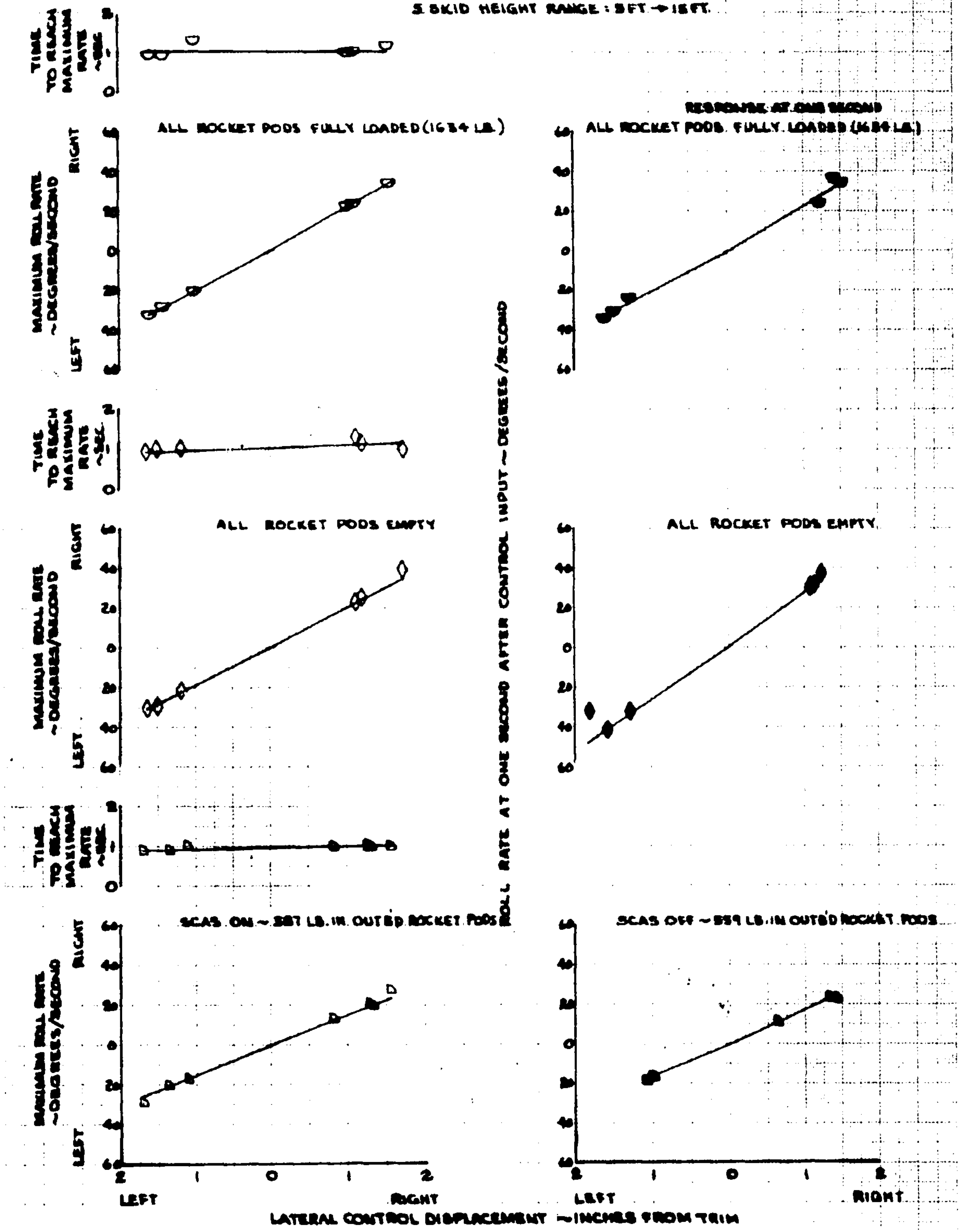


FIGURE No. 262
ANGULAR ROLL DISPLACEMENT
AH-1G USA S/N [illegible]
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
▽	-160	[illegible]	[illegible](MID)	[illegible]	HOVER	0.004[illegible]
◇	[illegible]	[illegible]	[illegible](AFT)	[illegible]	HOVER	0.004[illegible]
□	[illegible]	[illegible]	200.[illegible](AFT)	322.5	HOVER	0.004[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE • 5FT.→15FT.

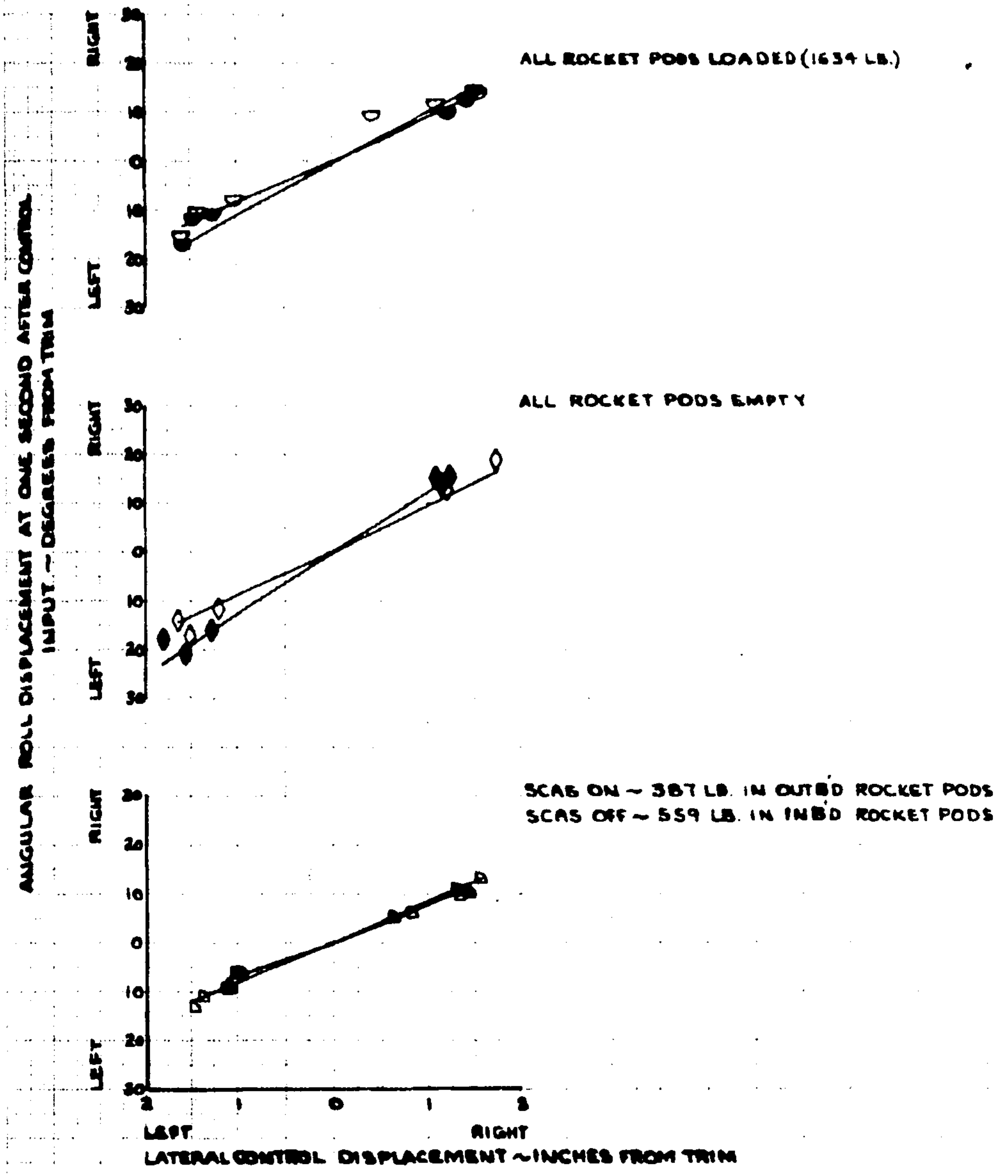


FIGURE NO. 263

LATERAL CONTROL RESPONSE

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_p~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
◁	860	7420	201.4 (AFT)	324.0	HOVER	0.003773
◁	770	8980	199.8 (AFT)	324.0	HOVER	0.004560

NOTE: SKID HEIGHT = 30 FT.

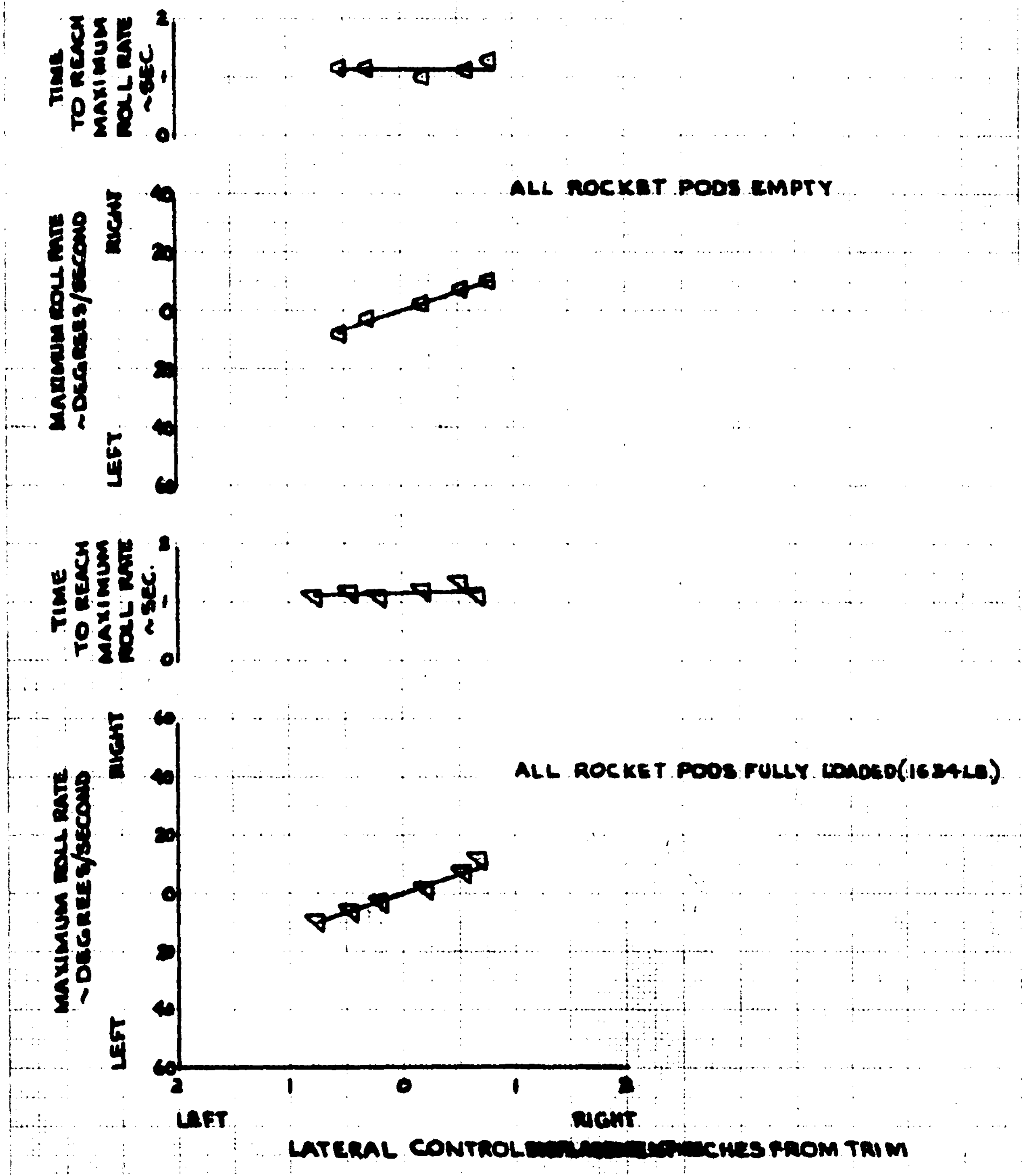


FIGURE No. 264
LATERAL RESPONSE AT ONE SECOND
AH-1G USA S/N 71-15698
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_D ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
◁	850	7620	201.4(AFT)	324.0	HOVER	0.005[illegible]
▽	770	8980	199.8(AFT)	324.0	HOVER	0.00456[illegible]

NOTE: SKID HEIGHT = 30 FT.

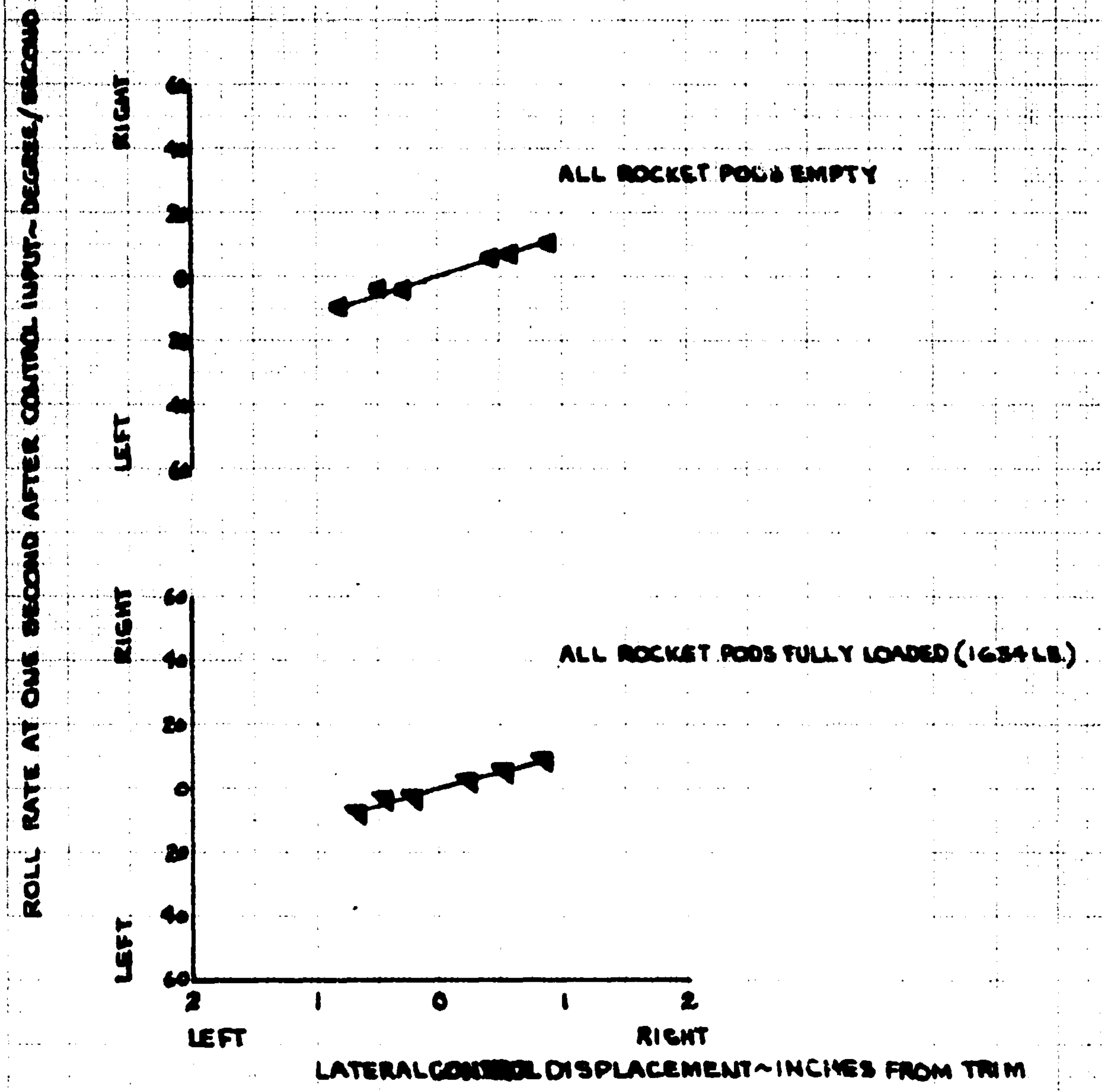


FIGURE No. 265
ANGULAR ROLL DISPLACEMENT
AH-1G USA [illegible]
CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE Hp~FT	AVG. G.W. ~LB.	AVG. LONG. C.G.~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~CT
▽	4460	7620	195.8(MID)	324.0	HOVER	[illegible]
◇	4850	8480	195.3(MID)	324.5		[illegible]
△	8650	7470	195.6 (MID)	324.0		[illegible]
◻	10320	7660	195.8 (MID)	324.0		[illegible]
○	550	7400	195.4 (MID)	324.0	↓	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON.
2. SOLID SYMBOLS DENOTE SCAS OFF.
3. SKID HEIGHT RANGE: 4FT.-15FT.

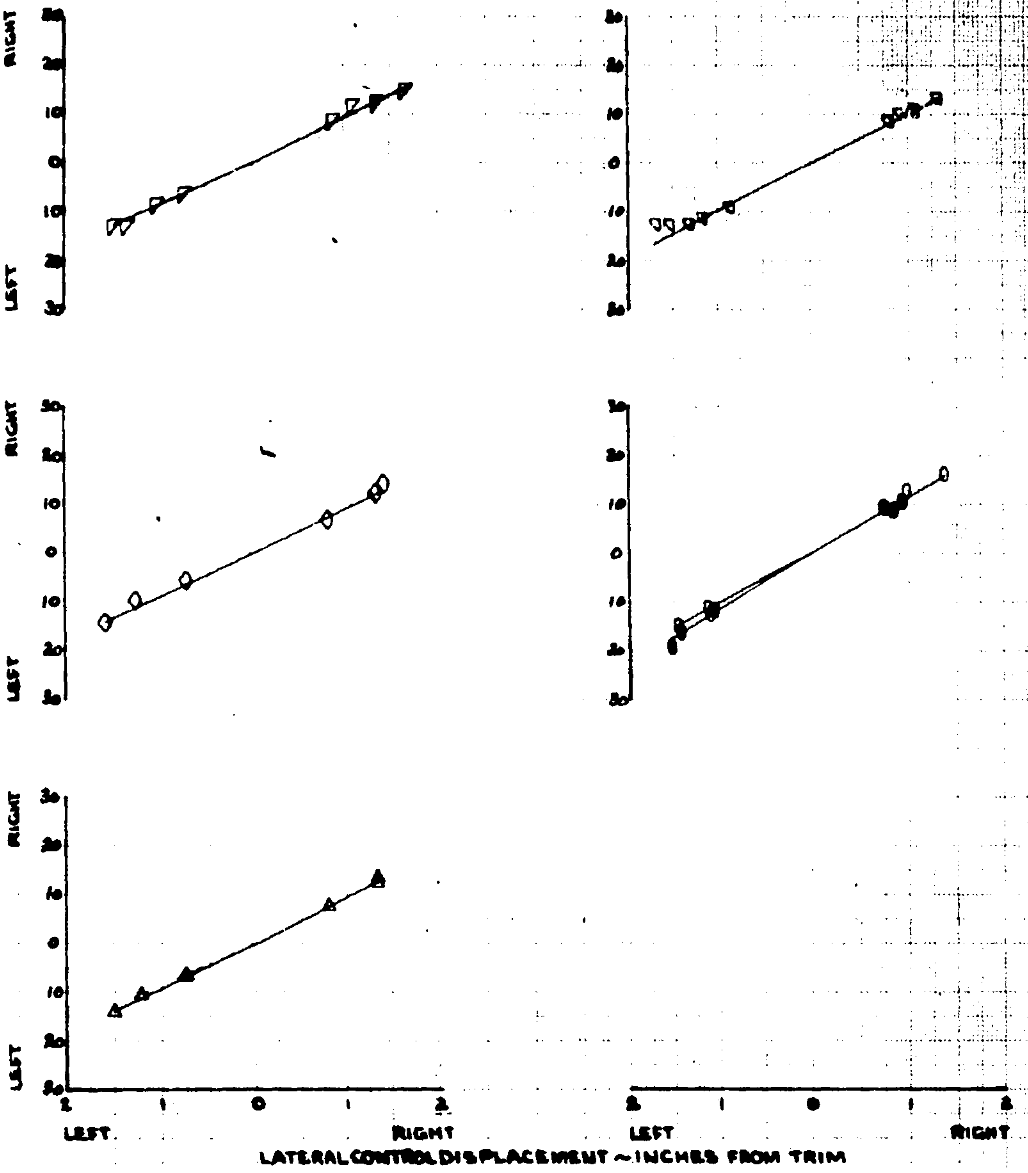


FIGURE NO. 266

ANGULAR ROLL DISPLACEMENT

AH-1G USA S/N 15695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
△	[illegible]	7920	[illegible] (AFT)	[illegible]	HOVER	[illegible]
◁	[illegible]	[illegible]	[illegible] (AFT)	[illegible]	HOVER	[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON

2. SOLID SYMBOLS DENOTE SCAS OFF

3. SKID HEIGHT = 30 FT

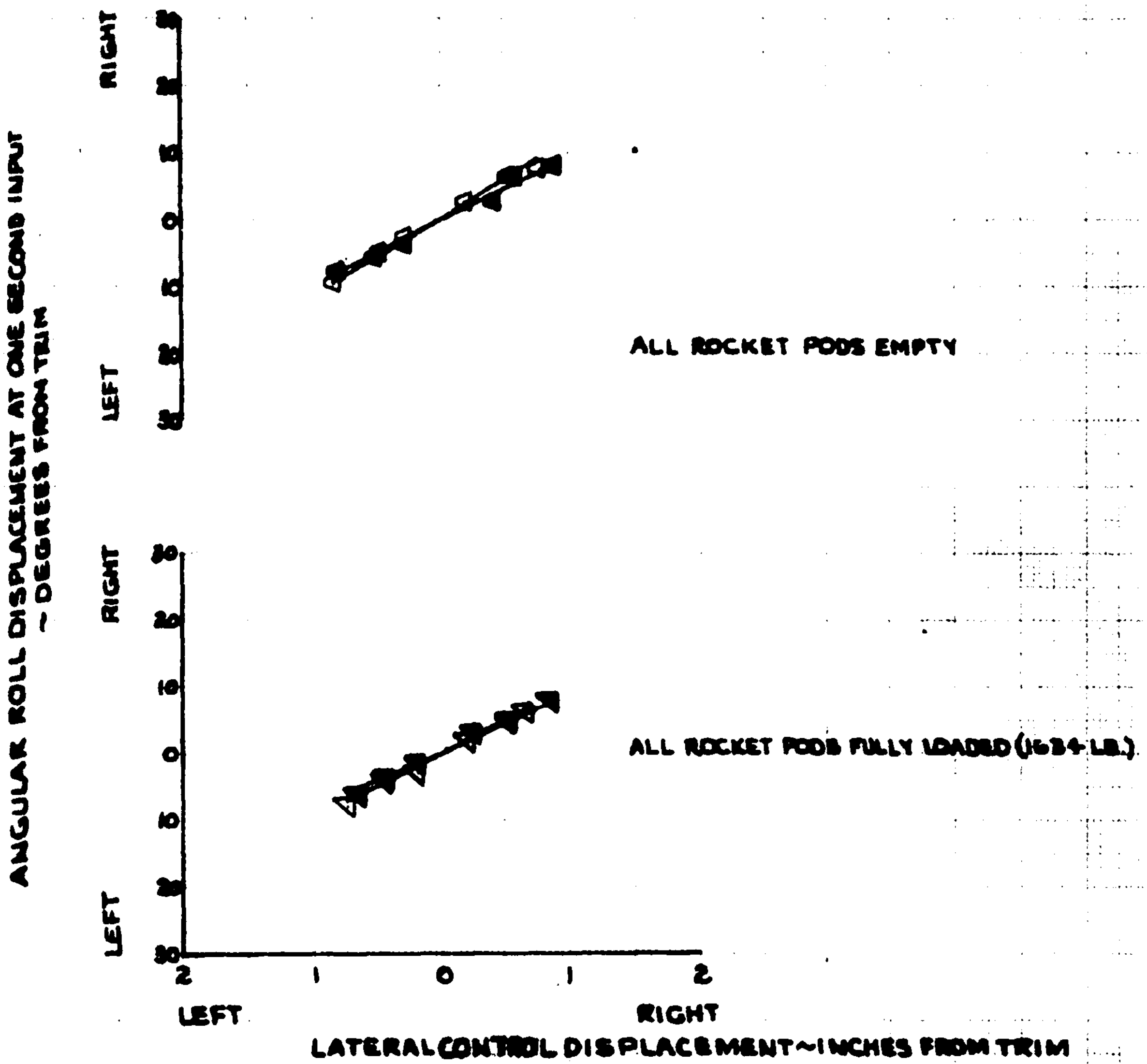


FIGURE NO. 267
DIRECTIONAL CONTROL SENSITIVITY
AH-1G USA S/N 615847
CLEAN CONFIGURATION
SCAS ON

SYMBOL	AVG. ALTITUDE H_P ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C_T
◇	4580	7280	195.6(MID)	323.0	HOVER	0.004168
△	4580	7220	195.6(MID)	314.5	↓	0.004360
○	4790	8630	195.4(MID)	324.5	↓	0.004926
⬯	4860	8400	196.2(MID)	314.5	↓	0.005114
□	5550	7330	195.5(MID)	324.0	↓	0.004716
◇	5550	7270	195.4(MID)	314.5	↓	0.00[illegible]

NOTES: 1. SKID HEIGHT RANGE - 5FT-7 FEET.
2. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004680

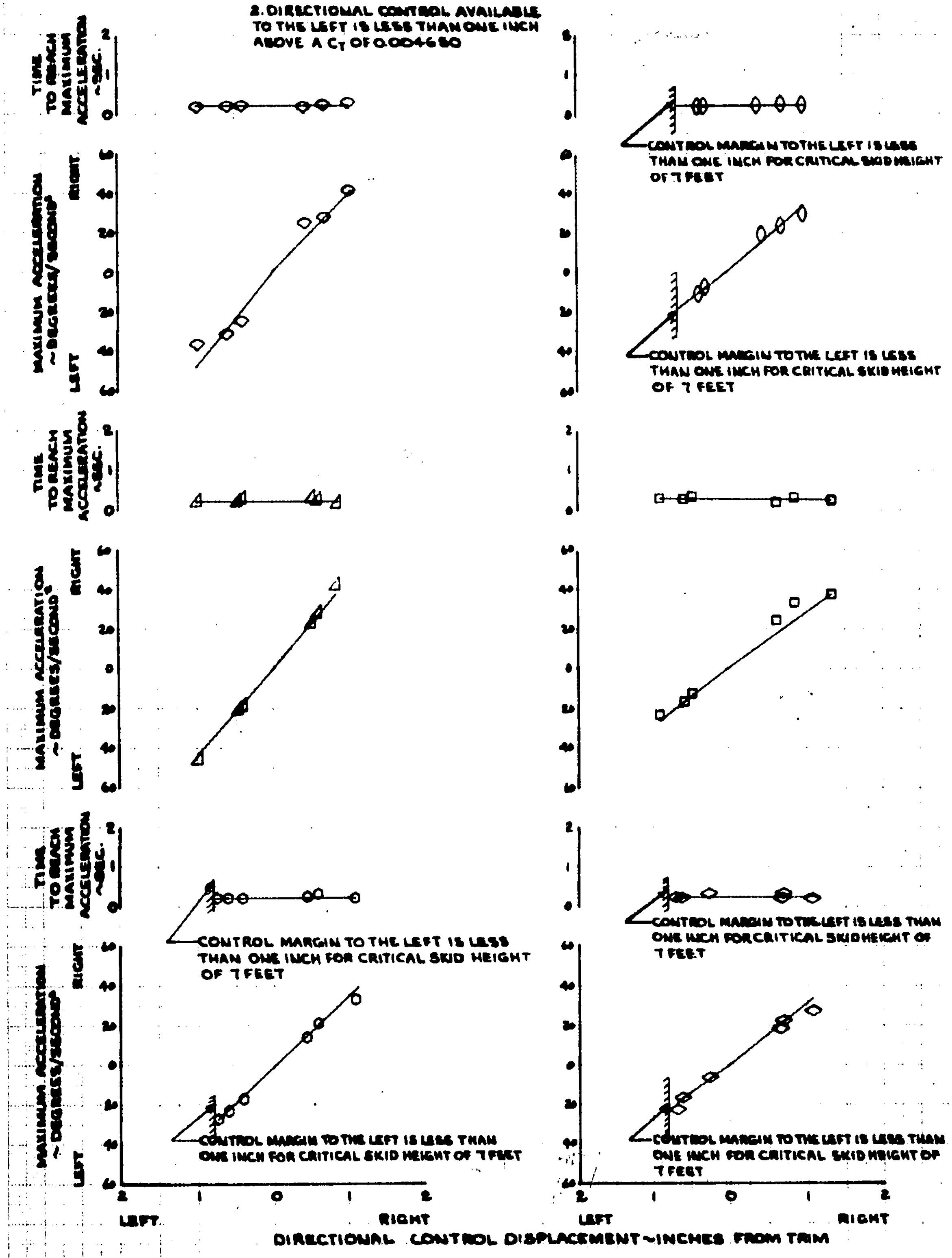


FIGURE No. 268

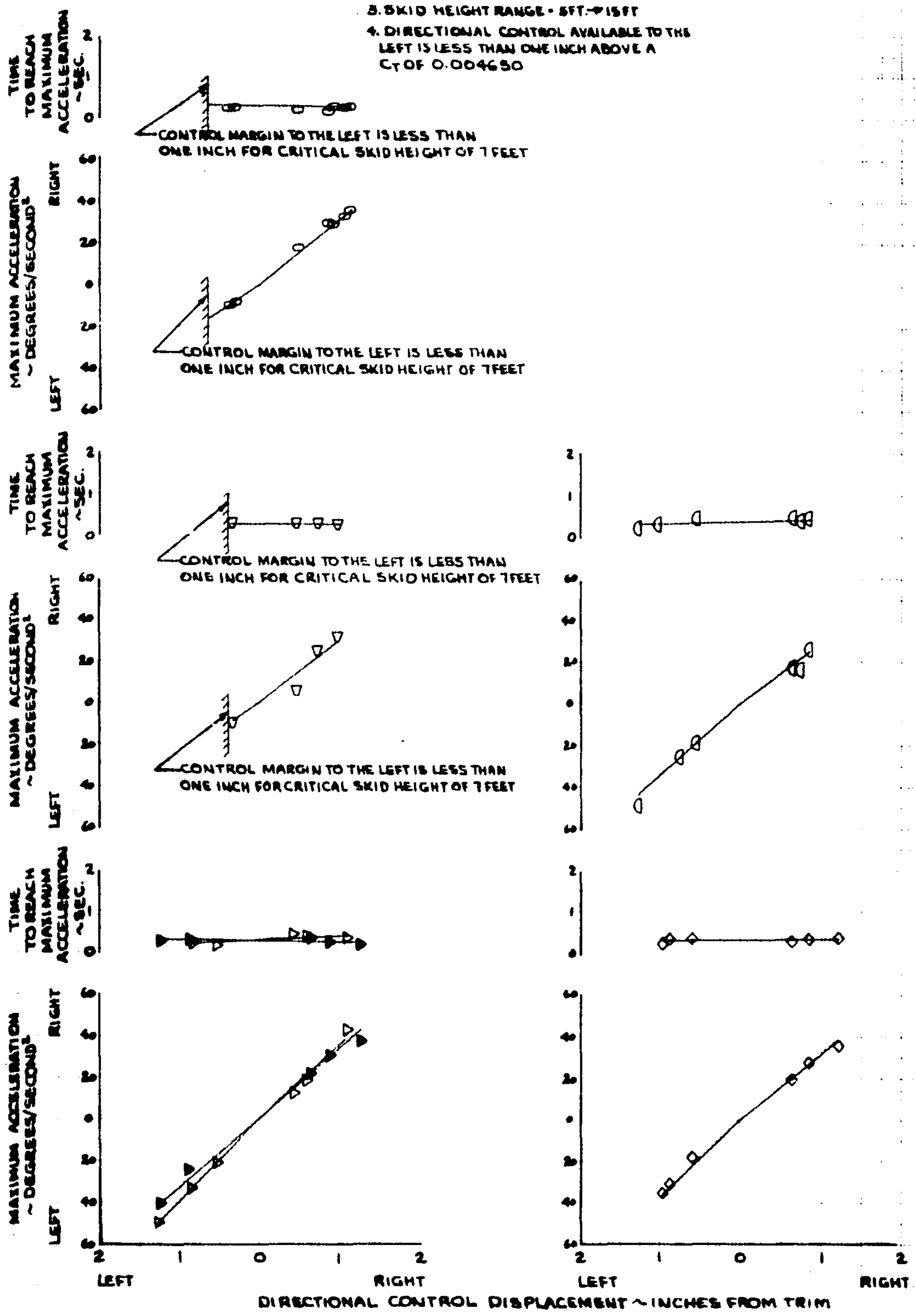
DIRECTIONAL CONTROL SENSITIVITY

AH-1G USA [illegible]

CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_D ~FT.	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND	THRUST COEFF. ~C_T
○	10320	7560	195.7(MID)	324.0	HOVER	0.0051[illegible]
▽	10320	7490	195.6(MID)	313.5	↓	0.00[illegible]
▷	560	7170	195.2(MID)	324.0		0.003620
◁	550	7160	195.1(MID)	313.5		0.00[illegible]
◇	570	6980	194.9(MID)	303.5		0.004016

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE - 5FT.→15FT
4. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004650



DIRECTIONAL CONTROL DISPLACEMENT ~ INCHES FROM TRIM

FIGURE NO. 269

DIRECTIONAL CONTROL SENSITIVITY

AH-1G USA S/N 615847

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H_D ~ FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
▽	-480	8460	195.9(MID)	323.0	HOVER	0.004160
◠	-490	8400	195.8(MID)	313.5	↓	0.004341
◇	SEA LEVEL	8770	200.4(AFT)	313.5	↓	0.004461
◁	060	8600	199.9(AFT)	323.0	↓	0.004304

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE • 8FT. → 15FT.

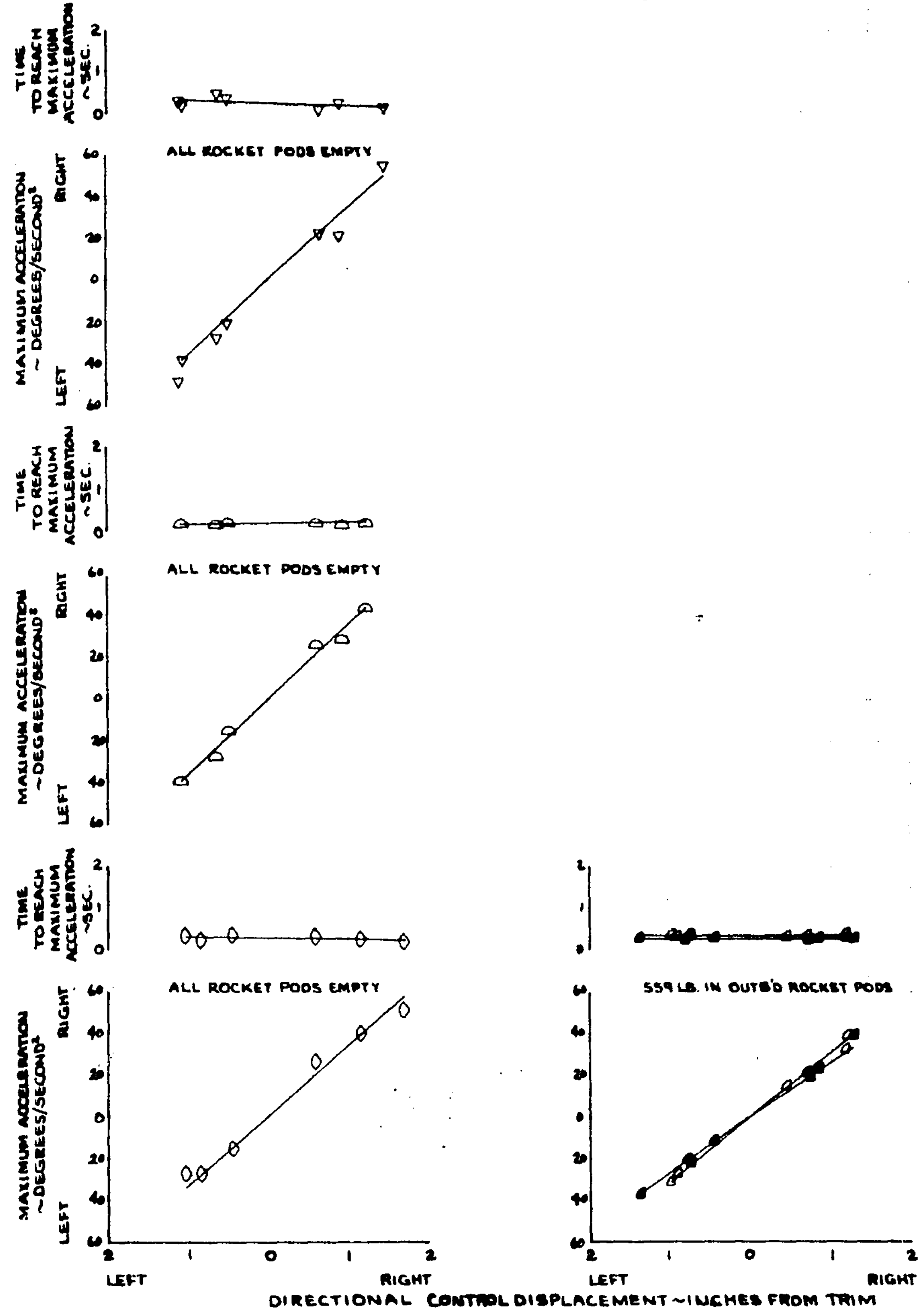


FIGURE NO. 270

DIRECTIONAL CONTROL SENSITIVITY

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_D ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C_T
○	980	7260	201.4 (AFT)	324.0	HOVER	0.003710
▷	450	8970	200.5 (AFT)	324.0	HOVER	0.004518

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT = 30 FEET

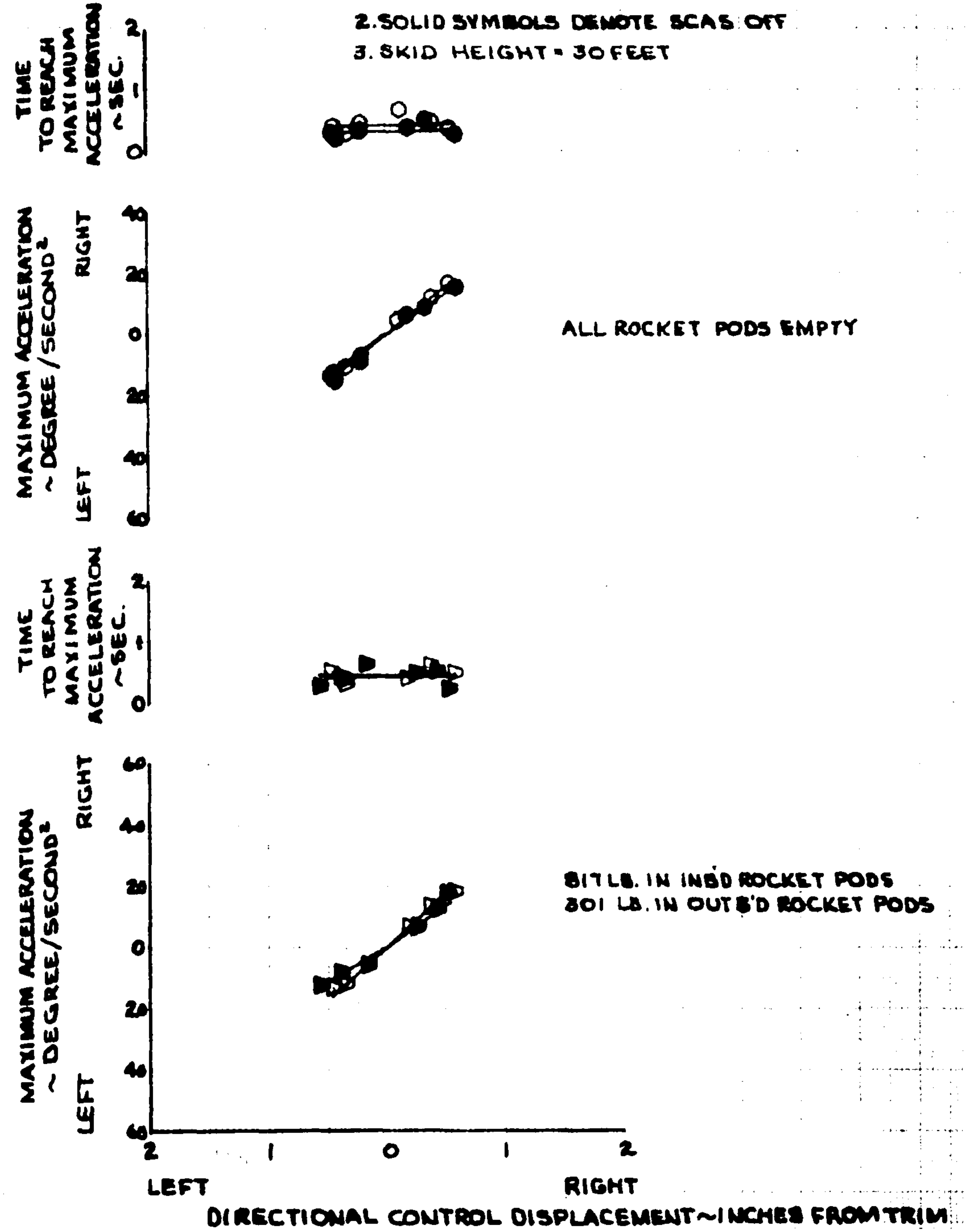
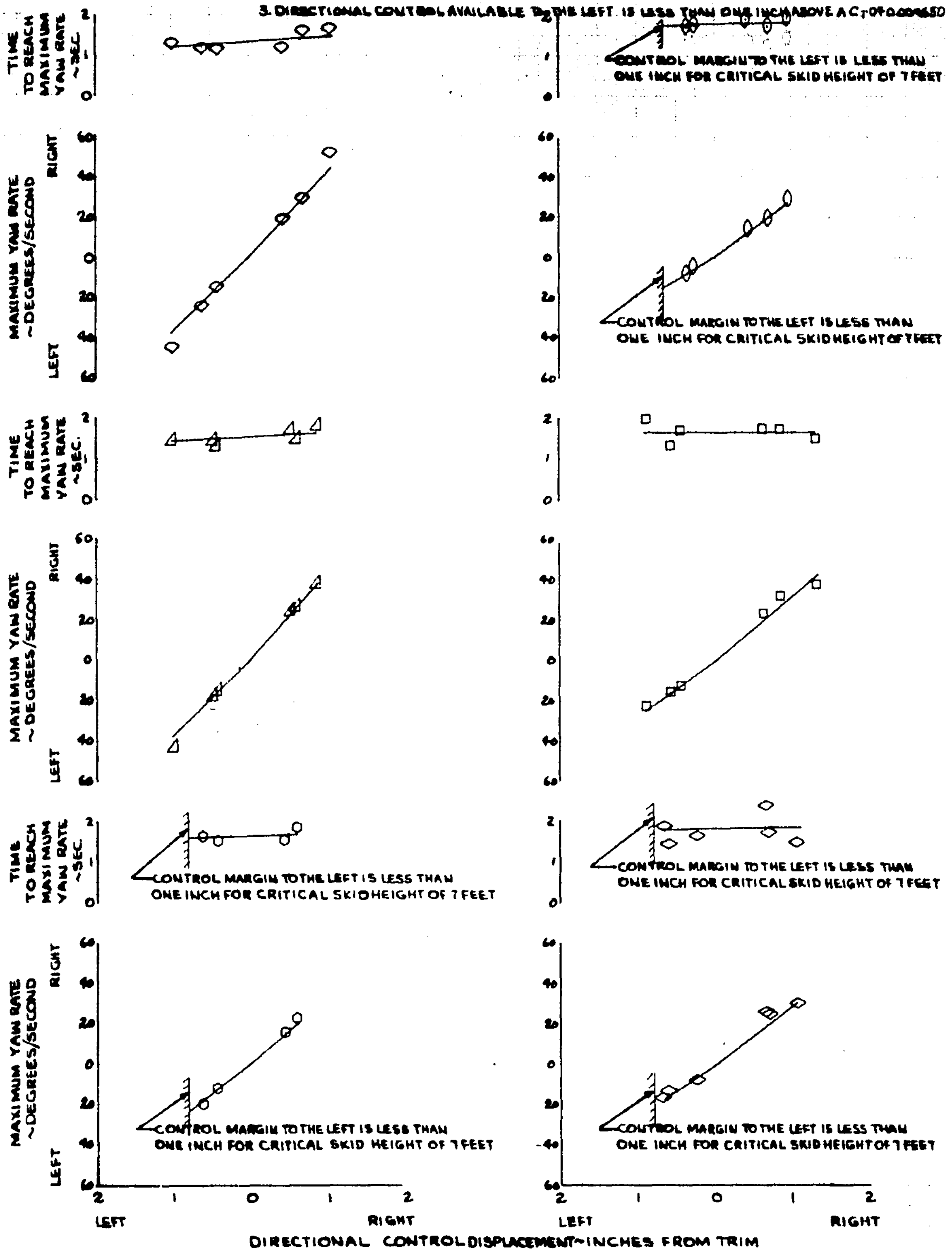


FIGURE NO. 271
DIRECTIONAL CONTROL RESPONSE
AH-1G USA 615247
CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_D ~ FT	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C_T
◇	4580	7280	195.6(MID)	323.0	HOVER	0.004168
△	4580	7220	193.6(MID)	314.5	↓	0.004368
○	4790	8630	195.4(MID)	324.5	↓	0.004926
⬯	4850	8400	195.2(MID)	314.5	↓	0.005114
□	8550	7830	195.5(MID)	324.0	↓	0.004718
◇	8550	7270	195.4(MID)	314.5	↓	0.004958

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004650



DIRECTIONAL CONTROL DISPLACEMENT ~ INCHES FROM TRIM

FIGURE NO. 272

DIRECTIONAL CONTROL RESPONSE

AH-1G USA [illegible]

CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_p ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	10320	7560	195.7(MID)	324.0	HOVER	0.[illegible]
▽	10320	7490	195.6(MID)	318.5		0.[illegible]
▷	560	7170	195.2(MID)	324.0		0.00[illegible]
○	550	7160	195.1(MID)	313.5		0.00[illegible]
◇	570	6980	194.9(MID)	303.5		0.00[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUM
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE: 5FT→15FT.
6. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004620

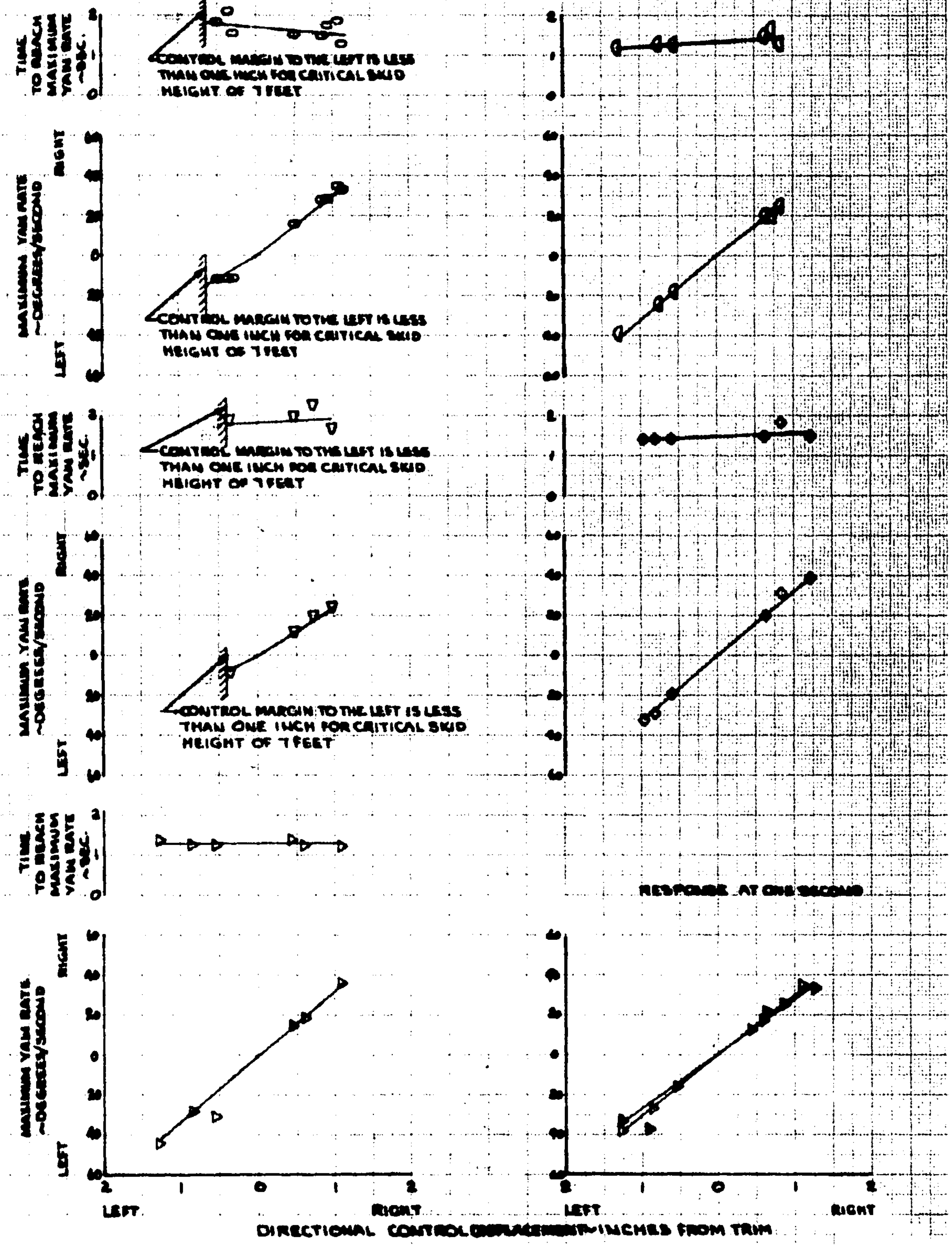


FIGURE No 273
DIRECTIONAL CONTROL RESPONSE
AH-1G USA S/N [illegible]
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H_p ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF ~ C_T
▽	-480	8460	195.9(MID)	323.0	HOVER	0.[illegible]
◠	-490	8400	195.8(MID)	313.5	↓	0.[illegible]
◇	SEA LEVEL	8770	200.4(AFT)	313.5		0.[illegible]
◁	060	8600	199.9(AFT)	323.0		0.[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE = 5 FT. → 15 FT.

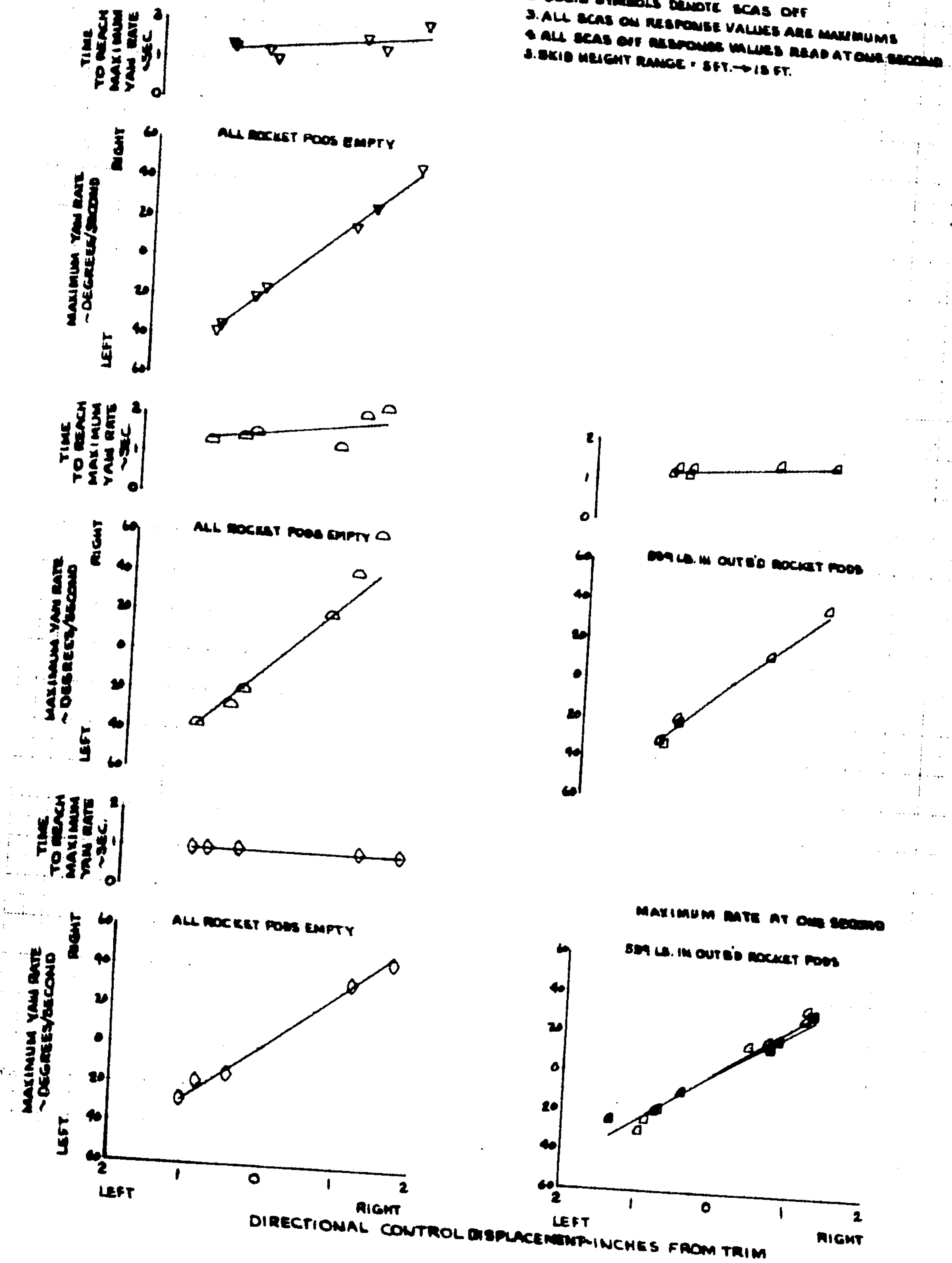


FIGURE NO. 274

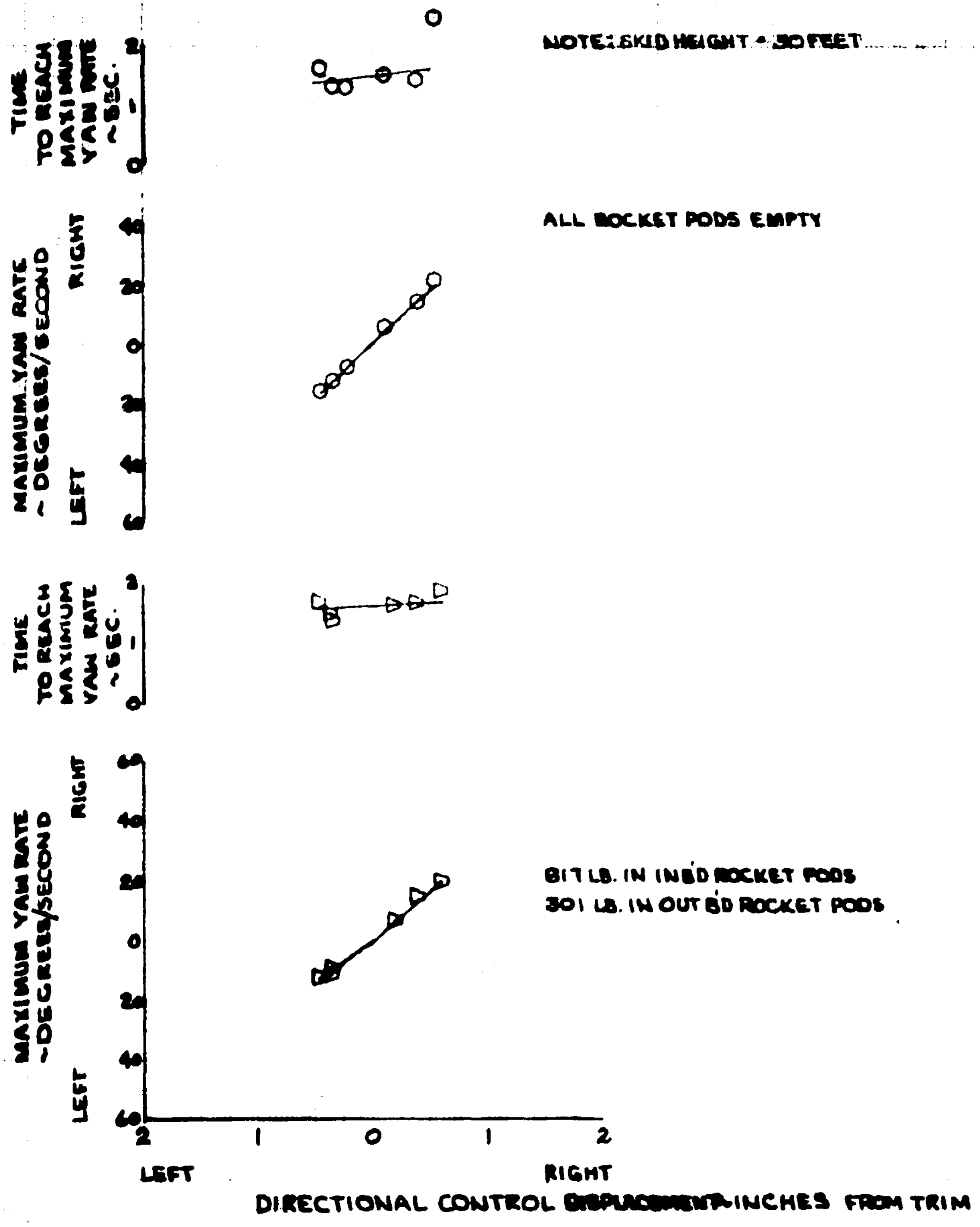
DIRECTIONAL CONTROL RESPONSE

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SYM	AVG. ALT. H_P~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	960	7260	201.4 (AFT)	324.0	HOVER	0.003910
▷	450	8970	200.5 (AFT)	324.0	HOVER	0.004513



NOTE: SKID HEIGHT = 30 FEET

ALL ROCKET PODS EMPTY

817 LB. IN INBD ROCKET PODS
301 LB. IN OUTBD ROCKET PODS

FIGURE NO. 275

DIRECTIONAL RESPONSE AT ONE SECOND

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. Hp~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~CT
○	980	7260	201.4 (AFT)	324.0	HOVER	0.003710
▷	450	8970	200.5 (AFT)	324.0	HOVER	0.004513

NOTE: SKID HEIGHT = 30 FEET

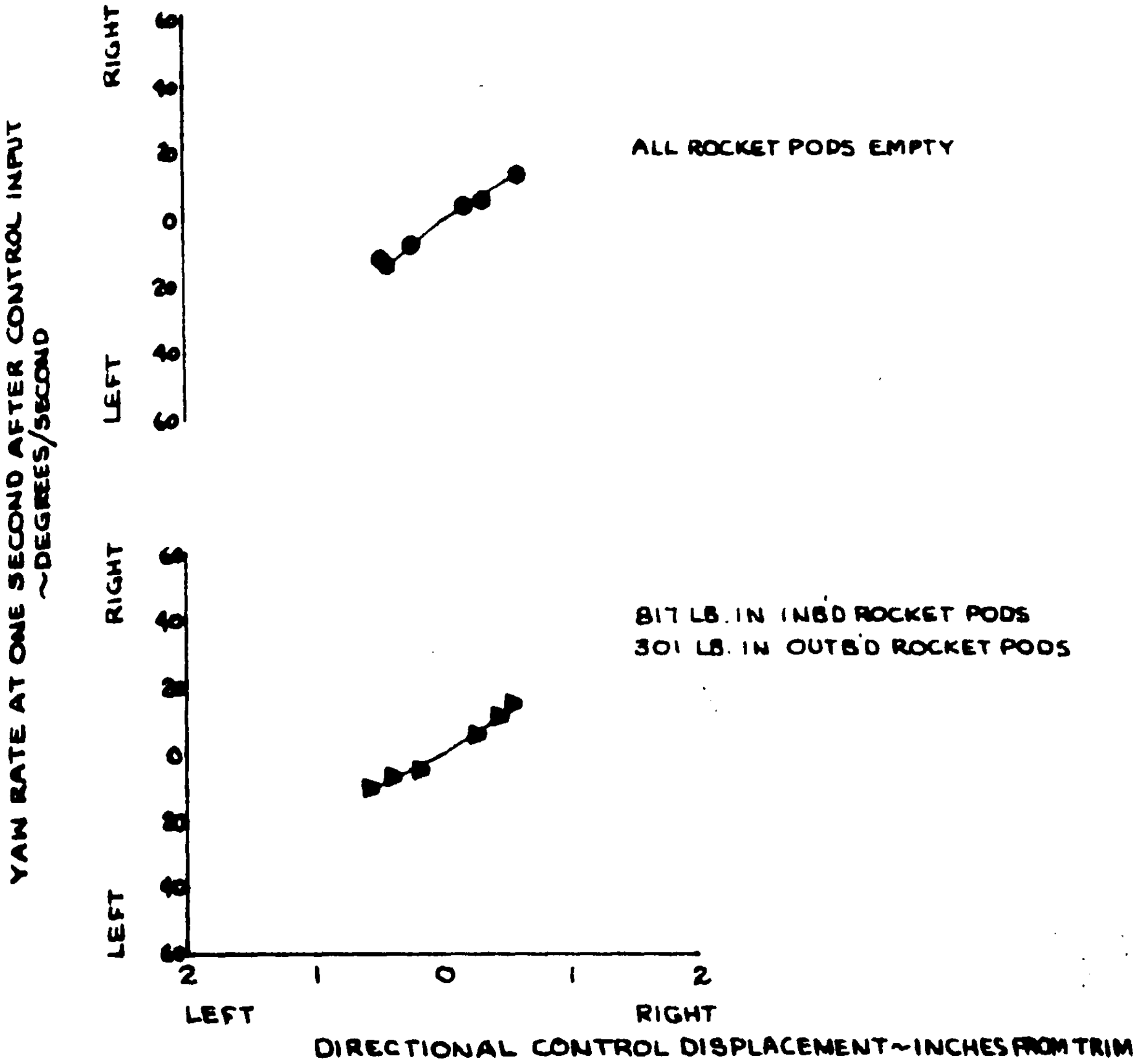


FIGURE NO. 276

ANGULAR YAW DISPLACEMENT

AH-1G USA S/N [illegible]

CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H_D ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C_T
○	10320	7560	195.7 (MID)	[illegible]	HOVER	[illegible]
▽	10320	7490	195.6 (MID)	313.5	↓	[illegible]
▷	560	7170	195.2 (MID)	[illegible]	↓	[illegible]
◖	550	7160	195.1 (MID)	313.5	↓	[illegible]
◇	570	6980	194.9 (MID)	303.5	↓	0.004016

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE: 5 FT. → 15 FT.
4. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004650

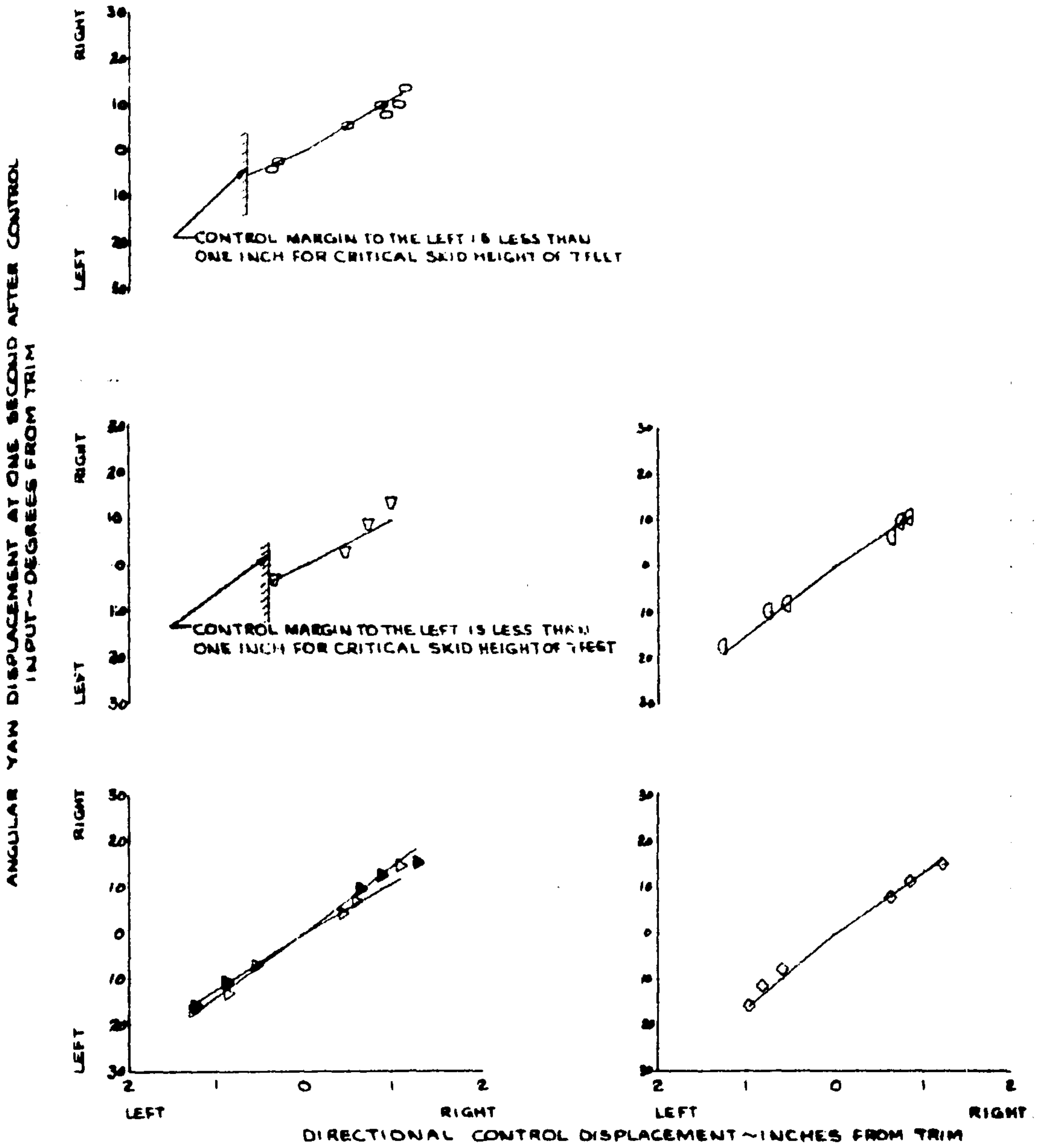


FIGURE NO. 277

ANGULAR YAW DISPLACEMENT

AH-1G USA [illegible]
CLEAN CONFIGURATION
SCAS ON

SYMBOL	AVG. ALTITUDE H_p ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF ~ C_T
▽	4580	7280	195.6 (MID)	325.0	HOVER	0.00[illegible]
△	4580	7220	196.6 (MID)	314.5	↓	0.00[illegible]
○	4790	[illegible]	195.[illegible] (MID)	324.5	↓	0.00[illegible]
⬯	[illegible]	[illegible]	195.2 (MID)	314.5	↓	0.005119
□	[illegible]	7830	195.5 (MID)	3[illegible]	↓	0.00[illegible]
◇	[illegible]	7270	195.4 (MID)	314.5	↓	0.00[illegible]

NOTES: 1. SKID HEIGHT RANGE = 5 FT. → 15 FT.
2. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004650

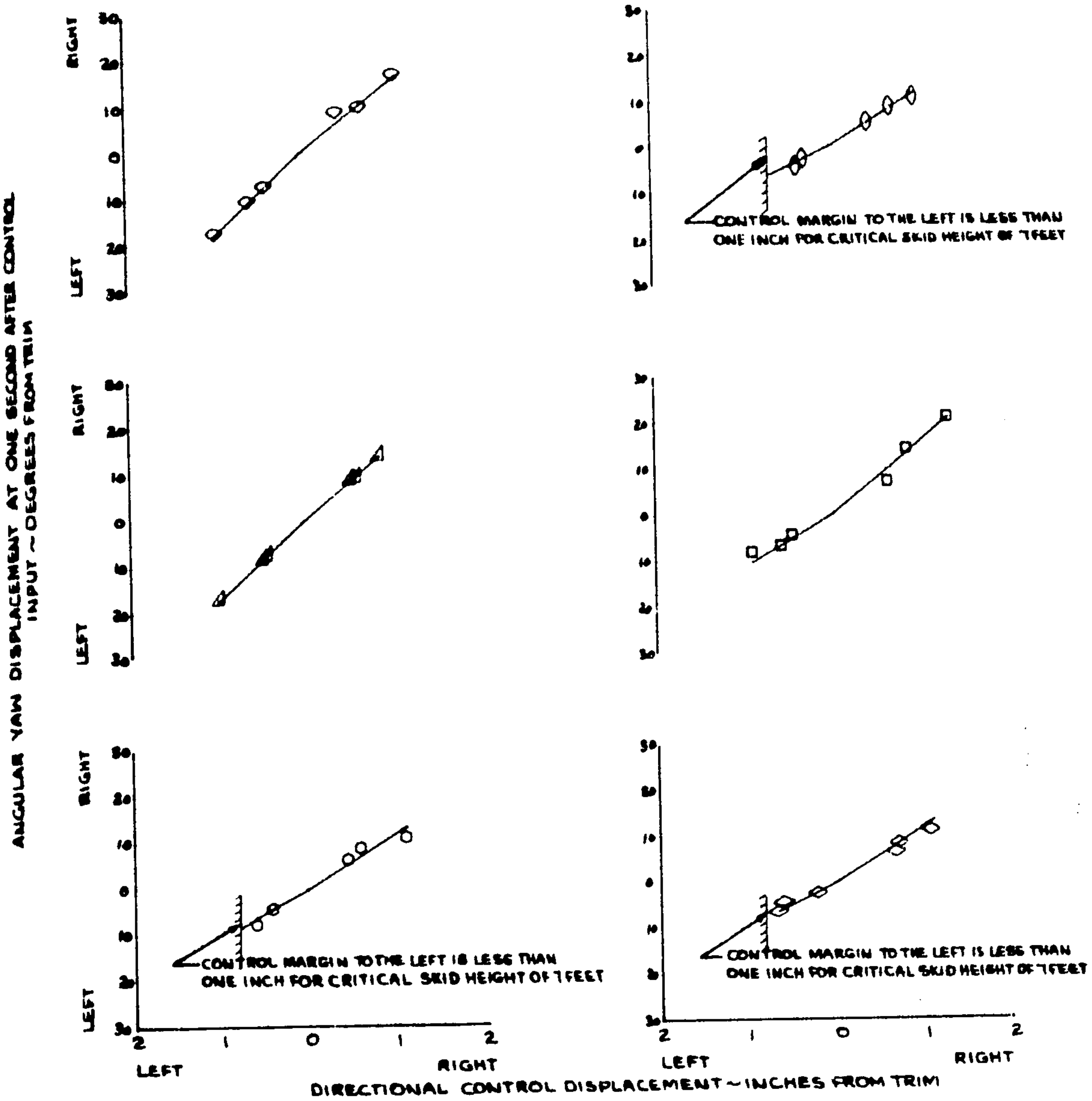


FIGURE NO. 278

ANGULAR YAW DISPLACEMENT.

AH-1G USA [illegible]

HVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H_p ~ FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
▽	-480	8460	195.9 (MID)	324.0	HOVER	0.00[illegible]
△	-450	8400	195.8 (MID)	315.5	↓	0.00[illegible]
◇	SEA LEVEL	8770	200.4 (AFT)	313.5		0.00[illegible]
□	060	8600	199.9 (AFT)	324.0		0.00[illegible]

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE: 5 FT. → 15 FT.

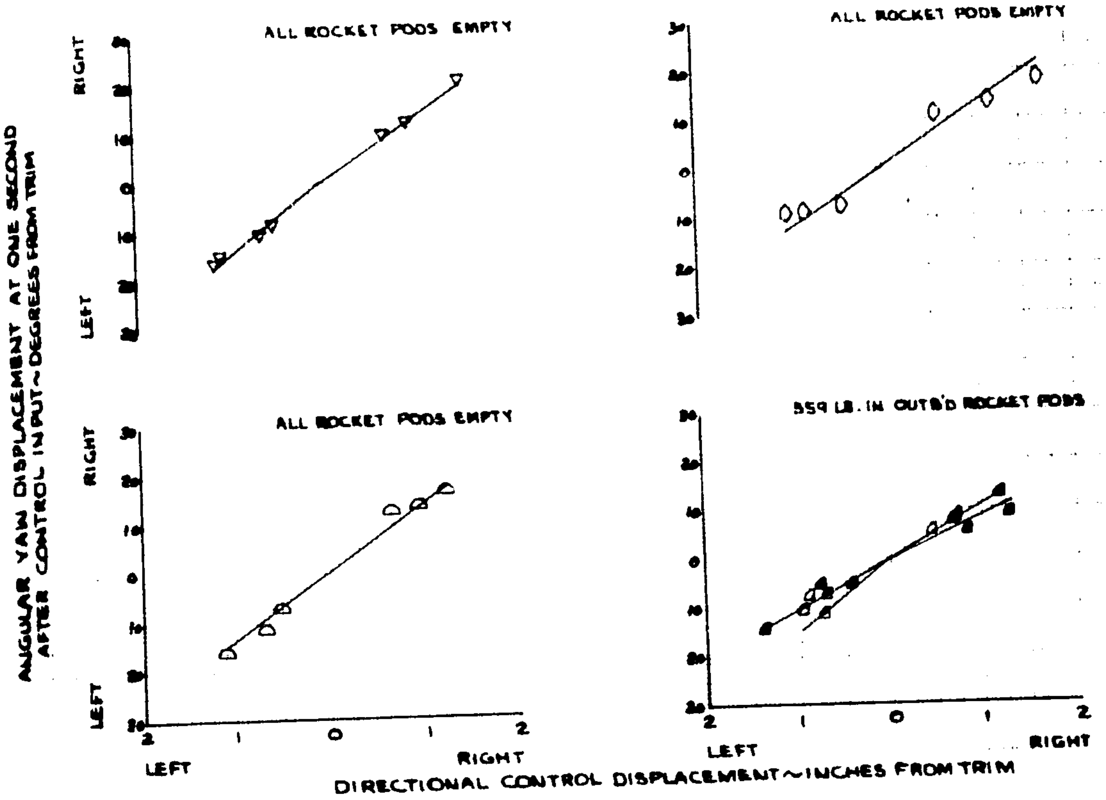


FIGURE NO. 279

ANGULAR YAW DISPLACEMENT

AH-1G USA S/N 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H_D~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C_T
○	980	7260	201.4(AFT)	324.0	HOVER	0.003710
▷	450	8970	200.5(AFT)	324.0	HOVER	0.004515

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT = 30 FEET

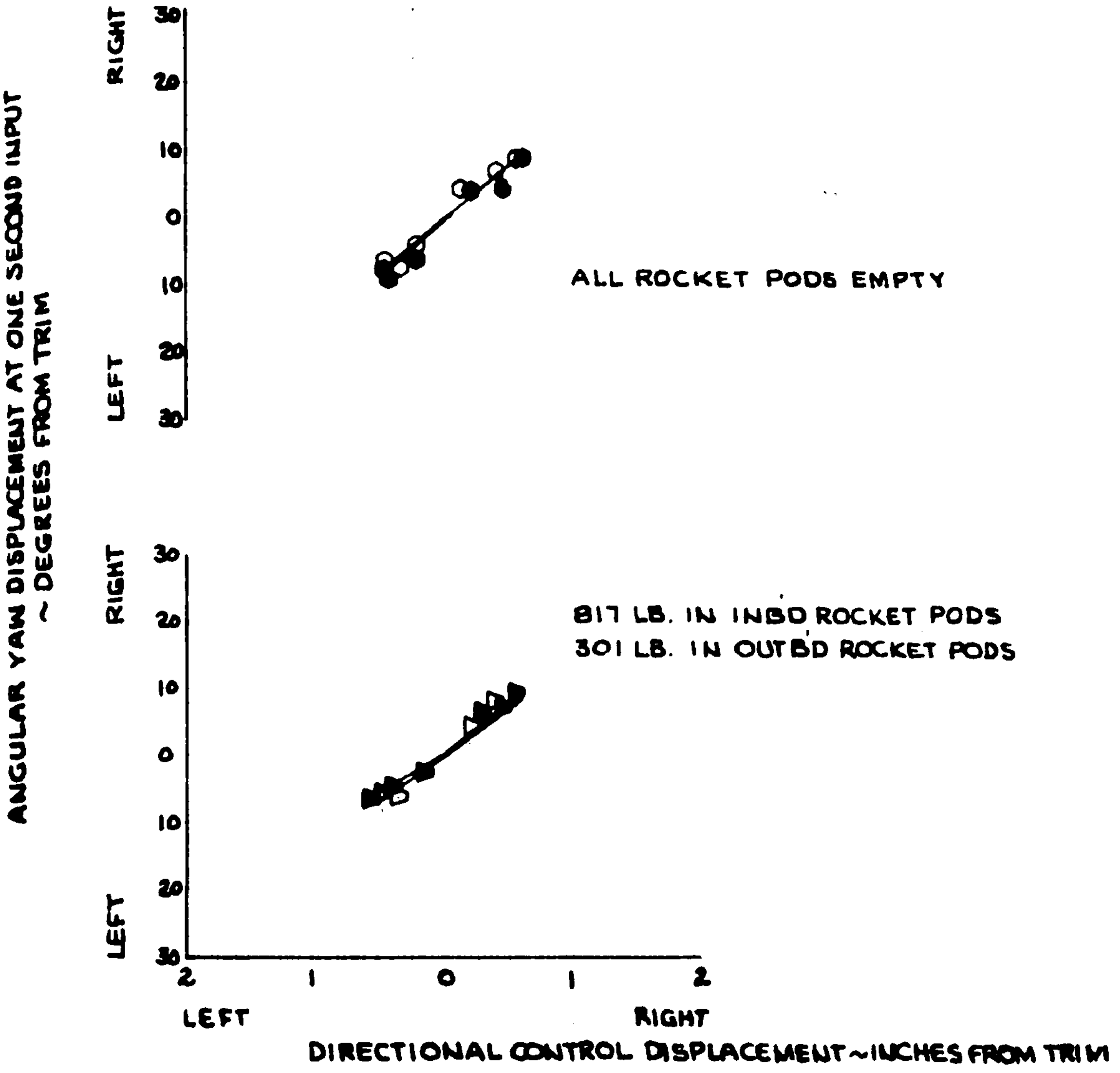


FIGURE NO. 280
AFT LONGITUDINAL STEP SCAS ON

AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
65~KCAS	4000~FT.	7540~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

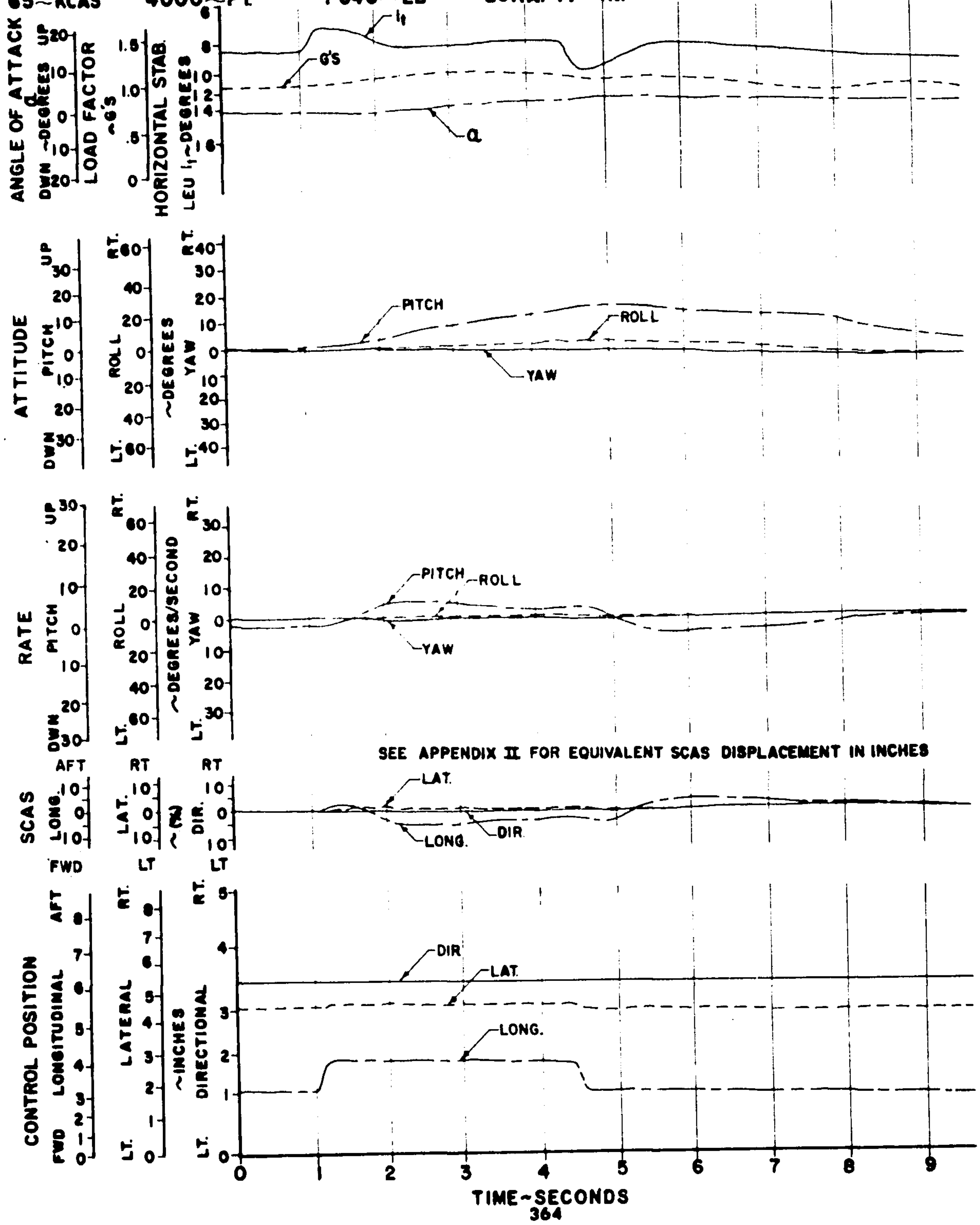


FIGURE NO. 281
FWD. LONGITUDINAL STEP SCAS ON

AH-1G USA S/N 6715695
CLEAN CONFIGURATION

AIRSPEED 65~KCAS
ALTITUDE (Hp) 4000~FT
GROSS WEIGHT 7540~LB.
LONG. C.G. 201(AFT)~IN.
ROTOR SPEED 324~RPM
FLT. CONDITION LEVEL FLT.

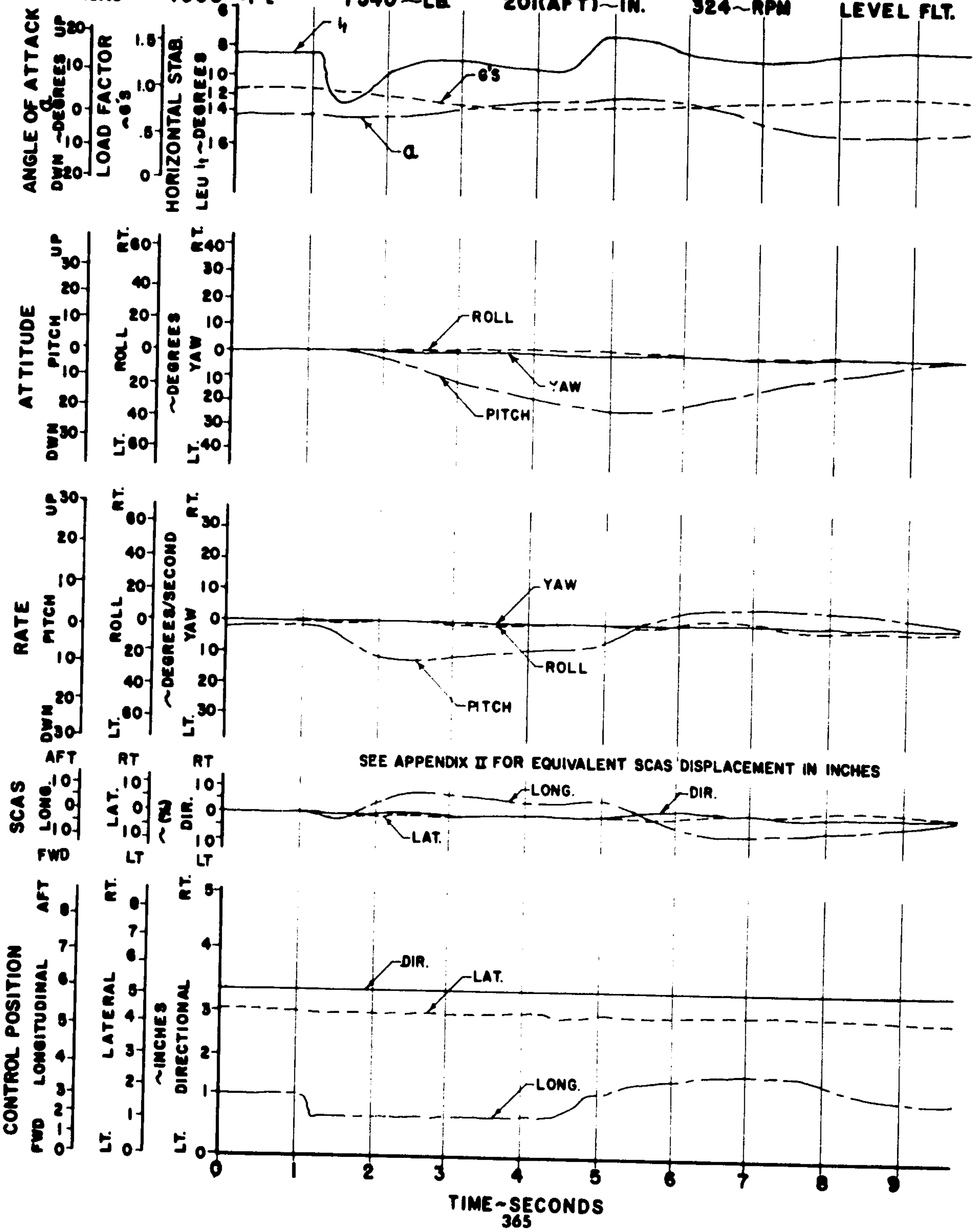


FIGURE NO. 282
RIGHT LATERAL STEP SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
105~KCAS	3700~FT	7620~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

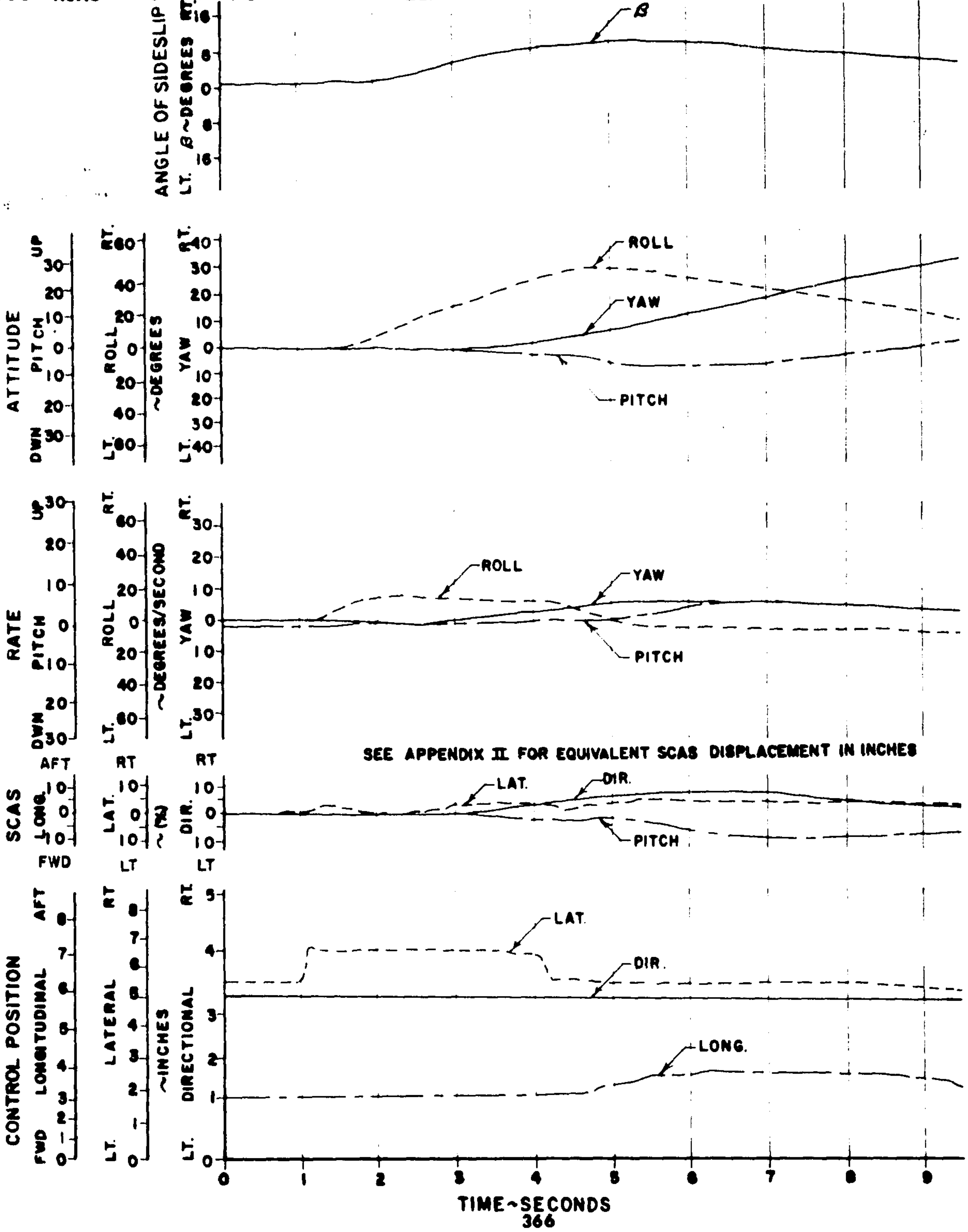
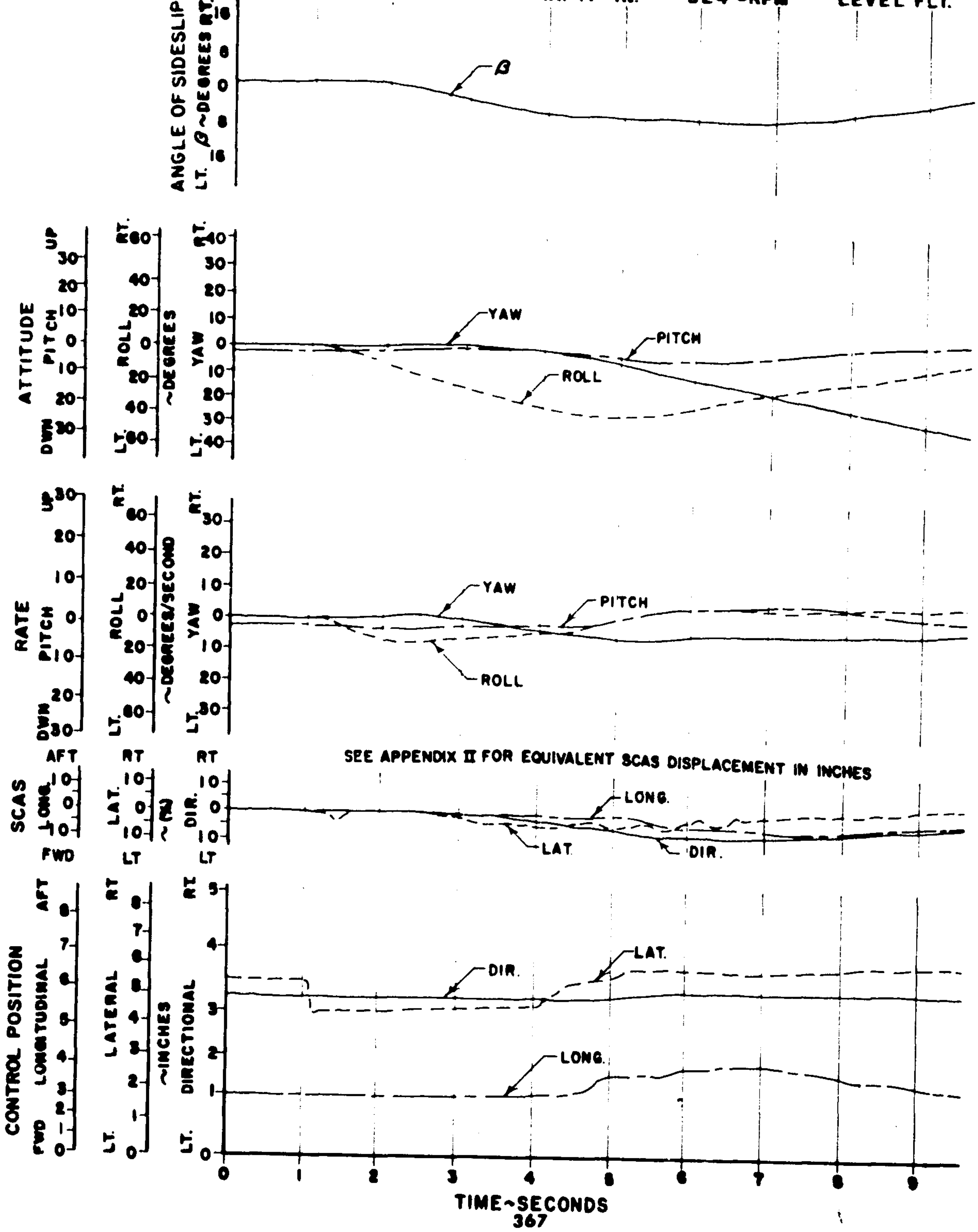


FIGURE NO. 283
LEFT LATERAL STEP SCAS ON

AH-1G USA S/N 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE (Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
105~KCAS	3700~FT	7130~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

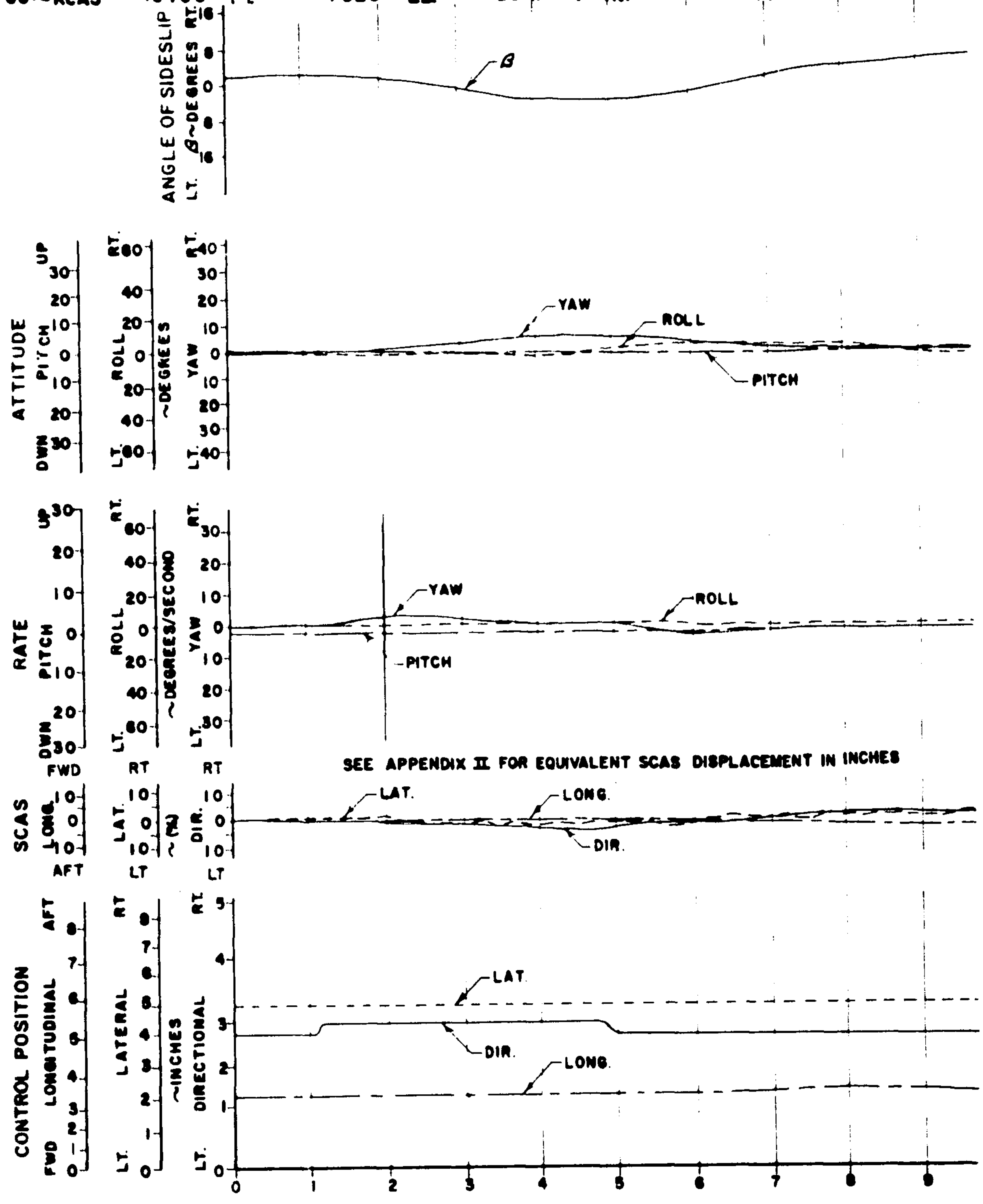


SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

FIGURE NO. 284
RIGHT DIRECTIONAL STEP SCAS ON

AH-1G USA S/N 6715695
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
55~KCAS	15400~FT	7620~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.



SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

FIGURE NO. 285
LEFT DIRECTIONAL STEP SCAS ON
AH-1G USA S/N 6715695
HVY. HOG CONFIGURATION (UNFAIRED)

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
55~KCAS	15400~FT	7620~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

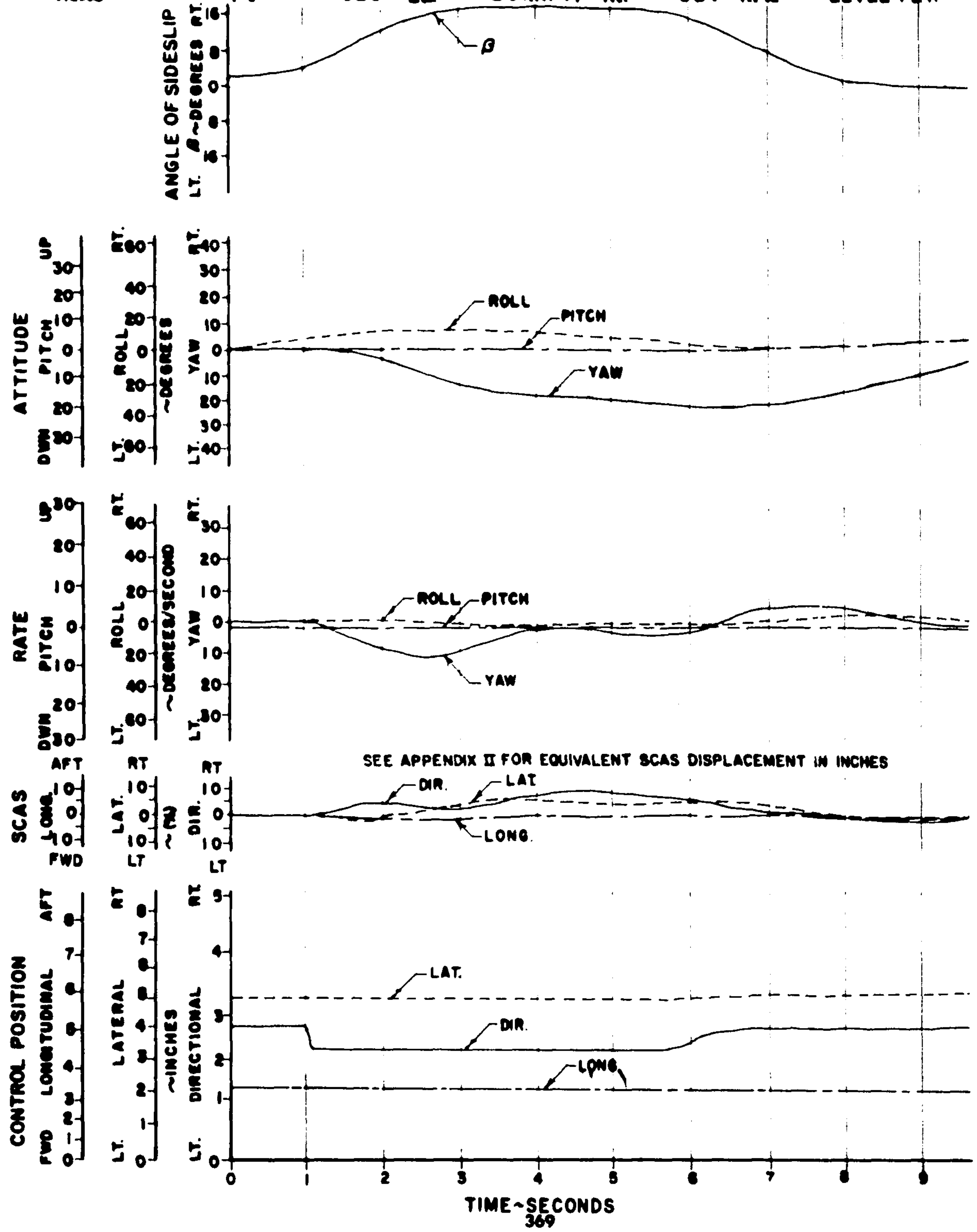


FIGURE NO. 286
LEFT DIRECTIONAL STEP SCAS ON

AH-1G USA S/N 6615247
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
0 ~ KCAS	10330 ~ FT	7560 ~ LB	196(MID) ~ IN.	324 ~ RPM	HOVER

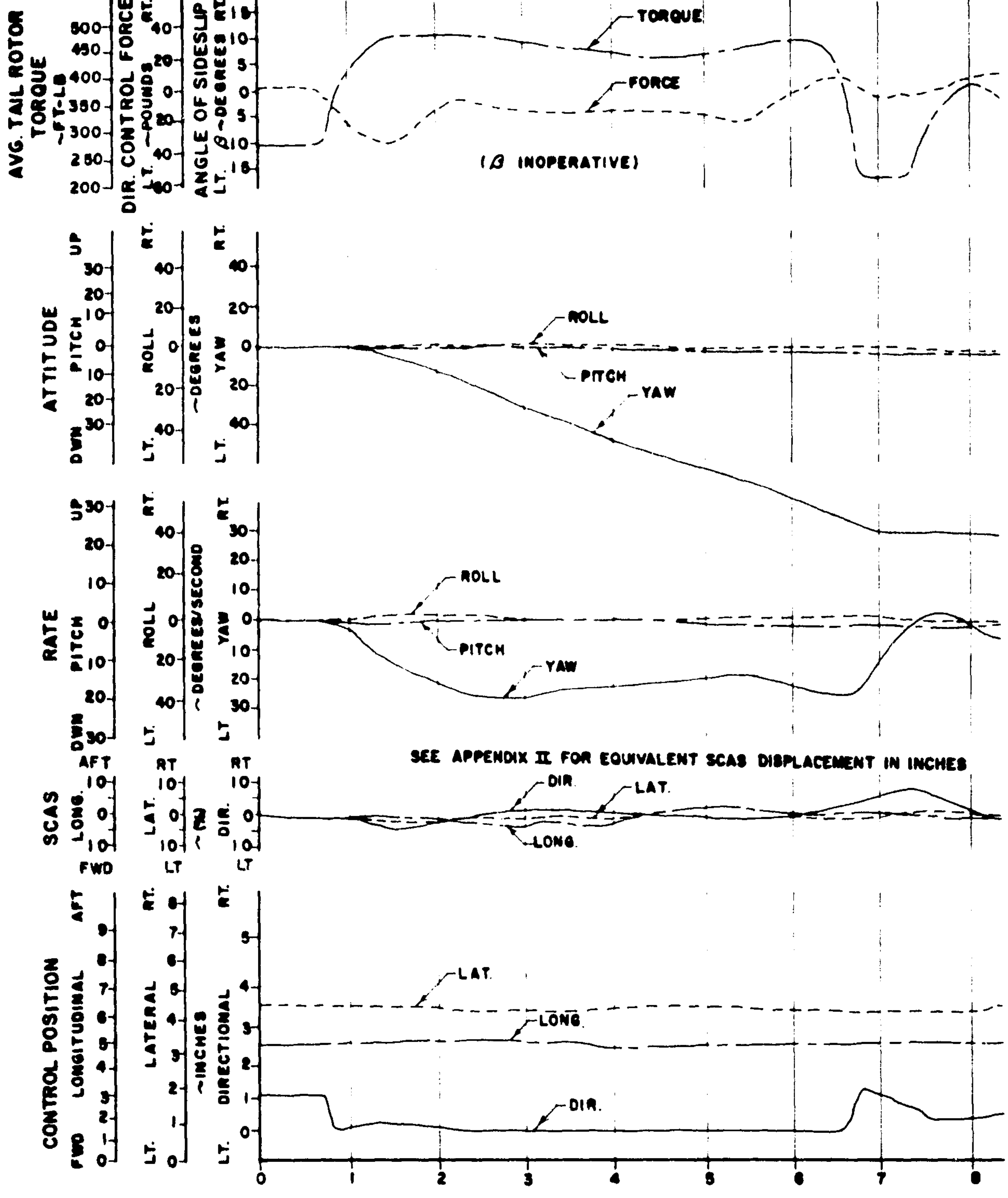


Figure No. 287

DIFFERENTIAL TAIL ROTOR HORSEPOWER ENCOUNTERED DURING DIRECTIONAL INPUTS

AH-1G USA 66-15247

CLEAN CONFIGURATION

SYM	DENSITY ALTITUDE H_D ~ FT.	GROSS WEIGHT ~ LB.	LONG. CG ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
○	4790	8680	195.4(MID)	3245	HOVER	0.004921
◊	4850	8400	195.2(MID)	3145	↓	0.005114
○	10820	7860	195.7(MID)	3240	↓	0.005135
▽	10820	7490	195.6(MID)	3135	↓	0.005484

NOTES:
1. ALL DATA GATHERED WITH AIRCRAFT IN GROUND EFFECT
2. SKID HEIGHT RANGE = 5FT. → 15FT.
3. SOLID SYMBOLS DENOTE AVERAGE TAIL ROTOR HORSEPOWER
4. OPEN SYMBOLS DENOTE PEAK TAIL ROTOR HORSEPOWER
5. SOLID LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM INITIAL CONTROL INPUT
6. DASHED LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM RECOVERY INPUT
7. DIFFERENTIAL TAIL ROTOR HORSEPOWER IS EQUAL TO TAIL ROTOR HORSEPOWER RESULTING FROM INPUT MINUS TAIL ROTOR HORSEPOWER FOR A TRIMMED HOVER CONDITION

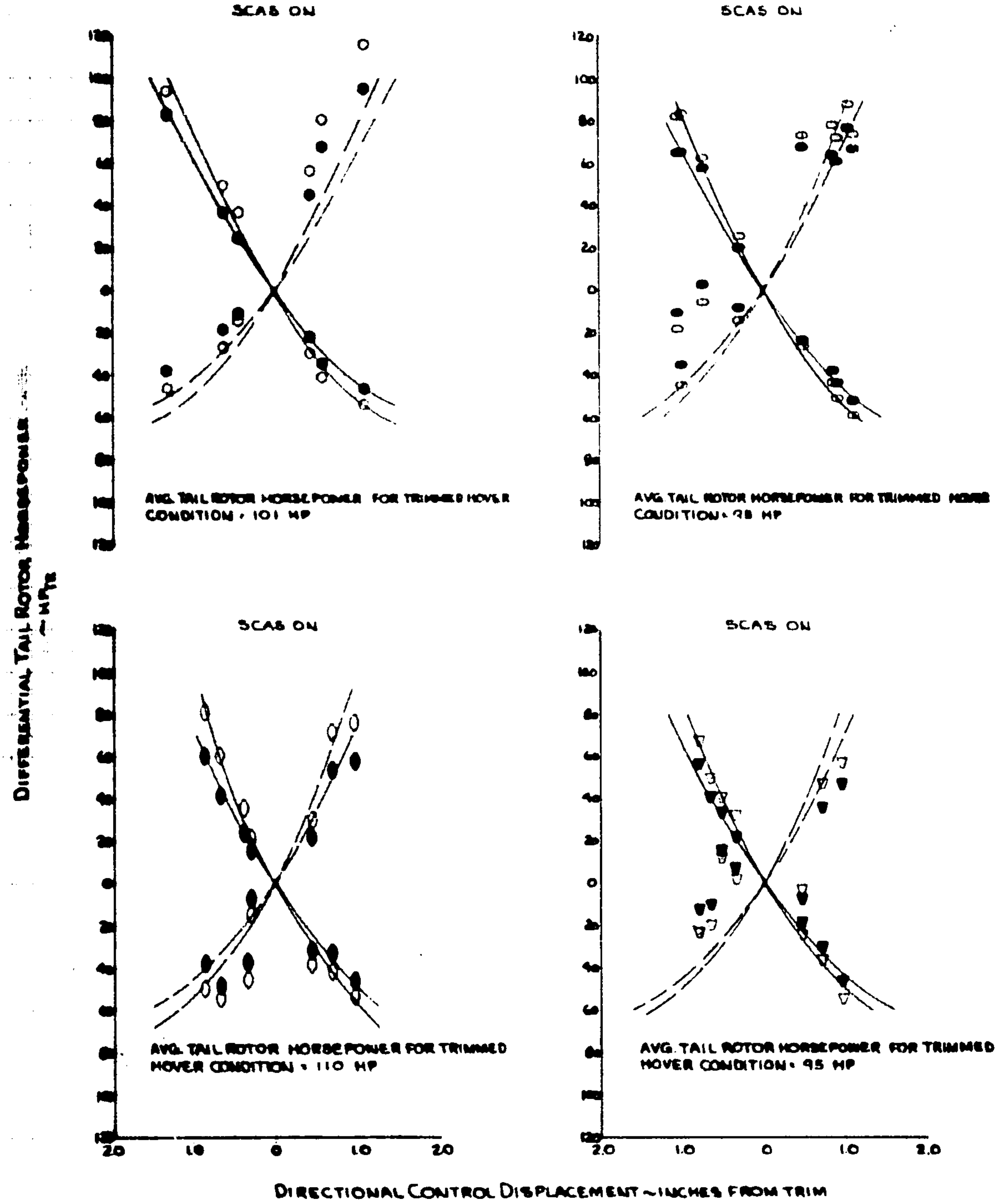


FIGURE NO. 288

DIFFERENTIAL TAIL ROTOR HORSEPOWER ENCOUNTERED DURING DIRECTIONAL INPUTS

AH-1G USA S/N 615247

CLEAN CONFIGURATION

SYM.	DENSITY ALTITUDE H_D ~ FT.	GROSS WEIGHT ~ LB.	LONG.C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C_T
○	4580	7280	195.6 (MID)	3210	HOVER	[illegible]
△	4580	7220	195.6 (MID)	314.5	↓	[illegible]
□	[illegible]	7320	195.5 (MID)	324.0		0.004104
◇	[illegible]	7270	195.4 (MID)	314.5		[illegible]

NOTES:
1. ALL DATA GATHERED WITH AIRCRAFT IN GROUND EFFECT
2. SKID HEIGHT RANGE = 5 FT. → 15 FT.
3. SOLID SYMBOLS DENOTE AVERAGE TAIL ROTOR HORSEPOWER
4. OPEN SYMBOLS DENOTE PEAK TAIL ROTOR HORSEPOWER
5. SOLID LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM INITIAL CONTROL INPUT
6. DASHED LINE DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM RECOVERY
7. DIFFERENTIAL TAIL ROTOR HORSEPOWER IS EQUAL TO TAIL ROTOR HORSEPOWER RESULTING FROM INPUT MINUS TAIL ROTOR HORSEPOWER FOR A TRIMMED HOVER CONDITION

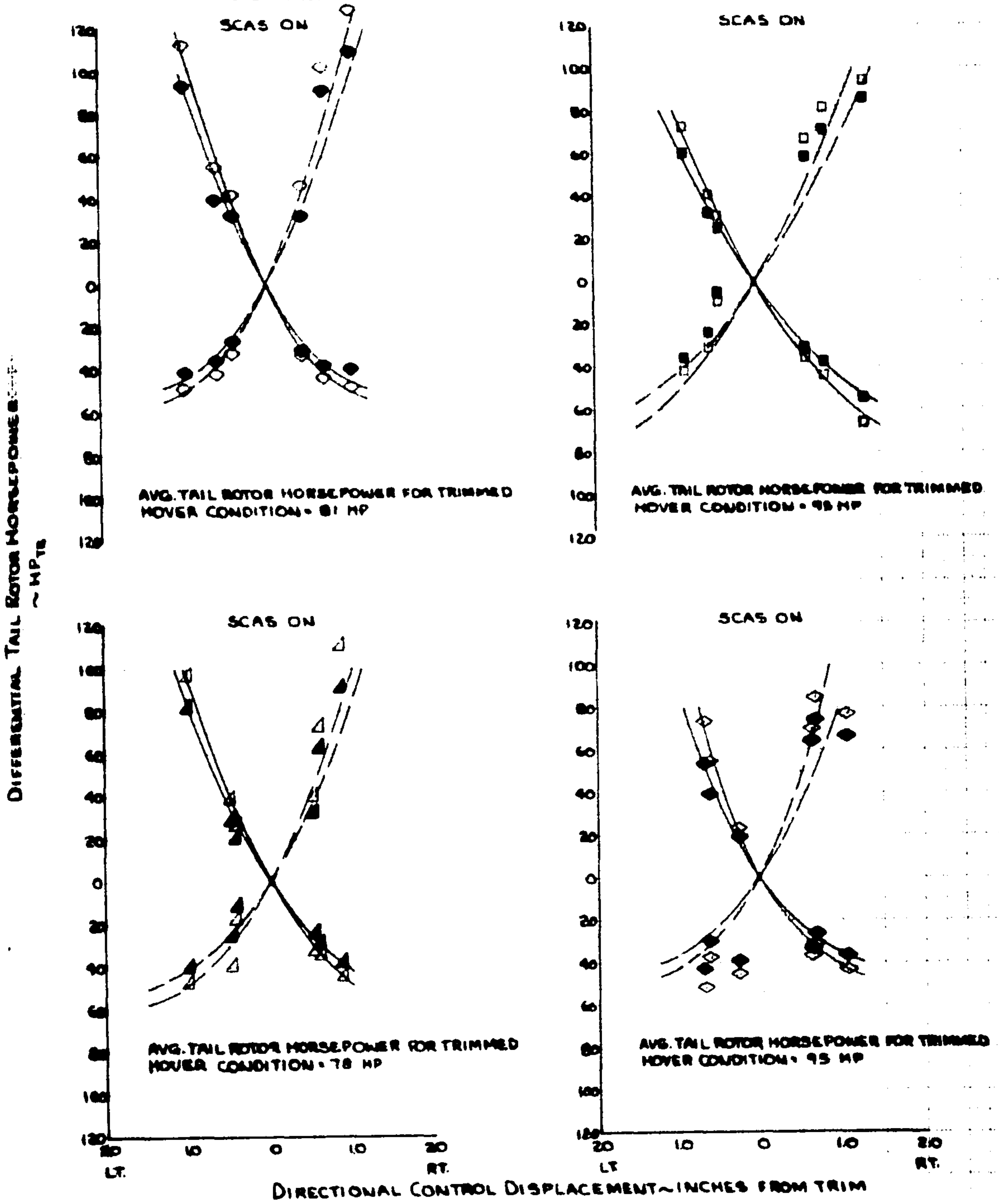


FIGURE NO. 289

DIFFERENTIAL TAIL ROTOR HORSEPOWER ENCOUNTERED DURING DIRECTIONAL INPUTS

AH-1G USA S/N 615247

CLEAN CONFIGURATION

SYM	DENSITY ALTITUDE HD ~FT.	GROSS WEIGHT ~LB.	LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C_T
▶	360	7170	193.2(MID)	[illegible]	HOVER	0.003619
▷	360	7170	193.2(MID)	[illegible]	↓	0.003619
◐	580	7160	193.1 (MID)	[illegible]	↓	0.003[illegible]
◆	570	[illegible]	199.9 (MID)	[illegible]	↓	0.004017

NOTES: 1. ALL DATA GATHERED WITH AIRCRAFT IN GROUND EFFECT
2. SKID HEIGHT RANGE • 5FT → 15FT.
3. SOLID SYMBOLS DENOTE AVERAGE TAIL ROTOR HORSEPOWER
4. OPEN SYMBOLS DENOTE PEAK TAIL ROTOR HORSEPOWER
5. SOLID LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM INITIAL CONTROL INPUT
6. DASHED LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM RECOVERY
7. DIFFERENTIAL TAIL ROTOR HORSEPOWER IS EQUAL TO TAIL ROTOR HORSEPOWER RESULTING FROM INPUT MINUS TAIL ROTOR HORSEPOWER FOR A TRIMMED HOVER CONDITION

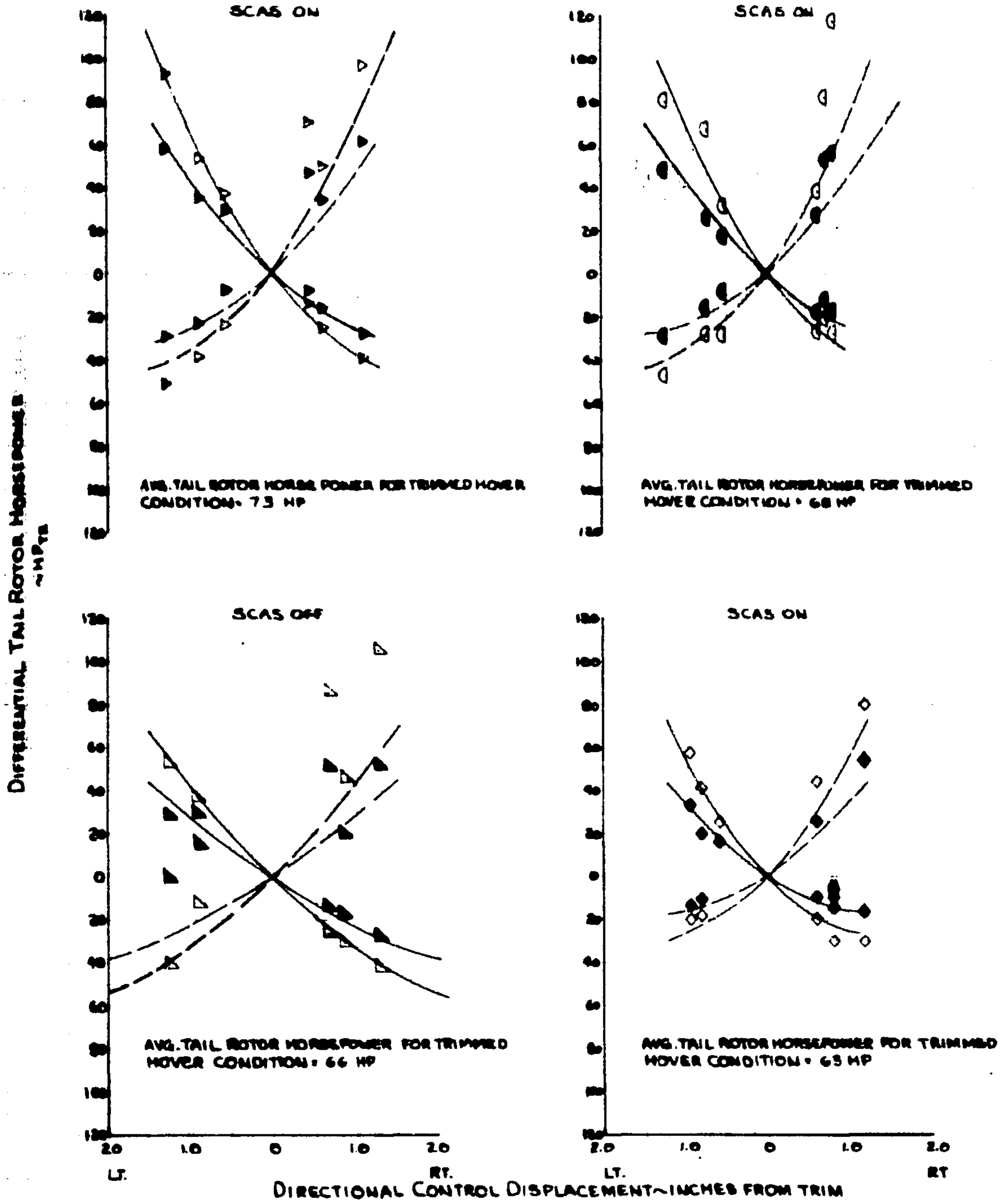


FIGURE NO. 290

SUMMARY OF STICK FIXED AND STICK FREE MANEUVERING STABILITY

AH-1G USA S/N 615247
CLEAN CONFIGURATION

SYM	AVG. AIRSPEED V_C ~ KCAS	AVG. GROSS WEIGHT ~ LB
○	138	7800
□	138	7000
△	117	7800
△	117	7000

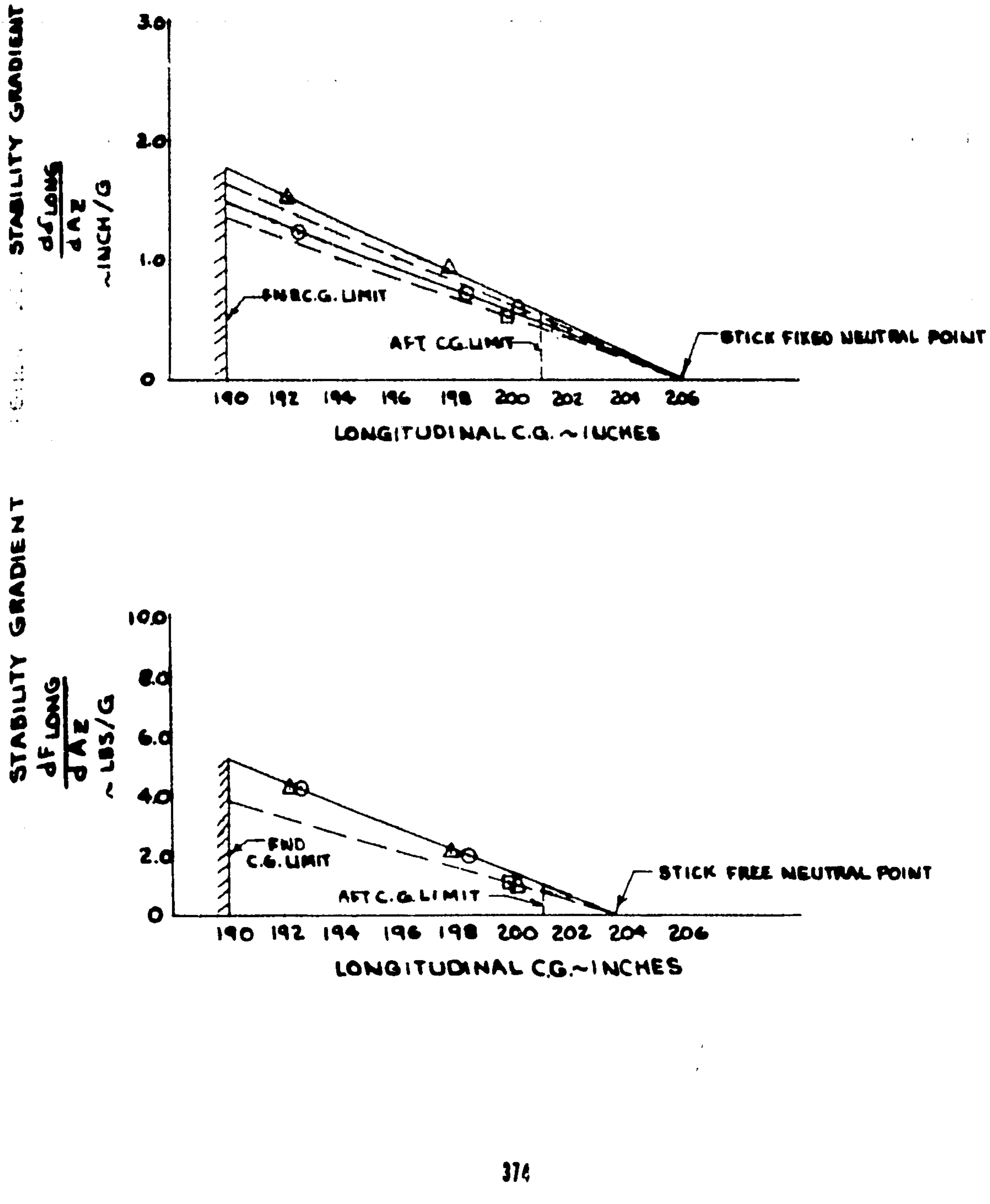


FIGURE NO. 291

MANEUVERING STABILITY

AH-1G USA S/N 66-15247
CLEAN CONFIGURATION

NOTES:
1. ○ DENOTES LEFT WIND-UP TURN
2. □ DENOTES RIGHT WIND-UP TURN
3. △ DENOTES SYMMETRICAL PULL-UP
4. CYCLIC FORCE TRIM ON
5. LONGITUDINAL CONTROL FORCE MEASURED AT CENTER OF HAND GRIP

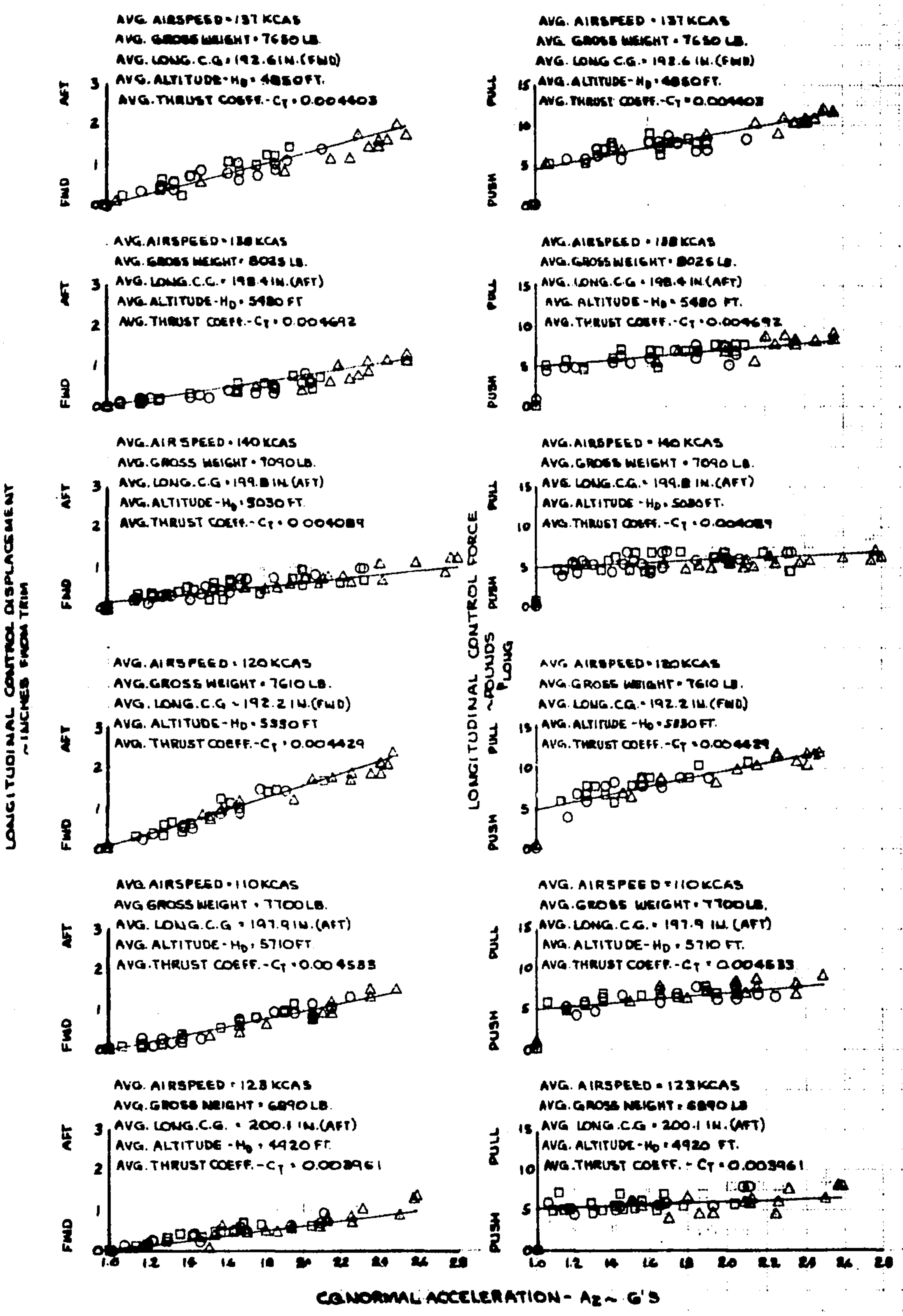


FIGURE No. 292

LATERAL CYCLIC CONTROL VARIATION WITH AIRCRAFT LOAD FACTOR

AH-1G USA S/N 615247

CLEAN CONFIGURATION

ROTOR SPEED = 324 RPM

NOTES:

○ DENOTES LEFT WING UP TURN

□ DENOTES RIGHT WING UP TURN

△ DENOTES SYMMETRICAL PULL-UP

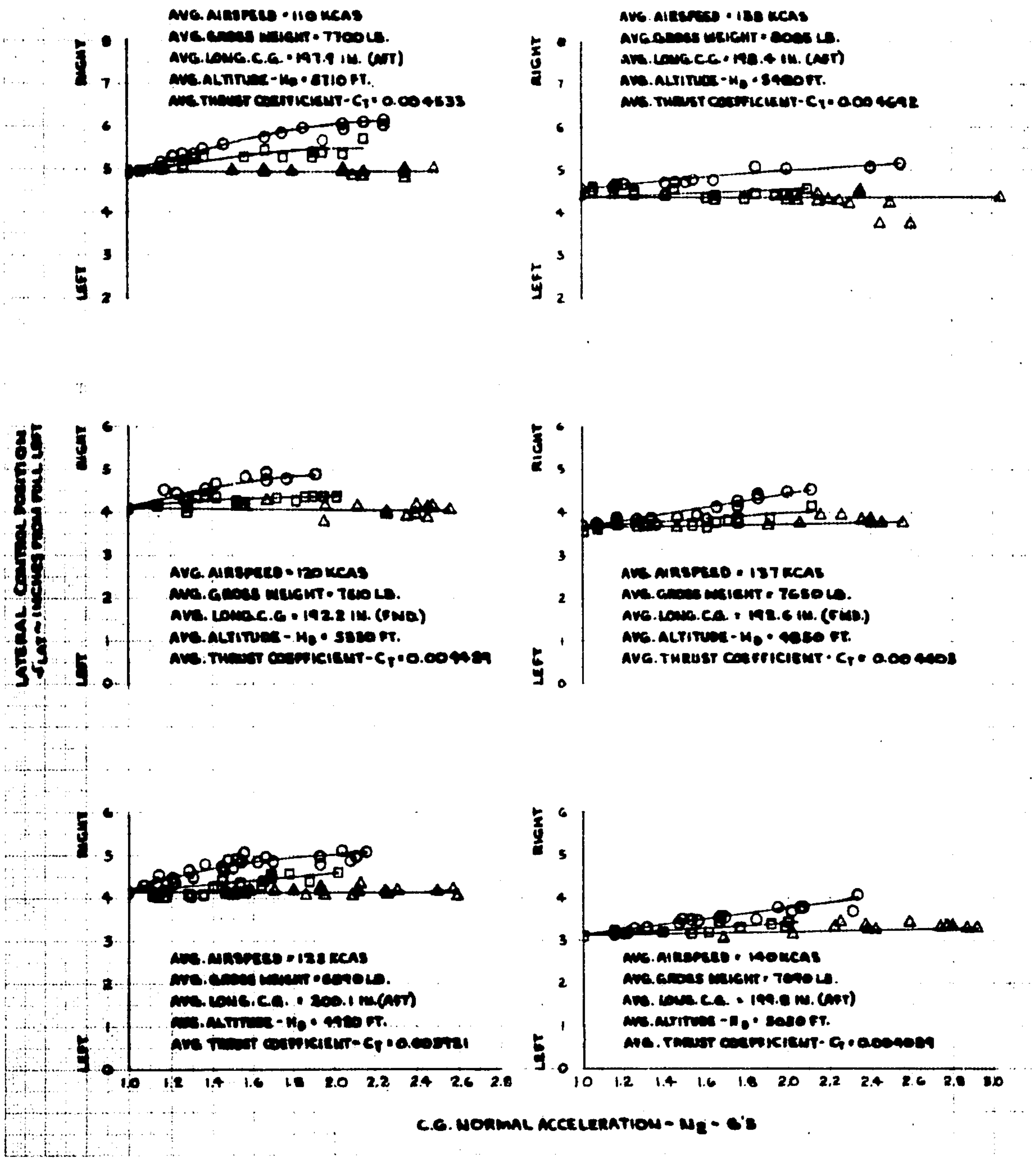


FIGURE NO 293

SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AH-1G USA #6615247

CLEAN CONFIGURATION

AVG. TRIM CONDITIONS:

SYM.	DENSITY ALT. H_D ~ FT.	GRWT ~ LB.	LONG CG ~ IN.	ROTOR SPEED ~ RPM	CONFIGURATION OF LANDING GEAR CROSSTUBE FAIRINGS
○	5000	7250	201.0 (AFT)	324.0	INSTALLED
□	5000	7050	201.0 (AFT)	324.0	NOT INSTALLED

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS

2. AVG. ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 6000 FT.

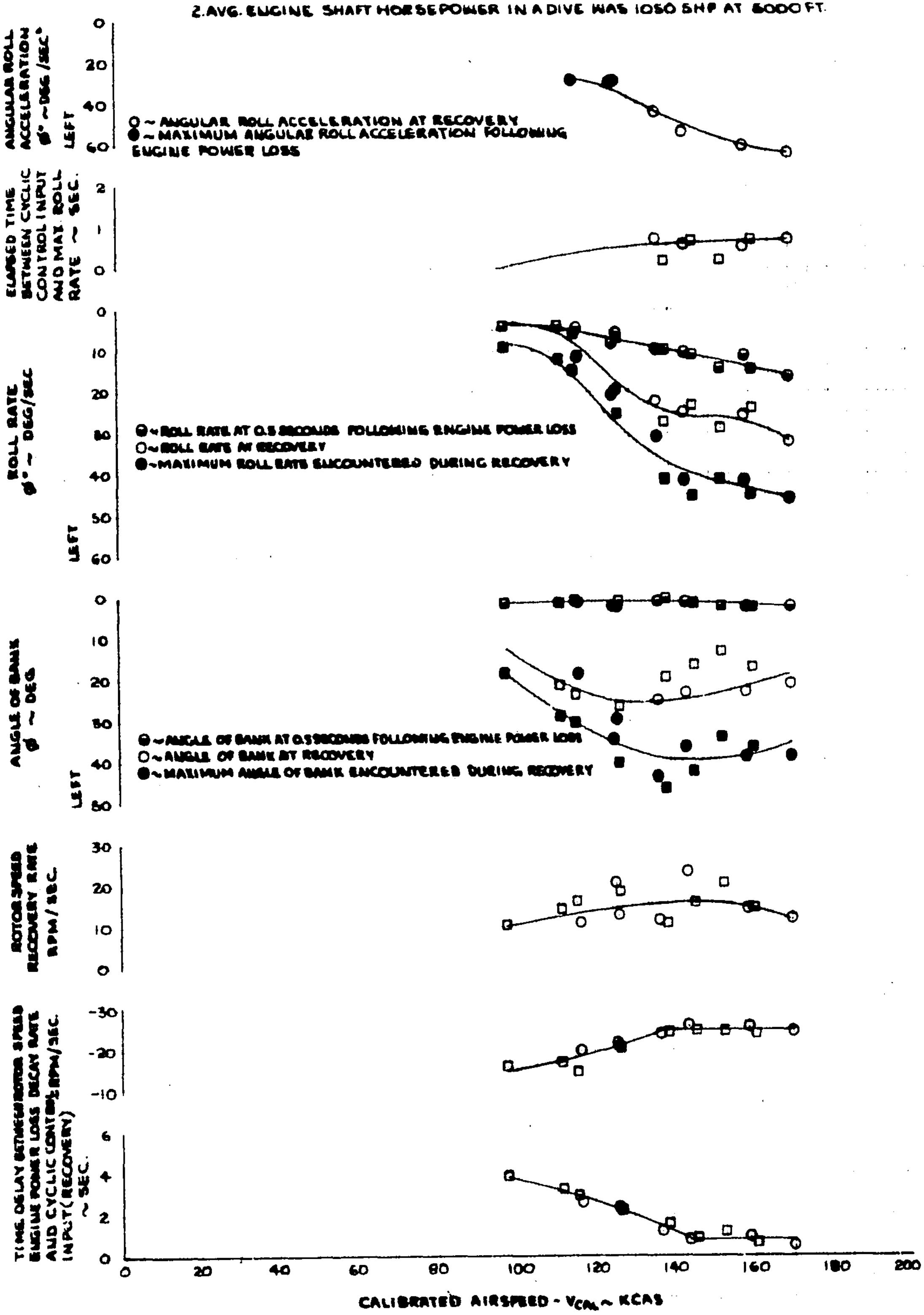


FIGURE NO 293 (CONTINUED)

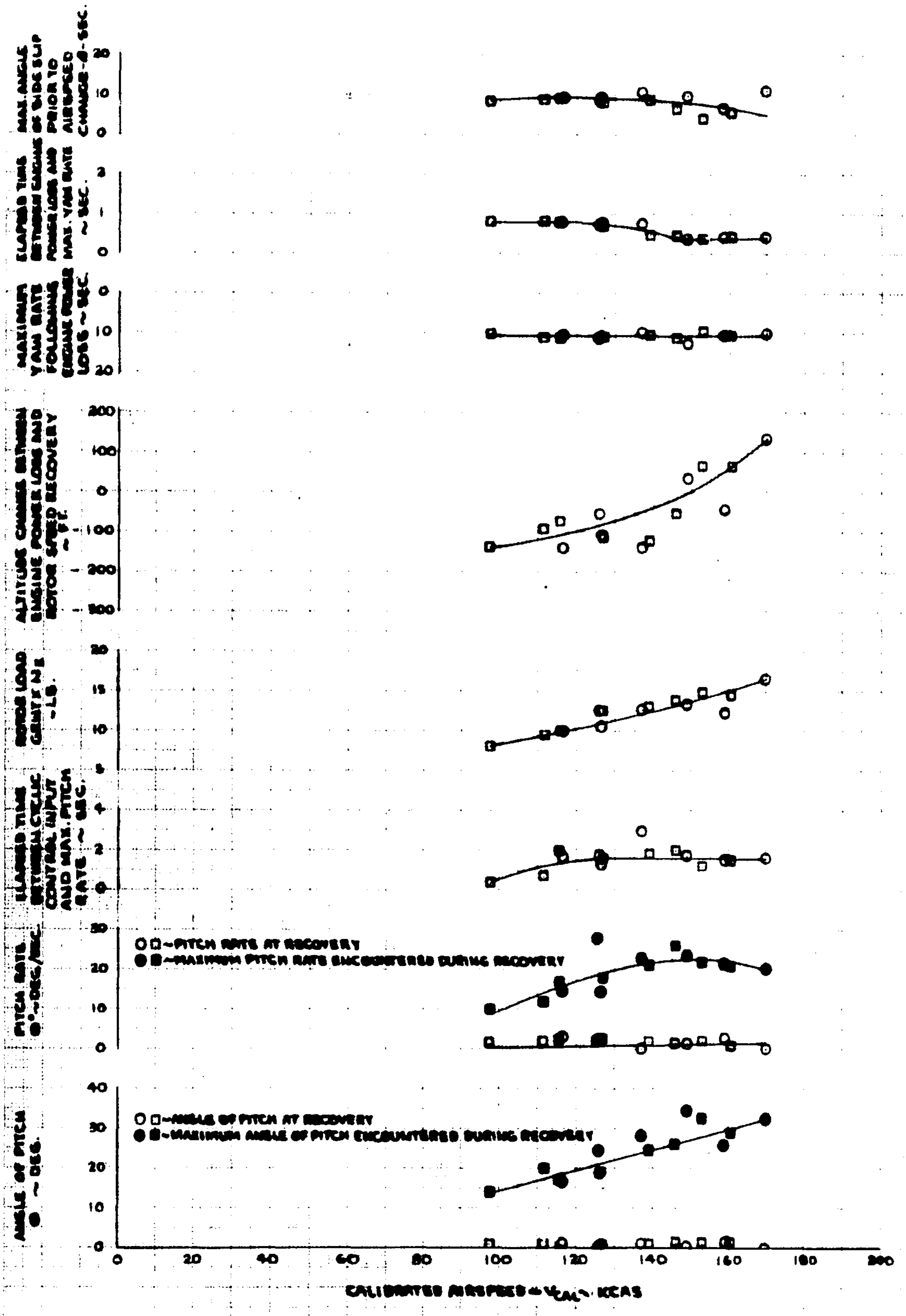


FIGURE No. 294
SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AH-1G USA S/N 66-15247

CLEAN CONFIGURATION

AVG. TRIM CONDITIONS:

SYM.	DENSITY ALT. Hp ~ FT.	GRWT ~ LB.	LONG. C.G. ~ IN.	ROTOR SPEED ~ RPM
○	5000	8500	191.4 (FWD)	324.0
□	10000	8050	191.1 (FWD)	324.0

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS

2. AVG. ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 5000 FT. AND 900 SHP AT 10000 FT.

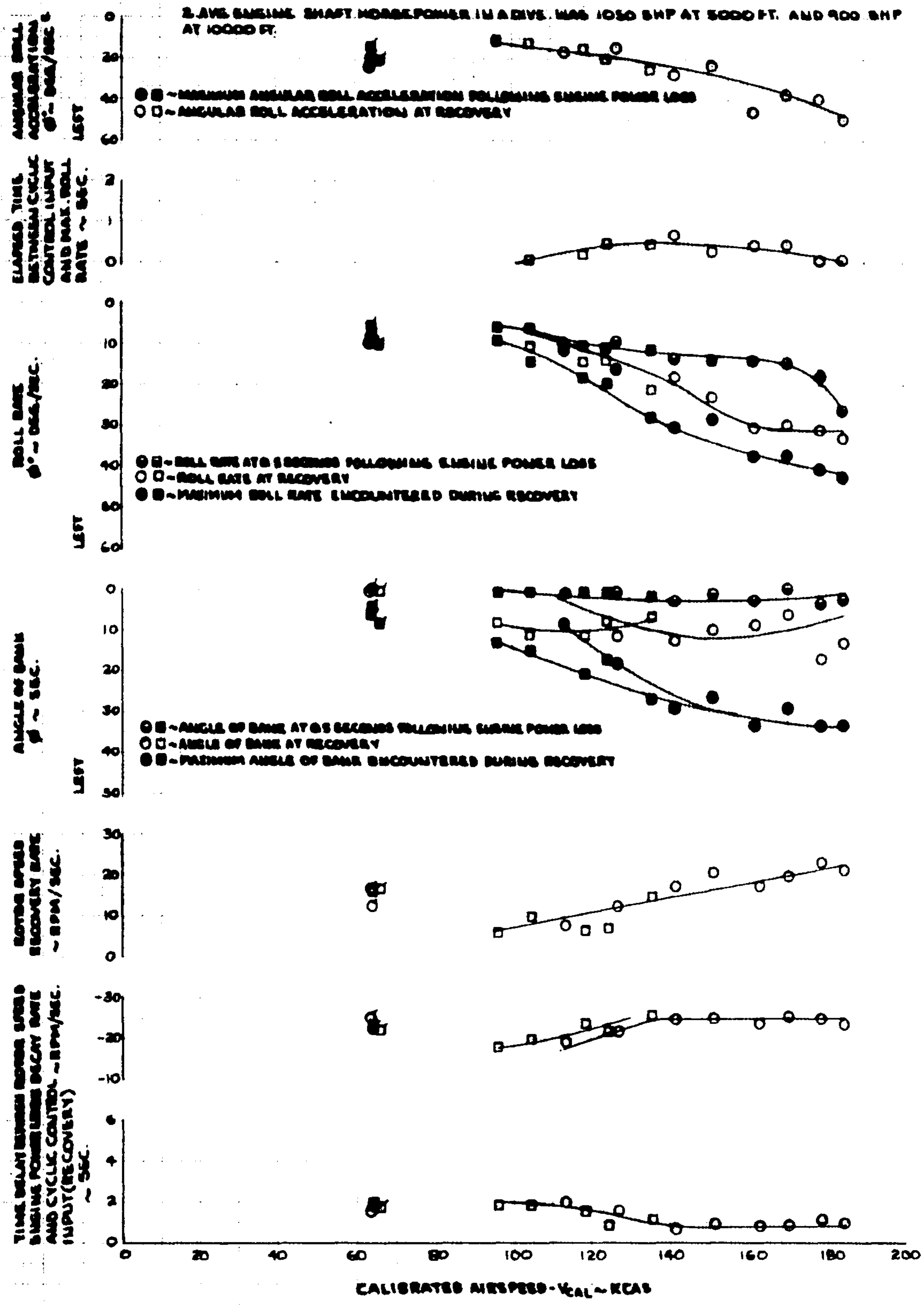


FIGURE No. 294 (CONTINUED)

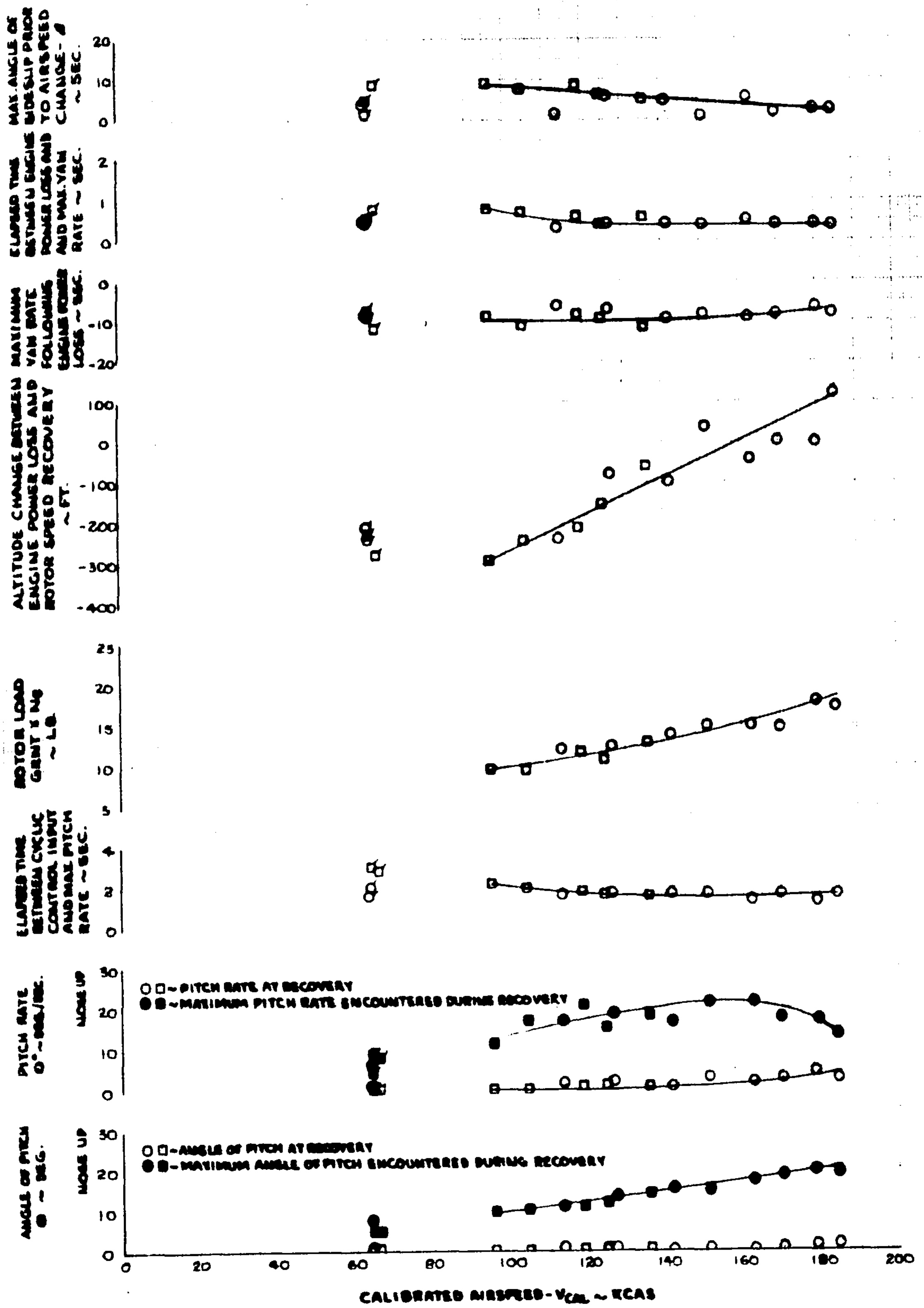


FIGURE No. 295

SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AH-1G USA S/N 615247

CLEAN CONFIGURATION

AVG. TRIM CONDITIONS:

SYM.	DENSITY ALT. H_D ~ FT.	GROSS WT ~ LB	LONG. C.G. ~ IN.	ROTOR SPEED ~ RPM
○	5000	8300	197.3(AFT)	324.0
□	10000	8100	197.1(AFT)	324.0

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS

2. AVG. ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 5000 FEET AND 900 SHP AT 10000 FEET

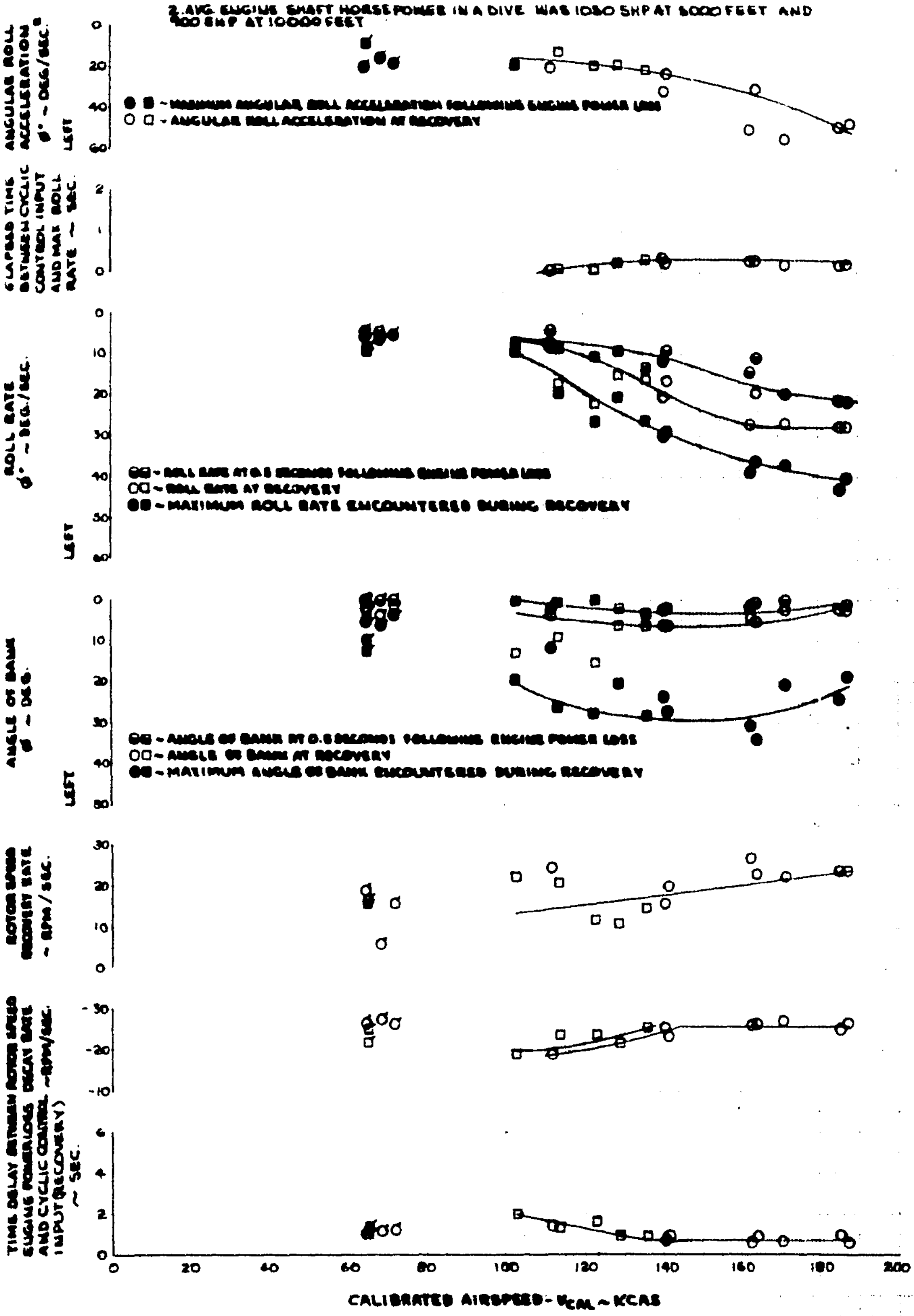


FIGURE NO 295 (CONTINUED)

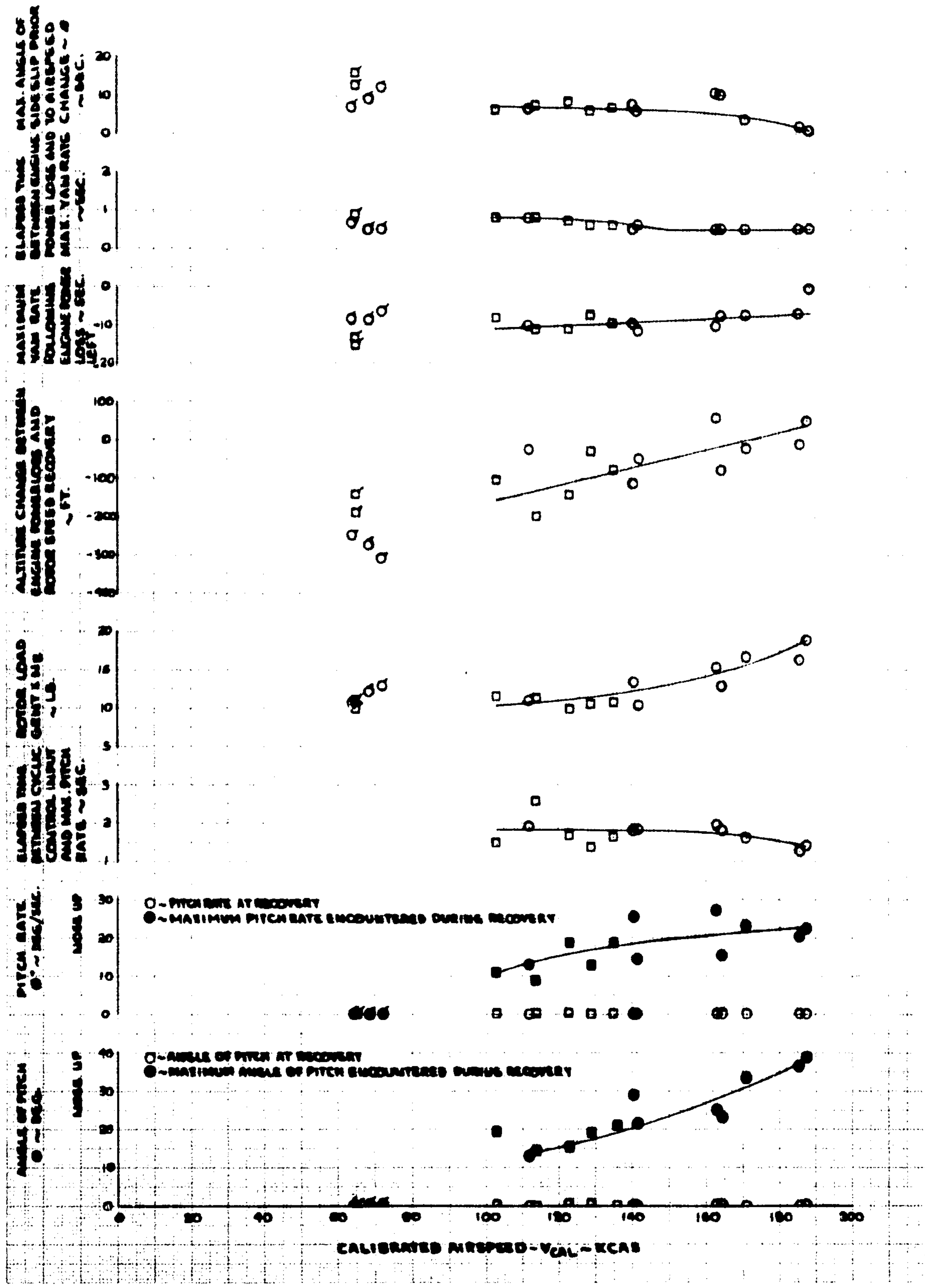


FIGURE NO. 296

SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AH-1G USA S/N 615247

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AVG. TRIM CONDITIONS:

SYM.	DENSITY ALT. HD ~ FT.	GRWT ~LB.	LONG. C.G. ~IN.	ROTOR SPEED ~RPM
○	5000	9350	192.8(FWD)	324.0

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS

2. AVG. ENGINE SHAFT HORSEPOWER IN ABOVE WAS 1050 SHP AT 5000 FEET

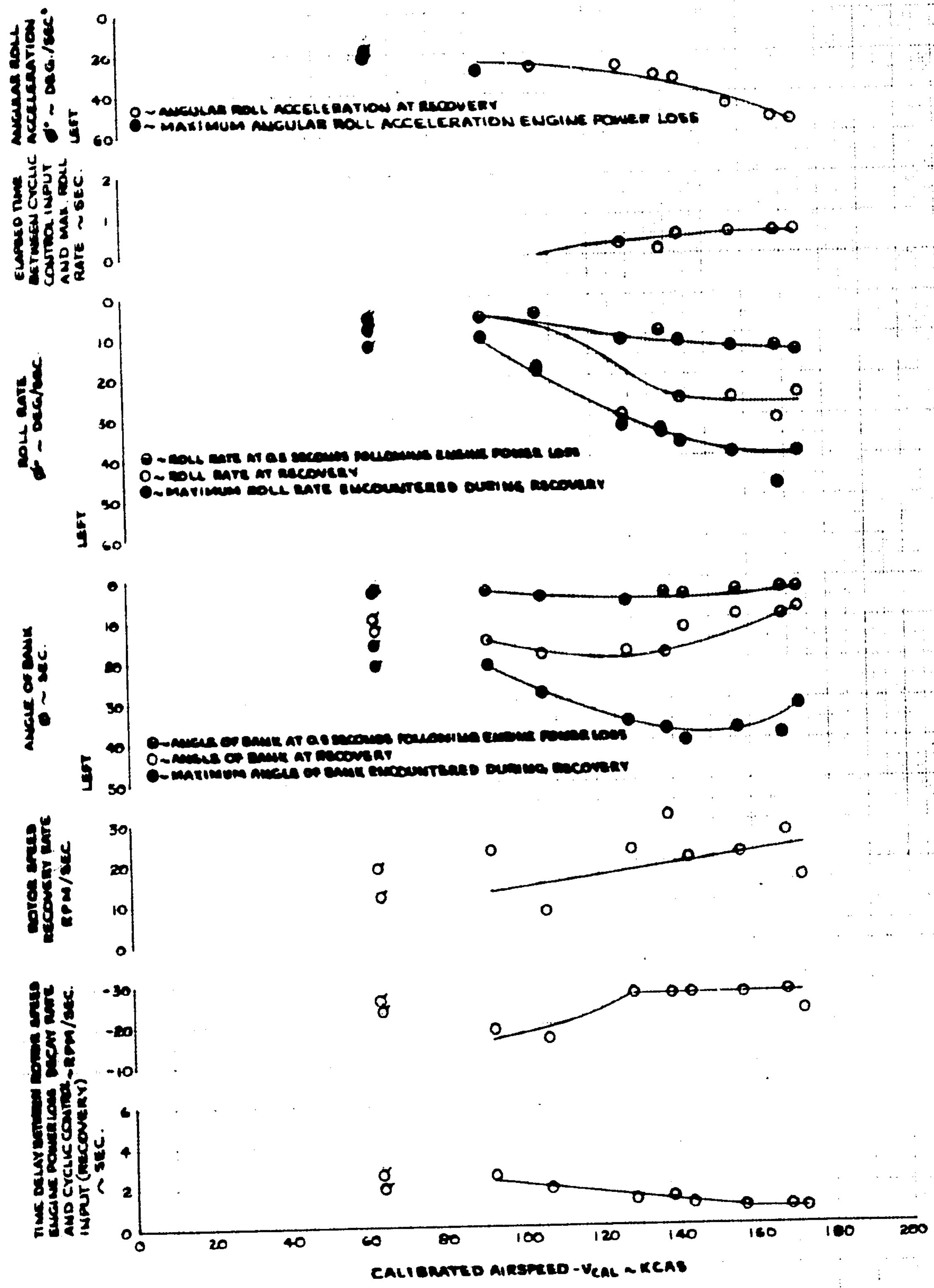


FIGURE No. 296 (CONTINUED)

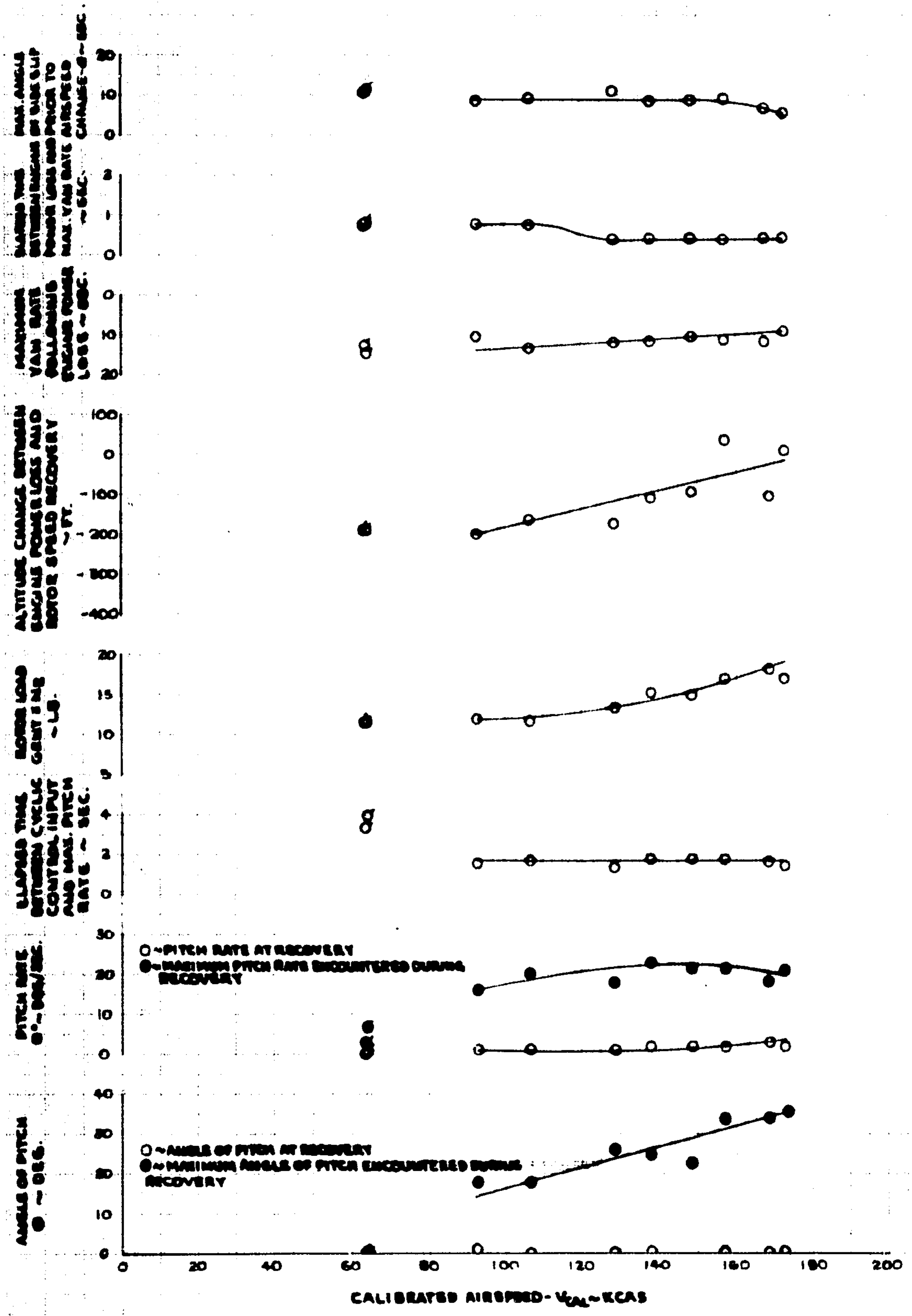


FIGURE No. 297

SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AH-1G USA 66-15247

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AVG. TRIM CONDITIONS:

SYM.	DENSITY ALT. H_D ~ FT.	GROSS WT ~ LB.	LONG. C.G. ~ IN.	ROTOR SPEED ~ RPM
○	5000	9500	200 (AFT)	324.0

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS
2. AVG ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 5000 FT

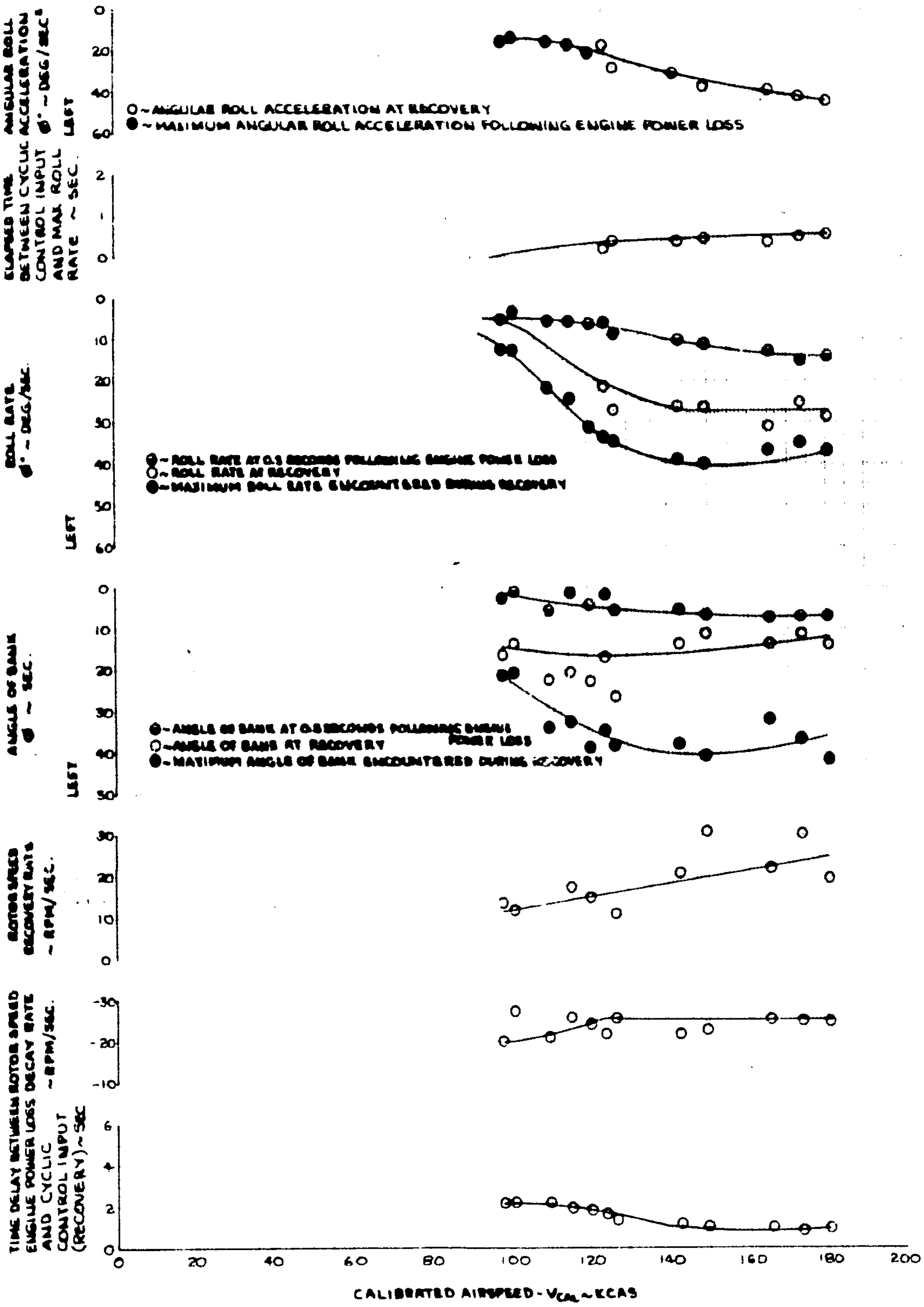


FIGURE No. 297 (CONTINUED)

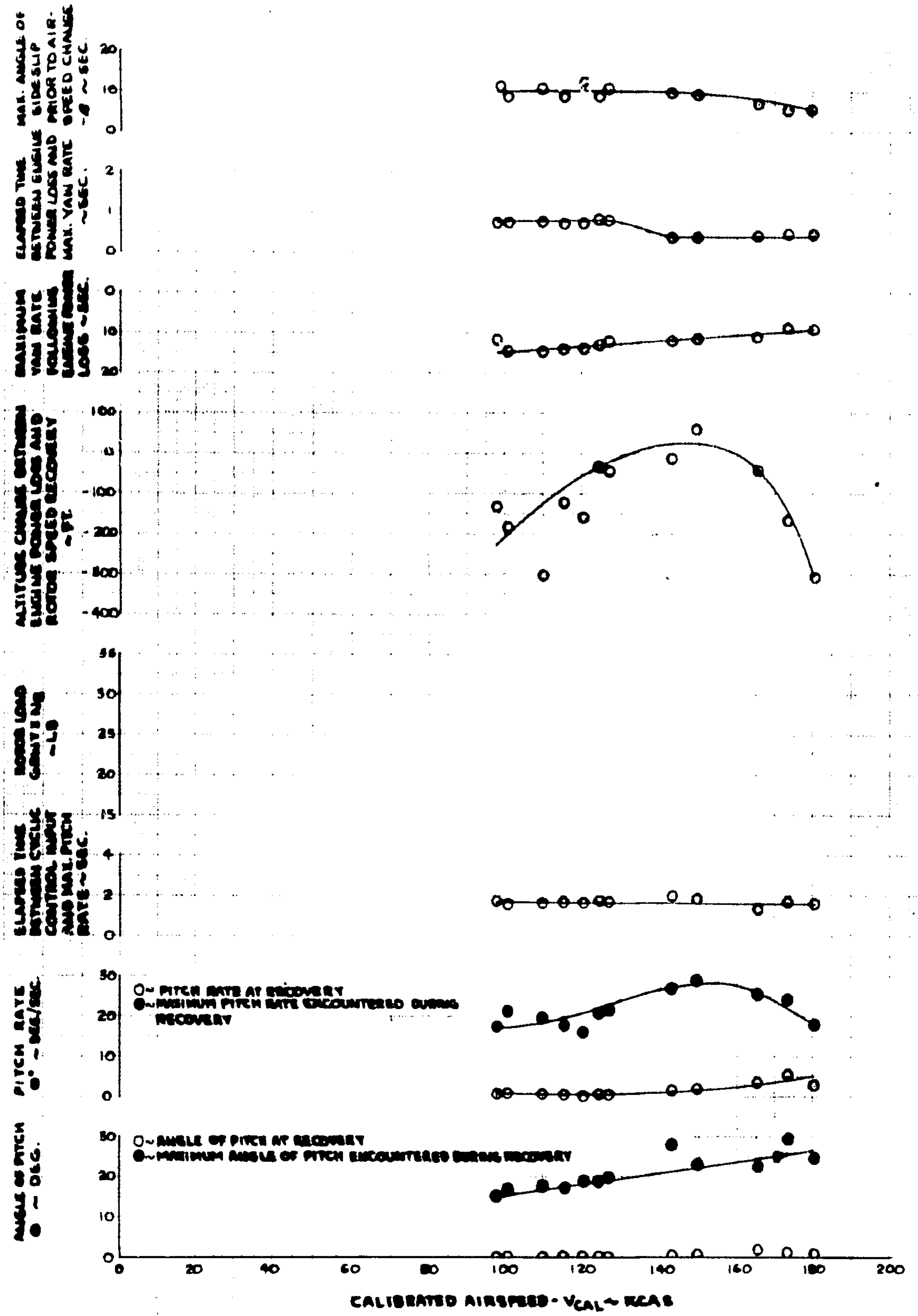
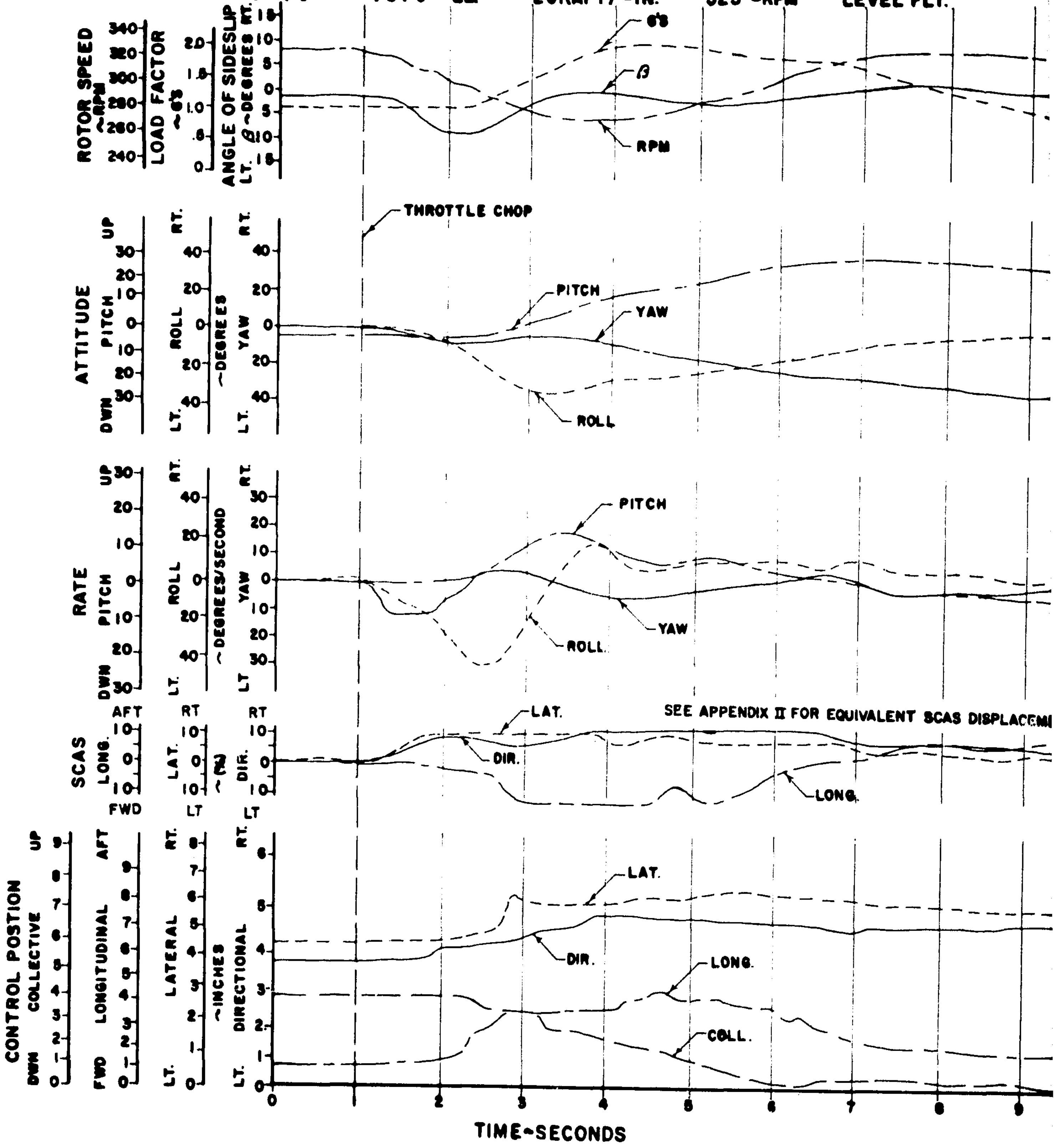


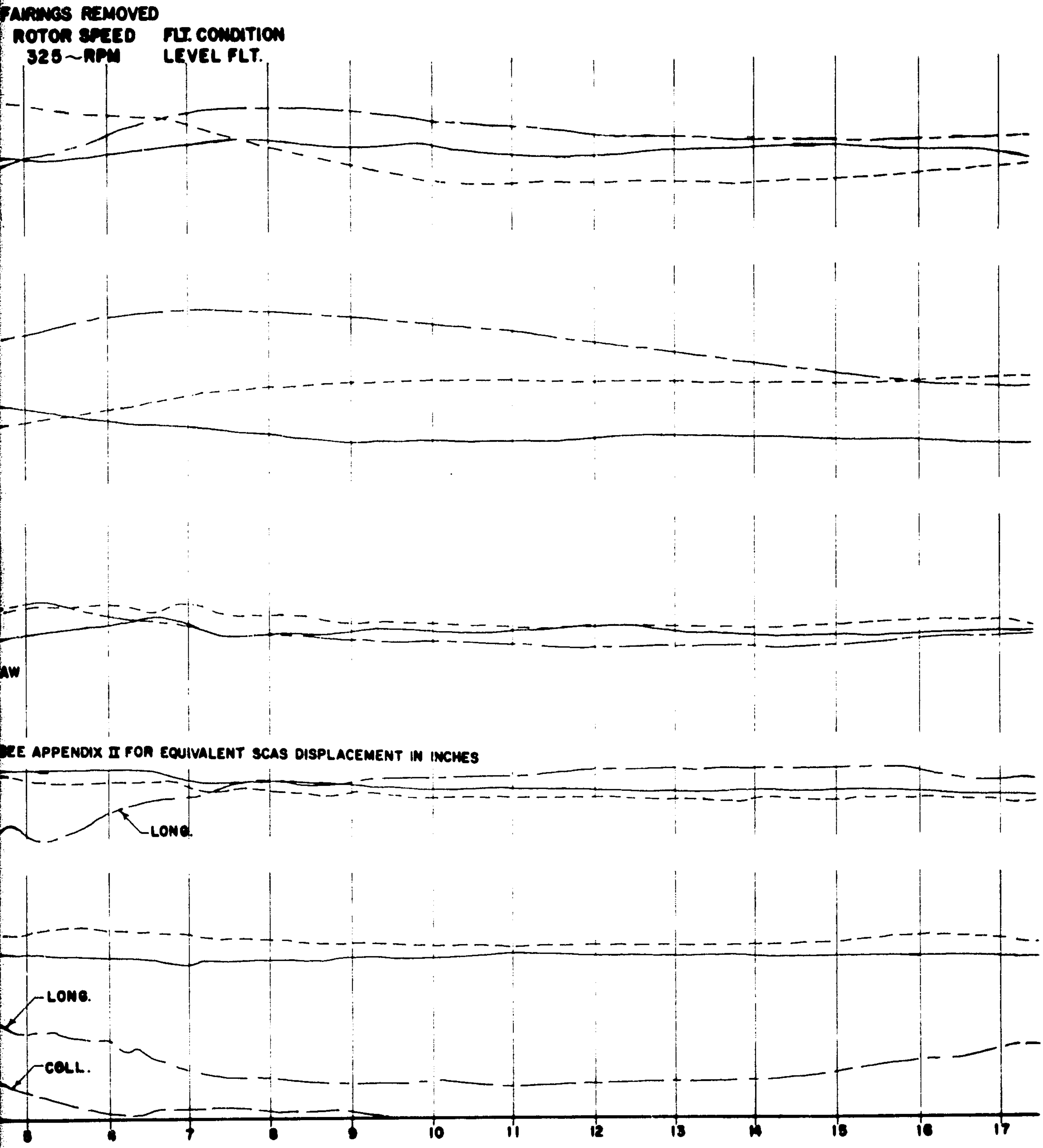
FIGURE NO. 298
AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE

AH-1G USA S/N 6615247
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
149~KCAS	4790~FT	7070~LB.	201(AFT)~IN.	325~RPM	LEVEL FLT.



ENGINE FAILURE

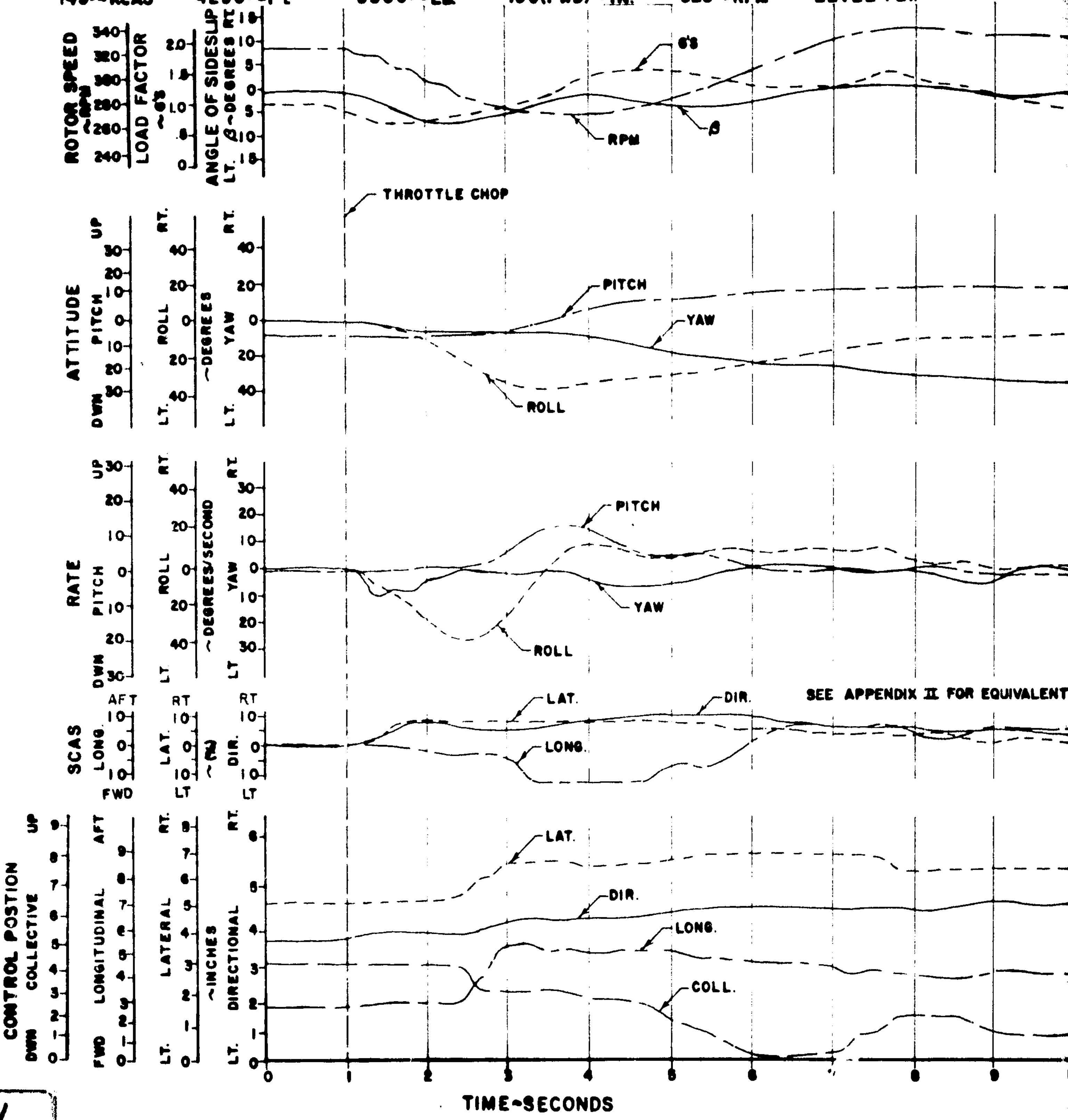


2

FIGURE NO. 299
AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE

AH-16 USA S/N 6615247
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

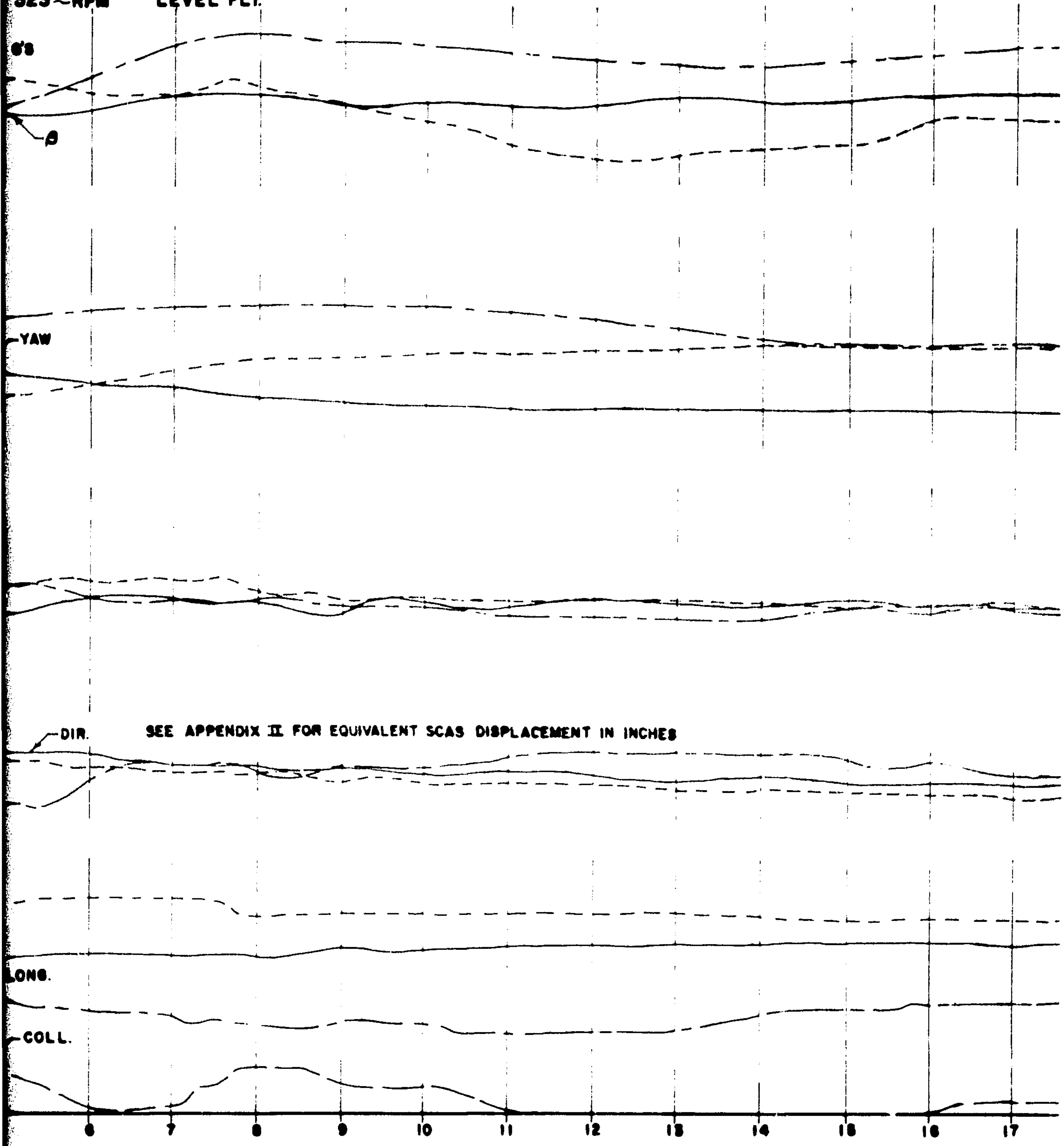
AIRSPEED	ALTITUDE (Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
149~KCAS	4290~FT	9300~LB	193(FWD)~IN.	323~RPM	LEVEL FLT.



1

GINE FAILURE

INGS REMOVED
OTOR SPEED FLT. CONDITION
323~RPM LEVEL FLT.

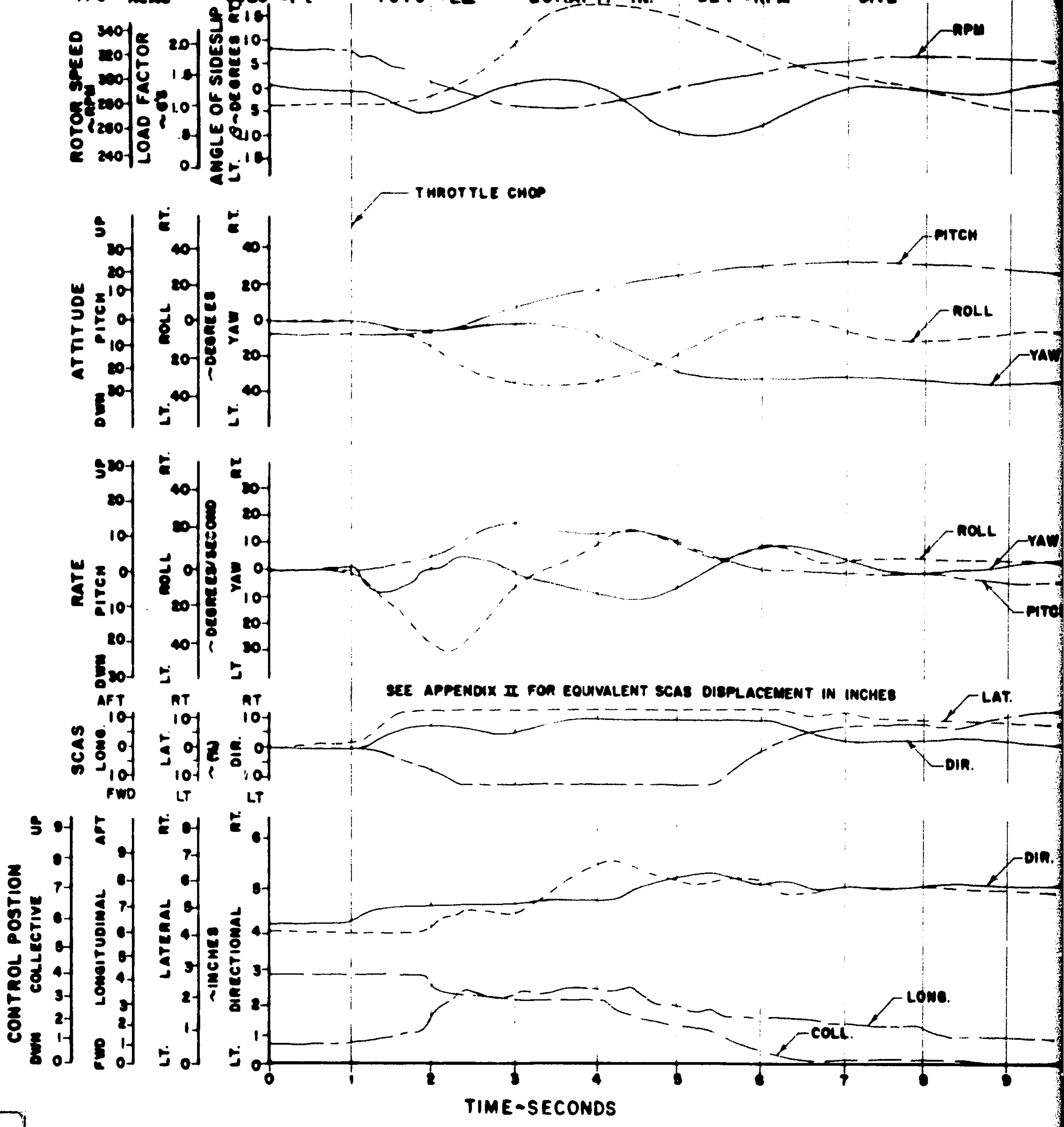


SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

2

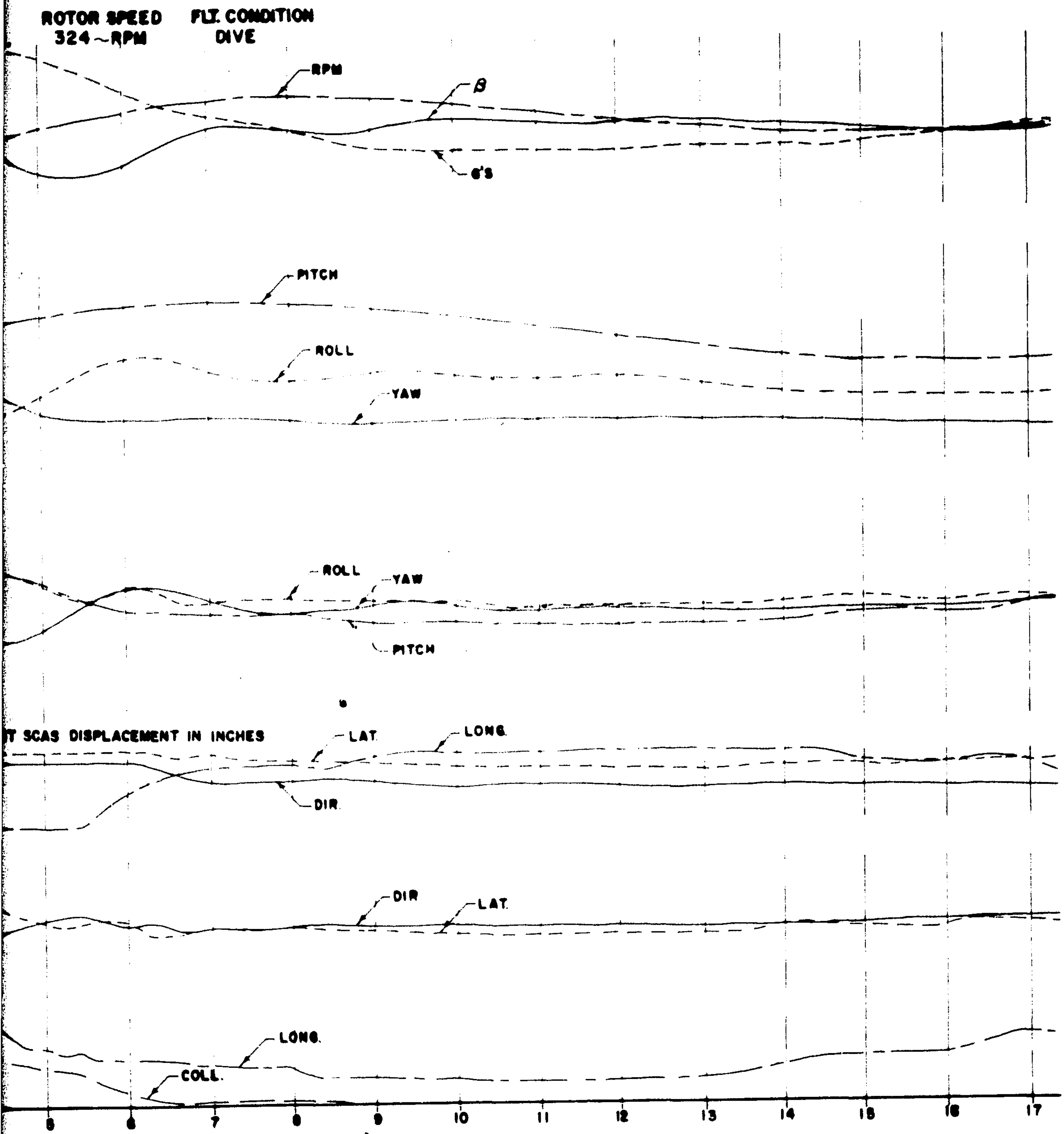
FIGURE NO. 300
AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE
AH-1G USA S/N 6615247
CLEAN CONFIGURATION

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
170~KCAS	5020~FT	7070~LB	201(AFT)~IN.	324~RPM	DIVE



1

NGINE FAILURE



2

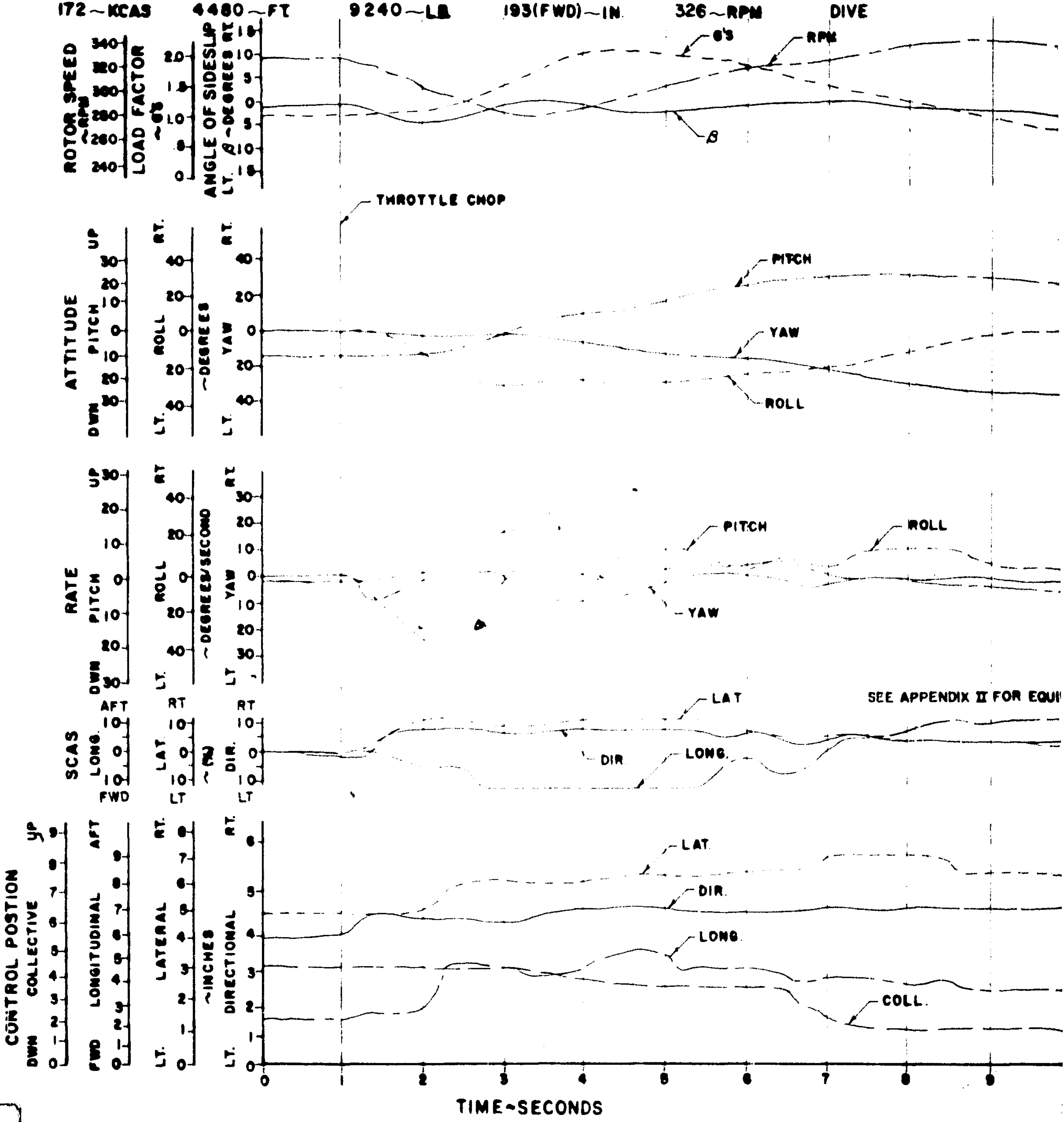
FIGURE NO. 301

AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE

AH-1G USA S/N 6615247

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED	ALTITUDE(Hp)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
172 ~ KCAS	4480 ~ FT	9240 ~ LB	193(FWD) ~ IN.	326 ~ RPM	DIVE



). 301

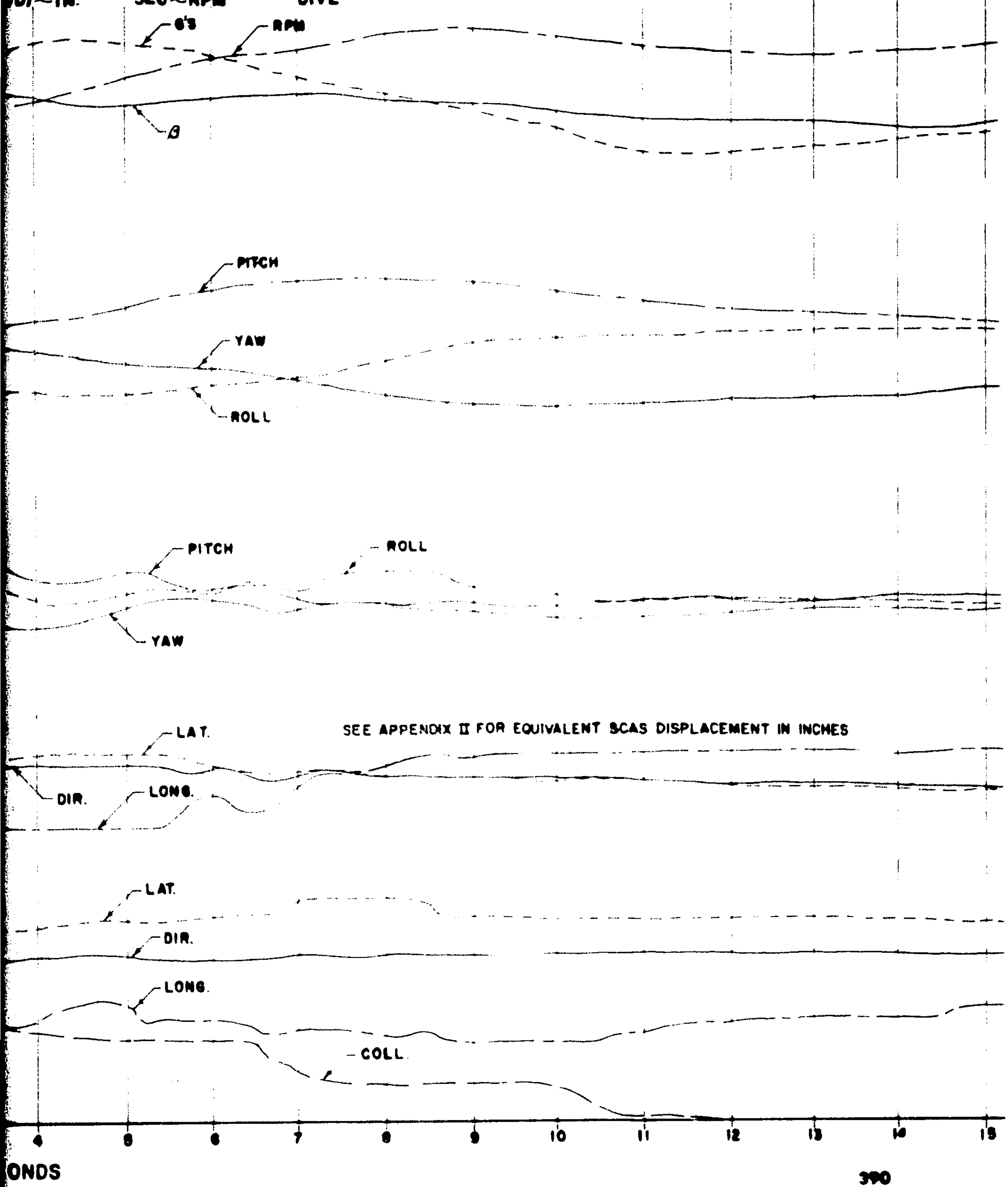
LATED ENGINE FAILURE

5247

KET POD FAIRINGS REMOVED

. C.G. ROTOR SPEED FLT. CONDITION

D)~IN. 326~RPM DIVE



SEE APPENDIX II FOR EQUIVALENT SCAS DISPLACEMENT IN INCHES

2

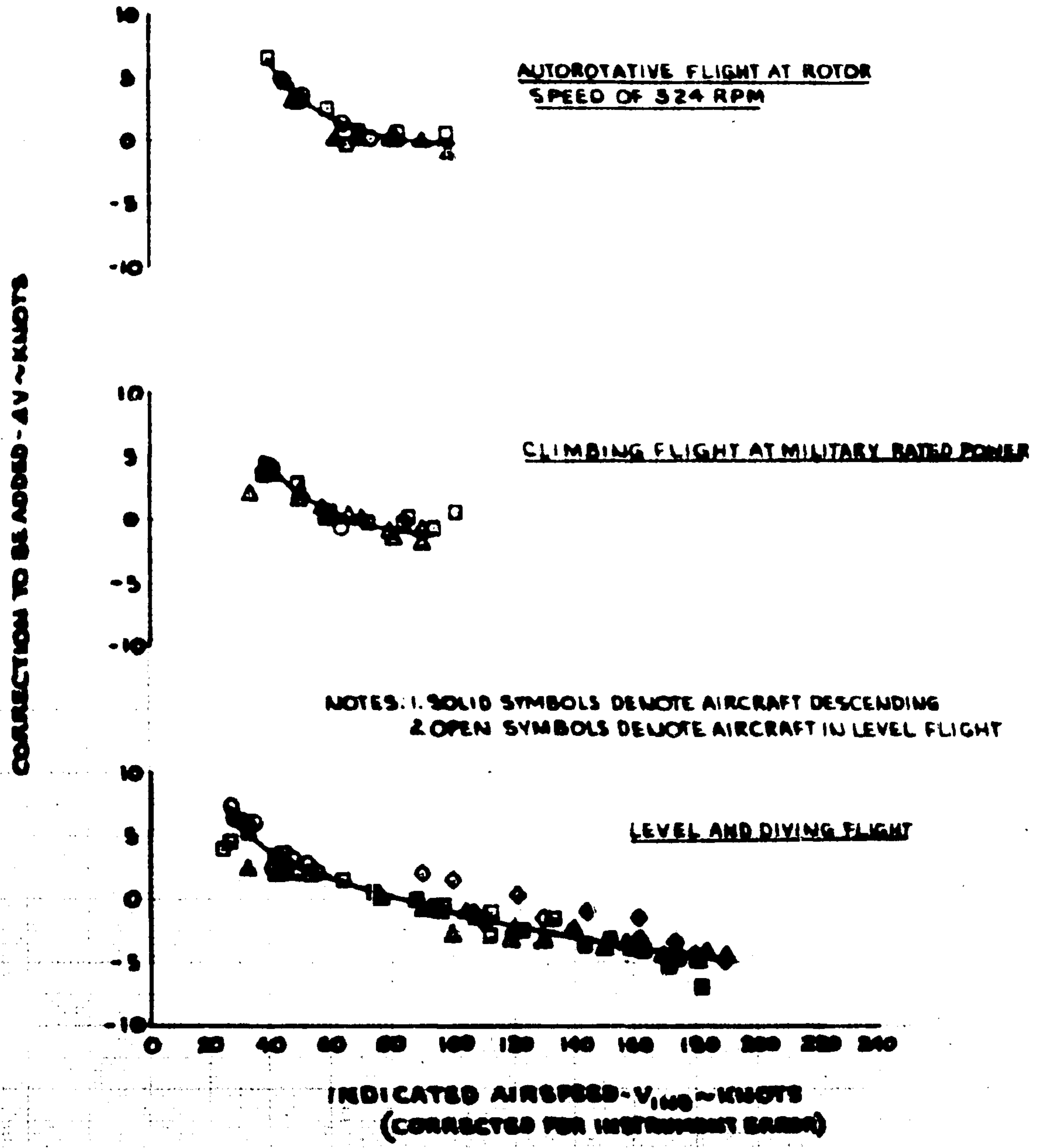
FIGURE NO. 302

AIRSPEED CALIBRATION

AH-1G T53-L-13

STANDARD AIRSPEED SYSTEM

SYM	AIRCRAFT S/N	CONFIGURATION	GRWT ~ LB	DENSITY ALT. ~ FT.	ROTOR SPEED ~ RPM	LONG. C.G. ~ IN.	SOURCE OF DATA
○	615247	CLEAN	7810	5500	324	191.7 (FWD)	PHASE D TEST PROG.
□	615246	BASIC	8280	5160	324	193.3 (FWD)	REF. 2 APP. I
△	615248	BASIC	8170	4920	324	194.2 (MID)	REF. 4 APP. I
◇	615283	OUTBD ALTERNATE	8290	3100	324	199.1 (AFT)	REF. 5 APP. I



NOTES: 1. SOLID SYMBOLS DENOTE AIRCRAFT DESCENDING
2. OPEN SYMBOLS DENOTE AIRCRAFT IN LEVEL FLIGHT

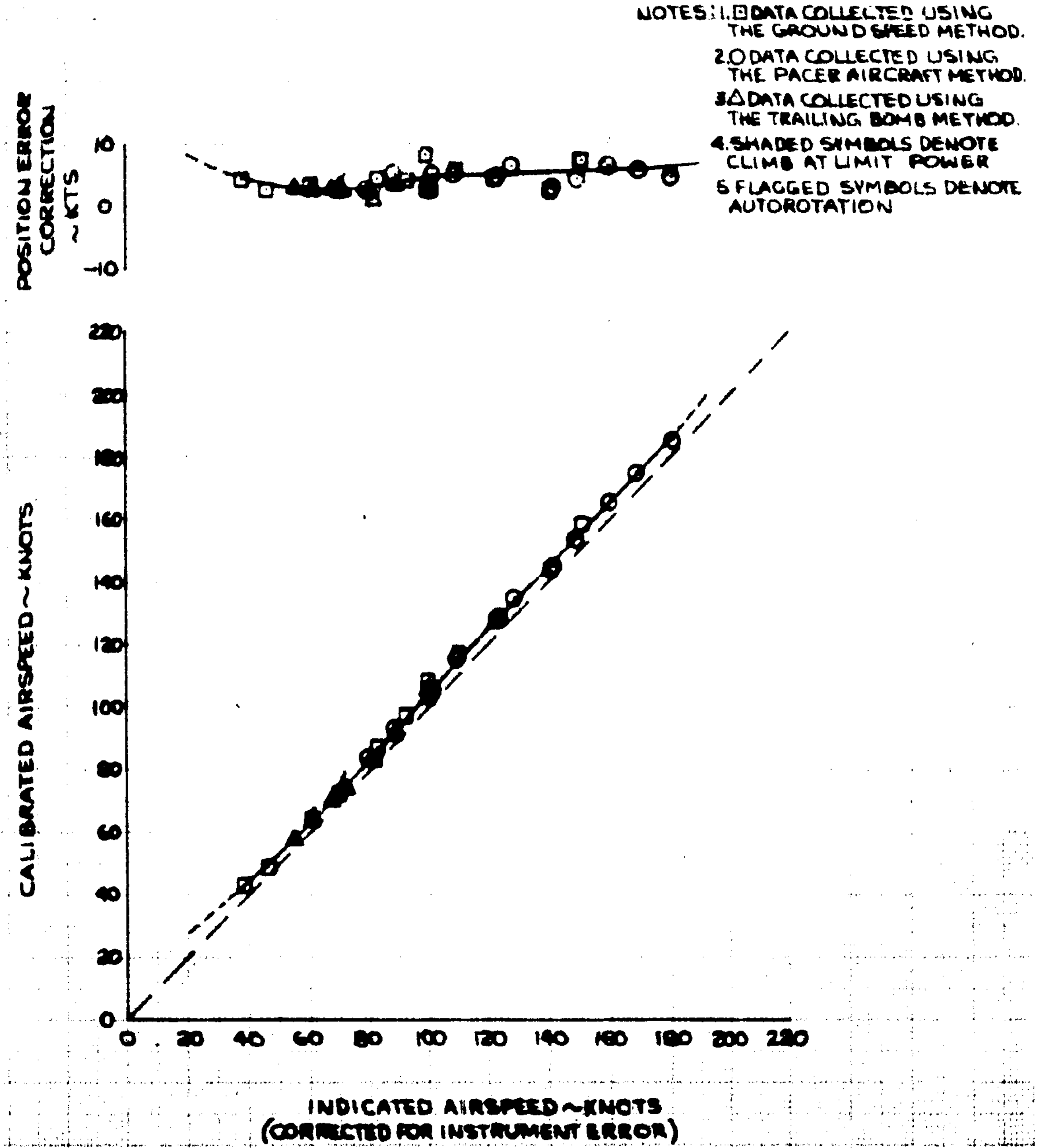
FIGURE NO 303

AIRSPEED CALIBRATION

AH-1G USA S/N615247

BOOM SYSTEM

SYM.	GROSS WEIGHT ~LBS.	C.G. STATION ~IN.	DENSITY ALTITUDE ~FT.	ROTOR SPEED ~RPM	CONFIGURATION
□	7265	1935	1020 FT	324	CLEAN
○	7176	193.5	5300 FT.	324	CLEAN
△	7200	193.5	6000 FT	324	CLEAN

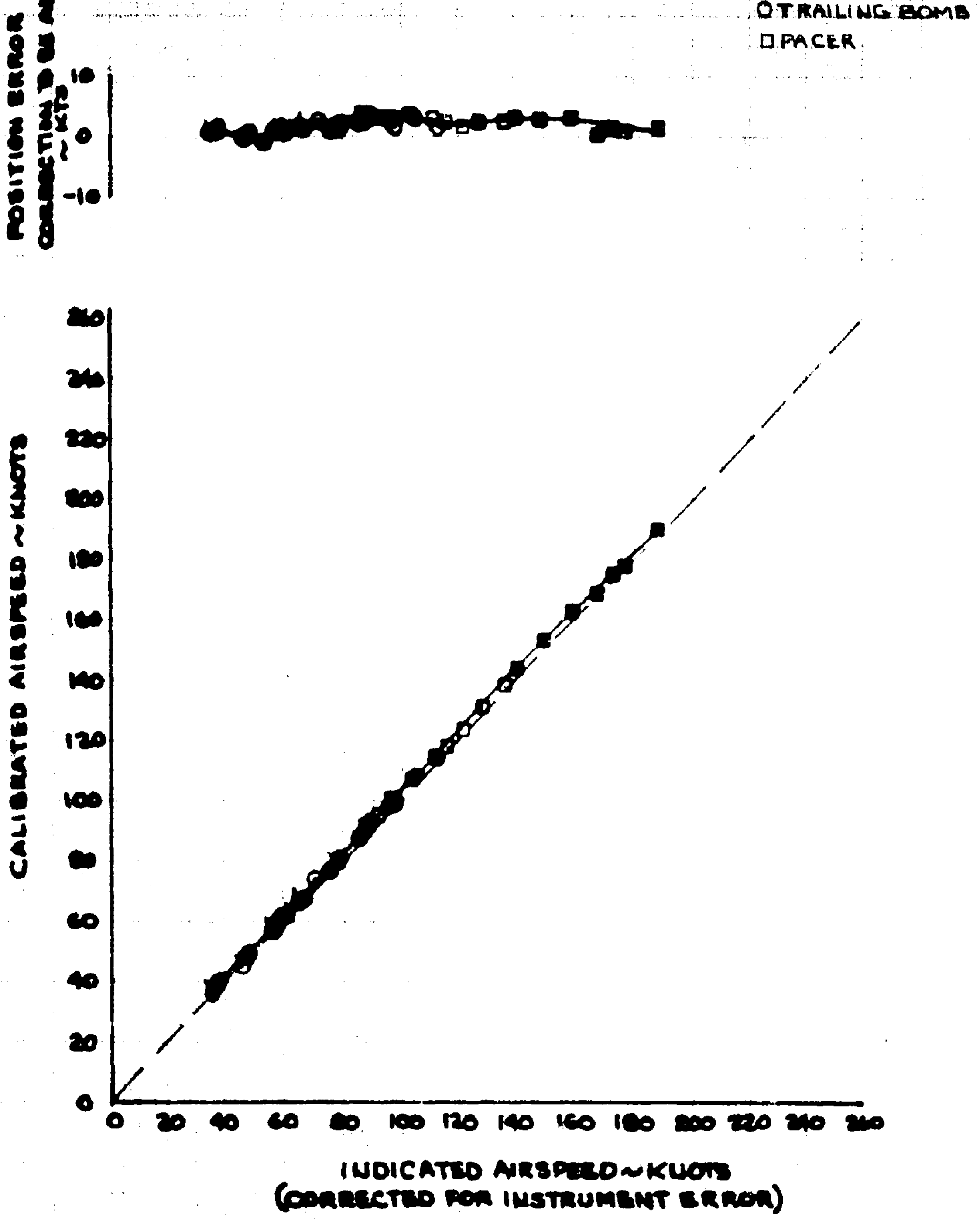


NOTES:
1. □ DATA COLLECTED USING THE GROUND SPEED METHOD.
2. ○ DATA COLLECTED USING THE PACER AIRCRAFT METHOD.
3. △ DATA COLLECTED USING THE TRAILING BOMB METHOD.
4. SHADED SYMBOLS DENOTE CLIMB AT LIMIT POWER
5. FLAGGED SYMBOLS DENOTE AUTOROTATION

FIGURE NO. 304
AIRSPEED CALIBRATION
AH-1G USA S/N 715695

SYM.	GROSS WEIGHT ~ LBS.	C.G. STATION ~ IN.	DENSITY ALTITUDE ~ FT.	ROTOR SPEED ~ RPM	CONFIGURATION
○	[illegible]	191.5	4650	324.0	CLEAN
□	[illegible]	191.4	7250	324.0	CLEAN

NOTE: OPEN SYMBOLS DENOTE LEVEL FLIGHT; SOLID SYMBOLS DENOTE AUTO-ROTATIONAL DESCENT; FLAGGED SYMBOLS DENOTE CLIMBS; & CROSS SYMBOLS DENOTE DIVES.



APPENDIX VIII. TEST CONDITIONS

Table 1. Static Trim Stability.

Rotor speed = 324 rpm

Configuration	Flight Condition	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)
Clean[1]	Level Flight and Dive	8665	3080	199.8 (aft)
Clean	Level Flight and Dive	8450	4540	200.8 (aft)
		8470	4980	191.4 (fwd)
		8420	14100	200.9 (aft)
	Climb	8170	5470	201.1 (aft)
		8240	5000	191.2 (fwd)
	Auto-rotation	8170	4950	201.1 (aft)
		8290	5000	191.2 (fwd)
Outboard Alternate[2]	Level Flight and Dive	8500	3720	200.8 (aft)
		9430	6480	200.0 (aft)
		8410	13800	200.9 (aft)
Heavy scout[2]	Level Flight and Dive	8370	4040	201.0 (aft)
		9555	3500	200.0 (aft)
Heavy hog[2]	Level Flight and Dive	8530	5360	200.8 (aft)
		9580	4440	200.0 (aft)
		8620	4960	191.8 (fwd)
		8600	14760	200.7 (aft)
	Climb	9320	5470	200.2 (aft)
		8280	6000	201.0 (aft)
		8350	5650	191.2 (fwd)
	Auto-rotation	9290	4950	200.1 (aft)
		8310	5920	201.0 (aft)
		8340	5770	191.5 (fwd)

[1] Landing gear cross-tube fairings removed.
[2] Rocket pod fairings removed

Table 2. Static Longitudinal Collective Fixed Stability.

Rotor speed = 324 rpm				
Configuration	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean[1]	8490	4630	199.7 (aft)	$0.8V_H$, V_H, V_L
Clean	8460	5310	200.8 (aft)	V for min R/D
Clean	8100	6750	191.0 (fwd)	V for R/C
Heavy hog[2]	8100	5730	201.1 (aft)	V for min pwr rq'd
Heavy hog[2]	8220	5940	191.1 (fwd)	$0.8V_H$,V_H and V_L
Outboard Alternate[2]	8190	4970	201.0 (aft)	V for min pwr rq'd
Heavy scout[2]	8015	5320	201.0 (aft)	$0.8V_H$,V_H, and V_L
Outboard Alternate[2]	9010	5730	200.4 (aft)	
Heavy scout[2]	9240	5320	200.2 (aft)	
Heavy hog[2]	9140	5310	200.3 (aft)	
Clean	8150	15420	201.1 (aft)	V for min pwr rq'd
Outboard Alternate[2]	8180	14650	201.7 (aft)	V_H
Heavy hog[2]	8570	14640	200.7 (aft)	V_L

[1] Landing gear cross-tube fairings removed.
[2] Rocket pod fairings removed.

Table 3. Static Lateral-Directional Stability.

Rotor speed = 324 rpm				
Configuration	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean[1]	8770	3700	200.6 (aft)	$0.8V_H, V_H, V_L$
Clean	8290	5400	199.2 (aft)	V for min R/L
Outboard Alternate[2]	8680	6080	200.7 (aft)	V for min R/D
Heavy scout[2]	8330	6750	201.0 (aft)	V for min pwr rq'd
Heavy hog[2]	8310	6080	200.9 (aft)	$0.8V_H$
Heavy hog[2]	8080	6070	191.1 (fwd)	V_H and V_L
Heavy hog[2]	9465	5170	200.0 (aft)	
Heavy hog[2]	7745	4730	201.3 (aft)	
Heavy hog[2]	8510	14640	200.8 (aft)	V for min pwr rq'd V_H and V_L

[1] Landing gear cross-tube fairings removed.
[2] Rocket pod fairings removed.

Table 4. Longitudinal Dynamic Stability.

	Control Inputs Forward and Aft Rotor speed = 324 rpm				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Stability and Control Augmentation System	Trim Airspeeds
Clean	7660	5000	190.5 (fwd)	ON and OFF	V for min pwr rq'd
Clean	7540	4000	201 (aft)	ON and OFF	V for max R/C V for min R/D $0.8V_H$, V_H and V_L
Heavy hog[1]	7740	4300	201 (aft)	ON and OFF	
Heavy hog[1]	9340	4400	200 (aft)	ON	V for min pwr rq'd 0.8 V_H,V_H,V for max A/C
				OFF	V_H, V for max R/C
Heavy scout[1]	9310	4500	200 (aft)	ON	V for max R/C $0.8V_H$,V_H, V_L
Heavy hog[1]	7730	15000	201 (aft)	ON and OFF	V for max R/L $0.8V_H$,V_H

[1] Rocket pod fairings removed.

Table 5. Lateral Dynamic Stability.

Inputs Right and Left

Rotor speed = 324 rpm

Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Stability and Control Augmentation System	Trim Airspeeds
Clean	7300	4100	201 (aft)	ON and OFF	V for min pwr rq'd
Heavy hog[1,2]	8360	4500	195 (mid)	ON and OFF	V for max R/C V for min R/D $0.8V_H, V_H, V_L$
Heavy hog[1,3]	8680	3600	195 (mid)	ON and OFF	
Heavy hog[1,2]	7620	3700	201 (aft)	ON and OFF	V for min pwr rq'd $0.8V_H, V_H, V_L$
Heavy hog[1,2]	7690	15060	201 (aft)	ON OFF	V for min pwr rqd $1.8V_H, V_L$ $0.8V_H, V_H$
Heavy scout[1,3]	9000	5000	200 (aft)	ON	$0.8V_H, V_H$
Clean[4]	8630	3700	199.5 (aft)	ON OFF	$0.8V_H, V_H, V_L$ V_H, V_L

[1] Rocket pod fairings removed.
[2] Rocket pods empty.
[3] Rocket pods loaded with rockets.
[4] Landing gear cross-tube fairings removed.

Table 6. Directional Dynamic Stability.

Control Inputs Left and Right

Rotor speed = 324 rpm

Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Stability and Control Augmentation System	Trim Airspeeds
Clean	7210	4200	201 (aft)	ON and OFF	V for min pwr rqd V for max R/C V for min R/D $0.8V_H, V_H, V_L$
Heavy hog[1,2]	7490	5000	201 (aft)	ON and OFF	V for max R/C V for max R/D $0.8V_H, V_L$
Heavy hog[1,3]	9180	4600	200 (aft)	ON OFF	V for min pwr rq'd $0.8V_H, V_H, V_L$ V_H, V_L
Heavy hog[1,2]	7620	15400	201 (aft)	ON OFF	V for min pwr rq'd $0.8V_H, V_H$ V_H
Clean[4]	8650	3700	199.5 (aft)	ON OFF	$0.8V_H, V_H, V_L$ $0.8V_H, V_H$

[1] Rocket pod fairings removed.
[2] Rocket pods empty.
[3] Rocket pods loaded with rockets.
[4] Landing gear cross-tube fairings removed.

Table 7. Longitudinal Controllability in Forward Flight.

Control Inputs Forward and Aft Rotor speed = 324 rpm				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean	6200	7610	190 (fwd)	V_{min}, $0.8V_H$, V_H, V_L V_{min}, R/D, V_{max}, R/C
Clean	5440	7780	201 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{min}, R/D, V_{max}R/C
Heavy scout[1]	5000	9500	200 (aft)	$0.8V_H$, V_H, V_L V_{max} R/C
Heavy hog[1]	5060	7910	201 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{min}, R/D, V_{max}, R/C
Heavy hog[1]	5470	9490	200 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{max}, R/C
Heavy hog[1]	5530	7840	201 (aft)	V_{min}, $0.8V_H$, V_H

[1] Rocket pod fairings not installed.

Table 8. Lateral Controllability in Forward Flight.

Control Inputs Right and Left

Rotor speed = 324 rpm

Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean	4270	7590	201 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{min}, R/D, V_{max}, R/C
Clean[1]	4070	7390	199.5 (aft)	$0.8V_H$, V_H, V_L
Heavy scout[2]	5000	9500	200 (aft)	$0.8V_H$, V_H, V_L,V_{max} R/C
Heavy hog[2,3]	5180	8580	195 (mid)	V_{min}, $0.8V_H$, V_H, V_L V_{min}, R/D, V_{max} R/C
Heavy hog[2,4]	4030	8830	195 (mid)	V_{min}, $0.8V_H$, V_H, V_L V_{min}, R/D, V_{max}, R/C
Heavy hog[2]	5270	9390	200 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{max}, R/C
Heavy hog[2]	5290	7800	201 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{max}, R/C, V_{min}, R/D
Heavy hog[2]	16150	7730	201 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{max}, R/C, V_{min}, R/D

[1] Landing gear cross-tube fairings removed.
[2] Rocket pod fairings not installed.
[3] All rocket pods empty.
[4] All rocket pods fully loaded (1634 lb).

Table 9. Directional Controllability in Forward Flight.

Control Inputs Right and Left Rotor speed = 324 rpm				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean	7480	5900	201 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{min} R/D, V_{max} R/C
Clean[1]	8680	4330	199.5 (aft)	$0.8V_H$, V_H, V_L
Heavy hog[2]	9280	6060	200 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{min} R/D, V_{max} R/C
Heavy hog[2]	7640	4650	201 (aft)	V_{min}, $0.8V_H$, V_H, V_L V_{min} R/D, V_{max} R/C
Heavy hog[2]	7640	16460	201 (aft)	V_{min}, $0.8V_H$, V_H

[1] Landing gear cross-tube fairings removed.
[2] Rocket pod fairings not installed.

Table 10. Longitudinal Controllability in a Hover.

Control Inputs Forward and Aft				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
Clean	7670	610	196 (mid)	324
	7590	4460	195 (mid)	323
	8635	Sea Level	195.5 (mid)	322
	7370	8550	196 (mid)	324
	8560	4850	195.5 (mid)	324.5
	7750	10320	200.0 (aft)	324
Heavy hog	7590	730	201 (aft)	324
	9000	750	200 (aft)	324

Table 11. Lateral Controllability in a Hover.

Control Inputs Right and Left				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
Clean	7400	550	195.5 (mid)	324
	7420	4460	196 (mid)	324.5
	8550	7420	195.5 (mid)	324
	8480	4850	195.5 (mid)	324.5
	7660	10320	196.0 (mid)	324
Heavy hog	7420	850	201 (aft)	324
	8600	-160	196.5 (mid)	322.5
	8600	480	198.0 (aft)	323
	8780	030	200.0 (aft)	322.5
	8980	770	200.0 (aft)	324

Table 12. Directional Controllability in a Hover

Control Inputs Right and Left				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
Clean	7170	560	195 (mid)	324
	7160	550	195 (mid)	313.5
	6980	570	195.5 (mid)	303.5
	7280	4580	195.5 (mid)	323
	7220	4580	195.5 (mid)	314.5
	7330	8550	195.5 (mid)	324
	8630	4790	195.5 (mid)	324.5
	7270	8550	195.0 (mid)	314.5
	8400	4850	195.5 (mid)	314.5
	7560	10320	195.5 (mid)	324
	7490	10320	195.5 (mid)	313.5
Heavy hog	7260	980	201 (aft)	324
	8460	-480	195.5 (mid)	323
	8600	060	200 (aft)	323
	8400	-490	196 (mid)	313.5
	8970	450	200.5 (aft)	324
	8770	Sea Level	200 (aft)	313.5

Table 13. Aircraft Reaction to Engine Failure.

Configuration	Gross Weight (lb)	Center of Gravity (in.)	Density Altitude (ft)
Clean	8500	Aft	5000, 10,000
Clean	8500	Fwd	5000, 10,000
Heavy hog	9500	Aft	5000
Heavy hog	9500	Fwd	5000
Clean[1]	7500	Aft	5000

[1] Tests conducted with landing gear cross-tube fairings installed and with them removed.

APPENDIX IX. SYMBOLS AND ABBREVIATIONS

Abbreviation	Definition	Unit
ALT	Altitude	foot
AVG	Average	--
COEFF	Coefficient	--
CG, cg	Center of gravity	--
COLL	Collective	--
COND	Condition	--
CONF	Configuration	--
CPS, cps	Cycles per second	--
DEG, deg	Degrees	degree
DESCRIPT	Description	--
DIR	Directional	--
DWN	Down	--
FLT	Flight	--
FT	Feet	foot
FS	Fuselage station	inch
FWD, fwd	Forward	--
GRWT, grwt	Gross weight	pound
HQRS	Handling qualities rating scale	--
HP	Horsepower	--
IFR	Instrument flight rules	--
IGE	In ground effect	--

Abbreviation	Definition	Unit
in.	Inch, inches	inch
KCAS	Knots calibrated airspeed	knot
KIAS	Knots indicated airspeed	knot
KTAS	Knots true airspeed	knot
LB, lb	Pound, pounds	pound
LAT	Lateral	--
LEU	Leading edge Up	--
LN	Natural log	--
LT	Left	--
LONG.	Longitudinal	--
MAX, max	Maximum	--
MIN, min	Minimum	--
ND	Nose down	--
NU	Nose up	--
NO., no.	Number	--
PSI, psi	Pound(s) per square inch	$lb/in.^2$
REF, ref	Reference, referred	--
RPM, rpm	Revolution(s) per minute	rpm
RT	Right	--
SCAS	Stability and control augmentation system	--
SEC, sec	Second	--
SHP, shp	Shaft horsepower	--
SL	Sea level	--

Abbreviation	Definition	Unit
S/N	Serial number	--
STD, std	Standard	--
SYM	Symbol	--

Symbol	Definition	Unit
A	Rotor disc area	ft^2
C_T	Thrust coefficient	--
F_{LAT}	Lateral control force	pound
F_{LONG}	Longitudinal control force	pound
F_{DIR}	Directional control force	pound
H_D	Density altitude	foot
H_P	Pressure altitude	foot
i_t	Horizontal stabilizer position	degree
R	Rotor radius	foot
R/C	Rate of climb	ft/min
R/D	Rate of descent	ft/min
V_{cal}	Calibrated airspeed	knot
V_H	Maximum airspeed for level flight	knot
V_L	Limit airspeed	knot
%	Percent	--
α	Angle of attack	degree
β	Angle of sideslip	degree
δ_{COLL}	Collective control position	inch

Symbol	Definition	Unit
δ_{DIR}	Directional control position	inch
δ_{LAT}	Lateral cyclic control position	inch
δ_{LONG}	Longitudinal cyclic control position	inch
ζ	Damping ratio	--
θ	Angle of pitch	degree
$\dot{\theta}$	Pitch rate	deg/sec
$\ddot{\theta}$	Pitch acceleration	deg/sec^2
ρ	Air mass density	$slug/ft^3$
ϕ	Angle of bank	degree
$\dot{\phi}$	Roll rate	deg/sec
$\ddot{\phi}$	Roll acceleration	deg/sec^2
Ω	Rotor rotational frequency	rad/sec
ψ	Yaw attitude	degree
$\dot{\psi}$	Yaw rate	deg/sec
$\ddot{\psi}$	Yaw acceleration	deg/sec^2
ω_d	Damped natural frequency	cycle/sec
ω_n	Undamped natural frequency	cycle/sec
P	Period of oscillation	second
X	Amplitude	inch
m	Number of half cycles	--
<	Less than	--
>	Greater than	--

Subscript	Definition
a	Ambient
std, s	Standard
t	Test

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13. ABSTRACT

The Phase D, Part 1 airworthiness and qualification handling qualities tests of the AH-1G helicopter were conducted at Edwards Air Force Base, California, and auxiliary test sites during the period 13 June 1968 through 29 July 1969. Handling qualities were quantitatively evaluated to determine model specification compliance and to obtain mission suitability information for inclusion in technical manuals and other publications. The AH-1G met all contractual requirements of MIL-H-8501A except for paragraphs 3.2.4 (cyclic force gradients), 3.2.7 (cyclic breakout forces), 3.5.4.1 (takeoff and landing in winds), 3.5.5 (autorotational entry) and 3.5.5.1 (aircraft reaction to engine failure). Tests were not conducted to verify compliance with paragraphs 3.5.4.3 (autorotational landings), 3.5.4.4 (autorotational landings) and 3.5.4.5 (autorotational landing with flotation gear) of MIL-H-8501A. By contractual agreement, the handling qualities requirements presented in paragraphs 3.3 (directional and lateral handling qualities) and 3.6 (handling qualities during instrument flight) of MIL-H-8501A were not applicable. The handling qualities of the AH-1G are acceptable throughout the flight envelope except for the four deficiencies for which correction is mandatory for mission accomplishment: excessive cyclic control breakout forces; inadequate directional control; inability to achieve maximum tail rotor blade angle (19 deg) when full left directional control is applied for all conditions with the present directional control/yaw SCAS geometry; and excessive tail rotor horsepower required for hovering and translational flight. In addition, there were five shortcomings for which corrective action is desirable.

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